

Effectiveness of station-rotation and flipped-blended learning strategies in improving study habits and academic performance of secondary school biology students in Osun State, Nigeria

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Abstract

The study investigated the effectiveness of Station-rotation and Flipped-blended learning in improving study habits and Academic achievement of students in Osun State Secondary School. It adopted quasi experimental pre-test, post-test control group design. The population for the study comprised all Biology students in senior Secondary Schools in Osun State. The sample consisted of 115 senior secondary school Biology students randomly selected from three secondary schools in their intact classes. Each intact class was randomly assigned to an experimental or control group. The instrument for the study comprised the Biology Achievement Test (BAT) and Study Habit Inventory (SHI). The result showed that students taught using the station-rotation blended learning strategy performed better than those taught using the flipped blended learning strategy. The result also showed that the study habits of students taught using station-rotation strategy were better enhanced than those taught using the flipped blended learning strategy. The study recommended the use of a more novel strategy like the station-rotation blended learning strategy in delivering Biology contents in secondary schools.

Key words: Blended learning strategies, Study habit, Academic Achievement

Introduction

Biology, as one of the core science disciplines taught in Nigerian senior secondary schools, holds a unique place in the curriculum. Students are exposed to the subject in senior high school as a foundation for human growth and the development of career skills (Federal Republic of Nigeria, 2008). As a matter of fact, many branches of study, including Botany, Anatomy and

Physiology, Microbiology, Medicine, Agriculture, Pharmacy, and others, require biology as a subject.

Despite enormous benefits that Biology offers as well as contributions of the federal government of Nigeria towards the realization of the curricula objectives, Studies by Isidor (2015); Kalu (2014) & Nkemka (2015) have shown that the interest of students in studying biology is declining which has resulted into an unimpressive performance. However, studies (Aladejana, 2015; Omorogbe & Ewashina, 2013) have been carried out to uncover some of the more specific elements that contribute to students' poor performance in Biology, with the results being linked to the mode of instruction, which is considered fundamental to students' learning outcomes.

Learning Outcomes are statements of the knowledge, skills and abilities that individual students should possess and be able to demonstrate upon the completion of learning experience. According to Adam (2004), learning outcomes are written statements of what the successful student/learner is expected to be able to achieve at the end of the programme module/course unit or qualification. The learning outcomes of focus in this study includes study habit and academic performance. The way students take their studies greatly determines the level of academic performance.

Academic performance is a measure of output and the main changes in knowledge, skills and attitude of individuals as a result of experiences acquired from the school. Academic performance is the extent to which a student, teacher or an educational institution has achieved their short or long-term educational goals. According to Narad and Abdullah (2016) academic achievement is the knowledge gained which is assessed by marks by a teacher or educational goals set by students and teachers to be achieved over a specific period of time. Academic achievement is commonly measured through examinations or continuous assessments. However, several factors predict academic achievement, such as anxiety, environment, motivation, teaching methods, and study habits, etc. Study habits is about the most important factor that determines academic success and attainable achievement of students. Study habit refers to the conscious and purposeful use of one's cognitive skills, feelings, and actions to maximize the learning of knowledge and skills for a given task and set of conditions (Cardelle-Elawar and Nevin 2003). Cardelle-Elawar and Nevein (2003) define study habits as the application of an individual's intelligence, emotions, and activities towards the acquisition of knowledge and skills to accomplish an assignment. Study habits manifest in students'

activities: assignments, reading, ability to concentrate; their learning interactions, consultation with teachers or more knowledgeable individuals, time management and their conduct in examinations. Generally, study habits can be classified into good study habits and bad study habits. Good study habits according to Katelyn (2013) are sometimes referred to as positive or productive study habits. As the name implies, they are habits which have the tendency to improve the academic performance of students. On the other hand, students who do not attend classes, do not take down notes, do not do their assignments, do not read their books or make use of the library are said to have poor or bad study habits which may negatively affect their academic performances.

The use of computers in education has undergone a massive transformation in the last decade, including for example, the use of the Internet in education, and the deployment of blended learning, which relies on technology to effectively deliver educational content to the learner. Nowadays, many students benefit from blended learning possibilities, and station rotation is one such learning model that allows students to rotate between multiple stations during their time in the classroom. The Station-rotation model is a blended learning model in which the teacher divides the students within a classroom into three to four groups. These groups rotate through a series of stations one of which must be technology based (Horn & Staker, 2015; Walne, 2012). In this Model, students are divided into stations or groups namely, small group instruction (this group is led by the teacher who guides the students to the topic), Collaborative activities (students in this group are made to discuss the topic to be taught among themselves), online learning (students in this group are made to watch the video on the topic to be taught. The learning activity is carried out concurrently in each group for about twenty minutes. Consequently, students spend a fixed amount of time on each group activity before rotating to the next station. The information in the online station allows each learner to go at his or her own direct learning speed. The stations are usually structured to encourage teamwork and collaboration among the students that work there, while the online element is done individually. Students can make minute adjustments to their learning experience with real-time feedback.

