ENHANCING COMPUTER ANIMATION ON THE INTEREST OF TECHNICAL COLLEGE STUDENTS IN BASIC ELECTRICITY IN NIGERIA

BY

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Abstract:

The effect of 3D computer animation and 2D vector-based animation on the interest of technical college students in basic electricity is the main concern of the study. Quasi- experimental research design was adopted for this study, precisely, pre-test, post-test non equivalent group design which involved groups of students in their intact classes. The population for the study was 195 year II Basic electricity (BE) students in the Technical Colleges in Niger State. Two research questions and three null hypotheses tested at 0.05 level of significance guided the study. The instruments used for data collection was the Basic electricity Interest Inventory (BEII). The BEII, training manual, 3D computer animation and 2D vector-based animation lesson plans were all subjected to face and content validation by three experts. The trial test for determining the coefficient of internal consistency of the BEII items was carried out using Cronbach Alpha. The reliability coefficient computed for the BEII was 1.85 Mean was used to answer the research questions, while ANCOVA was employed to test the hypotheses. The study revealed that both 3D computer animation and 2D vector-based animation enhanced students' interest but that the 3D computer animation instructional technique was more effective in stimulating students' interest than the 2D vector-based animation technique in basic electricity. The study also revealed that there was effect of gender on students' interest in basic electricity favouring boys. There were no interaction effects of treatments and gender on interest of technical college students in basic electricity. Thus the effectiveness of 3D computer animation instructional technique on students' interest in basic electricity was independent of gender. It was thereafter recommended that Ministries of Education, National Business and Technical Examination Board (NABTEB) and NBTE should organize workshops, seminars and conferences for technical teachers on regular basis to enlighten and improve their knowledge and skills on the use of the guided computer animation instructional techniques among others.

Key words: *interest, Technical College, students, basic electricity, 3D computer animation, 2D vector-based animation.*

Introduction

Teaching methods are ways used by teachers to create learning environment and to specify the nature of the activity in which the teacher and the learner will be involved during instructional delivery process. It is primarily a description of learning objective oriented activities and the flow of information between the teacher and the learner(s), Hombly (2001) categorized teaching method into two approaches; namely; student centered approach and teacher centered-approach.

Interest is a persisting tendency to pay attention and enjoy some activities. It is viewed as emotionally oriented behavioural trait which determines trade students' enthusiasm in tackling educational programmes or other activities (Olayemi, 2014). Galton (2005) described interest as that attraction which forces or compels a student to respond to a particular stimulus. To some others, it is a phenomenon that emerges from an individual's interaction with the environment (Agboola & Olayede, 2007). This postulate is also the starting point of an educational theory of interest (Uzuegbunam, 2009), also called 'person-object theory of interest' (Parent, 2011). According to this theory, interests evolve out of manifold relationships between persons and objects in social and institutional settings.
An interest represents a specific and distinguished relationship between a person and an object. Thus, such object can be concrete, topical, subject-matter or abstract ideas, i.e. a certain part of the cognitively represented environment. Again, such interest may also be for short or long periods of time. Research in education can assist to better understand how interest in vocational education in general and basic electricity in particular is developed, how it expands, disappears and how it can be sustained and promoted. One important role of the teacher is to order and structure the learning environment and use of motivational techniques to secure and sustain the attention and interest of the learners (Kalu, 2010). Interest does not come as a result of force, it is as a result of an individual`s eagerness to learn. Therefore, interest is an affective behaviour that can be aroused and sustained in teaching and learning through appropriate teaching strategy**.** Students' interest and achievement in any learning activity is sustained by the active involvement of the learner in all aspects of the learning process. Ogbu (2010) emphasized that unless the teacher stimulates students' interest in learning, students' achievement will be minimal. Hence, it is essential that technical/vocational education teachers use teaching methods such as computer animation technique which ensures students' active involvement in learning, stimulate and arouse interest and at the same time improve performance in a chosen trade of study.

