

Effect of Computer Simulation Game Package on Students' Academic Performance in welding and fabrication trade in Government Science and Technical Colleges in North Eastern Nigeria

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Abstract— The study determined the effect of computer simulation game packages on students' academic performance in welding and fabrication in government science technical colleges in North-East, Nigeria. The students in experimental group were taught using computer simulation game package, while their counterparts in control group were taught using demonstration method of teaching. The study was guided by three research questions. Quasi-experimental design of pretest and post-test were used for the study. The population of the study comprised of six teachers and 153 NTC II students of welding and fabrication trade in the 29 state owned technical colleges in North-East, Nigeria. Purposive sampling technique was used to select experimental and control groups. Two intact classes were used as the sample of the study, with sample size of 55 students in each class. The instrument for data collection consisted of 60 multiple choice objective items that were extracted from past NABTEB examination questions. The instrument was validated by three specialists in the Department of Technology Education, Modibbo Adama University, Yola, and the other two specialists are teachers of welding and fabrication trade in Government Science and Technical College, Numan, Adamawa State. The instrument was not subjected to any reliability test because the test questions were selected from standardized instrument. The findings of the study, among others, revealed that students taught using computer simulation game package performed better and had higher learning experiences retention than those students taught using demonstration method of teaching. It also revealed that there is significant difference between male and female teachers in the use of computer simulation instructional package in teaching and learning of welding and fabrication in favor of male teachers. However, based on the findings of the study, it was recommended that special training should be organized for male and especially the female teachers on how to use computer simulation game packages in teaching and learning of concepts that require students to imbibe operational principles and mastery of procedures in welding and Fabrication. And that Government should provide technical colleges with available computer simulation instructional packages.

Keywords— Computer simulation; Game package; Academic performance; Welding and Fabrication.

INTRODUCTION

Technical College is an institution established purposely to produce craftsmen at the craft level and master craftsmen at advanced craft level (Audu, Aede & Muhammed, 2014). The training programmes in Government Science and Technical Colleges are classified into trades.

National Business and Technical Examination Board, (NABTEB, 2015) identified the trades offered in Government Science and Technical Colleges; they include building, electrical, agricultural implement and equipment mechanics work, auto electrical work, auto mechanics work, auto body building, auto parts merchandising, air conditioning and refrigeration, mechanics work, foundry craft practice, instrument mechanics work and mechanical engineering craft practice, welding and fabrication, among others.

Welding and fabrication is one of the trades offered in Government Science and Technical Colleges in Nigeria (NABTEB, 2015).

It is the process of joining two or more pieces of metals together permanently to a desirable shape and size with the help of a source of heat and pressure (Yakubu, 2014). The main purpose of offering welding and fabrication trade in Government Science and Technical Colleges is to prepare craftsmen and technicians with welding occupational skills and attitude that will meet the demand and development of industries and to enable them further their study in tertiary institutions (Aminu & Apagu, 2016). Perhaps for the purposes for teaching of welding and fabrication trade to be achieved, teaching and learning process should employ computer simulation instruction (the focus of this study) in Government Science and Technical Colleges.

Computer simulation is the use of a computer for the imitation of a real live work situation (Okereke and Onwukwe, 2011). In the same vein, Bhalla (2013) defined computer simulation game as an activity that works, fully or partially, on basis of players' decision. Contributing, Olumide (2013) and Dankbaor, Jansen and Jeroem (2016) agree that, Computer simulation games provide students with social cognitive motivational and emotional experiences that have potential to enhance academic performance and retention of learning experiences. Oxford Advanced Learner's Dictionary defined retention as the ability to remember a piece of information acquired over a period of time. Chibuzo (2012) and Peter (2016) agree that retention is a repeated academic performance by a learner after an interval of time. Chibuzo further clarified that retention is outcome of learning which lasts beyond the initial testing period and is assessed with tests administered within two weeks to one month after the information has been taught and tested. Both Tyav (2017) and Eyo (2018) agree that, retention is the process of maintaining a replicate of knowledge and skills already acquired and gender of teachers determines the extent of learning experiences by students.

