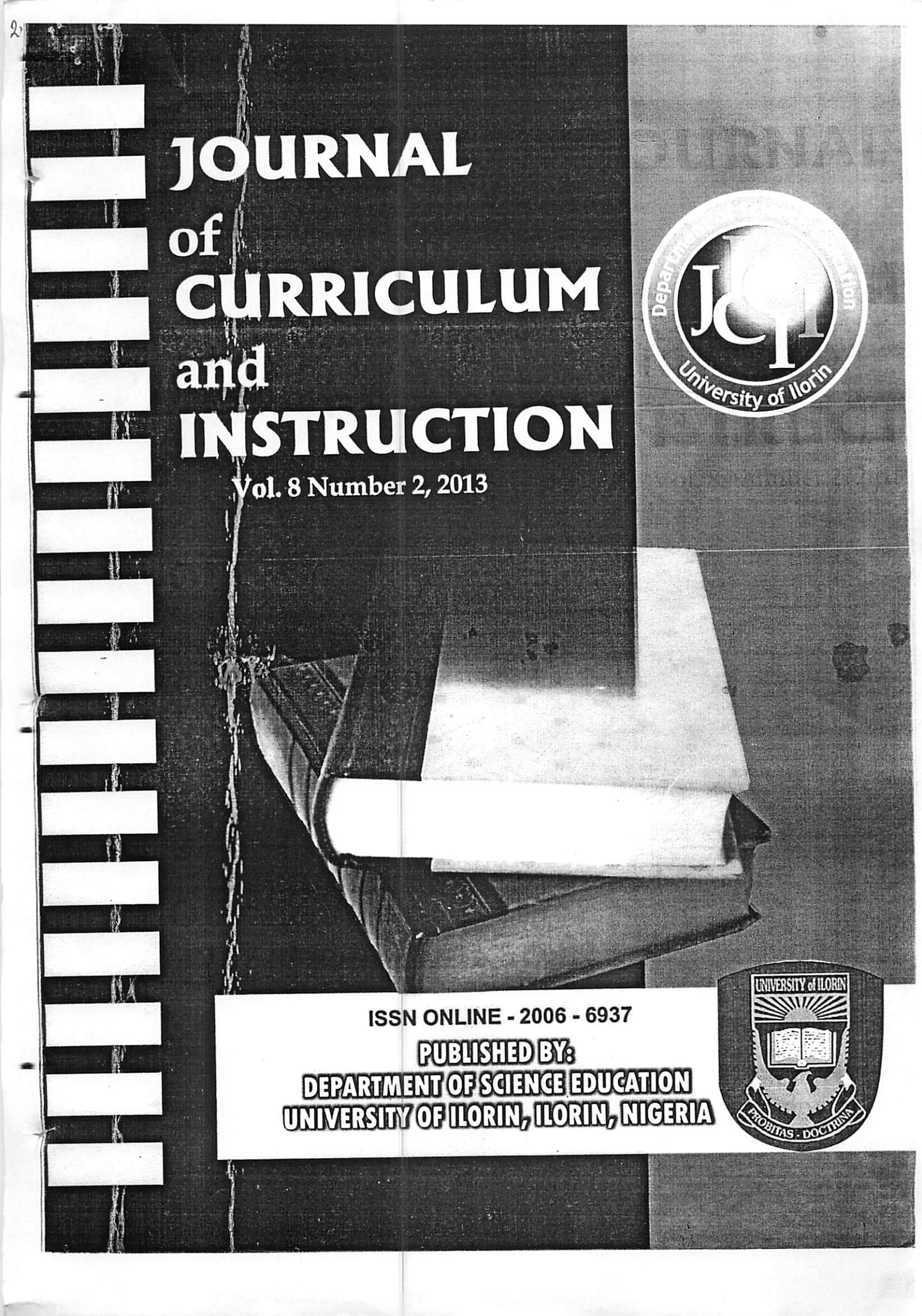
JOURNAL of CURRICULUM and INSTRUCTION

Vol. 8 Number 2, 2013



ISSN ONLINE - 2006 - 6937

PUBLISHED BY:
DEPARTMENT OF SCIENCE EDUCATION
UNIVERSITY OF ILORIN, ILORIN, NIGERIA

ISSN: 0794-4543

JOURNAL OF CURRICULUM AND INSTRUCTION

Volume 8 Number 2, 2013

Website: www.unilorin.edu.ng/ejournals/index.php/jci

Published by:
Department of Science Education,
Faculty of Education,
University of Ilorin,
P.M.B. 1515,
Ilorin, Nigeria.

