Original Article

Comparative Effect of Computer Tutorial and Simulation on Students' Retention in Blocklaying and Concreting In Technical Colleges in Rivers State

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ABSTRACT

The use of technology has been recognized as an essential tool in enhancing teaching-learning outcomes in all human endearvours hence there is the need to explore various strategies that could promote knowledge retention in learners. The study investigated the effect of computer tutorial and simulation on students' retention in blocklaying and concreting in technical colleges in Rivers state. Three research questions guided the study while three null hypotheses were formulated for the study. A quasi-experimental design, specifically, the non-randomized control group design involving four intact classes was used. The population was 123 National Technical Certificate (NTC) II blocklaying and concreting students of three technical colleges in Rivers state. These students in their intact classes were either assigned to experimental group (computer simulation) or control group (computer tutorial). Blocklaying and Concreting Retention Test (BCRT) was developed, validated and used for data collection. Reliability of the BCRT was 0.88. Meanand standard deviation were used to answer the research questions while Analysis of Covariance (ANCOVA) was used to test the hypotheses. Findings of the study revealed that the use of computer simulation instruction was a significant factor in students high retention in blocklaying and concreting, gender had significant influence on retention and the interaction due to instructional technique and gender in students' retention in blocklaying and concreting was not significant. The study further recommended among others that computer simulation instruction should be made a compulsory teaching strategy in the technical colleges; teachers should pay attention to the issue of gender differences in the classroom by eliminating contents and materials that will introduce gender differences in the teachingand learning environment.

Keywords: Retention, blocklaying and concreting, computer simulation, computer tutorial.

Introduction

The quality of graduates from Nigerian educational institutions has been a subject of great concern to many industries, manufacturing, servicing, business, commerce, trade, engineering and production industries. Little or no trust is exercised on the quality of graduates perhaps this may be as a result of inadequate skills acquired by the graduates of technical education programmes. Technical education is described as the training of

individuals for the implementation of technological development of a nation by providing the citizens with the appropriate skills necessary for employment. This form of education serves as a catalyst for economic, social and political changes of a nation due to its uniqueness in nature (Abdullahi, 2017). Technical education programs offer engineering trades such as electrical installation and maintenance works, motor vehicle and mechanic works and welding and fabrication which are offered in technical colleges.

Technical colleges in Nigeria are regarded on principal vocational institutions which produce craftsmen at the National Technical Certificate (NTC) level and master craftsmen at the Advanced National Technical Certificate (ANTC) level for various sectors of the economy. Technical colleges offer various building trades among which are Furniture crafts, Carpentry and joinery, Block laying and Concreting (B&C) trades. Block laying and concreting trade in Nigeria technical colleges is designed to produce competent craftsmen for the Nation's technological and industrial development. The block laying and concreting trade among others is designed to make an individual to be employed on graduation. The trade is taught in the technical colleges for National Technical Certificate (NTC) I-III students. The course content of blocklaying and concreting is structured as to produce individuals in the society who will be self-reliant possessing requisite saleable skills (Ilojeme & Okorieocha, 2021).

Furthermore, blocklaying and concreting is designed to produce knowledge based and practically skilled individuals in building construction. It is further designed to provide training in residential building including maintenance and as well demonstrate the ability to excavate foundation, erect walls and drainage system. Graduates of blocklaying and concreting from the technical colleges provide middle level manpower in the society mainly in the areas of industrial and domestic buildings; besides they are expected to carry out the building construction and maintenance ofindustrial, commercial and residential structures as well as repair (Ilojeme, 2013).

Blocklaying and concreting programme at the technical college level is designed to produce skilled builders for the building industry. Blocklaying and concreting comprises of different components or operations which require skills to perform them. These components include designing of building plans, setting out of the building, erection, blockwork on theconcrete foundation, leveling of the building, roofing pattern, plastering and rendering of walls (Azukwu & Puyate, 2022). These areas of operation require that students of blocklaying and concreting should possess the relevant skills to carry them out. Azukwu and Puyate (2022) further maintained that blocklaying and concreting students should possess skills in designing building plans and be able to read and interpret them.

