EFFECT OF SYNCHRONOUS AND ASYNCHRONOUS LEARNING STRATEGIES ON LEARNING OUTCOMES AND RETENTION AMONG BIOLOGY STUDENTS OF FEDERAL UNITY COLLEGES IN NORTH WEST, NIGERIA

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Abstract

The study examined the effect of synchronous and asynchronous learning strategies on learning outcomes and retention among Biology students of Federal Unity Colleges in North West, Nigeria. The study was guided by eight Objectives and their corresponding research questions and hypotheses which were tested at 0.05 level of significance. The study adopted quasi experimental design. The population of the study was 1,810 Biology students of Federal Unity Colleges across the North West, Nigeria. The data was collected using an instrument called Biology Achievement Test (BAT). The data was analyzed using t-test and Analysis of covariance. The findings of the study among others revealed that there is significant effect of synchronous and asynchronous learning strategies on learning outcomes among students of Federal Unity Colleges in North West, Nigeria. Based on the findings, the researcher concluded that there is significant effect of synchronous and asynchronous learning strategies on learning outcomes and retention among students of Federal Unity Colleges in North West, Nigeria. It is recommended that Government should provide constant connectivity in the colleges to improve the use of synchronous and asynchronous strategies in teaching Biology in Federal Unity Colleges in the North West, Nigeria.

Keywords: Synchronous, Asynchronous, Learning outcomes and Retention

Introduction

Education is a fundamental aspect of human development and societal progress. With the advancement of technology, traditional methods of learning have evolved to incorporate remote learning strategies, offering students greater flexibility and access to educational resources (Okonkwo, 2020). Education also develops competencies within a learner and enhances his/her knowledge, as well as to equip him/her with the skills that he/she could use while tackling challenges beyond the classroom setting. In the teaching and learning process, teachers require objective information on students' characteristics which might prepare them to benefit enormously from school curricula. There are also the need for information on the effectiveness of procedures in use to impart knowledge and how these procedures have caused a change in the learner's behavior. This is achieved through the use of diverse methods of teaching students such as remote learning strategies, particularly sciences subjects which Biology is inclusive (Bello, 2019).

Nigeria's educational system faces numerous challenges, including limited access to quality education, inadequate infrastructure, and disparities in educational outcomes among different regions and socio-economic groups. Federal Government Colleges were established by the Nigerian government to address some of these challenges by providing quality education to students across the country (Bello, 2019).

Synchronous learning is a teaching and learning approach where participants engage in real-time, often using technology to facilitate communication and interaction (Anderson, 2015). This strategy contrasts with asynchronous learning, where participants engage with the material on their own time. Synchronous learning strategies can be highly effective in fostering engagement and collaboration among learners. However, educators must consider the logistical challenges and ensure that the technology used enhances the learning experience rather than hinders it. A balanced approach, incorporating both synchronous and asynchronous elements, can often provide the most comprehensive learning experience.

Asynchronous learning is a flexible educational approach that allows learners to engage with course materials and complete assignments at their own pace and on their own schedule (Moore, 2013). Asynchronous learning strategy provides valuable flexibility and accessibility, making education more attainable for a diverse range of students. This method contrasts with synchronous learning, where participants interact in real-time.

Learning outcomes refers to the level of success and achievement a student demonstrates in their academic endeavors, typically within an educational institution such as a school, college, or university. It encompasses a variety of factors that assess a student's ability to grasp and apply knowledge, meet educational standards, and successfully complete coursework (Kabir, 2017).

Retention is said to be the act of remembering, recalling, reproducing already stored or retained information over a period of time (Umar, 2019). It is a component of memory process which involves the storage and retrieval of information from the past. The term is often used in the context of learning and memory, examining factors that influence how information is encoded, stored and retrieved in the mind. Whereas, Biology is a field of natural sciences that is concerned with the study of living things. Biology has a great position in the secondary school education curriculum due to its significance as a life science. However, in spite of students' preference of biology to physical science subjects like chemistry and physics, students underachieved in biology external examinations (Umar, 2019).