Gender differences in educational practice have been a subject of concern for educationists and researchers. This led to several investigations into gender issues that are related to the use of instructional method, audio visual materials and Computer simulation games packages in schools and colleges. Okereke and Onwukwe (2011); Bhalla (2013) and Heena and Jaswinder (2016); Nnamani and Oyibe (2016) and Donald (2017) revealed that the use of computer technology such as; television, android phone and computer simulation instructional packages in teaching and learning has gender disparity in students' academic performance.

The findings on gender use of computer simulation game packages are not consistent (Nnamani and Oyibe (2016). Nnamani and Oyebe further revealed that computer simulation game packages seem to be friendly to both male and female teachers.

This assertion by Nmani and Oyebe is in agreement with those of Ali, Mohammed, Umar, and Yagana (2015) and Ajay (2017). This implies that there is no significant difference between the academic performance of students taught by male or female teachers who use

computer simulation game packages for teaching in schools and colleges.

Information from literature and the current researchers' personal observation revealed that despite Governments' effort in providing resources towards achieving the objective of establishing technical colleges, Welding and Fabrication students still perform poorly in both internal and external examinations. This revelation is buttressed by reports by NABTEB chief examiners from 2017 to 2021. That students had had consistently low academic performance in welding and fabrication trade.

This consistent failure may be attributed to so many factors, such as wrong choice of instructional methods, inadequate instructional materials, obsolete infrastructure and unequipped workshops among others. If these challenge, of poor academic performance and low retention of learning experiences continuous an abated, it will continue to affect students' furtherance of education and loss of employment opportunities, among others. To train students on basic skill and principles of welding and fabrication trade, Computer simulation instruction may become an imperative method to employ.

Therefore, this study determined the effects of Computer simulation game on students' academic performance in welding and fabrication trade and recommended its use in Government Science and Technical Colleges in North Eastern Nigeria.

Purpose of the Study

The main purpose of the study was to determine the Effect of Computer Simulation Game Package on Students' Academic Performance in welding and fabrication trade in Government Science and Technical Colleges in North Eastern Nigeria. Specifically, this study sought to: -

1. Determine the effect of computer simulation game package on academic performance of students in welding and fabrication trade.
2. Determine the effect of computer simulation game package on students' retention in learning welding and fabrication trade.
3. Determine the effect of teacher's gender in the use of computer simulation instructional package on teaching and learning of welding and fabrication trade.

Research Questions

The following research questions guided the study;

1. What is the effect of computer simulation game package on academic performance of students in welding and fabrication trade?
2. What is the effect of computer simulation game package on students' retention in learning of welding and fabrication trade?
3. What is the effect of teacher's gender on students' performance when teachers use computer simulation instructional packages in teaching and learning of welding and fabrication trade?

Hypotheses

H0₁: There is no significant difference between the retention of students' taught using computer simulation game package and those taught using demonstration teaching method of welding and fabrication.

H0₂: There is no significant difference between male and female teachers in the use of computer simulation instructional packages in teaching and learning of welding and fabrication.

METHODOLOGY

Quasi experimental design of pretest, post-test research design was employed for this study, because some classroom conditions do not allow for excessive manipulations, thus this study used intact classes. The geographical area of the study is North Eastern Nigeria. The region comprises Adamawa, Bauchi, Borno, Gombe, Taraba and Yobe States (Abdul-Aziz, 2015). The population for this study comprised of 6 teachers and 781 NTC II students of welding and fabrication trade from the 29 Government Science and Government Science and Technical Colleges in the North-East Nigeria. Purposive sampling technique was used for the selection of the two Government Science and Government Science and Technical Colleges that served as experimental and control groups.

The sample size of the study was 96 NTC II students randomly drawn from the six Government Science and Government Science and Technical Colleges in North-East Nigeria. Three specialists served as face and content validates.