The teaching of blocklaying and concreting in technical colleges is having numerous challenges which according to Okorieocha and Ilojeme (2021) include insufficient instructional facilities, inadequate teaching and non teaching staff, lack of workshops, lack of power supply to operate the electrically operated moulding machines and inefficient instructional methods and materials. Various practical studies have been conducted to come up with different and efficient ways of teaching mainly trade subjects in the technical colleges. One of these is the use of computer assisted instruction (CAI) aspect of information and communication technology.

With the advent of information and communication technologies, recent decades have witnessed an explosion in the classroom using technological tools as instructional materials. This explosion of the technological tools is literally compelling technical and science educators to change the way they teach. Okorieocha in Ilojeme and Okorieocha (2021) posited that recent advances in information and communication technologies and their uses in technical and science education provides an opportunity for educators to take a critical look at how these tools are being integrated into the workshops, classrooms and laboratories.Research has shown that these technological tools can only be effective in

promoting students understanding when used in pedagogically sound ways inherent in computer assisted instruction (Kulik in Okorieocha & Eronini, 2016).

Computer Assisted Instruction (CAI) is an automated instructional technique in which a computer is used to present an instructional programme to the learner through an interactive process on a computer (Ajelabi in Okorieocha & Eronini, 2016). CAI moves at the students' pace and usually does not move ahead until the students have mastered the skills. It is learner centered and activity oriented. Bontempi and Hazlewood in Okorieocha and Ilojeme (2021) maintained that one of the most powerful features of CAI is its capacity to individualize instruction to meet the specific needs of the learner. CAI consists offive models which are tutorial, drill, problem solving, game and simulations (Sins in Okorieocha & Eronini, 2016). Tutorial mode of CAI involved the use of any computer application to present learning materials to a student working alone or in a small group independent of time and space constraints (Hardback, Scheveitzer & Pienkopioski, 2007). There are two types of CAI tutorial namely the ready-made off the shelf package and the self developed application. The off-the-shelf is a commercially produced educational package which has been prepared withall the possible users need in mind. These are stored in compact disc-read only memory (CD-ROM). The self developed packaged is developed in line with the prevailing and immediate environment that makes possible students queries as obtained in day to day classroom interaction. The package is also stored in a CD-ROM. The use of a computer assisted instruction tutorial in a CD-ROM has been foud by researchers to enhance students' academic and retention and hence should be compared with computer simulation instruction.The use of interactive tools such as computer tutorial and simulation can provide learners the opportunity to more effectively visualize real-world phenomena and engage in the process of scientific and technological inquiry.

Hartley in Arowolo, Abdulmalik and Hosea (2016) defined computer simulation as a technology enabled environment created to facilitate learning through immersion, engagement and all adaptive surroundings that ultimately provide guidance and constructive feedback to the learner. Simulation according to Garba in Arowolo, Abdulmalik and Hosea (2016) is defined as replicating or amplifying real experiences, often immersive in nature. Essence of simulation is highlighted as a replication of the essential aspects of reality so that reality can be better understood, controlled and practiced. Furthermore, Alessi and Trollip in Arowolo, Abdulmalik and Hosea (2016) stressed that simulation provides the learner with the ability to interact with a model of a real world situation or activity.

A wide acceptable tool for teaching and learning computer simulations combines visual and interactive learning experiences, promotes application of knowledge, and provides a simplified representation of real world systems (Eskrootidii & Oskrochi in Olorukooba, Sanda & Sulaiman, 2016). Computer simulation in the views of Nireti, Morenike and Joyce in Olorukooba et al (2016) has significant effect in improving the attitude of students toward technical subjects and was found to be a suitable method of instruction to both male and female students alike. Proponent affirms that computer simulations promote student interest and involvement, foster retention of information, and offers opportunities for effective and behavioural learning (Guys & Lownes-Jackson, 2015). The contribution of technical education in any country of the world today is highly enormous, hence it plays a very significant role on the national welfare.

Retention is the process by which new information is transferred from our short term to our long term memory. Succinctly, it is all about making new knowledge stick (Andriotis, 2018). Retention is the act of retaining. Andrew and Rebello in Onyema and Olele (2020) opined that retention of learned information can be defined as having the information stored inlong term memory in such a way that it can be retrieved. Academic retention on the other hand is a measure of the length of time a student can remember the content he or she was exposed to in a particular course. It goes a long way to tell how

much of what was learnt by a student was able to go for the long term memory (Onyema & Olele, 2020).

