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EFFECTS OF BLENDED LEARNING ON ACADEMIC ACHIEVEMENT OF SS 11 BIOLOGY STUDENTS IN OBIO-AKPOR LOCAL GOVERNMENT AREA' OF RIVERS STATE

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ABSTRACT

Our study centered on Effects of Blended Learning on Academic Achievement of SS2 Biology Students. The study involved a pre-test post-test nonequivalent control group involving quasi-experimental design. Two objectives, two research questions and two null hypotheses guided the study. Two thousand one hundred SS2 Biology students from twenty public secondary schools in Obio-Akpor Local Government Area constituted the population of the study while the sample size comprised of two hundred SS2 Biology students drawn from two schools via purposive sampling. Intact class was used and the students were randomly assigned to experimental and control groups. The experimental groups were taught using blended learning, while the control groups were taught using the lecture method. Biology achievement test on genetics (BATG) was used. Mean and standard deviation were used to answer the research questions while t-test was used to test the hypotheses at 0.05 level of significance. The study held that there is statistical significant improvement in students' achievement in genetics after exposure to blended learning instruction. There is no statistically difference in the achievement of boys and girls when exposed to blended learning. Consequently, the study recommended that Biology teachers should use blended learning approaches in solving learning problems. .Government should organize workshop for teachers and students on the use of blended learning approach.

Key Words: Blended Learning, Academic Achievement, Biology, Students, Genetics

INTRODUCTION

Technology has revolutionized the field of education, and the importance of adopting it into mainstream school curricula cannot be ignored. Using new technologies in the academic field has become more prevalent in today's world; simply keeping them as supplementary materials is a thing of the past. One such use of technology, online classrooms, is potentially powerful environments where innovative practices and new relationships can be created that can have a significant impact on learning. In order to maximize the potential that this instructional approach creates in education, instructors need to be trained on how to use technology in a meaningful way, as well as how to organize and deliver their material using methods that most effectively harness the power of this approach (Garrison & Vaughan, 2019).

Traditional learning and online learning can be used together to create blended learning. As technology becomes more and more readily accessible, the art of mixing online learning with traditional learning to create blended learning has transformed the landscape of many classrooms over the years. Blended learning has the capability to provide more effective and flexible ways of delivering knowledge to students. The nature of this method provides it with the ability to address various learning preferences of students as well as have the capability to meet all their learning needs. This paper aims to explore how blended learning has impacted students by looking into its history, some theoretical frameworks that support blended learning, and examples of successful implementations of effective blended learning environments. It also concludes with several areas of research still needed to fully understand the complete potential that blended learning has (Thomson, 2020).

Educational institutions are embracing digital devices to improve the effectiveness of teaching and learning. Students are immersed in technology every day, and due to recent advancements, the learning process has evolved with it. As schools around the world gain access to technology, a shift has occurred towards incorporating that technology into education (Garrison, & Vaughan, 2019). With access to technology, one of the biggest shifts in the classroom has been to move away from traditional learning to blended learning. Traditional learning refers to instruction organized around the face-to-face interaction of teachers and students within the four walls of the classroom, where both parties are present at the same point in time. Online learning, on the other hand, usually involves learning that takes place purely via web-based platforms, so that students can learn anywhere, at any time, and at whatever speed they choose.

Blended learning as defined by (Garrison & Vaughan, 2019), is a mixture of the two, with the inclusion of indirect instruction and collaborative teaching. Blended learning−sometimes called hybrid learning−is when, between thirty to eighty percent of the course content is delivered online, in addition to some face- to-face interaction (McDaniel, 2022). Blended learning integrates three key factors – student needs, computing access, and student preference for online learning – to create an environment that combines the best attributes of both traditional and online learning. Wang et al. add that blended learning also involves the utilization of various learning theories which subsequently help maximize the effectiveness of instruction when online learning was first introduced in the 1990s, there was a widespread belief that it had the potential to completely replace traditional learning. Because of the economic feasibility of online education, school administrators of the time began pushing their teachers to offer online courses. Unfortunately, online learning did not take off as anticipated, since learning itself was still a passive activity, and it struggled to catch on (Thomson, 2020). However, as time went on, curriculums began to emerge where the strengths of both traditional and online learning were combined together to form a new method, blended learning. It was discovered that combining off and online work is ideal, as opposed to using one or the other solely. In recent years, developments in blended learning have led to an increase in students, a change in the structure of the learning experience, and a shift in student motivation (Vikoo, 2018).

