

Research Paper

Effects of computer assisted instruction and inquiry instructional methods on secondary schools students performance in biology in Kebbi State, Nigeria

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This research compared computer assisted instruction (CAI) and inquiry instructional approach in teaching Biology as a subject in senior secondary in Kebbi State, Nigeria. The study employed a quasi-experiment design. The population comprised all senior secondary school students in (SS1) in 127 Schools in Kebbi State. A total of 12 SS1 intact classes were used for this study, two classes were drawn from each of the six 6 educational zones in the State, one male and one female school from each zone. One research instrument Biology Achievement Test (BAT) was used for data collection. Three null hypotheses were formulated and tested at 0.05 level of significance. The data collected were analyzed using descriptive statistic and t-test. The major findings

of the study indicated that; inquiry method was more effective than the CAI method in teaching biology; the level of performance was higher in students taught with inquiry method than students taught with CAI method. Female students taught biology with CAI in senior secondary school Kebbi state performed slightly better than male counterparts taught with the same method. Male students taught biology with inquiry in senior secondary school Kebbi state performed slightly better than male counterparts taught with the same method.

Keywords: Computer assisted instruction, inquiry instructional approach, and students' performance in biology

INTRODUCTION

Science is an essential tool for any nations' progress and development (Agboghoroma, 2009, Akinbobola, 2009; Chukwuneke, 2006). Students should be given opportunity to discover and invent for the rapid expansion in science and technology. Biology as science has made great impact in the development of nations and its importance warrants the need to expose biology students to innovative methods like computer assisted instruction (CAI) and inquiry methods. If biology students are exposed to appropriate methods of teaching in the secondary schools, they will be able to apply knowledge, communicate effectively, and be analytical, critical thinkers, inquisitive and imaginative (Edinyang, 2014). Once an individual acquires the right skills and attitude through appropriate teaching methods she/he can survive even in the desert.

Studies like those of Okereke, (2006), Odili, (2006),

Betiku, (2002), and Obodo (2001) indicated that many teachers prefer the traditional, expository/lecture method of teaching and shy away from innovative methods like inquiry, Computer Assisted Instruction, inquiry discovery and laboratory approaches to teaching. Researchers such as Nnaka, (2006) and Akubilo, (2004) have pointed out that despite the thirty years existence of learning style theories (detailing how people learn), most teachers still dispense information using traditional lecture methods without regard to students' learning abilities. These traditional teaching methods are theoretical, extremely didactic and teacher centered, instead of being activity-based and learner centered to enhance learning.

Several research reports indicate that students achieve poorly in secondary school science subjects especially biology (Azubuike 2005; Nwagbo, 2001). Several factors were identified as militating against students' attainment

of the objectives of science instruction. These include inappropriate and uninspiring teaching approaches adopted by science teachers. These researchers express the view that teachers shy away from activity oriented teaching approaches which are known to be more effective. They rely most on teaching approaches that are easy but most of the times inadequate and inappropriate. A lot of innovative instructional methods including discovery, cooperative learning, inquiry concept mapping CAI have been suggested for teaching science and they demonstrated to be effective. A great deal of research has been conducted during the 1970s, and early 1990s on the effects of computer use on students' achievement, attitudes, and other variables such as learning rate. Inquiry approach on the other hand is a teaching strategy which attempt to help learners ask questions and discover answers to their questions. Inquiry method permit student to observe an event recognize relevant and irrelevant questions, search out data and take complete responsibility for an entire process of obtaining organizing and interpreting data. Parents, teachers, government and the public generally are concerned about the state of education in Nigeria. Students' performances in science examinations have continued to dwindle despite governments' investment in physical infrastructure, instructional materials and in training of teachers. This problem has necessitated researchers and science educators to step-up efforts aimed at finding solutions to the problem and identify more effective strategies or approaches of teaching and learning science. The study was propelled by the very interesting discoveries from literature that CAI, and inquiry. Instructional strategies significantly affect student's performance. This development indicates a significant breakthrough in science education research in the identification and creation of learning environment where the students can learn equally and effectively too. However, a question may be asked as whether these two instructional approaches will produce the same effects on students in their study of different science subjects. This is a gap that exists in literature which needs to be filled to enable researchers and science teachers fully appreciate the roles and effects of these two instructional strategies in teaching and learning. The problem therefore is whether the application of CAI, and inquiry instructional approach in teaching and learning biology would produce similar effect on student's performance. This research wishes to compare the relative effectiveness of two methods of teaching biology, the Computer assisted instruction and inquiry method on students' achievement; and to find out if there is interaction effect between instructional method and sex on performances.

METHODOLOGY

Quasi - experimental design was used which employed

the pre-test, post –test control group. It was quasi - experimental because intact classes were used. The population comprises all senior secondary school one (SSI) students in the 127 secondary schools in Kebbi State, Nigeria. The sample consist of 218 senior secondary one (SSI) students from four intact classes from randomly selected secondary schools from amongst the 127 secondary schools in Kebbi State, one class from each of the four sampled schools. Biology achievement test was constructed using content on the topics Nutrition, Photosynthesis Enzymes, with object 50 items. The Biology Achievement Test (BAT) was pilot-tested to establish its reliability using test re-tests. A reliability coefficient of 0.75 was obtained using the Pearson Product Moment Correlation. The experimental group were taught with computer- assisted learning strategy. For this group, the diskette containing the highly-structured lesson was placed in the computer and the students studied the three topics in the diskette on their own from the computer. Control group were taught using inquiry method of instruction.