On the other hand, the flipped classroom learning model flips the instruction that would normally occur in the classroom; replaced by video to be watched at home. The work that would normally be considered homework is then completed within the classroom where it is supported by the teacher (Bagby, 2014). Flipped blended learning strategy is a pedagogical approach in which direct instruction moves from the group learning space to the individual

learning space and the resulting group space is transformed into a dynamic, interactive learning environment where the teacher guides the students as they apply concepts and engage creatively in the subject matter. Students in a flipped classroom are provided preliminary information outside of class and then use class time to expand their knowledge base (Bergmann and Sams, 2012). The use of the blended learning strategy is one of the ways teachers begin bringing more technology into the students' learning environment and to support self-directed learning. Studies have shown the efficacy of blended learning strategies, particularly, the use of flipped and the station-rotation blended learning strategies in improving student achievements (Boyratz, 2014). The study conducted by (Ahmed 2011; Lopez and Rodrigue 2013; Maguire 2005) revealed that using a blended learning approach improved students' achievement scores as compared to other approaches and had improvement effects on students' attitudes towards learning. Furthermore, Nur Fathin and Noor Dayana (2020) opined that the flexibility of station-rotation strategy has the ability to be adopted in diverse formats thereby making students learn at their own pace. Also, Dusenbury and Olson (2019) observed that students respond positively to the flipped classroom model due to the fact that it impacts their motivation and, therefore, enhances academic success. This is because flipped learning model requires students to be more self-directed, meaning the burden to motivate themselves to study and review the course material falls primarily in their hands.

From the foregoing, this study aims to ascertain which of station-rotation and flipped blended learning strategies will better enhance positive student study habits and improve academic performance in Biology.

Objectives of the study

- a) determine the effectiveness of station-rotation blended learning strategy (SRBLS) , flipped blended learning strategy (FBLS) and conventional teaching strategy in improving students' academic performance in Biology
- b) examine the effectiveness of the blended learning strategies and conventional teaching strategy in enhancing students' study habit in Biology.

Research Hypothesis

1. There is no significant difference in the Academic performance of students taught using station-rotation blended learning strategy (SRBLS), flipped blended learning strategy (FBLS) and those taught using the conventional teaching strategy (CTS).

2. There is no significant difference in the study habit of students taught using station-rotation blended learning strategy (SRBLS), flipped blended learning strategy (FBLS) and those taught using the conventional teaching strategy (CTS).

Methodology

A quasi-experimental pre-test, post-test control group research design was used in this study. All senior secondary school Biology students in Osun State served as the population for the study. The sample consisted of 115 Biology students in their intact classes randomly selected from three secondary schools in Ife central local Government Area of Osun State. Each intact class from the selected schools was randomly assigned to experimental groups and a control group. Experimental group A was taught using station-rotation blended learning for eight weeks with two class sessions per week and experimental group B was taught using flipped blended learning for eight weeks with two class sessions per week. The control group was taught using conventional teaching strategy for eight weeks with two class sessions per week. The instruments for the study were Biology Achievement Test (BAT) and Study Habit Inventory (SHI). In order to establish the reliability of the instruments, they were administered on 20 respondents in a school different from the schools for the study. Their responses were subjected to Cronbach Alpha reliability test. The BAT has a reliability coefficient of 0.75 while that of SHI is 0.71. These values are significant at 0.05 level.

Results

Research Hypothesis #1

There is no significant difference in the academic performance of students taught using Station-Rotation Blended Learning Strategy (SRBLS), Flipped Blended Learning Strategy (FBLS) and those taught using the Conventional Teaching Strategy (CTS).

To test the hypothesis, the scores of the respondents to the Biology Achievement Test (BAT) were collected from the pre-test and post-test and then were subjected to Analysis of Covariance (ANCOVA). The pre-test scores act as a covariate to provide a background knowledge on the performance of the students before the treatment was administered. The posttest was then administered after the treatment has been administered to the students. The result of the analysis is presented below.