Basic Electricity is the fundamental subject of study in the fields of electricity and electronics at all levels of Education (Ogbu, 2010). It deals with all the fundamental issues of current-electricity, static-electricity and electronics as studied in schools and colleges. Basic Electricity is so important that students academic performance in it is so crucial and major determinant of their performance in other electronics/electricity (E/E) subjects. This demands competence, efficiency and effectiveness on the part of the teacher in other for students to achieve maximally in Basic electricity.
The computer animation method has been found to be most suitable for the teaching of science, technical and engineering oriented courses by different scholars than the traditional teaching method (Parent, 2011).

There exist different techniques of the computer animation, the differences between these techniques rest upon the mode of administration of the teaching method. Galton (2005) opined that the differences among the techniques lie in the level of involvement of the teachers. These techniques include Traditional animation, 2D Vector-based animation, 3D computer animation, Motion graphics, Stop motion. Traditional animation, sometimes referred to as cel animation, is one of the older forms of animation, in it the animator draws every frame to create the animation sequence. Just like they used to do in the old days of Disney. If you've ever had one of those flip-books when you were a kid, you'll know what it mean. Sequential drawings screened quickly one after another create the illusion of movement. 2D Animation (Vector-Based) This style has become very popular in the last decade due to the accessibility of the technology and the growth of online video. Flash is cheap and easy to use, as are other vector-based animation programs. 3D (CGI, Computer Animation) animation works in a completely different way than traditional animation. They both require an understanding of the same principles of movement and composition, but the technical skill set is very different for each task. while

traditional animation requires you to be an amazing draftsman, computer animation doesn't. 3D animation is more similar to playing with puppets rather than drawing. Motion Graphics (Typography, Animated Logos) While still considered a form of animation, motion graphics is quite different from the other types of animation. Unlike the other types it is not character or story driven. It's the art of creatively moving graphic elements or texts, usually for commercial or promotional purposes. Stop Motion (Claymation, Cut-Outs) Stop motion is done by taking a photo of an object, and then moving it just a little bit and taking another photo. The process is repeated and when the photos are played back one after another they give the illusion of movement. This is similar to traditional animation but it uses real life materials instead of drawings.

Basic electricityis one of the trade courses offered in technical colleges in Nigeria. Basic electricity are involved with the servicing, maintenance and repair of electrical work. The work is wide ranging and includes routine servicing in accordance with manufacturers' recommended procedures. The goal of basic electricity, according to the National Board for Technical Education NBTE (2014) is to produce skilled craftsmen with good knowledge of the working principles of electricity, the techniques and safety practices involve in its maintenance. Basic electricity programme in technical colleges are offered at levels leading to the award of National Technical Certificate (NTC) and Advanced National Technical Certificate (ANTC) for craftsmen and master craftsmen respectively (Federal Government of Nigeria, 2013)

In order to achieve the objective of effective training of competent basic electricity, government at both the federal and state levels expended huge amount of money on the procurement of equipment for use in the technical colleges. In the same vein, such effort like curriculum review, policy shift, re-training, and production of technical college teachers by the government to ensure qualitative education at the technical colleges and bring about high quality products both in academics and for employment have not yielded much dividend. There have been persistent reports of high rate of failure among graduates of the Technical Colleges (FGN, 2013). Also, FGN (2015) in her reports on technical colleges revealed that students in technical colleges are always put-off or not been interested in vocational education because of the un-motivating and un-challenging methods and approach used by their teachers. Basic electricity is an integral part of vocational and technical education, in order to facilitate teaching and learning, interest of the students; most especially as it affect gender is a relevant factor.

Gender differences in scientific interest depend to a large degree on the domains. There are well documented evidences that female turn away from such science courses like physics and chemistry than male students during schooling (Hardman, Smith and Wall, 2003). Although recent studies have also indicated that the differences between girls and boys in the area of performance and that of interest in the sciences are now only very minimal (Strickland, 2004) Thus the inter play of gender in the interest of basic electricity students when exposed to computer animation is also worthy of investigating.