The continuous study of blended learning over the years revealed that it has the potential to achieve an effective – and much needed – restructuring of the educational system. This is due to the fact that blended learning generates more opportunities for students to receive individualized, one-on-one instruction, on a regular basis, as well as enabling credit recovery and advanced placement opportunities for students who are in need of them. Additionally, the use of virtual environments in blended learning allows unlimited, remote access to learning, where students can attend classes or training anywhere without having to travel to a specific location. Classes/trainings are no longer limited to being held in certain spaces or at specific locations. For example, educators can provide their students with foundational material to learn or read up before class, thereby providing ample time during class to be devoted to active learning exercises like case-based discussions, automated response system questions, and think-pair share sessions. Blended-learning environments can result. It improved student outcomes and facilitate the acquisition of competencies that may not otherwise be possible, combining the strengths of computer-mediated instruction (such as dynamic digital interfaces, embedded assessments, data analytics, and self-paced learning) with the benefits of face-to-face instruction e.g., engagement by faculty members and peers. Using the method of blended learning has been proven to enhance student engagement in the learning process, foster critical thinking, and improve learning outcomes. To reap the benefits of blended learning, instructors must create an interactive, supportive, and collaborative learning environment. In 2010, the U.S Department of Education released a meta- analysis on the subject, and their findings revealed that it was not online learning that was superior as a medium, but rather the combination of all the elements that produced learning advantages. Yu and Wang (2024) emphasize the

importance of student engagement in the learning process and claim that their learning is maximized when they are given the opportunity to be actively involved in their learning. Meaningful learning is not likely to occur if students are not active participants but merely passive recipients of information

In the present dispensation, teachers have alternative teaching and learning approaches. The teacher uses different approaches and strategies to teach in order to make their learners active. One of the aims of Education is to inspire and enable individuals to develop their abilities to the highest potential levels throughout lifetime, so they can grow intellectually, well equipped for work, and contribute effectively to society and achieve personal fulfillment, thereby improving their knowledge and understanding for their own sake and to render the application of the knowledge of the growth of the economy and society (Bonk & Graham, 2021). The present world of information and communication technology (ICT) has prompted alternative means of communicating curriculum content to learners in various subject areas including biology. There is now an emerging technology such as the blended learning. Interestingly, the biology students, when armed with knowledge of blended learning technology, can identify problems and needs in biology, formulate questions and design specification in biology, Collect, select and organize information and contrast information on biological concepts, interpret information in biology, and Search for solutions or designs which could be adapted to apply in problem solving in biology. Bonk and Graham (2021) posited that the importance of blended learning sharing instructional approach to teaching and learning of biology and argued that blended learning method may be used in a way that stimulates student participation in the learning process. Most teachers of biology may not have been aware of the potentials of blended learning during instructional development hence the researchers' choice to investigate into the effect of blended learning on Academic Achievement of SS11 biology Students in Obio/Akpor Local Government Area of Rivers State.

Statement of the Problem

The present dispensation requires school teachers and students to go about teaching and learning encounter using new emerging teaching/learning approaches involving educational information and engineering technologies. This is especially the case at a period when information and communication technology, information engineering concepts, principles, equipment and materials are available for use during instructional development, as part of effort to enhance students understanding of what is being taught in biology.

The abstract nature of most science concepts has led to poor academic performance of students in most public secondary schools in Obio-Akpor Local Government Area of Rivers State (Asikhia, 2022). The poor performance of students in biology in both internal and external examinations is the major reason this study is been carried out as, among other things, to find out the effect of blended learning on biology student academic achievement in Obio-Akpor Local Government of Rivers State.