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ISSN Online: 2006 - 9537

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TABLE OF CONTENTS

EFFECTS OF TEACHERS' USE OF CHECKSHEETS ON SENIOR SCHOOL STUDENTS' ACHIEVEMENT IN BIOLOGY IN ILORIN, KWARA STATE, NIGERIA

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Abstract
The dismal performance of students in Biology in Senior School Certificate Examinations over the years and the need for more efficient instructional strategies necessitated this research work. The study sought to determine the effects of teachers' use of checksheets on students' achievement in Biology. The research design was a quasi experimental one, involving Pre-test, Post-test and Control groups. Biology Achievement Test (BAT) and Researcher Designed Checksheet (RDC) were the two research instruments used in the research for 272 students. Analysis of Co-variance was used to test the hypotheses while pre-test and post-test were analyzed using the mean scores. The findings of this research work revealed that the use of checksheet as an instructional strategy enhanced better achievement of students in Biology. It is recommended that teachers should adopt the use of checksheet for both male and female students to enhance meaningful learning and retention.

Keywords: Teachers, Checksheets, Achievements, Biology

Introduction

Science is defined as a systematic method of knowledge pursuit, which relies heavily on observation and collection of data. It also allows for replications with the likelihood of arriving at the same result as well as aims at predicting, in order to control events in the world (Igbon & Anugwan, 2000). Science education is the field concerned with sharing science content and process with individuals not traditionally considered part of the scientific community.

Biology could be defined as the study of living things and non-living things in the environment. Biology is the Science subject usually chosen by many students nationwide when sitting for the Senior School Certificate Examinations (SSCE) (Ramalinga, 2011). Many students usually fail Biology in SSCE in Nigerian schools, inspite of the popularity of the subject. Some of the reasons adduced for student failure includes teachers methodology and learning strategies of the learners (Hubbard, 1992a). This called for the use of innovative strategies.

Innovation, according to the new Oxford English Dictionary (1998) is bringing in new methods, ideas and making changes. In every curriculum, there is always the need for change. This paper focuses on an innovation involving teachers' use of checksheet as a strategy for teaching Biology, which is an innovative strategy that can be adopted to improve Biology teaching and learning in the senior secondary schools. A checksheet "is a list of materials, often divided into sections, that give the theory and practical steps which

when completed, give one a study completion" (Ron Hubbard Library, 2000:p.131). This method is one of the features of study technology.

Hubbard (1998) developed study technology to help students truly understand what they study and essentially learn how to learn. Study Technology is the basis of all techniques, which teachers can use to improve the learning rate of their students. It can be used by students to improve their ability to understand and use the materials they read and study. Study Technology is the spearhead to a bright new world of understanding and achievement and it forms the basis of the success of all Applied Scholastics Educational Programmes in the United States.

Study Technology, researched and developed by Hubbard (1998), is a unique program enabling a student to overcome the basic barriers to studying and learning the subject, so that he/she can understand and retain the knowledge, which he/she is trying to absorb and can effectively put into application. The features or characteristics of Study Technology are:

(i) Use of checksheet to enhance effective teaching and learning.
(ii) Key word clearing.
(iii) Use of standard and reference dictionaries, to mention a few of them.
(iv) Availability of course materials, including checksheet for students learning – a material based a form of instruction.
(v) Students' partnership (twins) cooperative learning.
(vi) Absence of verbal data which makes student discovers their own mistake.
(vii) Clay modeling (of concepts, through individual study and processes re-study, without teacher's giving answers to question and disposition).
(viii) Chinese school (for deliberate memorization and class participation).
(ix) Availability of projection equipment, and
(x) Sketching (of concepts, processes and dispositions).

According to Hubbard (1998), the checksheet then was a new development in the field of study. It is a vital part of Study Technology. A checksheet is a form of information, which sets out the exact sequence of item by item on a course. It lists all the materials of the course in the order in which they are to be studied with a place for the student to put his initial and the date as each item on the checksheet is studied, performed or checked out.