Research Questions

The following research questions were possed to guide this study:

1. What is the effect of 3D computer animation and 2D vector-based animation on students' interest in studying basic electricity?
2. What is the effect of Gender on the interest of students (male and female) when taught basic electricity with the 3D computer animation and 2D vector-based animation?

Hypotheses

The following null hypotheses were formulated to guide the study and will be tested at .05 level of significance:

HO1There will be no significant difference between the effect of treatments (3D computer animation and 2D vector-based animation) on students mean interest scores in BE interest inventory.

HO2: There will be no significant difference between the effect of gender (male and female) on students mean interest scores in BE interest inventory.

HO3: There will be no significant interaction effect of treatments given to students taught with 3D computer animation and 2D vector-based animationand their gender with respect to their mean scores on the interest inventory

Methodology

quasi-experimental design with a pre-test and post- non-equivalent comparison group design was adopted. This design was considered suitable to conduct this study because intact classes (non-randomized groups) were assigned to the two different computer animation as there was no plan to disrupt the schools' calendar.

The study was carried out in Niger State, Nigeria. The sample size for this study was all the 195 year II basic electricity students in the four technical colleges offering Basic electricity in Niger State. These comprised 160 male and 35 female students. The reason for choosing year II classes is that the students have undergone the curriculum of the trade in their year I and they could respond to the test items. Secondly, the major practical topics in basic electricity curriculum are in the second year. The simple random sampling technique was adopted for randomly assigning the four colleges that offers basic electricity to both experimental groups (3D computer animation and 2D vector-based animation) in the study. The four technical colleges offering BE and their corresponding student population are Government Technical College (GTC), Minna (53); Government Technical College (GTC), Kontagora (41); Government Technical College (GTC), New-Bussa (39); Government Technical College Eyagi(GTCE), Bida (62). Thus 94 of the subjects were assigned to 3D computer animation (GTC Minna and GTC Kontagora) while 101 subjects were assigned to 2D (GTC New-Bussa and GTCEyagi, Bida).

The instrument used for data collection in this study was the Basic electricity Interest Inventory (BEII). The Basic electricity Interest Inventory (BEII) was developed by the researcher for the purpose of testing students' interest in basic electricity. The face and content validities were determined by experts in Basic electricity trade.

The experts were specifically requested to examine the BEII items with respect to the extent to which the statements in the BEII assess interest in the units of study. The suitability of the language used in the BEII with respect to the students' level of study and the extent of relationship between the BEII items and the student experiences in units of study. Following the face and content validation, the items were reviewed based on their comments, and thirty statements made up of 15 positive and 15 negative items were finally chosen to constitute the BEII. Thus Section A of the questionnaire contains items pertaining to the respondents' Bio data while section B contains the list of the thirty items based on five-point Likert scale of Strongly Agree (SA), Agree (A), Undecided (UD), Disagree (D) and Strongly Disagree (SD). Students are to respond to the items according to the level of agreement with each of them

The 3D computer animation and 2D vector-based animation technique lesson plans were also developed by the researchers for the use of teaching the two experimental groups. Each of the lesson plans has the following computer animation elements built into it. Each 3D computer animation and 2D vector-based animation lesson plan indicated among others, the lesson topic, specific objectives, entry behaviour, instructional materials and the instructional procedure. The instructional procedure showed details of the steps, content development, students` and teachers` activities. The lesson plans were also validated by three experts in the Industrial and Technology Education, Federal University Technology, Minna. The experts were specifically requested to examine the extent to which the lesson plans conform to the theoretical basis of computer animation method. Also, two basic electricity teachers took part in the validation of the lesson plans. The teachers were specifically requested to examine the lesson plans with respect to the extent towhich:

1. The lessons covered the units of study
2. The lesson objectives were clearly stated
3. The objectives were appropriate for the students' level of study
4. Appropriate instructional materials were specified.
5. The evaluation questions were intimately related to the contents and lesson objectives. The comments of both the experts and teachers were later used in rewriting the lesson plans.