Retention is the act of transferring information from short term memory to long term memory (Okeke in Achor &Gbadamosi, 2020). Retention comes in before recall. It is recall that reveals how much knowledge the students have retained after the teaching and learning. Retention can be the extent to which one can retrieve information from long term memory. The success of retrieval depends on effective encoding (meaningful learning) which involves making association with existing knowledge that can facilitate future retrieval among students irrespective of their gender.

Gender is the fact of being male or female. Umoru (2016) defines gender as a socio-cultural and psychological dimension of being a male or female. It is a moderating variable of this study. The influence of gender on the dependent variables was explored. Retention is the term used to describe the remembering of a fact or idea after a passage of time. It is worthy to note that without retention there could be no transfer of knowledge to the fields of endeavour. According to Okeke in Achor and Gbadamosi (2020), gender significantly influences the mean retention scores of science students. Hence, it is against backdrop to determine the comparative effect of computer tutorial and simulation on students' retention in blocklaying and concreting in technical colleges.

Statement of the Problem

Blocklaying and concreting trades are vocational and technical trades aimed at producing competent individuals with sound practical skills, knowledge, self-reliant and able to employ others. Graduates of blocklaying and concreting from technical colleges provide middle level manpower in the society as they are expected to carryout building construction and maintenance of industrial, commercial and residential structures including repairs of such structures. The primary purpose of teaching at all levels of education is students' acquisition of knowledge. It is expected that when students are well taught and have as well learnt well, they will perform creditably well in the public examination such as National Technical Certificate (NTC) examination conducted by the National Business and Technical Examinations Board. Unfortunately, the reverse is the case as revealed by consistent failure rate of students in the blocklaying and concreting trade examinations (NABTEB Chief Examiner report in Ilojeme & Okorieocha, 2021).With the efforts of the Rivers State Government in conjunction with the World Bank and European Union assisted projects in the technical colleges from 2014 – 2018, it is expected that the level of instructions in the institutions would improve and invariably enhance better students academic performance and retention of concepts taught. It is sad to note that despite these efforts, the result from the students is quite unimpressive as a result of the teaching methods employed by the teachers. Okebukola in Ilojeme (2013) maintained that poor teaching methods such as those of the traditional or conventional method are the most contributing factors to students under achievement and retention.

This unsatisfactory situation could lead to breakdown in the economic, industrial, technological and educational growth of the nation since the main goal of technical education is for self-reliance. The foregoing, therefore, underscores the need to explore other teaching methods that would enhance and facilitate retention and acquisition of the knowledge being taught and possibly encourage higher students enrolment in the technical colleges. In order to improve students retention, there is need to turn from the conventional teaching methods to the modern methods, such as the computer tutorial and simulation. Despite several studies on the effect of computer tutorial instructional technique, researchers have revealed that simulation instructional technique has been of tremendous effect in other subjects areas, though yet to be confirmed of it will have the same effect on blocklaying and concreting students. Based on this, the problem of this study is to compare effect of tutorial and simulation techniques on students retention in blocklaying and concreting.

Purpose of the Study

The major purpose of the study was to investigate the comparative effect of computer tutorial and simulation on students' retention in

blocklaying and concreting in technical colleges in Rivers state. Specifically the study sought to:

i. compare the mean scores of students taught blocklaying and concreting with computer simulation and computer tutorial instructional techniques in blocklaying and concreting retention test (BCRT).
ii. determine the differences that exist in the overall scores of female and male students taught BCRT with computer tutorial and simulation instructional techniques as measured by BCRT.
iii. ascertain the extent of treatment gender interaction influence on students retention in blocklaying and concreting.

Research Questions

The following research questions guided the study

i. What are the mean scores of students taught with computer simulation and computer tutorial instructional techniques in blocklaying and concreting retention test (BCRT)?
ii. What is the difference in the mean scores of female and male students taught blocklayingand concreting with computer simulation technique as measured by blocklaying and concreting retention test?
iii. What is the treatment-gender interaction influence on students' retention in blocklaying and concreting?