Purpose of the Study

The main objective of the study is to find out the effect of blended learning instruction on the academic achievement of secondary school biology students in Obio-Akpor Local Government Area of Rivers State. Specifically, the study seeks to:

1. Determine the extent the use of blended learning method have positive influence on the academic achievement of SS 11 biology students in Obio-Akpor Local Government Area.
2. Determine if there is significant difference in the academic achievement of the male and female SS 11 biology students taught genetic using blended instructional method and those taught with conventional (lecture) instructional method

Research Questions

1. To what extent does the use of blended learning method have positive impact on the academic

achievement of SS 11 biology students in Obio-Akpor local government area?
2. Is there significant difference in the academic achievement of the male and female SS 11 biology students taught genetics using blended instructional method and those taught with conventional (lecture) instructional method?

Hypotheses
$H0_1$: Blended learning method does not significantly influence academic achievement of SS 11 biology students in Obio-Akpor local government area.

$H0_2$: There is no significant difference in the academic achievement of male and female SS 11 students taught genetics using blended instructional strategy and those taught using conventional method.

Significance of the Study
Blended learning is one of the most used methods in education to promote active learning and students' learning outcomes. It is gaining popularity because it has showed to be a successful method for accommodating an increasingly students learning peculiarities. This study would be of immense benefit to the students of biology and teachers in public secondary schools in Obio-Akpor Local Government Area of Rivers State regarding effect of blended learning on the academic achievement of students.

It would provide relevant material for students and other researchers undertaking similar research. It would be relevant in assisting biology teachers in understanding the use of blended learning to enhance students' learning. The study would equally benefit the ministry of education in helping the stake holders in education in finding emerging teaching and learning approaches available in the information and communication technology age.

Literature Review
The review of related literature covered the following areas: Theoretical framework, the concept and importance of biology, concept and relevance of blended learning in biological concept and importance of genetics, concept of gender, empirical studies and summary of literature review.

Theoretical Framework
This study identified constructivism and Connectivism theory as having bearing with the research.

Constructivism Theory
Constructivism theory was propounded by Jean Piaget in 1972. Constructivists believe learning doesn't happen in a vacuum. Instead, the theory suggests that people internally and unconsciously relate new information with existing information. In this way, learners actively ''construct" their own knowledge. They organize information into a unique, individualized base of knowledge. Humans create knowledge through the interaction between their experiences and ideas (Thomas, 1997).

The efficacy of blended learning with regard to improvement in student learning outcomes can be attributed to constructivism, a theory that sees knowledge as a dynamic and ever-evolving process shaped by interactions of learners with others and their environment. The constructivist approach emphasizes the use of active learning to engage students in the teaching process through meaningful activities that promote reflection on their ideas and experiences, learn how to self-assess their knowledge, master the gathering of information, and apply it to solving problems. It therefore follows or stresses the importance of providing biology students with information resources and tools that they can access before class to facilitate independent self-paced learning and an opportunity for self-assessment (Jonassen, 1999).

The Connectivism Theory

Connectivism was introduced as a coherent theory by Siemens in 2004. This initial formulation was followed though discussion and enhancements in a constructivism conference in 2007 and a series of massive online courses titled "Constructivism and Connective Knowledge". It can be characterized as a network theory of knowledge and learning with an emphasis on the use of digital technology to enhance and extend interaction online." Connectivism, though, is most often thought of as a theory of learning and pedagogy. Significantly, the study of connectivism resulted in the development of the first Massive Open Online Course (MOOC), "Connectivism and Connective Knowledge", offered through the University of Manitoba in 2008. Just as the study of MOOCs has continued in the years since, so has the study of connectivism focusing on recent interpretations of connectivism that serves two objectives. First, it allows the reader to consider whether the theory has evolved or changed over the first decade and a half of its existence. And second, it allows the reader to consider what aspects of connectivism are seen to be especially relevant in the current environment (Downes, 2019).

