Effects of Computer Assisted Instruction (CAI) on Students' Achievement in Social Studies in Osun State, Nigeria

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Abstract: The study investigated the effect of Computer Assisted Instruction (CAI) on Junior Secondary School Students' achievement in Social Studies. The study equally examined the interaction effects of treatment of academic ability on students' achievement in Social Studies. Simple random sampling was employed in selecting 160 students from four co-educational public secondary schools in Osogbo and Ife Central Local Government Areas of Osun State, Nigeria. The study used a 2 x 2 factorial analysis of ANOVA and three null hypotheses were tested. Four instruments were used namely: "Social Studies Achievement Test" (SSAT) "Computer Assisted Instruction Guide for Social Studies" (AIGSS), "Teacher Operational Guide for Social Studies Instruction" (TOGSSI) and "Students' Academic Ability Test" (SAAT) with reliability coefficients of 0.87, 0.79, 0.71 and 0.78 respectively. Data Analysis was done by using Analysis of Covariance Procedure. The results indicated that there is no significant main effect of treatment (Computer Assisted Instruction and Conventional Methods) on student achievement in Social Studies ($F_{(1,153)} = 0.415$, $P > 0.05$). The result also revealed that there is significant main effect of academic ability on students' achievement in Social Studies ($F_{(1,153)} = 7.852$, $P < 0.05$). The high academic ability students were significantly better than the low ability students in their achievement in Social Studies. The findings further revealed that there is no significant interaction effect of treatment and students' academic ability in their achievement in Social Studies ($F_{(1,153)} = 0.687$, $P > 0.05$). Based on the findings of the study, recommendations were made among others, that conducive environment should be provided with adequate facilities for Computer Assisted Instruction (CAI) as a mode of instruction to be effectively utilized in schools.

Keywords: Computer Assisted Instruction, Conventional Teaching Method, Academic Ability, Social Studies and Achievement

1. Introduction

The recent changes in the world and within nations have brought about changes in educational goals. The schools are called not only to equip the learner with basic knowledge of Social Studies content as far as Social Studies Curriculum is concerned, but also with practical skills capable of enhancing self-development and continuous learning. This is to say that the quality of education in particular could not be compromised in the modern day of science and technology.

The pedagogical implication of the above statement centred on teachers and ways and methods employed in imparting facts and ideas to learners. According to NTI (2008), the old approach to teaching is teacher-centred which implies that teacher does all the talking, and the learners do all the listening. Cooper (1973) noted that the traditional or the conventional instruction method is characterized by:

1.Unspecified or vague objectives
2.Emphasis on instructor behaviour rather than student behaviour.
3.Use of lectures to provide critical information
4.A constant instruction – set pace for all students
5.Evaluation which is infrequent over large sections of materials, and for the purpose of assigning relative standing rather than for remediation.
6.Delayed feedback to student about his performance.
7.Minimal responses of students to the instructional materials.
8.Few faculty/student or teacher/student interactions.

Hess and Lehman (1976) noted that under the traditional system of instruction, the student is motivated primarily by the fear of receiving a poor grade, of losing a course credit or of being forced to leave the College (droping out) for academic failure.

However, the new approach is learner centred, the learner is not treated as an empty vessel. He is credited with knowledge, skills and attitudes from the day he or she is born which requires development, through guidance, encouragement and motivation.

It is therefore not a gainsaying to say that the quality of education is largely dependent on the quality of instruction provided in the classroom. There is no doubt that technology has become incorporated into our school system. Computers are not only used as means of helping schools analyse data, they have become pervasive tools toward optimizing students' learning. For example, students are regularly using the internet to gather and assimilate information for use in research assignments. According to Traynor (2003), computers are used in preparing "electronic" presentations using computer presentation programs and LCD projectors. He was also of the view that many schools have incorporated interacted computer-assisted-instruction into programme to provide students opportunities to master specific educational objectives or standards.

Computer Assisted Instruction (CAI) can be referred to as a self-learning technique usually offline/online, involving interaction of students with programmed instructional materials. CAI is an interactive instructional technique whereby a computer is used to present the instructional material and monitor the learning that takes place. CAI uses a combination of text, graphic sound and video in enhancing the learning process. The computer has many purposes in the classroom, and it can be utilized to help a student in all areas of the curriculum.

CAI refers to the use of the computer as a tool to facilitate and improve instruction. CAI programs use tutorials, drill and practice, simulation and problem solving approaches to present topics and they best test the students' understanding.