Table 1: Analysis of Covariance (ANCOVA) of Posttest Scores of SRBLS, FBLS and CTS on Students' Academic performance in Biology

Dependent Variable: posttest

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Source	Type III Sum of Squares	Df	Mean Square	F	Sig.	Partial Eta Squared
Corrected Model	699.411 ^a	3	233.137	38.507	.000	.510
Intercept	625.049	1	625.049	103.240	.000	.482
Pretest	244.013	1	244.013	40.304	.000	.266
Group	188.190	2	94.095	15.542	.000	.219
Error	672.032	111	6.054			
Total	17740.000	115				
Corrected Total	1371.443	114				

Table 1 result showed that $F = 15.54$, $p < 0.05$. This implies that a significant difference existed in the effectiveness of station-rotation blended learning strategy, flipped blended learning strategy and conventional teaching strategy on academic achievement of Osun state secondary school students in Biology . Hence, the null hypothesis that states that there is no significant difference in the academic performance of students taught using station-rotation blended learning strategy (SRBLS), flipped blended learning strategy (FBLS) and those taught using the conventional teaching strategy (CTS)was rejected. A Partial Eta Squared value of 0.219 showed that the strategies used accounted for 21.9% variation in the performance of the students exposed to the strategies. A pairwise comparison Post- Hoc analysis was then carried out on the three groups to determine the source of difference in the performance of students in the groups.

Table 2: Scheffe Post Hoc Analysis of the three instructional strategies (SRBLS FBLS, CTS) on students' academic performance in Biology

Dependent Variable: Post-Test Scores for BAT

(I) group	(J) group	Mean Difference (I-J)	Std. Error	Sig. ^b	95% Confidence Interval for Difference ^b	
					Lower Bound	Upper Bound
SRBL	FBL	1.921 [*]	.561	.001	.810	3.032
	CTS	3.289 [*]	.609	.000	2.083	4.495
FBL	SRBL	-1.921 [*]	.561	.001	-3.032	-.810

	CTS	1.368*	.642	.035	.097	2.639
CTS	SRBL	-3.289*	.609	.000	-4.495	-2.083
	FBL	-1.368*	.642	.035	-2.639	-.097

The results in Table 2 show pairwise comparison of the three instructional strategies. The result showed that those exposed to station-rotation blended learning strategy performed better than those exposed to flipped blended learning with a mean difference of 1.92, they also performed better than those exposed to conventional teaching strategy with a mean difference of 3.289. It was also revealed that those exposed to flipped blended learning strategy performed better than those exposed to conventional teaching strategy with a mean difference of 1.368. This shows that students exposed to station-rotation blended learning strategy had a better academic performance while those exposed to the conventional teaching strategy had the lowest academic performance. This shows that station-rotation blended learning strategy is more effective in the teaching of Biology than flipped blended learning strategy and conventional Teaching strategy, as students performed better using station-rotation blended learning strategy

Research Hypothesis #2

There is no significant difference in the study habit of students taught using station-rotation blended learning strategy (SRBLS), flipped blended learning strategy (FBLS) and those taught using the conventional teaching strategy (CTS).

To test the hypothesis, the scores of the respondents to the Study Habit Inventory (SHI) were collected before and after the treatment and were subjected to Analysis of Covariance (ANCOVA). The total scores before treatment administration served as covariates to provide a background knowledge on the study habit of the students before the treatment was administered and cater for discrepancies that may occur. The post treatment study habit was then administered to the students. The results were analyzed using a descriptive analysis, ANCOVA and Scheffe Post hoc test as presented below:

Table 3: Analysis of Covariance (ANCOVA) of posttest scores of SRBLS, FBLS, CTS on students' study habit in Biology

Dependent Variable: post study habit

Source	Type III Sum of Squares	df	Mean Square	F	Sig.	Partial Eta Squared
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Corrected Model	5385.427 ^a	3	1795.142	188.025	.000	.836
Intercept	12.211	1	12.211	1.279	.261	.011
Pre study-habit	3815.815	1	3815.815	399.673	.000	.783
Group	72.414	2	36.207	3.792	.026	.064
Error	1059.756	111	9.547			
Total	332455.000	115				
Corrected Total	6445.183	114				

Table 3 show that $F = 3.792$, $p < 0.05$. This implies that a significant difference existed in the effectiveness of Station- Rotation Blended Strategy and Flipped Blended Learning Strategy on study habits of secondary school students in Biology in Osun state. Hence, the null hypothesis that states that there is no significant difference in the study habit of students taught using Station-rotation blended learning strategy (SRBLS), flipped blended learning strategies (FBLS) and those taught using the conventional teaching strategy (CTS) was rejected. A Partial Eta Squared value of 0.064 showed that the strategies used accounted for 6.4% variation in the study habits of the students exposed to the three strategies. A pairwise comparison Post-Hoc analysis was then carried out on the three groups to determine the source of difference in the study habit of students in the groups using Scheffe posthoc test.