Connectivism is a relatively new learning theory that suggests students should combine thoughts, theories, and general information in a useful manner. It accepts that technology is a major part of the learning process and that our constant connectedness gives us opportunities to make choices about our learning. It also promotes group collaboration and discussion, allowing for different viewpoints and perspectives when it comes to decision-making, problem-solving, and making sense of information. Connectivism promotes learning that happens outside of an individual, such as through social media, online networks, blogs, or information databases.

The Concept of Biology

Biology is a fundamental science subject taught in senior secondary schools worldwide. Practical sessions are an integral part of biology education as they provide hands-on experiences and deepen understanding of theoretical concepts. Biology practical are an essential component of the biology curriculum for senior secondary students as they provide hands-on experience and opportunities for students to apply theoretical knowledge to real-world situations (Maduabum, 2020). However, the effective implementation of biology practical in schools is often hindered by various challenges, which can have a significant impact on the academic performance of students.

The general objectives of the biology curriculum as stated in the curriculum document (FME, 2009) are to:

(i) Provide basic literacy in biology for functional living in the society.

(ii) Acquire basic concepts and principles of biology as a preparation for further studies

(iii) Acquire essential scientific skills and attitude as a preparation for the technological application of biology.

(iv) Stimulate and enhance creativity (Ukpabi, 2020)

Students' academic accomplishment in biology depends on the tasks and studies involved in it. Other factors on quality include attendance, extracurricular activities, standardized test, grades and a behavior, etc. Difference in intelligence and personality are a result of individual differences in academic performance. All education institutions, that is colleges and universities must have students as their primary and fundamental asset. These are the trainees for the future of any given country which needs a steadfast human resource for the development of the country. Every country is directly associated with economic and social development which is greatly achieved through the students in higher institutes of learning. Educational training helps to produce relevant manpower in various fields of endeavour that would bring about positive changes in the society (Jia, Chen, Ding & Ruan, 2021*).*

In past research studies, significant attention has been given to academic performance of the students in biology. Factors like psychological, personal, social and environmental were found to affect students' performance. These factors are different from country to country and also from individual to individual but they still affect the students' performances in respective countries. Factors like gender difference, socioeconomic factor, family educational background, teaching style, teacher education and class environment, determine the academic performance of any student. To evaluate performance of the student most researchers preferred to use World application of GPA to assess achievement of the student anywhere (Stephan & Schaban, 2002). Darling (2005) and Galiher (2006) evaluated students' performances by using GPA. Others used previous year's results or the outcome of different subjects to assess performance of student, test outcomes were also used by other researchers or consideration of earlier performance in other subjects. (Jia, Chen, Ding & Ruan, 2021) confirms that many past researches depend on various factors such as class size, class plans, environment of the class, reading material, work exercises, the innovation utilized as a part of the class and exams frameworks, family and extracurricular exercises. Several studies have been conducted to find out students' academic performance (Jia, Chen & Ruan, 2021). Grade Point Average (GPA) was used by all these studies engaged as common indicator of students' performance. Monteiro and Morrison (2020) confirm that learners with difficulties such as lack of association between success and aptitude, defective approaches of learning, faulty study practice need proper guidance in their institutions. Many scholars held that the students' performances are affected by factors namely; gender differences, age and learning facilities. Competence of English as a language is the most noteworthy influence with the constructive conclusion on learners' presentation.

On the other hand, there are some challenges associated with blended learning instructional method in biology. Applying blended learning method to biology instruction has some limitations. Monteiro and Morrison (2020) posited that: it requires more organization and scheduling, students may experience some technical road bumps, it reduces social learning opportunities, artificial intelligence concerns are mounting, such hybrid learning offers less immediate feedback and support, it is difficult to ensure that all students have access to the necessary equipment and materials needed for hands-on experiments. While videos can be useful for demonstrating experiments, students may need to conduct some elements of the experiments themselves to fully understand the concepts. This can be especially challenging for students who do not have access to a biology lab and may not be able to purchase materials on their own (Jia, Chen, Ding, & Ruan, 2021).
Thai, Wever and Valcke (2024) posited that some teachers could not handle the difficult topics because of their poor explanation of concepts. Reports of literature on student's poor achievement trend in Biology particularly to the lack of instructional resources in schools are due to poor funding Studies also have shown that such challenges as: The expense of technology, inadequate training, technological issues, the need to adapt content to blended learning, decrease motivation. This is a great challenge for principals since they cannot provide the teachers with adequate instructional material. Blended learning as an instructional strategy can arouse the interest of students'/ learners and help the teachers in easy concepts delivery.