Hypotheses

The following null hypotheses were tested in the study at .05 level of significance.

i. There is no significant difference in the mean scores of students taught block/bricklaying and concreting using computer simulation and computer tutorial techniques in blocklaying and concreting retention test.
ii. There is no significant difference in the mean scores of female and male students taught block/bricklaying and concreting with computer simulation technique as measured by block/bricklaying and concreting retention test.
iii. There will be no significant difference in the treatment gender interaction influence on students' retention in block/bricklaying and concreting.

Methodology

The study employed a quasi experimental design, specifically the non-randomize control group design involving two groups. The quasi experimental design was used in this study because subjects were not randomly assigned to experimental and control groups. This design is also termed 2x2 factorial design involving two independent variables (teaching method and gender). Each factor has two levels. The factors teaching method has two levels namely; computer simulation instruction and computer tutorial instruction while the factor of gender has female and male as its levels.

The study was conducted in the three technical colleges in Rivers state that offer blocklaying and concreting trade with ICT facilities. Population of the study was 123. This figure is drawn from National Technical Certificate (NTC) II students in the selected technical colleges. There was no sampling of subjects as the entire subjects were involved in the study.

Four instruments were developed for the study. They were blocklaying achievement test, blocklaying retention test used for data collection and blocklaying computer simulation instruction and blocklaying computer tutorial instruction stored in separate CD-ROMs. The blocklaying and concreting achievement test used for the study was developed by the researchers. The test consisted of 40 objective questions based on technical college blocklaying curriculum for NTC II students. Each item had four alternative options. Every correct answer carried one point while an incorrect answer carried zero point.

The blocklaying and concreting achievement test instrument was validated by three blocklaying and concreting teachers at Government technical colleges Port Harcourt, Rivers state. The instrument was piloted tested on 24 NTC II blocklaying and concreting students at Boys' Technical College, Osusu Aba, Abia state. Reliability coefficient of the instrument was determined using Kuder Richardson formula (K-R-20) which gave the coefficient of internal consistency on 0.88. Both the computer simulation instruction and computer tutorial instruction groups had their lessons separately for a period of three weeks.

The instrument for data collection was administered to the students prior to commencement of the experimental procedure. Data collected in the first administration served as pre-test scores of the study. At the expiration of the treatment which lasted for three weeks, the instrument was re-arranged and re-administered to the students immediately after the last period of teaching. The retention test was administered two weeks after the last period of teaching. The achievement and retention tests were scored using the validated marking schemes.

The research questions were answered using mean and standard deviation. The null hypotheses were tested at .05 level of significant level using a 2x2 (mode of instruction x gender) analysis of covariance (ANCOVA). The null hypothesis was rejected with the calculated F-ratio being greater than the table or critical F-ratio while the null hypothesis was accepted when the calculated F-ratio is less than the table F-ratio.

Results

The result of this study was obtained from the research questions and hypotheses tested.

Research Question 1

What are the mean scores of students taught with computer simulation and computer tutorial instructional techniques in blocklaying and concreting retention test?

Table 1: Mean Scores and Standard Deviation of Students taught Blocklaying and Concreting with Computer Simulation Instruction& Computer Tutorial Instruction Techniques in Blocklaying and Concreting Retention Test

Test	Group	N	Mean	Standard Deviation
Retention	Computer Simulation	46	74.2391	13.5285
	Computer Tutorial	77	57.7597	19.3377

Table 1 revealed that the computer simulation instruction (experimental) group had a higher mean retention score of 74.24 with a standard deviation of 13.53 while the computer tutorial (control) group had a mean retention score of 57.76 and standard deviation of 19.34. It then implies that students taught with computer simulation had more retention ability than those taught the same concepts using computer tutorial instruction method.

Research Question 2

What is the difference in the mean scores of female and male students taught blocklaying and concreting with computer simulation instruction technique as measured by blocklaying and concreting retention test?

