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Effects of Computer-Assisted Instruction and Demonstration Method of Teaching Automobile Technology in Federal Colleges of Education (Technical) in North-Eastern Nigeria

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Abstract: ***The study compared the relative effectiveness of computer-assisted instruction (CAI) and demonstration method of teaching automobile technology in federal colleges of education (Technical) in Yobe and Gombe states, both in North-Eastern Nigeria. The students in federal college of education (Technical) Potiskum were taught using computer–assisted instruction. While those students in federal college of education (Technical) Gombe were taught using demonstration method of teaching. Four research questions and four null hypotheses were formulated in line with the purposes to guide the study. The pre-test and post-test non-equivalent quasi experimental design was used. The researchers developed computer-assisted instructional package and an achievement test which were validated and administered to final year NCE 111for the 2010/2011 academic session students in automobile technology. The t-test statistical method was used to test the null hypotheses at 0.05 level of significance. The result of the findings revealed that CAI group performed better than the demonstration method of teaching group. A significant difference exist between the post-test mean achievement scores of the students taught automobile technology using computer-assisted instruction and those taught using demonstration method of teaching. Based on the findings, colleges of education were advised to provide CAI software to make teaching and learning more effective.***

Keywords: Effects, Computer-Assisted Instruction, Demonstration

1. Background of the Study

Computer-assisted instruction (CAI) encompasses a broad range of technology that supplements the classroom teaching and learning environment. Computer-assisted instruction is a diverse and rapidly expanding spectrum of computer technologies that assist the teaching and learning process (Douglas, 1997). CAI is a programme that is specifically designed to take care of the problems of dealing with the bright and dull students and those who come from different social and religious backgrounds at the same time (Abdullahi,2008). Obviously, students that come from different backgrounds will have different learning rates. In computer-assisted instruction, the computer presents frames of information and questions. A student working with the computer proceeds through sequenced learning materials. The computer provides the students with exercises that reinforce the learning of specific skills taught in the classroom and supplies immediate feedback on the correctness of the response. Used in this manner, CAI functions as a supplement to regular classroom instruction and may be specifically useful when aa teacher does not have the time to work individually with the student. Computer-assisted instruction could be of great help to students because of the drill and practice, tutorial and simulation activities offered as a supplement to traditional teacher directed instruction can have a significantly positive impact on student learning and achievement (Kulik and Kulik, 1985 & Cotton, 2001).

According to Lillie, Hannum and Struck (1989), computers can benefit students by helping them to improve self-confidence, develop a sense of accomplishment and overcome anxiety in teaching and learning of automobile technology. Communication between students and teachers can adapt to the abilities and preferences of individual students and increase the amount of personalized instruction a student receives (Collins, Deck & Myra 2008). The students will be exposed to the three dimensional simulations of the engine and its components as it relates to automobile technology. In teaching, the teacher can use various models of integrating computer into the classroom. These models according to Newhouse (2002) are: (i) the whole-class model (ii) the one-to-one model and (iii) the group work support model.

Demonstration is the basic method especially in automobile technology for introducing new skills to the learner. It consists of showing the leaner how new skills should be performed. The teacher does the showing, while the learner observes. The showing is accompanied by explanation on the part of the teacher of 'how' the skill is being demonstrated (Miller, 1990).Demonstration method of teaching can be used at all levels of education – primary, secondary and tertiary. The method demands certain level of skills, practice and appeals to many senses. It is a good method for introducing new skills, developing understanding and showing the appropriate ways of doing things (Abimbade, 1997& Cyril, 2010).

The modern approaches to classroom instruction calls for the use of computer-assisted instruction in order to improve students' academic achievement. In Nigeria, teachers still stick to the old traditional method of teaching instead of using the various multimedia available to provide modern method of instruction. Therefore, in order to improve on the existing methods of teaching automobile technology, a comparative study on the effects of computer-assisted

instruction and demonstration method of teaching was carried out. Further more, the need to integrate modern knowledge with modern methods of teaching inform this study.

Purpose of the Study

The study was set to find out the comparative effectiveness of computer-assisted instruction and demonstration method of teaching on student's achievement in automobile technology.