The Concept and Relevance of Blended Learning in Biology Instruction

Blended learning (BL), or the integration of face-to-face and online instruction, is widely adopted across higher education with some scholars referring to it as the "new traditional model" or the "new normal" in course delivery. Blended learning, a combination of virtual and physical learning conditions, is therefore a learning strategy integrating two different educational models, e.g. distance and traditional learning. There are three most popular definitions of blended learning, blending instructional modalities, instructional methods and online learning with face-to-face instructional approaches (Bonk & Graham, 2014).

Blended learning is one of the key issues in teaching and learning in the EDUCAUSE Learning

Initiative's 2017 annual survey of higher education (EDUCAUSE 2017). As institutions begin to examine blended learning instruction, there is a growing research interest in exploring the implications for both faculty and students *(*Thomson, 2020). For biology teachers and students to engage or start blended learning, they need to: Set blended learning goals, choose a blended learning model, Get the right tools to create and deliver content, Redesign your learning environment, and Launch blended learning and be patient.

The challenges associated with biology practical can have a significant impact on the academic performance of senior secondary students. According to Monteiro and Morrison (2020) these challenges can include inadequate equipment and resources, lack of supervision and teacher guidance, time constraints, and difficulty in understanding the concepts being taught. Blended learning, when effectively used in biology instruction, can: Improve students' motivation and performance, promote participation, self-learning and team work, opens new forms of interrelation between teachers and students, allows greater flexibility, boosts digital intelligence and the acquisition of digital skills and self-paced learning support.

Concept and Importance of Genetics

Certain scholar conceptualized 'Genetics' that genetics has a far reaching impact on various fields of study, from medicine, agriculture to biological and forensic science. The word "Genetics" is the study of heredity, genes and variation. It expresses genetic manifestation, how traits are passed from one generation to another, the structure and function of genes, and the variation that occurs within population. James Watson and Francis Crick in 1954 revolutionized understanding of genetics when they determined the double helix structure of DNA. The effects of genetics are familiar to most people in understanding inheritance, medical applications to prevent genetic disorder, forensic science, crop improvement in terms of disease resistance and nutritional content etc. The known father of genetics is Gregor Mendel on his work on pea plants laid the foundation for modern genetics.

Gender

This is committed to the characteristics of women, men, girls and boys that are socially constructed. This includes norms, behaviours and roles associated with being a woman, man, girl or boy, as well as relationships with each other. As a social construct, gender varies from society to society and can change over time. Ayodele (2020) posited that gender has to do with socially constructed roles, behaviours, expressions and identities of girls, women, boys, men, and gender diverse people. It influences how people perceive themselves and each other, how they act and interact, and the distribution of power and resources in society. The concept of gender includes the following important elements: relational, hierarchical, historical, contextual and institutional. Gender roles are influenced by the media, family, the environment, and society. In addition to biological maturation, children develop within a set of gender-specific social and behavioural norms embedded in family structure, natural play patterns, close friendships; and the teeming social jungle of school life (Ayodele, 2020).

Empirical Studies

Allahnana, Akande, Alaku and Alaku (2022) investigated teachers and students' use of blended learning in sciences with respect to learning mathematical concepts, and data were collected from participants in secondary school or college and reported having learned science in a variety of contexts including completely online and or blended learning. The data collection instrument, an online questionnaire, was designed to detect both quantitative and qualitative changes in the use of blended learning. In addition, statistics for the overall blended learning chemistry education channel for 2018 through 2021 were compiled to provide evidence of blended learning with a large sample (98.6 million video views) over a timeframe (Garrison & Vaughan, 2019).