Previous studies such as Kulik, Kulik and Bangert-Drowns (1985), Wade (2006), Macaruso & Rodman (2009) have succeeded in examining typicality, types, advantages and limitation of CAI.

Typical CAI provides:

1.Text or multimedia content
2.Multiple-choice questions
3.Problems
4.Immediate feedback
5.Notes on incorrect responses
6.Summarized students' performance
7.Exercises for practice
8.Worksheets and tests.

Types of CAI include:

1. Drill-and-practice. Drill and practice provide opportunities for students to repeatedly practice the skills that have been previously presented and further practice is necessary for mastery.
2. Tutorial: Tutorial activity includes both the presentation of information and its extension to different forms of work, including drill and practice, games and simulation.
3. Games: Game software often creates a content to achieve the highest score and either beat others or beat the computer.
4. Simulation: Simulation software can provide an approximation of reality that does not require the expense of real life or its risks.
5. Discovery: This provides a large database of information specific to a course or content area and challenges the learner to analyse, compare, infer and evaluate based on their explorations of data.

6. Problem-solving: The approach helps children develop specific problem skills and strategies.

Advantages of CAI include:

– One-to-one interaction
– Great motivator
– Freedom to experiment with different
– Instantaneous response/immediate feedback to the answer elicited
– Self pacing – allowing students to proceed at their own pace.
– Help teacher to devote more time to individual students
– Privacy helps the shy and slow learner to learn
– Individual attention
– Learn more and more rapidly
– Multimedia helps to understand difficult concepts through multi-sensory approach
– Self directed learning – students can decide when, where and what to learn.

Limitations of CAI include:

– May feel overwhelmed by the information and resources available.
– Over use of multimedia may divert the attention from the content
– Learning becomes too mechanical
– Non availability of good CAI packages.
– Lack of infrastructure

In the light of all the above, it is considered appropriate to examine the extent to which CAI method of teaching will affect students' achievement in Social Studies. Therefore, this study examines the effect of CAI on students' achievement in Social Studies through an experimental study.

2. Hypotheses

Ho_1: There is no significant main effect of treatment on students' achievement in Social Studies.
Ho_2: There is no significant main effect of academic ability on students' achievement in Social Studies.
Ho_3: There is no significant interaction effect of treatment and academic ability on students' achievement in Social Studies.

3. Research Design

The study makes use of 2 x 2 randomized pre-test, post-test factorial design in a quasi-experimental setting.

4. Variables in the study

The design crossed the independent and moderator variable to provide for a 2 x 2 factorial analysis of ANOVA.

5. Population

All the Junior Secondary School II students in Osun State constitute the population.

6. Sampling and Sample

Simple random sampling was employed in selecting four co-educational schools from Ife Central and Osogbo Local Government Areas which were also randomly selected. Simple random sampling was equally

employed in selecting 40 students in each of the schools selected. In all, 160 students constituted the sample for the study. Subjects were therefore classified into the experimental and control groups.

7. Instruments

Four major instruments were made use in their study. These include:
(i) Social Studies Achievement Test (SSAT). This is a 60-item multiple choice test. It covers three levels of cognitive domain i.e. knowledge comprehension and application. This instrument has a reliability estimate of 0.87.
(ii) Computer Assisted instruction Guide for Social Studies (CAIGSS).
The Computer Assisted Instruction Guide for Social Studies (CAIGSS) is a programmed instructional package for the purpose of instruction in the classroom. The instructor guide which contain three major topics in Social Studies – (i) Leadership and followership (ii) Science and Technology and (iii) Transport and communication.

The programmed Computer Assisted Instruction consists of a lesson plan for each lesson, and each of the lesson plan contains specifics such as:

. The subject
. The content (topic)
. The objective to be achieved at the end of the instruction
. The instructional materials; and
. The assessment

The CAIGSS has a reliability value of 0.79

(iii) Teacher Operational Guide for Social Studies Instructional (TOGSSI)
The teacher Operational Guide for Social Studies is an instructional guide employed in teaching the control group by utilizing the conventional method of teaching. It consists of lesson plan written for each lesson. Each of the lesson plan contains specifics like:

. The subject
. The content (topic)
. The objective to be achieved at the end of the instruction
. The instructional materials
. The specific activities; and
. The assessment

The TOGSSI has reliability coefficient of 0.71

(iv) Students' Academic Ability Test (SAAT)
This is a 30-item multiple choice achievement test with five options per item A to E which the students were to choose the correct option. It was adopted from Ugo (2008). The thirty questions were selected from a pool of verbal aptitude test on N.C.E.E. which were already standardized However, the 30 items were still subjected to Kuder-Richardson formula 20 in order to establish the internal consistency of the items and this yielded the reliability coefficient of 0.78.