The instrument was not subjected to reliability test because the test questions were selected from past NABTEB question papers from 2009 to 2019. The

reliability coefficient of 0.78 was however obtained through the use of test and retest techniques of the test instrument in Government Science and Technical College Bukuru Plateau State which was outside the study area. A pre-test instrument for data collection was directly administered by the researchers and research assistants in both experimental and control groups before the commencement of the experiment. That was meant to ascertain the students' entry level. The experiment lasted for six weeks. After treatment period of six weeks, the groups were again re-subjected to post-test to ascertain the students' academic achievement performance. After two weeks of post-test administration, retention test was directly administered again on the experimental and control groups. Pre-test, posttest and retention test administered and collected were marked and results of the retention test were compared with the post-test of both experiment and control groups, in order to establish which method of teaching has more effect on student's performance and retention of learning experiences. The mean scores of students taught by male or female teachers using computer simulation instructional packages in teaching and learning of welding and fabrication were compared in order to determine the effect of gender in the use of computer simulation instructional packages in teaching and learning of welding and fabrication. Mean scores and standard deviations of the students in both the experimental and control groups were used to answer the research questions.

The decision rule for each research question was that, if the mean score of one group is lower than that of the other, it implies that, the second group has better academic performance or retention of learning experiences and vice versa. The null hypotheses were tested at 0.05 level of significance using t-test statistics. The decision rule for the null hypotheses was based on the compared t-calculated value and t-critical table value in each case.

The rule was that any item whose t-calculated value is equal to or greater than t-critical value, the null hypothesis was rejected, meaning it is not significant, but where other-wise, the null hypothesis was accepted, meaning it is significant.

RESULTS

Research Question 1

What is the effect of computer simulation game package on academic performance of students when taught welding and fabrication?

Table 1: Mean Scores of Students Taught Using Computer Simulation Game Package and Those Taught Using Demonstration Method of Teaching Welding and Fabrication

S/N	Teaching method	N	\bar{X}	SD	Mean Difference
1.	CSG Package	30	31.60	4.45	0.19
2.	Demonstration	66	31.79	3.75	

Key: \bar{X} = Mean, N = Number of students
CSG = computer simulation game, SD = Standard Deviation

Table 1 shows that students taught using computer simulation game package had a mean 31.60 and standard deviation of 4.45 while students taught using demonstration teaching method had a mean of 31.79 and standard deviation of 3.75. The mean difference of 0.19 is in favor to demonstration method of teaching. This is an indication that students taught using demonstration method of teaching have performed better than their counterpart taught using computer simulation game

package. This implies that demonstration method of teaching is more effective than computer simulation game package in Government Science and Government Science and Technical Colleges.

Research Question 2

What is the effect of computer simulation game package on students' retention in learning of welding and fabrication?

Table 2: Mean Retention Scores of Students when taught welding and fabrication Using Computer Simulation Game and Those Taught Using Demonstration Methods of Teaching Welding and Fabrication.

S/N	Teaching method	N	\bar{X}	SD	Mean Difference
1.	CSG Package	30	26.03	4.06	0.23
2.	Demonstration	66	25.80	3.79	

Key: \bar{X} = Mean, N= Number of students, SD = standard deviation
CSG = computer simulation game

Table 2 shows that students taught using computer simulation game package had a mean retention score of 26.03 and standard deviation of 4.06. While students taught using demonstration method of teaching had mean retention of 25.80 and standard deviation of 3.79. The mean difference of 0.23 is in favor of computer simulation game package. This is an indication that students taught using computer simulation game package have higher mean retention score than those taught using demonstration method of teaching welding and fabrication. This means that using computer

simulation game package is more effective in terms of students' retention of learning experiences in welding and fabrication trade in Government Science and Government Science and Technical Colleges.

Research Question 3

What is the effect of teachers' gender on students' academic performance when teachers use computer simulation instructional package in teaching and learning of welding and fabrication?