A checksheet according to Hubbard (1998) is a list of the materials that are needed to study and the practical demonstration, drills, exercises and essays one needs to do. They are given in the order in which they should be treated. The checksheet is laid out to provide the most optimum path through the subject. Theory is interspersed with practical parts to present the subject in a balanced manner. The use of checksheet is not a common instructional strategy used by teachers in Nigeria generally and particularly for Biology teaching and learning. Therefore there is need to consider its potentiality and to find out what effects its use would have on biology students' achievement.

Purpose of the Study

The main purpose of this study was to find out the effects of the use of checksheet on the achievement of senior secondary students in Biology in Ilorin, Kwara State, Nigeria.

The study examined the:

(i) Effects of teachers' use of checksheet on Senior Secondary School students' achievement in Biology;

(ii) Difference in the achievement of Senior Secondary School students using checksheet and those not using checksheet, based on gender;

(iii) Difference in the achievement of Senior Secondary School students taught using checksheet and those not using checksheet, based on their scoring levels; and

(iv) Difference in the achievement of Senior Secondary School students taught using checksheet and those taught without using checksheet, based on interaction effects of gender and scoring levels.

Research Questions

The following research questions were raised:

(i) What is the effect of teachers' use of checksheet on the achievement of Senior Secondary School students in Biology?

(ii) What is the difference in the achievement of Senior Secondary School students exposed to checksheet based on gender?

(iii) Do the achievement of Senior Secondary School students taught Biology using the checksheet and those taught without using checksheet vary with their scoring levels?

(iv) What is the interaction effect of gender and scoring levels on students taught Biology using checksheet?

Research Hypotheses

The following null hypotheses were formulated and tested:

Ho_1: There is no statistically significant difference in the mean achievement scores of secondary school students taught Biology using checksheet and those taught without using checksheet.

Ho_2: There is no statistically significant difference in the mean achievement scores of secondary school students taught biology using checksheet and those taught without using checksheet based on gender.

Ho_3: There is no statistically significant difference in the mean achievement scores of students taught biology using checksheet and those taught without checksheet based on their scoring levels.

Ho_4: There is no statistically significant interaction effect of gender and scoring levels on students taught biology using checksheet and those taught without using checksheet.

Methodology

This was a quasi-experimental research. The pre-test and post-test control group design was adopted for the study. The target population consisted of all students in Senior Secondary Schools in Ilorin metropolis, Kwara State. Four co-educational schools were purposively selected for the study. Two hundred and seventy-two (272) students were involved in the four schools.

The instruments used for data collection were Nervous coordination is one of the topics in the Nigeria Secondary School Biology Curriculum. The sub-topics include: Nervous System, Central Nervous System, Peripheral Nervous System, Neurons, Transmission of Nerve Impulse, the spinal cord and the Brain, Somatic Nervous System, Autonomic Nervous System, Parasympathetic, sympathetic Nervous System, Nerves and Synapses. Biology Achievement Test (BAT) and Researchers' Designed Checksheet (RDC) and checksheet glossary. Biology Dictionary and Biology Textbooks were used as the instructional materials. The study involved six weeks of teaching and one week of testing the students. The test instruments were given to three (3) experts in the Department of Science Education, University of Ilorin, Ilorin, Nigeria for face and content validation. Several suggestions were made and they were used to improve the quality of the instruments. Nervous coordination which is one of the topics in the Nigeria Secondary School Biology Curriculum is the content of biology for the study. The sub-topics include: Nervous System, Central Nervous System, Peripheral Nervous System, Neurons, Transmission of Nerve Impulse, the spinal cord and the Brain, Somatic Nervous System, Autonomic Nervous System, Parasympathetic, sympathetic Nervous System, Nerves and Synapses. This topic and subtopics were selected because they have been identified to be difficult concepts teachers and students find difficult to teach and learn respectively (Oyebanji, 1998).

The pre-test was administered to the students by the researchers to determine the students' level of understanding of the selected topics before teaching them. After 6 weeks of teaching both the experimental and control groups, they were post-tested. The data collected from pre-test and post-test scores for both the control and experimental groups were analyzed using mean scores and Analysis of Covariance (ANCOVA) and pre-test scores were used as covariate. The statistical analyses were carried out using Statistical Package for Social Sciences (SPSS), while the hypotheses were tested using Analysis of Covariance (ANCOVA).