Table 2

Mean Scores and Standard Deviation of Female and Male Students taught Block/Bricklaying and Concreting with Computer Simulation Instruction Technique

SexTest	NMean (×)	Standard Deviation	Mean Gain
Female	Post-Test 14	55.714312.	106412.5000
Retention	14	68.214318.4346	
Male	Post-Test	3257.734411.	059919.1406
Retention	3276.8750	9.9798	

Table 2 showed that the female students have post-test mean score of 55.71 and retention mean score of 68.21 having a mean gain of 12.50. The male students have post-test mean score of 57.73 and the retention mean score of 76.88 with a mean in of 19.14. This implies that the male students taught with computer simulation instruction technique have more retention ability than their female counterparts.

Research Question 3

What is the treatment gender interaction influence on students' retention in blocklaying and concreting?

Table 3

Mean and Standard Deviation on Treatment Gender Interaction Influence on Students Retention in Blocklaying and Concreting

Gender		Computer Simulation	Computer Tutorial	Overall
Male	Mean	76.875062.	187569.5313	
	SD	9.979518.	310514.1452	
	N			324880
Female	Mean	68.214350.	431059.3227	
	SD	18.434619.	052018.7433	
	N			142943
Overall	Mean	75.544756.	309364.4270	
	SD	14.207218.	681316.4430	
	N			4677123

Table 3 revealed that male students in the computer simulation (experimental) group had mean retention score of 76.88 while the male students in the computer tutorial (control) group had mean retention score of 62.19. The female students in the experimental group had mean retention score of 68.21 while their counterparts in the control group had mean retention score of 50.43. Male students taught with computer simulation instruction technique had mean retention score of 14.69 higher than their counterparts taught with computer tutorial instruction technique. In the same vein the female students taught with computer simulation instruction technique had mean retention score of 17.78higher than their counterparts taught with computer tutorial instruction technique. The implication of this result is that students in the experimental group both male and female have higher retention ability than those in the control group.

Hypothesis 1

There is no significant difference in the mean scores of students taught blocklaying and concreting using computer simulation instructional and computer tutorial instructional techniques in blocklaying and concreting retention test.

Table 4

Analysis of Covariance (ANCOVA) of Students' Retention Scores in Blocklaying and Concreting Retention Test

Source	Sum of squares	df	Mean square	F-cal	Significant level
Corrected model	37160.512	4	9290.128	149.851	.000
Intercept	2030.446	1	2030.446	32.751	.000
Post Test	26111.028	1	26111.028	421.174	.000
Group	740.849	1	740.849	11.950*	.000
Sex1568.90811568.90825.307*.000					
Group*Sex	22.264	1	22.264	.359*	.550
Error7313.50411861.996					
Total547068.750		123			
Corrected Total44476.016		122			

Significant atsig ofP<0.05

Table 4 showed that F-cal value for group is 11.95 at .000 level of significance which is less than .05 level of significance. This implies that the null hypothesis is rejected. It further implies that there is significant difference in the mean scores of students taught blocklaying and concreting with computer simulation and computer tutorial instructional technique in the blocklaying and concreting

retention test. That is, students taught with computer simulation instructional technique do not have equal retention ability with those taught the same subject with computer tutorial instructional technique.

Hypothesis 2

There is no significant difference in the mean scores of female and male students taught blocklaying and concreting with computer simulation instruction technique as measured by blocklaying and concreting retention test.

Result on table 4indicates that gender (sex) is a significant factor in students' retention ability in blocklaying and concreting. The F-cal is 25.307 at .000 level of significant which is less than .05. Hence, the null hypothesis 2 is rejected at .05 significant level. This result therefore, means that there is significant difference in the mean retention ability of female and male students taught blocklaying and concreting using computer simulation instructional technique. Specifically, from the result the male and female students do not have equal retention ability.

Hypothesis 3

There is no significant difference in the treatment gender interaction influence on students' retention in blocklaying and concreting.

Table 4 revealed that the effect of mode of instruction on group gender is .359 at .550 significant level which is greater than .05 level of significance. Thenull hypothesisis therefore accepted. It then means that there is no significant difference in the overall students' retention scores on BCRT by treatment gender interaction.