Research Questions

The following research questions guided the study:
1) Is there any significant difference in student's pre-test mean achievement scores when taught using computer-assisted instruction and those taught using demonstration method of teaching?
2) Will there be any difference in student's post-test mean achievement scores when taught automobile technology using computer-assisted instruction and those taught through demonstration method of teaching?
3) Is there any difference in student's pre-test and post-test mean achievement scores when taught automobile technology using computer-assisted instruction?
4) Is there any difference in student's pre-test and post-test mean achievement scores when taught automobile technology using demonstration method of teaching?

Hypotheses
Four null hypotheses were formulated to guide the study and tested at 0.05 level of significance:
1) There is no significant difference between the pre-test mean achievement scores of students taught automobile technology using computer-assisted instruction and those taught through demonstration method of teaching.
2) There is no significant difference between the post-test mean achievement scores of students taught automobile technology using computer-assisted instruction and those taught through demonstration method of teaching.
3) There is no significant difference between the pre-test and post-test mean achievement scores of students taught automobile technology using computer-assisted.
4) There is no significant difference between the pre-test and post-test mean achievement scores of students taught automobile technology using demonstration method of teaching.

2. Methodology

The study used quasi experimental design that employed a pre-test and post-test control group design approach. The design was considered appropriate for the study because it is more reliable to use a natural classroom setting to ensure wider applicability of results than to create classroom groups through random selection and random assignments. In this design, two groups were involved, the experimental group (CAI) and the control group (Demonstration).

The geographical location of the study is North Eastern State of Nigeria where Federal College of Education (Technical), Gombe in Gombe state and Federal College of Education (Technical), Potiskum, Yobe state were used for the study. The study area was appropriate because the two colleges were equipped with the necessary facilities for information and communication technology. Yobe state is located along latitude 12° $00^{'}$ North and longitude 11° $30^{'}$ East.

The population of the study was made up of the 32 National Certificate in Education (NCE) final year students for 2010/2011 academic session offering automobile technology in the two colleges. Therefore, there were two intact classes; one in Federal College of Education (Technical), Gombe in Gombe state supervised by two researchers and Federal College of Education (Technical), Potiskum, Yobe state also supervised by the remaining two researchers. The Statistical Package for Social Sciences (SPSS) was used to analyze the data collected. Mean and standard deviation were used to answer the research questions. The t-test statistic was used to test the null hypotheses at 0.05 significant levels A decision was rule that if the calculated value is less than or equal to the table value then the null hypothesis was upheld. Otherwise, it was rejected.

Reliability of the Instrument

The instrument was pilot tested in Federal College of Education (Technical), Bichi and College of Education (Technical), Gusau, both of them in North- Western Nigeria. The reliability of the instrument was 0.86 (Cronbach Alpha). To control extraneous variable and eliminate experimental bias, the following conditions were laid down:
I) The same lesson topics were taught to the groups.
II) The same achievement test was administered to the groups.
III) The researcher was not directly involved in the administration of the tests instruments but only in supervision.

Validation of the Instrument
The instrument went through both content and face validation by specialist in Modibbo Adama University of Technology, Yola and Umar Ibn El-kanemi college of Science and Technology, Bama. Their suggestions and recommendations were used to produce the final version of the test instrument.

Experimental Treatment

The students were given an orientation for the first week. Both groups were pre-tested with 30 item multiple choice questions to ascertain their entry behaviour. The treatment took place simultaneously in each of the areas under study. The researchers developed a comprehensive lesson notes and lesson plan on two-stroke cycle and four-stroke cycle spark ignition engines. The treatment was given to the demonstration group during the normal two hours period for practical lessons. Other lecturers in the department of automobile technology were used as research assistants. A CD-ROM serving as the teaching medium was used for the computer-assisted instruction group. The lesson covered the same topics with the demonstration group. Each lesson lasts for about twenty minutes. The whole exercise lasted for about five weeks. Finally, at the end of each lesson, a post-

test was administered to both groups in each of the colleges under study.