Gabriel Amadi, carried out a research on the use of blended learning as an instructional strategy to arouse the interest of secondary school students in the subject biology in Ikwerre Local Government Area of Rivers State. The study focused on how the use of blended learning method as an educational tool can arouse the interest of secondary school students in the subject, Biology. Four research questions, four hypotheses were raised, answered at 0.05 level of significance. One relevant study on this topic is "The Role of blended learning in Science Education: A Review of Recent Research" by Ludovic Morge and Carina Girvan. The study found that number of times blended learning took place on physics education, the accuracy, completeness, and suitability of the blended learning varies greatly (Domike, 2012). Blended learning instructional strategy can be a useful technique for instructional delivery and learning science topics, including chemistry and physics, but highlighted the need for careful selection of videos to ensure accuracy and effectiveness.

Robin (2023) reported an investigation into 'The Impact of blended Instruction in a High School Physics Class', and had it to say that integrating blended instruction to increase learning and engagement for high school was achieved. Through constructivist ideals, an intervention was designed where students watched a short video at the beginning of each class and collaborated on practice problems, allowing students to be actively engaged and take ownership of their learning. At the end of each class, students completed an exit ticket to check for understanding to determine the effectiveness of the video instruction. The students took a summative assessment and completed a post-survey to assess learning and engagement. Another study, "Effectiveness of blended learning in Chemistry Education: A Review of the Literature" by Christa Nüsslein, examined the impact of digital videos on student learning outcomes in mathematics education. The study found that while digital videos can be effective in enhancing student comprehension and motivation, the effectiveness depends on the quality of the video content and the instructional design.

Wood and Tiller (2012) investigated 'Use of Blended Learning to Facilitate Mastery of Laboratory Techniques in Chemistry. Journal of Chemical Education, 89(1), 56-58. The article focused on the use of blended learning as an instructional technique to improve the mastery of laboratory techniques in chemistry. The authors found that students who were exposed to blended learning encounter were better prepared for laboratory work and were able to perform qualitative analysis with greater accuracy. Furthermore, a scholarly work on Impact of Using Blended Learning on Chemistry Performance and Science Self-Efficacy Beliefs of College Students was carried out as shown in Journal of Chemical Education, 95(11), 1983-1990. The study examined the use of Blended Learning instructional strategy as a supplementary teaching – learning technique for improving the chemistry performance and self-efficacy beliefs of college students. The results suggest that students who encountered learning through blended learning technique had significantly higher chemistry performance scores and self- efficacy beliefs than those who did not (Wood & Tiller (2012).

The Use of Blended Tutorials as a Tool to Enhance Learning and Instruction in physics was investigated, and this contained in an International Journal of Emerging Technologies in Learning (IJET), 9(4), 48-52. The study investigated the use of online tutorials, including blended learning, to enhance learning and instruction in qualitative analysis in chemistry. The results suggest that online tutorials can significantly improve student understanding and proficiency in qualitative analysis, particularly when used in combination with traditional classroom instruction (Garrison & Vaughan, 2019)

Methodology

Research Design: The design for this study is quasi experimental. In using this research design, the researchers employed the pre-test, post-test non-equivalent control group design. There was no randomization of participants to group or subjects.

Population of the study: The population of the study comprised of senior secondary school students who are currently studying biology as a subject within the boundaries of Obio-Akpor

local government area in Rivers State. The population of the study consisted of 27 secondary schools in Obio-Akpor local government area according to Rivers State ministry of education with an estimated total number of students given as 1082.

Sample and Sampling Techniques: purposive sampling was used to select two schools. Two intact classes were used and Student's were randomly assigned to experimental and control groups in all 200 SSll made up the sample size.

Instrument for Data Collection: Biology Achievement Test on genetics (BATG) was developed as the instrument for data collection drawn from the content taught. The instrument contained two sections, section A contained students' personal information such as class, name of school while section B had twenty (20) multiple choice objective items based on the topic. Each item had four options (a,b,c and d) where the respondents picked the right options which was collated and used for pre-test then reshuffled for post-test during the data collection.