Statement of the Problem

Science has been regarded as the bedrock which modern day technological breakthrough is built. Nowadays, countries all over the world such as Nigeria, are striving hard to develop technologically and scientifically, since the world is turning scientific and all proper functioning of lives depend greatly on Science (Sunday & Veronica, 2014). However, it has been observed by researchers that over the years, students' learning outcomes and retention in science subjects, particularly Biology has been below expectations (Akanbi et al., 2018; Ugwuanyi et al., 2019). Students' learning outcomes in Biology examinations has not been encouraging at different levels of education (Ugwuanyi et al., 2020). Besides, Ugwuanyi, Nduji, Elejere, Oladimeji, Bamidele & Omeke, 2020) found that learning outcomes in Biology is lower than other science subjects such as physics and chemistry.

Furthermore, according to a report by the Chief Examiner, National Examination Council, 2023, it indicated that only 45% of the students scored credit in Biology whereas, the 55% of the Biology students in the zone scored below average. Similarly, it is an evident in the 6th year's analysis of students' achievement in the science subjects as reported by Chief examiner of West African Examination Council

(2019-2023). The report shows that out of 15,208 Biology students who participated in the WASSCE Biology examinations within the age bracket (2019-2023), only 6,520 students scored the required grades. Which means only 30% of the students scaled through at credit level while the remaining 70% of students were reported to have failed the subject.

The above poor learning outcomes and retention of students in Biology has been a matter of concern for all stakeholders including government, law makers, teachers, parents and even the public at large. Several factors have been attributed to the situation in question such as lack of appropriate methods of teaching the science subjects which the biology is inclusive, inadequate facilities, poor attitude of students to work, faulty instructional strategy and inadequate or inappropriate application of assessment procedures and lack of teachers' use of innovative teaching strategies in the twenty-first-century classroom (Ugwuanyi, Nduji, Elejere, & Omeke, 2020)

Many researchers such as Ugwuanyi, Nduji, Elejere, & Omeke, 2020, Akanbie, 2018 Ugwuanyi, Eguere and Timothy, 2019 have carried out several researches on the effect of and remote learning strategies on students' learning outcomes and retention in Biology among different public secondary schools and even tertiary institutions in the North West, Nigeria but there is lack of enough literatures on Federal Unity Colleges in the North West, Nigeria on the effects of remote learning strategies on students' learning outcomes and retention in Biology among Federal Unity Colleges in North West, Nigeria and therefore, this study aims to bridge the above observed gaps by systematically investigating the effects learning outcomes and retention in Biology and multifaceted effects of remote learning strategies on learning outcomes and retention rates in Biology among students of Federal Unity Colleges in the North West region of Nigeria.

Objectives of the study

The objectives of the study were to determine:

1. The effect of synchronous learning strategy on learning outcomes among Biology students of Federal Unity Colleges in North West, Nigeria.
2. The effect of Asynchronous learning strategy on retention among Biology students of Federal Unity Colleges in North West, Nigeria.
3. The effect of gender on learning outcomes among Biology students of Federal Unity Colleges in North West, Nigeria.

Research Questions

The following research questions were raised from the above stated objectives:

1. What is the effect of synchronous learning strategy on learning outcomes among Biology students of Federal Unity Colleges in North West, Nigeria?
2. What is the effect of Asynchronous learning strategy on retention among Biology students of Federal Unity Colleges in North West, Nigeria?
3. What is the effect of gender on learning outcomes among Biology students of Federal Unity Colleges in North West, Nigeria?

Hypotheses

The following null hypotheses were tested at 0.05 level of significance

HO_1: There is no significant effect of synchronous learning strategy on learning outcomes among Biology students of Federal Unity Colleges in North West, Nigeria?

HO2: There is no significant effect of Asynchronous learning strategy on retention among Biology students of Federal Unity Colleges in North West, Nigeria?