Instrument for Data Collection

Data for this study were collected through a researcher's developed test instrument based on the 2009 National Commission for Colleges of Education (NCCE) Minimum Standards and a CD-ROM serving as the teaching medium. The topics covered were:

i. Two-stroke cycle spark ignition engine.
ii. Four-stroke cycle spark ignition engine.

The achievement test instrument included the following:

i. A 20-item multiple choice pre-test instrument which was administered to the students before the treatment in order to ascertain their entry behaviour. The result was compared with that of the post-test.
ii. A 40-item multiple choice post-test instruments based on two-stroke cycle spark ignition engine.
iii. A 40-item multiple choice post-test instruments based on four-stroke cycle spark ignition engine.

3. Results of the study

Four research questions were stated for the purpose of this work. The first research question compared an independent sample mean achievement score of students at the pre-test computer-assisted instruction (CAI) and pre-test demonstration. The second research question compared paired sample statistics at pre-test CAI and post-test CAI. The third research question compared paired sample statistics at pre-test CAI and post-test demonstration. The fourth research question compared paired sample statistics at post-test CAI and post-test demonstration level.

Table 1: Analysis of Research Questions

Variable	N	Mean	Std deviation	Remark
Pre-Test (CAI)	20	16.80	2.71	Low
Pre-Test (DEM.)	11	16.90	2.66	Low
Post-Test (CAI)	20	26.60	3.53	High
Post-Test (DEM.)	11	18.09	3.59	High

DEM. = Demonstration CAI= Computer-assisted instruction

The mean achievement scores for the two pre-tests are 16.80 for CAI and 16.90 for DEM. with standard deviations of 2.71 and 2.66 respectively. This indicates that the two groups are at a level ground. This gives a fair judgment on the post-test result because there was no background difference between the groups. The mean achievement scores for the two post-tests are both high (26.60 and 18.90) respectively with standard deviations of 3.53 and 3.59.

Hypothesis 1

There is no significant difference between the pre-test mean achievement scores of students taught basic automobile technology concepts using computer-aided instruction and those taught using demonstration method of teaching.

Table 2: Summary of Pre-test Mean Achievement Scores of CAI and Demonstration

Groups Variable	N	$\bar{X}$	Df	t-cal	t-table	Decision
Pre-Test (CAI)	20	16.80	29	0.091	2.045	NS
Pre-Test (DEM.)	11	16.90				

NS = Not Significant

Table 2 shows the result of the computer-aided and demonstration groups at pre-test level. The number of observations and degree of freedom are highlighted. The table value of 2.045 is greater than the calculated value of 0.091. Therefore, the null hypothesis is accepted.

Hypothesis 2

There is no significant difference between the post-test mean achievement scores of students taught automobile technology using computer-assisted instruction and those taught through demonstration method of teaching.

Table 3: Summary of Post-test Mean Achievement Scores of CAI and Demonstration

Groups Variable	N	$\bar{X}$	Df	t-cal	t-table	Decision
Post-Test (CAI)	20	26.60	29	3.195	2.045	S
Post-Test (DEM.)	11	18.90				

S = Significant

Table 3 shows the result of the computer-aided and demonstration groups at post-test level. The number of observations and degree of freedom are highlighted. The group has a calculated t-value of 3.195 against the critical t-value of 2.021 at 29 degree of freedom. Since the calculated t-value is higher than the value of t-critical, therefore, the null hypothesis is rejected.

Hypothesis 3

There is no significant difference between the pre-test and post-test mean achievement scores of students taught automobile technology using computer-assisted instruction.

Table 4: Summary of Pre-test and Post-test Mean Achievement Scores of CAI

Group Variable	N	$\bar{X}$	Df	t-cal	t-table	Decision
Pre-Test (CAI)	20	16.80.	38	8.950	2.021	S
Post-Test (CAI)	20	26.60				

S = Significant

Table 4 shows the result of the computer-aided and demonstration groups at post-test level. The number of observations and degree of freedom are highlighted. The groups test has a calculated value of 8.950 against the critical table value of 2.021 at 38 degree of freedom. Since the calculated t-value is higher than the value of t-critical, therefore, the null hypothesis is rejected.