Cronbach Alpha was used to determine the internal consistency of the Basic electricity Interest Inventory items. The BEII instrument was administered on 30 year II Basic electricity trade students in Government technical college Kaduna, an area which was not part of the study area. The reliability coefficient computed for the Basic electricity Interest Inventory was found to be 0.92. This formula

was considered appropriate due to the fact that composite scores of the students on the instrument were required and also that the formula is applicable to items that are not dichotomously scored such as the BEII

The following conditions were laid down to minimize experimental bias: (a) the same lesson topic was taught to both experimental groups: (b) the same achievement test was given to both groups at the same time in order to avoid experimental bias :(c) the students had no pre knowledge of their involvement in the experiment: (d) the researchers were not directly involved in the test administration.

All lesson plans used for the study was prepared by researchers in order to control invalidity that could be coursed by teacher variability.

A two –week intensive training was organized for the participating teacher by the researchers on the use of the 3D computer animation and 2D vector-based animation instructional techniques and their lesson plans

Each experimental group was taught for 8 weeks. Practical classes are always carried out once a week in all the schools used for the study. To this therefore, each of the experimental groups were taught for a totalofeightperiods.Thethirdphasewasthepost-testphase.Thephasealsolastedforoneweek

The data obtained from the students' scores were analyzed using mean for answering research questions and analysis of covariance (ANCOVA) to test the hypotheses of no significant difference

Result

The results of data analysed in this study are as follows

Research Question 1

What is the effect of 3D computer animation and 2D vector-based animation on students' interest in studying basic electricity?

To answer the research question 3, the pre–test and post–test mean values were determined in respect of 3D computer animation and 2D vector-based animation. The results are presented in table 3

Table 1 - *Mean of Interest Inventory Scores of BE students taught with 3D computer animation and 2D vector-based animation*

Test	**Computer animation**			
	3D Computer Animation		**2D Vector-based Animation**	
	N	***Mean***	**n**	***Mean***
Pre-test	9	97.98	10	99.21
Post-test	9	136.53	10	136.34
Mean gain score		**38.55**		**37.13**

Table 1 shows that the treatment group taught basic electricity with 3D computer animation technique had a mean interest score of 97.98 in the pretest and a mean interest score of 136.53 in the posttest making a posttest mean gain in the treatment group taught with 3D computer animation to be 38.55. The treatment group taught basic electricity with 2Dvector-based animation technique had a mean interest score of 99.21 in the pretest and a posttest mean of 136.34 with a posttest mean gain of 37.13. With these results, both 3D computer animation technique and 2D vector-based computer animation technique are effective in stimulating students' interest in basic electricity but the effect of 3D computer animation technique on students' interest in basic electricity is higher than the effect of 2Dvector-based animation technique.

Research Question 2

What is the effect of Gender on the interest of students (male and female) taught basic electricity with computer animation?

To answer the research question 2, the pre–test and post–test mean values of male and female students were determined in respect of 3D computer animation and 2D vector-basedanimation. The results are presented in table 2

Table 2 - Mean of Interest Inventory scores of BE students taught with Computer animation

Gender	Computer animation							
	3D Computer Animation				2D Vector-based Animation			
	n	Pretest	Posttest	*Mean Gain* $\overline{X}$	n	Pretest	Posttest	*Mean*
Male	74	98.28	136.86	38.58	86	99.04	136.48	37.44
Female	20	96.90	135.30	38.40	15	100.20	135.53	35.33