HO3: There is no significant effect of gender on learning outcomes among Biology students of Federal Unity Colleges in North West, Nigeria?

Methodology

The research adopted quasi experimental research design involving pretest, posttest and post posttest experimental and control groups. The population comprises of one thousand eight hundred and ten (1,810) SSII students of Federal Unity Colleges across the North West, Nigeria. It also comprises one hundred and twenty (120) SS II students obtained from the three schools selected using multistage sampling. The three schools selected randomly involves Kaduna, Kebbi and Zamfara States all of which were mixed schools. Three intact classes were used, one from each State. One instrument called Biology Achievement Test (BAT) was used for data collection. The instrument was validated by three experts two of which were from Educational Psychology and Counselling and the other one from Measurement and Evaluation all from Usmanu Danfodiyo University, Sokoto. The instrument was pilot tested using 40 SSII Biology students from Federal Unity College Sokoto, which was part of the population but not within the sampled schools. The results of the pilot study was subjected to Pearson Product Moment Coefficient (PPMC). The reliability index obtained was 0.84 which ascertained the high reliability of the instrument. The BAT was used in pretest, posttest and post posttest (retention) tests. The data obtained was analyzed using both descriptive and inferential statistics. The Bio data and research questions were analyzed using the descriptive statistics while the hypotheses were analyzed using analysis of covariance (ANCOVA).

Results

Hypothesis One: There is no significant effect of Synchronous Learning on learning outcomes in Biology among Federal unity Secondary School Students.

Table 1

Results of the T-test Analysis of Posttest mean scores of the Experimental Group 1 and Control Group.

Groups	N	Mean	S D	Df	t-cal	P (Sig)
Synchronous Learning	40	56.80	5.68940	78	4.276	0.000
Conventional method	40	51.70	4.95208			

t-test at .05 level of significance

Table 1 shows the effect of Synchronous Learning on learning outcomes in Biology, the result shows that the p value of 0.000 is lower than the 0.05 alpha level of significance at df 78 indicating that significant difference exits between Synchronous Learning group and the control group. The posttest mean of Synchronous Learning group (56.80) was significantly higher than the posttest mean of the Conventional method (51.70) implying a significant effect has taken place. Consequently, the null hypothesis which stated that, there is no significant effect of Synchronous Learning on learning outcomes among Biology Students of Federal Unity Colleges in North West, Nigeria is hereby rejected.

Hypothesis Two: There is no significant effect of Asynchronous Learning on learning outcomes in Biology among Federal unity Secondary School Students.

Table 2

Results of the T-test Analysis of Posttest mean scores of the Experimental Group 1 and Control Group.

Groups	N	Mean	S D	Df	t-cal	P (Sig)
Asynchronous Learning	40	54.10	5.35796	78	2.080	0.041
Conventional method	40	51.70	4.95208			

t-test at .05 level of significance

Table 2 shows the effect of Asynchronous Learning on learning outcomes in Biology, the result shows that the p value of 0.041 is lower than the 0.05 alpha level of significance at df 78 indicating that significant difference exits between Asynchronous learning group and the control group. The posttest mean of Asynchronous Learning group (54.10) was significantly higher than the posttest mean of the Conventional method (51.70) implying a significant effect has taken place. Consequently, the null hypothesis which stated that, there is no significant effect of Asynchronous Learning on learning outcomes among Biology Students of federal unity colleges in North West, Nigeria is hereby rejected.

Hypothesis Three: There is no significant effect of Gender on learning outcome in Biology among Federal unity Secondary School Students.

Table 3

Results of the T-test Analysis of Posttest mean scores of the Experimental Group 1 and Control Group.

Groups	N	Mean	S D	df	t-cal	P (Sig)
Male	85	54.2588	5.34334	118	.176	0.861
Female	35	54.0571	6.55270			

t-test at .05 level of significance

Table 3 shows that gender has no effect on learning outcomes in Biology, the result shows that the p value of 0.861 is greater than the 0.05 alpha level of significance at df 118 indicating that gender has no effect on learning outcomes in Biology,. The posttest mean of male group is (54.258) was significantly equal with that of the female group (54.057) implying that no significant effect has taken place. Consequently, the null hypothesis which stated that, there is no significant effect of Gender on learning outcome among Biology Students of Federal Unity Colleges in North West, Nigeria is hereby retained.