Hypothesis 4

There is no significant difference between the pre-test and post-test mean achievement scores of students taught automobile using demonstration method of teaching.

Table 5: Summary of Pre-test and Post-test Mean Achievement Scores Demonstration

Group Variable	N	$\bar{X}$	Df	t-cal	t-table	Decision
Pre-Test (DEM)	11	16.90	20	2.086	1.648	S
Post-Test (DEM.)	11	18.09				

S = Significant DEM = Demonstration

Table 5 shows the result of the demonstration group at pre-test and post-test level. The groups test has a calculated t-value of 2.021 against the critical t-value of 1.648 at 20 degree of freedom. Since the calculated t-value is greater than the value of t-critical, therefore, the null hypothesis was rejected.

4. Discussion of Findings

The discussions were centered on the research questions and hypothesis. During the pre-test, the students were found to be low achievers and having equivalent entry behavior. Perhaps this happened because the students did not read the course in advance. As result of the higher critical t-value that was returned, the null hypothesis was accepted as in table 2. This result agrees with the findings of Ragasa (2008) which revealed that the achievement pre-test of the two groups had a significant effect on the dependent variable.

Table 3 reveals that there was a high achievement score of students of the two study groups after the post test. The summary of the outcome of this funding is that student was helped to understand better the operations in automobile technology using the computer aided instruction and demonstration. However, the experiment where the treatments (two different teaching methods) were applied showed that students thought using CAI performed better than those taught with demonstration method as revealed in tables 1 & 3 post-test CAI with mean 26.60.

This result is inconsistent with the findings of Owosu, Mooney, Oppiah and Wilmot (2010) who revealed that students who were instructed by conventional methods performed better on the post test than those instructed by computer aided instruction. Nevertheless, this does not mean that demonstration method does not have positive effect on students' achievement. In cases where it was not easy to have a clear simulation of the operation under the CAI method, the demonstration method was preferred since it gave the students better appreciation of the operations (See table 2, pre test (Dem) with mean 16.90). From the outcome of the experiment, the researchers concluded that while the CAI method remains an excellent method of teaching automobile technology, some complex (difficult to animate or simulate) components of automobile technology should be taught with a combine method of CAI and demonstration for best results.

Table 4 shows that the CAI group paired sample analysis at pre-test and post –test level. The result indicates that the group has a calculated value of 8.95and a table value of 2.021. Therefore, significant different exists between the pre-test and the post-test scores. These findings concur with Abdullahi (2008) view who said that computer provides student with exercises that reinforce the learning of specific skills taught in the classroom and supplies immediate feedback on the correctness of the response. The interactive nature of CAI greatly improves student's academic achievement.

The summary of the pre-test and post-test scores on demonstration group is depicted in table 5 which returned t-cal as 2.086 and while t-table as 1.648. Therefore, the null hypothesis was rejected. This shows that there is a significant difference in the degree of improvement achievable by demonstration group in understanding two stroke and four stroke ignition engines. This finding is in line with the view of Abimbade (1997) who stated that demonstration method of teaching is a good method of introducing new skills, developing understanding and showing the appropriate ways of doing things.

5. Findings of the Study

The following findings have been made based on the results of data analysis for this study:

1) The two independent statistics of the pre-test for both computer-assisted instruction and the demonstration groups shows a sign of indifference in the two groups. The student's academic performance at the pre-test level is the same. This revealed that the students did not read in advance.
2) There is a significant difference in the post-test result of the two paired groups in two-stroke and four-stroke cycle spark ignition engines. This has shown that the deployment of computer-assisted instruction in teaching automobile technology resulted in a higher gain than demonstration method of teaching. The students were able to better understand the operation of the internal combustion engines in real time three dimensional simulations.
3) The effect of the two pre-test and post-test paired group statistics for the computer-assisted showed a significant difference. The learning loss which led to the rejection of the null hypothesis serves as evidence. This happened as a result of chance or error.
4) The effect of the pre-test and post-test paired group statistics for demonstration group proved the difference in learning enumerated in hypothesis 4 led to the rejection of the null hypothesis. The demonstration group performed better at post-test level.