Results

Research Question 1: What are the effects of teachers' use of checksheet on the achievement of secondary school students in Biology? This research question translated to the ***Hypothesis 1:*** (Ho_2) which states that: There is no statistically significant difference in the mean achievement scores of secondary school students taught biology using checksheet and those taught without using checksheet.

Table 1: Analysis of Covariance on the Achievement between the Experimental and the Control Group

Source	Type III Sum of Squares	df.	Mean Square	F	Sig.
Corrected Model	5696.035[a]	2	2848.018	90.408	.000
Intercept	15785.301	1	15785.301	501.094	.000
Pre-test	2746.689	1	2746.689	87.192	.000
Group	3551.903	1	3551.903	112.753	.000
Error	8473.950	269	31.502		
Total	247000.000	272			
Corrected Total	14169.985	1			

a R-squared = .402 (Adjusted R-squared = .398).

Table 1 shows that there was a significant difference in the achievement of students taught using checksheet and those taught using conventional strategy because the significance probability of 0.000 for the F-value of 112.75 is less than 0.05, therefore, the hypothesis is hereby rejected, which means that there was significant difference in the achievement of students taught Biology using checksheet and those that were taught Biology using conventional strategy in favour of those for whom checksheet was used.

Research Question 2: What is the difference in the performance of students exposed to checksheet and those not exposed to checksheet based on gender? This research question translated to the ***Hypothesis 2:*** (Ho_2) which states that : There is no statistically significant difference in mean gain scores of secondary school students taught biology using checksheet and those taught without using checksheet based on gender.

Table 2: Analysis of the Post-test Scores of Male and Female

Source	Type III Sum of Squares	df.	Mean Square	F	Sig.
Corrected Model	309.485[a]	2	154.742	5.224	0.007
Intercept	17143.587	1	17143.587	578.782	0.000
Pre-test	302.750	1	302.750	10.221	0.002
Group	2.540	1	2.540	.086	0.770
Error	3702.515	125	29.620		
Total	141300.000	128			
Corrected Total	4012.000	127			

a R-squared = 0.077 (Adjusted R-squared = 0.062).

Table 2 reveals the dependent variable of post-test achievement of the experiment group, which shows that there is no significant difference in the achievement of male and female students taught using checksheet and this is because the significance probability of 0.770 for F-value of .086 is more than 0.05. Therefore, the hypothesis, which states that there is no significant difference in the achievement of male and female students taught with checksheet, is hereby not rejected.

Research Question 3: Do the achievement of students taught biology using checksheet and taught without using checksheet vary with their scoring levels? This research question translated to ***Hypothesis 3:*** (Ho_3) which states that : There is no statistically difference in the mean achievement scores of secondary school students taught biology using checksheet (experimental) and those taught without using checksheet (control) based on their scoring levels.

Table 3: Results of Analysis of Covariance of High, Medium and Low Scorers in Experimental Group

Source	Type III Sum of Squares	df.	Mean Square	F	Sig.
Corrected Model	312.631[a]	3	104.210	3.493	0.018
Intercept	2960.128	1	2960.128	99.221	0.000
Pre-test	102.268	1	102.628	3.440	0.066
Group	5.685	2	2.843	0.095	0.909
Error	3699.369	124	29.834		
Total	141300.000	128			
Corrected Total	4012.000	127			

a covariates appearing in the model are evaluated at the following values: Pre-test = 14.27

As shown in Table 3, there is no significant difference in the performance of the low, medium and high level ability students taught Biology using checksheet because the significance probability of 0.909 for F-value of .095 is more than 0.05. Therefore, the hypothesis is hereby not rejected, which means that there was no significant difference in the performance of low, medium and high level ability taught Biology using checksheet.

Research Question 4: What is the interaction effect of gender and scoring levels on students taught Biology using checksheet? This research question translated to ***Hypothesis 4:*** (Ho_4) which states that: There is no statistically significant difference based on the interaction effects of gender and scoring levels on students taught biology using checksheet (experimental) and those taught without using checksheet (control).