8. Treatment Procedure and Data Collection Strategy

Two research assistants were trained on how to use the instruments. SSAT and SAAT were administered on the experimental and control groups prior to the instruction. The scores obtained after administering SSAT

served as pre-test while the scores obtained from SAAT was used to classify the students into high and low ability groups. The students who scored below the mean score in SAAT are classified as low ability students while those whose score range between mean score and above were classified as high ability students.
The students in the two groups were taught three topics
(i) Leadership and followership (ii) Science and Technology and (iii) Transport and communication, the experimental group with the use of Computer Assisted Instruction (CAI) and the control group with the use of conventional method. At the end of the six weeks the post-test in Social Studies achievement was administered on the two groups. A two-way Analysis of Covariance (ANCOVA) was used to analyse the data obtained. Normally, one would have used a t-test analysis to compare the experimental and control group; and at the same time use t-test to compare low and high students' academic ability, but the researcher is also interested in interaction effect which could only be carried out with the use of ANCOVA.

9. Result and Discussion

The findings of this study are presented in the following tables:

Table 1: Summary of Analysis of Covariance (ANCOVA) on Social Studies Achievement

Source	Type III sum of squares	df	Mean square	F	Sig	Partial Eta squared
Corrected model	10400.559[a]	4	2600.140	90.027	.000	.699
Intercept	.649	1	.649	.022	.881	.000
Achievement pre-test	8042.212	1	8042.212	278.452	.000	.642
Method	11.999	1	11.999	.415	.520	.003
Level of ability	226.783	1	226.783	7.852	.006	.048
Method * level of ability	19.836	1	19.836	.687	.409	.004
Error	4476.685	155	28.882			
Total	88365.000	160				
Corrected Total	14877.244	159				

[a] R Squared = .699 (Adjusted R Squared = .691)

Table 2: Summary of level of Students' Academic Ability

Level of Academic Ability	Mean	Standard Error	95% confidence interval	
			Lower Bound	Upper Bound
Low Ability	20.073[a]	.913	18.270	21.876
High Ability	23.229[a]	.671	21.904	24.555

[a] Covariates appearing in the model are evaluated at the following values: Achievement Pre-Test = 14.72

Table 3: Summary of Method of Teaching and Students' Level of Academic Ability

Method of Teaching	Level of Academic Ability	Mean	Standard Error	95% Confidence Interval	
				Lower Bound	Upper Bound
Computer Assisted Instruction (CAI)	Low Ability High Ability	20.915[a] 23.138[a]	1.716 1.148	17.525 20.870	24.305 25.406
Conventional	Low Ability High Ability	19.231[a] 23.320[a]	.668 .694	17.911 21.950	20.551 24.691

[a] Covariate appearing in the model are evaluated at the following values: Achievement Pre-test = 14.72.

Hypothesis 1

There is no significant main effect of treatment on students' achievement in Social Studies.
The ANOVA Table 1 shows that there was no significant main effect of treatment (Computer Assisted Instruction and Conventional Methods) on students' achievement in Social Studies ($F_{(1,153)} = 0.415$, $P > 0.05$) since the value of "F" is not significant, it means that the hypothesis on the main effect of treatment (Computer Assisted Instruction and Conventional Methods) on students' achievement in Social Studies is accepted. This shows clearly that the experimental group (Computer Assisted Instruction) is not significantly better than the control (Conventional method) with respect to students' achievement in Social Studies.

Hypothesis II

There is no significant main effect of academic ability on students' achievement in Social Studies.
The ANOVA as presented in table 1, shows that there was significant main effect of students' academic ability (high and low) on their achievement in Social Studies ($F_{(1,153)} = 7.852 < 0.05$) since the value of "F" is significant, it follows that the hypothesis on the main effect of students' academic ability on achievement in Social Studies is rejected. Also, as shown in table 2; the high ability students had mean score of 23.229 while the low academic ability students had mean score of 20.073. Table 3 as well shows the level of academic ability of students based on the teaching methods. In Computer Assisted Instruction, high ability students had mean score of 23.138 as against low ability students who had mean score of 20.915, for conventional method, high ability students had mean score of 23.320 while low ability students had mean score of 19.231. These results clearly showed that the high academic ability students were significantly better than the low academic students with respect to students' achievement in Social Studies.

Hypothesis III

There is no significant interaction effect of treatment and students' academic ability on students' achievement in Social Studies.