The data presented in Table 2 shows that male students taught basic electricity with 3D computer animation technique had a mean score of 98.28 in the pretest and a mean score of 136.86 in the posttest making a posttest mean gain in the male students taught with 3D computer animation technique to be 38.58. Meanwhile, female students taught basic electricity with 3D computer animation technique had a mean score of 96.90 in the pretest and a posttest mean of 135.30 with a posttest mean gain of 38.40 Also, male students taught with the2D vector-basedcomputer animationtechniquehadameanscoreof99.04inthepretestandameanscoreof136.48inthepposttest making a posttest mean gain in the male students taught with 2D vector-based animation technique to be 37.44 Meanwhile, female students taught basic electricity with 3D computer animation technique had a mean score of 100.20 in the pretest and a posttest mean of 135.53 with a posttest mean gain of 35.33. With these results male students taught basic electricity with 3Dcomputer animation had higher mean scores than female students in the Basic electricity Interest Inventory (BEII). Thus, there is an effect attributable to gender on the interest of students taught basic electricity with computer animation techniques.

Hypotheses

HO1: There will be no significant difference between the effect of treatments (3D computer animation and 2D vector-based animation) on students mean interest scores in BE interest inventory

HO2: There will be no significant difference between the effect of gender (male and female) on students mean interest scores in BE interestinventory

HO3: There will be no significant interaction effect of treatments given to students taught with computer animation techniques and their gender with respect to their mean scores on the interestinventory

Table 3 - Summary of Analysis of Covariance (ANCOVA) for Test of Significance of Three Effects: Treatments Gender and Interaction of Treatment and Gender on Students' Interest in BE

Source of Variation	Sum of Squares	df	Mean Square	F	Sig of F
Covariates	8.83	1	8.83	1.28	.26
Pre-test	8.83	1	8.83	1.28	.26
Effects	44.17	2	22.08	3.20	.04
Treatment	.50	1	.50	.07	.79
Gender	44.14	1	44.14	6.40	.01
2-way Interactions	2.14	1	2.14	.31	.58

Treatment*Gender	2.14	1	2.14	.31	.58
Explained	60.61	4	15.15	2.20	.07
Residual	1311.21	190	6.90		
TOTAL	1371.82	194	7.07		

***Significant at sig of F< .05**

Table 3 shows F-calculated for three effects: treatment, gender and interaction of treatment and gender on students' interest in basic electricity. The F-calculated value for treatment is .07 with a significance of F at .79 which is greater than .05. Hence, the null hypothesis of no significant difference between the effect of treatments (3D computer animation and 2D vector-based animation) on students' interest in basic electricity is upheld at .05 level of significance. The F-calculated for gender stood at 6.40 with a significance of F at.01 which is less than .05. The null-hypothesis is therefore rejected at .05 level of significance. With this result there is a significant effect of gender (male and female) on students' interest in basic electricity. The interaction effect of treatment and gender has F-calculated value of .31 with significance of F of .58 which is greater than .05. This result means that there is no significant interaction effect of treatments given to students taught basic electricity with computer animation and their gender with respect to their mean scores in the Interest Inventory.

Findings of the Study

The following findings emerged from the study based on the data collected and analyzed and hypotheses tested.

- There was no significant difference between the effect of treatments (3D computer animation and 2D vector-based animation) on students' interest in basic electricity.
- There was a significant effect of gender (male and female) on students' interest in basic electricity.
- There was no significant interaction effect of treatments given to students taught basic electricity with computer animation and their gender with respect to their mean scores in the Interest Inventory.