Table 3: Mean Scores of Students Taught by Male and Female Teachers Using Computer Simulation Instructional Packages in Teaching and Learning of Welding and Fabrication

S/N	Gender	N	\bar{X}	SD	Mean Difference
1.	Male Teachers	57	36.92	4,46	5.32
2.	Female Teachers	30	31.60	4.45	

Key: \bar{X} = Mean, N= Number of Students, SD = standard deviation

Table 7 shows the results of students' taught by male and female teachers using computer simulation instructional Package in the experimental groups. Students' taught by male teachers had a mean score of 36.92 and standard deviation of 4.46 in the students' posttest. While students' taught by female teachers had a mean score of 31.60 and standard deviation of 4.45 in the students' posttest. The mean difference of 5.32 is in favor of male teachers that taught using computer simulation instructional Package in the experimental groups. This is an indication that male teachers are more effective in the use of computer simulation instructional package in teaching and learning of welding and fabrication trade in Government Science and Technical Colleges, because they have higher mean score of

students in the posttest than the female teachers that taught using the same computer simulation instructional packages. This means that male teachers are more effective in the use of computer simulation instructional package in teaching and learning of welding and fabrication trade than female teachers in Government Science and Government Science and Technical Colleges.

Hypothesis 1

There is no significant difference between the retention of students taught using computer simulation game package and those taught using demonstration method of teaching welding and fabrication.

Table 4: *t-Test Analysis of Mean Retention Scores of the Students Taught Using Computer Simulation Game Package and Those Taught Using Demonstration Method of Teaching Welding and Fabrication*

S/N	Respondents	N	\bar{X}	Sd	t-Cal	t-Crit	Remark
1	Students Taught CSGP	30	26.03	4.04			
					3.17	±1.96	Significant
2	Students Taught DMT	66	25.80	3.79			

Key: \bar{X} = Mean, N= number of students, SD = standard deviation

CSIP = Computer Simulation Game Package

DMT = Demonstration Method of Teaching

Table 4 shows that students taught using computer simulation game package had a 26.03 and those students taught using demonstration method had a mean score of 25.80. The t-calculate value of 3.17 is greater than the t-critical value of 1.96. This implies that the null hypothesis is rejected, meaning there is significant difference between the mean retention scores of students taught using computer simulation game and those taught

using demonstration method of teaching welding and fabrication.

Hypothesis 2

Ho2 There is no significant difference between the mean score of male and female teachers taught using computer simulation instruction packages and those taught using demonstration method of teaching welding and fabrication.

Table 5: *t-Test Analysis of Mean Scores of Students Taught by Male and Female Teachers Using Computer Simulation Instructional Package in Teaching and Learning of Welding and Fabrication*

S/N	Respondents	N	\bar{X}	Sd	t-Cal	t-Crit	Remark
1	Male Teachers	57	36.92	4.46			
					3.07	±1.96	Significant
2	Female Teachers	30	31.60	4.45			

Key: \bar{X} = Mean, N= number of students, SD = standard deviation

Table 5 shows that students taught by the male teachers using computer simulation instructional packages had 36.92, while students taught by Female teacher had a mean score of 31.60. The t-calculated value of 3.07 is greater than the t-critical value of 1.96. This implies that the null hypothesis is rejected, meaning there is significant difference between male and female teachers

in the use of computer simulation instructional packages in teaching and learning of welding and fabrication.

Findings of the Study

The following findings emerged after the data analysis.

1. Students taught using computer simulation game package performed lower than those taught using

demonstration method of teaching welding and fabrication trade.

2. Students taught using computer simulation game package have higher retention than those students taught using demonstration method of teaching welding fabrication trade.
3. Male teachers are more effective in the use of computer simulation instructional package in teaching and learning of welding and fabrication trade than female teachers in Government Science and Government Science and Technical Colleges.
4. There is significant difference between the mean retention scores of students taught using computer simulation game and those taught using demonstration method of teaching welding and fabrication.
5. There is significant difference between male and female teachers in the use of computer simulation instructional packages in teaching and learning of welding and fabrication

Discussion of Findings

The finding with respect to research question one indicated that computer simulation game package is less effective than demonstration method of teaching, in terms of academic performance. This finding is not in line with the findings of Dankhea, Jeroem and Jonsen (2016) who found out those students taught using computer simulation game possessed higher cognitive skill and highly motivated than those students taught with lecture method of teaching. Similarly, this finding did not corroborate that of Bello, Ibrahim and Mustapha (2016) whose study revealed that computer simulation games have significant effect on students' academic performance in secondary schools than lecture method of teaching. Similarly, the finding of Ajay (2017) revealed that students taught using game method achieved higher academically and retained learning experiences better than those taught using conventional method.