Analysis of ANOVA, as presented in table 1 revealed that there is no significant interaction effect of treatment and students' academic ability on their achievement in Social Studies ($F_{(1,153)} = 0.687$, $P > 0.05$). Since the value of F is not significant, it follows that the hypothesis on the interaction effect of treatment and students' academics ability on achievement in Social Studies is accepted.

10. Discussion of Result

According to the findings of this study, there was no significant main effect of treatment (Computer Assisted Instruction and Conventional Methods) on students' achievement in Social Studies. This implies that students taught via Computer Assisted Instruction did not perform better in Social Studies achievement than

those students taught with conventional method. This study contradicted most of the earlier studies such as Tabassum (2004) who was of the view that students taught through CAI as supplementary strategy performs significantly better than other students. Also Ford, Mazzone and Taylor (2005) were of the view that students exposed to Computer Assisted Instruction in the learning of Musculoskeletal Special Tests performed better than students exposed to traditional mode of instruction of the same task. Other similar studies that gave credence to the importance of Computer Assisted Instruction are Jamaison, Suppes and Butler (1970), Bialozor, Fine, McLaughlin (1991), Caryl and Noonan (2000), Soe, Koki and Chang (2000) Basturk (2005), Maitoned, DuPaul and Jitendra (2005), Liao (2007). The insignificant of result present study might be as a result of the fact that most of the students were used to conventional method of teaching, not only that, it was observed that most of the students in the course of this study find it difficult to quickly adjust to the use of Computer Assisted Instruction due to environmental problem It was equally noticed that the procedures involved in the acquisition of skills needed by the students in the learning of the basic concepts are somehow difficult.

The findings of the effect of treatment on academic ability show that high academic ability students performed more significantly in Social Studies than the low academic students in both Computer Assisted Instruction and Conventional Methods. This result corroborated Abadzi (1985), Holmes and Ahr (1994), Emeke and Adegoke (2001), Condron, (2003), Falaye (2006), Adewale (2008), Denessen, Veenman, Dobbelsteen and Vanschilt (2008), Karademir (2009), who were all of the view that high ability students performed better than low ability students. Although it is not mandatory that there should be significant difference between higher and low students ability as pointed out by Muhfahroyin (2009) whose result indicated no difference between higher and lower students ability in the cognitive achievement of Biology, Critical thinking and process skills. Also, Holmes and Ahr (1994) were of the view that ability grouping has no effect on students' achievement.

Furthermore, this study found that there was no significant interaction effect of treatment as students' academic ability on their achievement in Social Studies. This implies that treatment (Computer Assisted Instruction and Conventional Methods) are not sensitive to students achievement in Social Studies. This finding is in line with the findings of Muhfahroyin (2009) who found out that there was no effect of interaction between learning strategy and academic ability towards the cognitive achievement of Biology, Critical and Process skills. Also, Ibode (2008) found that there was no interaction effect of treatment and students' academic ability on achievement in English language.

11. Conclusion

This study has shown that students exposed to Computer Assisted Instruction (CAI) did not perform significantly better in their achievement in Social Studies than those students exposed to conventional method of instruction. In the same vein, high academic ability as revealed by the study boosts students' achievement in Social Studies as against low academic ability. Also, the study revealed that no significant interaction effect existed in treatment of students' academic ability and achievement in Social Studies.

In conclusion therefore, the use of Computer Assisted Instruction should be seen as so germane in this present dispensation and students and teachers should be so equipped in the usage and conducive environment should be provided. Also, the influence of high academic ability on the achievement of students, which this study found, underscores the need for students to strive to improve their academic ability since it has proven to be an important factor in Social Studies achievement.

12. Recommendations

Based on the findings, the following are recommended:

(1) Conducive environment should be provided with adequate facilities for Computer Assisted Instruction to

be effectively utilized in schools.
(2) There is need for Social Studies teachers to update themselves through seminars, conferences and workshop that will enhance the teaching of Social Studies.
(3) Motivation is central to creativity students should be motivated to use Computer Assisted Instruction (CAI) so that its usage will not serve as a burden or waste of time.
(4) Concerted effort is required on the part of Ministry of Education to provide schools with enough funding for the purchase of necessary materials like ICT facilities for use of Computer Assisted Instruction.
(5) Computer Assisted Instruction strategy will go a long way to improve the attitude of both the students and teachers toward the use of this strategy in their future classroom interaction.
(6) There is need for Computer Assisted Instruction to be gradually introduced into the teaching and learning process in Nigeria to supplement the existing method of instruction.

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