Table 4: Results of Interaction Effects for Group, Gender and Scoring Level

Source	Type III Sum of Squares	df.	Mean Square	F	Sig.
Corrected Model	6850.216[a]	12	570.851	20.199	0.000
Intercept	2909.712	1	2909.712	102.956	0.000
Pre-test	480.026	1	480.026	16.985	0.000
Group	1797.974	1	1797.974	63.619	0.000
Scoring Level	34.533	2	17.266	0.611	0.544
Gender	6.769	1	6.769	0.240	0.625
Group* Scoring Level	963.785	2	481.893	17.051	0.000
Group* Gender	5.995	1	5.995	0.212	0.645
Scoring Level* Gender	2.680	2	1.340	0.047	0.954
Group*	86.921	2	43.460	1.538	0.217
Scoring Level* Gender Error	7319.769	259	28.262		
Total	247000.000	272			
Corrected Total	14169.985	271			

a R-squared = 0483Adjusted R-squared = 0.459)

Table 4 reveals that there was no significant difference based on interaction effects for scoring level and gender. There was significant difference in the interaction of scoring level and grouping experimental. This is because, the grouping has a degree of freedom of (1,271) = 63.619, which is less than 0.05, also the grouping and scoring level have a degree of freedom at 2,271 at 17.051, which is also less than 0.05 i.e.: Group = df (1,271) = 63.619 < 0.05. However, no differences were established for scoring level, gender and interactions of group and gender, for scoring level and gender and for group, scoring level and gender. The hypothesis is hereby not rejected i.e., Group and scoring level = df (2,271) = 17.051 < 0.05.

Discussion

The findings from this study revealed that students taught using checksheet as an instructional strategy achieved better than those taught using conventional strategy, hence, teacher's use of checksheet enhanced students' achievement in Biology.

It was observed that the experimental group had a higher mean score in the post-test administered than the control group. During the administration of the treatment, the experimental group had a special class activity by using checksheet. The approach facilitated a better understanding of the topic as shown in their achievement in the post-test. The result showed that students who were exposed to the use of checksheet treatment in the experimental group performed better than the control group who were exposed to the conventional strategy of teaching Biology. This agrees with Cuban (1984) cited by Abimbola (2001) who pointed out that one way of finding how teachers taught over a period of time is to examine if instruction has been teacher-centered or student-centered or a mixture of the two in various degrees. This also implies that for meaningful learning to take place, learners would have had training with suitable methods of instruction that take into cognizance learners' cognitive structure (Ausubel, 1989). In addition, Peopping and Melle (2001) reported that apart from the lesson content, the teaching methods and the classroom activities have a large influence on students' achievement in secondary school science classes.

It was found that gender had no effect on students' achievement; this is in line with the works of Daramola (1983) and Bichi (2006) who found that no significant difference existed in the achievements of male and female students in Physics and Biology, respectively in their various studies.

Findings further revealed that teachers' use of checksheet had great effect on high, medium and low scoring students. This is because, though the high scoring students still maintained their high scores after they had been exposed to treatment, but the low and medium scoring students gained more as indicated in their mean gain scores. This is ni agreement with

There was no significant joint interaction effect of group, scoring level and gender on the achievement of senior secondary school students taught biology using checksheet. It was only the interaction effect of group and ability that was significant. This means that it was the effect of treatment alone that was most important in this study. This seems to suggest

that the use of checksheet in teaching biology is beneficial to both gender and scoring levels.

Conclusion

Findings from this study have shown that teacher's use of checksheet could enhance students' learning and achievement in Biology. Gender did not influence the achievement of students when checkcheet was used to teach them.

Even though it was found out that there was no significant difference in the achievement of high, medium and low scoring students in the post-test, when the various groups were taught using checksheet, the low and medium scorers still gained more than the high scorers, hence the use of checksheet could be used to enhance the performance of low and medium scorers in biology.

Recommendations

Based on the findings from this study the following recommendations are advanced:

1. In order to solve the problem of poor achievement in Biology, teaching and learning should be more student-centered. Student-centered approaches such as checksheet is strongly recommended.
2. Biology teacher should pay more attention to difficult topics in Biology using innovative strategies such as checksheet that will help the students to understand these topics.
3. Both male and female students should be given equal consideration as far as the use of checksheet is concerned since gender had no effect on their achievement.
4. The Federal and State Ministries of Education and other educational bodies like the Nigerian Educational Research and Development Council (NERDC), the Science Teachers' Association of Nigeria (STAN), should organize training/workshops for teachers so as to update their knowledge of instructional strategies such as study technology and the use of checksheet to improve teaching and learning.

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