The treatment lasted for six (6) weeks. Immediately after the treatment the test instrument was administered again to the students as a post test. To find out if there were significance differences among the groups, descriptive statistics and t-test were used

RESULTS

Result in Table 1 shows post-test scores of students taught via CAI and Inquiry approach. The result shows the mean performance in biology for students taught using computer assisted instruction (23.07) and those taught using inquiry based approach (28.32) in senior secondary schools in Kebbi State. The result indicated that students taught with inquiry approach achieved higher than those taught with CAI. Result in Table 2 shows the mean academic performance in biology of male (20.17) and female (26.85) students when taught with computer assisted instruction in senior secondary schools in Kebbi State. The statistical analysis indicated that the female students achieved higher than their male counterparts.

The result in Table 3 shows academic performance of male and female students taught biology using inquiry approach in senior secondary schools in Kebbi State. The result indicated that the males performed better with mean value of 31.00 than their female counterparts with mean of value of 25.40.

Post-test scores of students taught using computer assisted instruction and those taught with inquiry approach is shown on (Table 4).

Results in Table 4 showed there is significant difference between the academic performance of students taught using CAI and those taught with inquiry approach. This implies that students taught by inquiry

Table 1. Students performance for CAI and Inquiry approach.

Groups	N	Mean	SD.
CAI	106	23.07	12.86
Inquiry Approach	98	28.32	15.78

Source: Field Work, 2016

Table 2. Mean performance of male and female students taught using CAI.

Groups	N	Mean	SD
Male CAI	60	20.17	9.30
Female CAI	46	26.85	15.70

Source: Field Work, 2016.

Table 3. Mean performance of male and female students taught using inquiry Approach.

Groups	N	Mean	SD.
Male Inquiry	51	31.00	15.59
Female Inquiry	47	25.40	15.63

Source: Field Work, 2016.

Table 4. Summary of t-test analysis of scores of students taught using computer assisted instruction and inquiry approach.

Variables	N	Mean	DF	t-Cal	t-Critical	Remarks
CAI	106	23.07	202	2.59	1.96	Significant
Inquiry	98	28.0				

Source: Field Work, 2016.

performed significantly better than those taught with CAI in secondary schools in Kebbi State, Nigeria. Results in Table 5 show post-test scores of male and female students taught Biology using computer assisted instruction.

Results in Table 5 show that there is no significant difference in academic performance between male and female students taught using CAI. This indicated that there is no relationship between sex of students and their performance in biology when CAI is used in secondary schools in Kebbi State, Nigeria.

Post-test scores of male and female students taught Biology using inquiry is presented in (Table 6).

Results in Table 6 show that there is no significant difference in academic performance between male and female students taught using inquiry approach. Therefore, hypothesis three is retained. This indicated that there is no relationship between sex of students and their performance in biology when inquiry approach was used in secondary schools in Kebbi State.

Table 5. Summary of t-test analysis of male and female students post-test scores taught using computer assisted instruction.

Variables	N	Mean	DF	t-Cal	t-Critical	Remarks
Male CAI	60	20.17	104	-2.59	1.96	Significant
Female CAI	46	26.80				

Source: Field Work, 2016.

Table 6. Summary of t-test analysis of male and female students' post-test scores taught using inquiry approach.

Variables	N	Mean	DF	t-Cal	t-Critical	Remarks
Male Inquiry	56	31.00	100	1.67	1.96	Not Significant
Female Inquiry	46	25.00				

Source: Field Work, 2016.

DISCUSSION

The findings of the study indicate that the level of learning is higher for students taught with inquiry. Bruner, (1961) noted that what is crucial in learning are storage and retrieval of knowledge. Egbule, (2000) stated that the greater the students' involvement the greater the learning and level of retention. Stressing the value of retention, Akubilo, (2004) pointed out that since students find out information for themselves through inquiry, retention of knowledge is better facilitated.

Another major finding of this study is that there is no significant interaction effect between instructional method of teaching and sex on achievement. This implies that a combination of instructional method and sex do not have any effect on the achievement of students. As pointed out by Dada (2000), a teacher is free to choose his/her method once he/she believes in the efficacy of the method in achieving the aims and objectives. Speaking in line, Oxford (2001) commented that with careful planning any teacher could integrate skills using appropriate methods that will enable him/her to achieve his objectives irrespective of sex. This finding is in line with the findings of Ochonogor and Ajaja, (2005). Ochonogor and Ajaja, (2005) pointed out that teaching task based on a good instructional method keeps the students intellectually alert and keen to participate in an instructional class thus enhancing performance.

Conclusion

This study highlights the effects of inquiry and computer assisted instruction approaches on performance of students in biology in secondary schools. The findings indicate that the inquiry method is more effective and superior to the CAI method in improving students' performance in biology. It can be concluded that the best method for teaching/learning biology is the inquiry

method; since students taught with inquiry method achieve higher score. It is therefore concluded that learning of biology is enhanced more by the inquiry teaching than CAI approach. Biology teachers should be encouraged to use inquiry in teaching of Biology in secondary schools.

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