Summary of Findings

1. Null hypothesis one shows a significant effect of Synchronous Learning Strategy on learning outcomes among Biology Students of Federal Unity Colleges in North West, Nigeria with (P-value 0.000 <alpha value of 0.05 at df 78).
2. Null hypothesis three shows a is significant effect of Asynchronous Learning Strategy on learning outcomes among Biology Students of Federal Unity Colleges in North West, Nigeria with (P-value 0.041 <alpha value of 0.05 at df 78).
3. Results of null hypothesis shows no significant effect of Gender on learning outcomes among Biology Students of Federal Unity Colleges in North West, Nigeria with (P-value 0.861 >alpha value of 0.05 at df 118).

Discussion of Findings

This study set out to determine the effect of Synchronous and Asynchronous learning strategies on learning outcomes and retention among students of Federal Unity Colleges in North West, Nigeria at 0.05 level of significance.

The findings of this study based on hypothesis one revealed that there is significant effect of Synchronous learning strategy on learning outcomes among Biology Students of Federal Unity Colleges in North West, Nigeria. (P-value = 0.000, p< alpha value of 0.05 at df 78). This is in agreement with the findings of Oluwadara, Adetunmbi, Luman and Mohammed (2022) who found that students taught using synchronous method performed better than those students taught using conventional method. The results of this study also agrees with the findings of Okagbare (2022) who found that students taught using synchronous method performed far better than those taught using lecture method. But in contrast, the results of this study disagrees with the findings of Birabi and Nebo (2023) who found that students taught using blended learning performed better than those taught using synchronous method.

Hypothesis two revealed that there is significant effect of Asynchronous learning strategy on learning outcomes among Biology Students of Federal Unity Colleges in North West, Nigeria. (P-value = 0.041, p< alpha value of 0.05 at df 78). This study is in line with the findings of Alimejad, Koshnoshin and Hatami (2022) who found that students taught using asynchronous learning strategy performed better than those taught using lecture method. Again, this study agrees with the findings of Adebisi, Adeyemi and Umbugodu (2021) who found that students taught using asynchronous learning strategy performed better than those taught using conventional approach. But, in contrast, the study is in disagreement with the findings of Vikoo (2011) who found that students taught using lecture method performed better than those taught using asynchronous learning strategy.

Hypothesis three revealed that there is no significant effect of gender on learning outcomes among Biology Students of Federal Unity Colleges in North West, Nigeria. (P-value= 0.861, P> alpha value of 0.05 at df 118). The study is in agreement with the findings of Vikoo (2011) who found that gender (whether male or female) has no significant effect on students learning outcome. But, in contrast, this study disagrees with the findings of John, Benjamin and Emmanuel who found that, gender significantly influence students learning outcome.

Conclusion

Based on the findings of this study, it was concluded that there is significant main effect of Synchronous and Asynchronous Learning Strategies on learning outcomes among biology students of Federal Unity Colleges in North West Nigeria. It was also concluded by the researcher based on the findings of this study that there is significant interaction effect of Synchronous and Asynchronous Learning Strategies and gender on learning outcomes among biology students of Federal Unity Colleges in North West Nigeria.

Recommendations

1. School management should liaise with counselling centers in order to manage and control extreme cases of truancy while in the computer laboratories to learn using synchronous and asynchronous learning strategies. Therefore, students of Federal Unity Colleges in North West, Nigeria should be enlightened in the relevance and advantages of synchronous and asynchronous learning strategies.

2. Government should encourage Biology teachers and instructors to so as to improve in the use of synchronous and asynchronous learning strategies in Federal Unity Colleges in North West, Nigeria.

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