6. Conclusion

The result of the findings of this study has provided some useful implications. To the students, it has been revealed that computer-aided instruction facilitates learning. They allow students to progress at their own pace and work individually or in a group since they have prepared lesson on a CD-ROM. Computers captures the student's attention since the programmes are interactive and engage the student's spirit of competiveness to increase their scores.

The findings also have great implication to teachers as it motivates the teachers to find reason in the use of computer-aided instruction in teaching and learning of automobile technology. Teachers will enjoy greater and ease of updating

instructional materials, less reputations in preparing lesson plans and more time for working directly with students.

The implication of this finding to decision makers is that it will provide them with data based information on the importance of computer-aided instruction in colleges of education. They will also enjoy greater uniformity in the content taught throughout the states of the federation unlike in situation when every teacher used his/her discretion to teach a topic. Teachers will be motivated to see the reason in adopting computer-aided instruction as a method of teaching in all states of the federation.

7. Recommendations

Based on the findings of the study and their implications, the following recommendations were made:

1) The use of computer aided-instruction should be made mandatory in all colleges of education to catalyze learner's interest and motivation. This will surely improve the student's academic achievement.
2) Colleges of education should acquire all the necessary hardware and software and encourage the teachers to adopt this current teaching and learning strategy.
3) There is the need to encourage teachers to attend seminars and workshops on the use of modern instructional media for teaching and learning. This will help them in updating their knowledge.

References

[1] Abdullahi, M. (2008).Using Information Technology for Science and TechnologyInstructions. Being a Paper Presented at a Workshop Organized by the Federal College of Education (Technical), Potiskum, Wednesday, June 25.
[2] Abimbade, A. (1997). *Principles and Practice of Educational Technology*. Ibadan: International Publishers Limited.
[3] Cotton, K. (2001)."Computer Assisted Instruction".North West Regional Educational Laboratory.Retrieved on01/10/10.from ttp://www.nwrel.org/scpd/sirs/5/cu/10.html.
[4] Collins, T.D., Alan, B.D & Myra, M. (2008). Computer Aided Instruction: A Study of Student Evaluations and Academic Performance. *Journal of College Teaching & Learning* 5(11)49-55. Retrieved from http// scholar.lib.vtedu/ejournals.
[5] Cyril, M.U. (2010). *Entreprenuerial Competencies Needed by Vocational Technical Teachers Education Students in Norht Eastern Nigeria.*Unpublished ph.D Thesis, Federal University of Technology, Yola.
[6] Douglas, N.A. (1997). *Computer Aided Instruction.* Microsoft Encarta 98 Encyclopedia Microsoft Corporation.
[7] Kulik, J.A. &Kulik, C.C. (1985).Effectiveness of Computer-Based Education in Elementary Schools.*Computers in Human Behaviour*. 1(1), 59-74.
[8] Lillie, D.L, Hannum, W.H., & Struck, G.B. (1989). *Computers and Effective Instruction*. NewYork.Longman.
[9] Miller, W.R. (1990). *Instructors and their Jobs.* Illinois: American Technical Publisher Inc.
[10] Ogbonna, B.B. &Dakun,W.S. (2003). *A New Approach to Educational Measurement and Evaluation*: Pankshin. Eureka Academic Foundations
[11] Owosu, K.A; Monney, K. A, Appiah, J. Y. & Wilmot W. M. (2010) Comparative efficiency of computer assisted instruction and conventional teaching method in biology on Senior High School Students in Ghana*Education Technology 55(2), 904-910*
[12] Ragasa, C.Y. (2008). A Comparative of Computer-Asssisted Instruction and Traditional Method of Teaching Basic Statistics. Journal of Statistics Education. 16, (1) 4-11.Retrieved on 03/02/11 from http//www.amstat.org/publications/jse/vl6nl/ragasa.html
[13] Sambo, A. A. (2005). *Research Methods in Education.* Ibadan Sterlin: Horden Publishers.