The finding with respect to research question two indicates that students taught using computer simulation game have higher retention than those taught using demonstration method of teaching welding and fabrication. This finding is in tandem with that of Bello, Ibrahim and Mustapha (2016) whose study revealed that computer simulation games have higher retention of learning experiences than traditional method of teaching, such as demonstration, lecture, and discussion, among others. This finding is also in agreement with the

finding of Olumide (2013); Ezeudu and Ezinwanne (2013) & Nwafor and Abonyi (2016), who, in their separate studies, also found that students who are exposed to computer simulation game performed better in terms of retention of than those taught using conventional explanatory methods.

The findings with respect to research question three indicates that male teachers are more effective in the use of computer simulation instructional package in teaching and learning of welding and fabrication trade than female teachers in Government Science and Government Science and Technical Colleges. The finding of this study is in agreement with the findings of Eyo (2018) and Nnamani and Oyibe (2016) who, in their separate studies, revealed that male teachers who taught using computer simulation instructional package performed better than their female counterpart teachers who taught using computer simulation instructional package. Also, Ambrose and Donald (2017) also in their study found out that gender difference in favor of male teachers have been recorded in terms of classroom interaction, skill acquisition, and academic performance of students taught using computer aided technology.

The findings in respect to hypothesis one revealed that there is a significant difference between the mean retention score of students taught using computer simulation game than those taught using demonstration method of teaching. This finding is similar to the finding of Ajay (2017) who revealed that there is a significant difference in the retention of learners taught using video computer games than those taught using lecture method. It is also in line with that of Tyav (2017) who revealed that there is a significant difference in the mean retention on learners taught using video computer games than those taught using lecture method.

The finding with respect to hypothesis two revealed that, there is significant difference between male and female teachers in the use of computer simulation instructional packages in teaching and learning of welding and fabrication. The finding of this study is in agreement with the findings of Eyo (2018) & Nnamani and Oyibe (2016) who, in their separate studies revealed that male teacher taught using computer simulation instructional package performed better than their female counterpart teachers taught using computer simulation instructional package. Ambrose and Donald (2017) also in their study found out that gender difference in favor of male teachers have been recorded in terms of

classroom interaction, skill acquisition, and academic performance of students taught using computer aided technology

CONCLUSION

Based on the findings of the study which revealed that, the mean of retention of learning experiences is higher when students are taught Welding and Fabrication using computer simulation game package alone side the traditional teaching method than when taught the same trade subject using only traditional teaching method of teaching such as demonstration or lecture teaching method, the researcher concluded that, computer simulation package is good for welding and fabrication in technical colleges in North- East, Nigeria.

Educational Implication of the Study

The educational implication of the study is that, since the mean retention of learning experiences is higher when computer simulation game packages is used as a complementary method of teaching and learning to conventional method, it means that if technical teachers combine computer simulation game package alone side any of the traditional method of teaching, students's academic performance and retention of learning experiences continue te to high and thus enable them perform very in both internal and external examinations.

Contribution to Knowledge

This study has contributed to the body of knowledge by providing researchers with reference materials and information, information that was not available before now, on effect of computer simulation game package on students' academic performance and retention of learning experiences in welding and fabrication trade in Government Science and Technical Colleges in North East Nigeria.

RECOMMENDATIONS

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

1. Teachers of welding and fabrication should start using computer simulation game package, as complementary method to the traditional method of teaching when teaching welding and fabrication.
2. Teachers teaching welding and fabrication should expose the students to computer game package to promote retention of learning experience in their trade.

3. State government should timely organize special training for both male and especially female teachers, on the use of computers simulations instructional packages

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