Discussion of findings

The data presented in Table 1 provided answer to research question one. Finding revealed that both 2D vector-based animation and 3Dcomputer animation are effective in improving students' interest in basic electricity but the effect of 3D computer animation technique on students' interest in basic electricity is higher than the effect of 2D vector-based animation. This finding indicates that 3D computer animation technique is more effective in 2D vector-based animation students' interest in basic electricity than the 2D vector-based animation technique. However, the Analysis of covariance of the treatments effects on interest presented in Table 3 showed that there was no significant difference between the effects of treatments (2Dvector-based animation and 3D computer animation) on students' interest in basic electricity. Thus, the difference between the 3D computer animation technique and 2D vector-based animation technique on students' interest in basic electricity was not found significant. The lack of differences between the groups may be because in both research groups the computer animation process involves practical work. Parent (2011) assumed that students' practical, outdoor or field work helped them develop responsibility and a sense of caring for the environment. This finding is in agreement with previous research that reports outdoor learning is popular with students (Eick and Reed, 2002), raises curiosity (Homby, 2001), and engenders fun (Oyelami, 2000). Although there was no overall significant difference between the groups, 3D computer animation students planned their project, and they were exposed to change and expressed anticipation (Agboola and Olayede, 2007), whereas 2D vector-based animation students were led by the teacher, thus they were less exposed to change, more passive than their 3D computer animation peers, and did not express feelings of anticipation. Without anticipation, there is often no disappointment and no surprise (Ogbu, 2010).

Furthermore, another salient finding from this study is that it was found that male students taught

basic electricity with Computer animation had higher mean scores than female students in the Basic Electricity Interest Inventory, revealing that there is an effect attributable to gender on the interest of students taught basic electricity with Computer animation. However, analysis of covariance of test of significant difference between the effect of gender on students' interest in basic electricity as presented in Table 3 showed that there was no significant difference between the effect of gender (male and female) on students' interest in basic electricity. This means that the observed difference in the mean interest scores of male and female students was not statistically significant. Interestingly, providing of opportunities to interact with course material through the use of appropriate real live electrical components, tools and equipment cooperatively tends to change the course from a competitive endeavour to one that is more student-centred, and focused on the construction of knowledge in the students (Brewer, 2003). Hence, one means of constructing knowledge is to create meaning by doing. Creating support for knowledge construction within the students is a critical component to the success of developing self-motivated, intellectually stimulated learners (Kalu, 2010). The obvious implication of the use of appropriate real live electrical components, tools and equipment therefore, is to facilitate students' interaction with the learning environment. This will help to sustain students' interest which increases the strength of ego-involvement of the learners and which does not allow the learners to be distracted by trivial extraneous events in the perceptuall environment.

Analysis of covariance was used to test hypothesis 3, Table 3, at the calculated F-value (.31), significance of F (.58) and confidence level of .05, the interaction effect of treatment and gender was not found to be significant. This implies that the effectiveness of Computer animation on students' interest in basic electricity is independent of gender.

Conclusion and Recommendation

The influence of technological advancement in technology has rendered traditional skills inadequate for work in the electrical industry. This advancement in technology has created the need for new and often sophisticated skills. Obviously, the electrical industry needs the service of Basic electricity that can adapt to the changes in technology in the industry. Greater stress need therefore be placed on providing students with broad learning and skills in order to prepare them for a wide range of challenges posed by technological advancement which has occasioned the need to seek for alternative instructional method such as 3D computer animation to teach the modern work place skills requirements of the industry. Moreover, it has been discovered that the persistent poor academic achievement and low interest of students in Basic electricity and other trade curses in technical colleges is as a result of the inappropriate teaching methods adopted by teachers (Hombly, 2001). The need to find the appropriate teaching technique to assist Technical college students to learn Basic electricity and naturally increase students' interest, involvement and commitment in learning, is the focus of the study.

Based on the findings of this study, the following recommendations are made:

1. Technical teachers of Basic electricity should adopt the use of 3D computer animation technique to the teaching of Basic electricity. in such a way that students are allowed ample opportunity to interact freely with one another in the 3D computer animation space so as to increase students interest in basic electricity and invariably improve both their psychomotor and cognitive achievement
2. Workshops, seminars and conferences should be organized by Ministry of Education, NABTEB and NBTE to enlighten technical teachers and improve their knowledge and skills on the use of 3Dcomputer animation for improving students' interest in vocational technical education generally and basic electricity inparticular.

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