Discussion of Findings

Table 1 revealed that students taught with computer simulation instructional technique had more retention ability than their counterparts taught the same concepts using computer tutorial instructional technique. This finding is in agreement with that of Okorieocha and Eronini (2016) who observed that students' taught basic electricity with computer assisted instruction have higher retention than their counterparts taught the same concepts with conventional teaching methods. The finding is also in line with the opinions of Guy and Lowens-Jackson (2015) who affirmed that computer simulations foster retention of information, and offers opportunities for effective and behavioural learning. This study furthermore agrees with Okwori and Tartiyus in Asogwa, Muhammed, Asogwa and Ofoegbu (2016) who stated that simulation instructional packages increase students retention. The findings of this study collaborates with that of West and Veenstra (2012) who affirmed that simulation model of instruction enhances retention of junior school students in basic science. The study finding is also in agreement with Suleiman, Salaudeen and Falade in Onyeme and Olele (2020) who observed that computer based blended learning strategy improved students retention in chemistry in collaborative learning settings better than in individualized learning and in lecture method. This therefore, implies that the mode of instruction has effect on the retention rate as exhibited by the experimental computer simulation instruction group could be as a result of the interactive nature of the instructional technique employed. To buttress this assertion, Odika and Tom (2022) posited that the simulation use of audio, text, multi-coloured images, graphics, motions, light and other special effects provide ample and exceptional opportunities for the learners (students) to develop capability for high quality learning and increase their ability to be highly innovative in thinking and in practice.

The study in table 2 revealed that male students taught with computer simulation instructional technique exhibited higher retention ability than the female students. This is in contrast to the findings of Okeke in Achor and Gbadamosi (2020) who reported that girls retain more than boys in the sciences. This finding upholds the view of Okeke (2011) who posited that gender influences the mean retention scores of science students.

On treatment gender interaction influence on students retention, this study in table 3 revealed that students (both male and female) taught blocklaying and concreting with computer simulation instructional technique have higher retention scores than those taught with computer tutorial instructional technique.

The study in table 4 revealed that there is a significant difference in the mean scores of student

taught blocklaying and concreting using computer simulation instructional technique and computer tutorial instructional technique. This implies that students taught with computer simulation technique do not possess equal retention ability with their counterparts taught same concepts using computer tutorial instructional technique. This finding is in line with Abdullahi (2010) who reported that students retain more when they were taught biology with simulation teaching techniques than when they were taught with other methods.

This study further revealed that there is significant difference in the mean retention ability of female and male students instructional technique. This is in agreement with the findings of Igwe (2012) who stated that there is significant difference in the mean scores of boys and girls taught basic electronics with computer tutorial and simulation in retention of learning. This is in constrast with Onyeme and Olele (2020) who affirmed that gender is not an indicator of whether students retain physics concepts longer or not. This therefore, means that the extent to which a student retains the concept right depends on gender. The result further disagree with the findings of Alhassan, Aede, Hassan and Idris (2020) who found out that there was no significant differences between the retention of male and female students in technical drawing.

This study also found out that there is no significant difference in the treatment gender interaction influence in students' retention inn blocklaying and concreting. This is in agreement with Okwori and Tartiyus in Asogwa, Muhammed, Asogwa and Ofoegbu (2016), that computer simulation packages increase students retention irrespective of gender.

Conclusion

Computer simulation instructional technique is discovered to be very important in the teaching and learning process of properly utilized, it provides a learning environment that will help learners (students) to be more effective. Students taught blocklaying and concreting with computer simulation instructional technique retained higher than those taught using computer tutorial instructional technique. This suggests that computer simulation instructional technique facilitates students' retention. Male students taught with computer simulation instructional technique retained better than female students taught with the same technique. Students retention ability depends on the instructional technique employed.

Recommendations

The following recommendations are made in line with findings of the study.

1. Computer simulation instruction should be made a compulsory teaching strategy in the technical colleges in the country as it will enhance student retention of concepts in their areas of study.
2. Technical teachers should be trained by the government (federal and state) on the 21st century teaching strategies such as computer and ICT based teaching which includes computer simulation instruction technique in order to improve students retention.
3. Blocklaying and concreting teachers should pay attention to the issue of gender differences in the classroom. They should at all cost try to eliminate content instructional technique and materials that will introduce gender differences inthe teaching and learning environment.
4. The National University Commission (NUC) and National Commission for Colleges of Education (NCCE) should adequately supervise teachers for effective implementation of curriculum in Nigeria especially when computer simulation instructional technique is introduced into the school system.

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