Table 4 : Scheffe Posthoc Analysis of the study habit of students taught with the three instructional Strategies (SRBLS, FBLS, CTS)

Dependent Variable: Post-Test Scores for SHI

(I) group	(J) group	Mean Difference (I-J)	Std. Error	Sig. ^b	95% Confidence Interval for Difference ^b	
					Lower Bound	Upper Bound
SRBLS	FBL	.905	.746	.228	-.573	2.382
	CTS	1.977*	.720	.007	.551	3.404
FBLS	SRBL	-.905	.746	.228	-2.382	.573
	CTS	1.073	.820	.193	-.552	2.698
CTS	SRBL	-1.977*	.720	.007	-3.404	-.551

FBL	-1.073	.820	.193	-2.698	.552
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The pairwise comparison in Table 4 showed that those students exposed to Station-rotation blended learning strategy had a better study habit than those exposed to flipped blended learning strategy with a mean difference of 0.905 while they also had better study habit than those exposed to conventional teaching strategy with a mean difference of 1.977. It was also revealed that those exposed to flipped blended learning strategy had a better study habit than those exposed to conventional teaching strategy with a mean difference of 1.073. This shows that students exposed to station- rotation blended learning strategy had a better study habit while those exposed to the conventional strategies had the least study habit.

Discussion of findings

The results of the study revealed that there was a significant difference in the effectiveness of station-rotation and flipped blended learning on academic achievements of senior secondary school students in Biology. Students that were taught using these instructional strategies performed better academically than those exposed to conventional teaching strategy. The study indicated the amount of effect each of the blended learning strategies had on students' academic performance and other learning outcomes in Biology. The performance mean difference between station-rotation and flipped blended learning strategies is 1.92. This implies that station-rotation blended learning strategy is more effective in improving the academic performance of students in Biology than flipped blended learning strategy and conventional teaching strategy.

From above, the result on the effectiveness of station-rotation blended learning strategy on academic achievements of students corroborates the findings of Govindaraj and Silverajah (2017) who reported that Malaysian college students performed better in Physics when they were taught using blended learning strategies. The result of the findings on the effectiveness of flipped blended strategy on students' academic achievement is also in line with Alamri (2019) who reported on their study in Saudi Arabia that learning in flipped classroom increases students' academic performance and level of satisfaction compared with conventional teaching methods. This is also supported by Ahmed (2011) who investigated the impact of blended learning in Nigerian high school chemistry classes on students' achievement, retention, and attitudes toward the subject. The findings showed that students' attitudes towards blended learning were positive, and their achievement was greater than students who learnt through

traditional techniques. The result of the study also tallied with the study of Maguire (2005) who examined the effect of blended learning on the achievements of Asia-Pacific students in mathematics in the middle school where blended learning strategy helps students to perform and score better than the others. Similarly, the result on the effectiveness of station-rotation and flipped blended learning strategies further agreed with the research of Lopez and Rodriguez (2013) who investigated the impact of technology on students' outcomes in a blended learning context in university of Granada, Spain and shows that the students' participation in these activities and the number of tasks completed both had a positive effect on the students' performance. Furthermore, the study is also in agreement with Simpson and Anderson (2009) who examined the impact of blended learning on the level of knowledge and motivation among ninth-grade science students. The findings reveal that the experimental group's learning outcomes improved as a result of the blended learning strategy. The findings of the study also corroborate result of the research conducted by Nur Fathin and Noor Dayana (2020) in Malaysia which revealed that station-rotation strategy had a more positive impact on students' achievement. The implication of the findings of the study suggests that using innovative instructional strategy like station-rotation would help student acquire better understanding of various Biology concepts, hence, this could assist in improving their academic achievement.

Results of the study revealed that there was a significant difference in the effectiveness of station-rotation, flipped blended learning and conventional teaching strategy on students' study habits in Biology. The change in students' study habits accounted for 6.4% variation. Students exhibited better study habits in Biology when exposed to station-rotation and flipped blended learning strategies than conventional teaching method. The performance mean difference between station-rotation and flipped blended learning strategies of 0.905 implies that station-rotation is more effective than flipped blended learning in enhancing study habit of students in Biology. The study is in agreement with the observation by Aqel and Haboush (2017) that station-rotation blended learning strategies enhanced study habit and performance of students in technology as the strategy provided students with an opportunity to interact with the learning content. This shows that enhancing the study habits of students in Biology, station-rotation blended learning could be adopted in teaching and learning process as it avails students the opportunity to explore learning materials by themselves.

Conclusion

The results of the study provide the empirical support for integrating station-rotation blended learning instructional strategies into the teaching of Biology in Nigerian senior secondary schools. Station-rotation blended learning strategy is more effective in improving the learning outcomes of students in Biology than both the flipped blended learning and conventional teaching strategy.

Recommendations

Arising from the findings of this study the following recommendations are made:

- Curriculum planners should include innovative methods of teaching Biology such as the use of online materials in teaching Biology in their pedagogical manuals.
- Workshop, seminars and conferences should be organized on a regular basis to acquaint teachers with innovative instructional strategies of teaching Biology
- Teacher training institutions should be encouraged to train would-be-teachers on effective use of blended learning instructional strategies in the teaching and learning process

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