Validation of the Instrument: The researchers subjected the instrument to face and content validity in which case three experts from the Department of Science Education validated it. The process included the supervisor and two other specialists in biology and measurement and evaluation. Their recommendations were integrated into the final draft of the instrument.

Reliability of the Instrument: The reliability of the instrument was established using Pearson Product Moment Correlation statistics in estimating the internal consistency of the instrument. The outcome of the reliability test gave a co-efficient index of 0.79 which was high enough and used in the study.

Method of Data Collection: The data was collected using the pre-test and post-test administered to the students through Biology Achievement Test. This was administered to the students in (both experimental and control) before and after the treatment and the data was collected from the marked scripts of the students to measure changes in students' academic achievement in biology before and after exposure to the blended learning instructional technique.

Method of Data Analysis: To answer the research questions, mean and standard deviation were used while the independent sample t-test statistics was used to test the null hypotheses.

Data Presentation and Analysis

Research Question 1: To what extent does the use of blended learning method have positive impact on the academic achievement of SS 11 biology students in Obio-Akpor Local Government Area?

Table 1: Mean Scores and Standard Deviation on Use of Blended Learning Method and Its Positive effect on the Academic Achievement of SS 11 Biology Students Taught Genetics and those Taught Using the Conventional (Lecture) Method in Senior Secondary Schools in Obio-Akpor Local Government Area

		Pre-test		Post-test		
Groups	**Number**	**Mean**	**Standard Deviation**	**Mean**	**Standard Deviation**	**Mean Gain**
Experimental	165	30.44	4.67	33.87	5.20	3.43
Control	161	30.21	4.32	32.28	5.09	2.07
Mean Diff.						1.36

Analysis

Table 1 shows that the experimental group taught using blended learning approach, had a pre-test mean score of 30.44 with a standard deviation of 4. 67, while the control group taught the conventional (lecture) method, had a similar pre-test mean score of 30.21 with a standard deviation of 4.32. After the intervention, the experimental group's post-test mean score increased to 33.87 with a standard deviation of 5.20, whereas the control group's post-test score rose to 32.28 with a standard deviation of 5.09. The mean gain for the experimental group was 3.43, compared to the control group's gain of 2.07, showing that the experimental group improved more on academic achievement. The mean difference in achievement gains between the groups was 1.36 in favour of the experimental group.

Research Question 2

Is there significant difference in the academic achievement of the male and female SS 11 biology students taught genetics using blended instructional method and those taught with conventional (lecture) instructional method?

Table 2: Mean Scores and Standard Deviation on Academic Achievement of Male and Female SS 11 Biology Students Taught Static Electricity Using Blended Method in Senior Secondary Schools in Obio-Akpor Local Government Area

Gender	Number	Mean Achievement	Standard Deviation Achievement
Male	89	35. 78	5.50
Female	76	32. 64	5.27

Analysis

Looking at the data in table 2 above, it shows that male SS 11 biology students (N- 89) had a higher mean achievement score of 35. 78 compared to female students (N=76), who had a mean score of 32. 64. The standard deviation for achievement scores were 5.50 for males and 5.27 for females, indicating that male students' achievement scores were slightly more spread out

when compared to that of the female students.

Hypotheses Testing

$H0_1$: There is no significant difference between SS11 students taught genetics using blended learning instructional method and academic achievement in biology

Table 3: An Indepe**ndent t-test Statistical Analysis of Mean Scores of Male and Female Secondary School Biology Teachers on the Extent Students Taught Genetics Using Blended Learning Instructional Method and Academic Achievement in Biology**

N value Deviation		Mean Df Level	Error	Standard P-Value	Standard	t-Alpha (Sig//2 Tailed)	
VAR0001 1.00	18	344.3333	83.44493	19.66814	9.43	34 0.05	.000
VAR000 2.00	18	1285.9444	415.22771	97.87011			

Decision: Looking at table 4.2. 2 above, as shown in the SPSS computer analysis in table, P-value of 0.00 is less than the alpha level of 0.05 which means that it is significant. In other words, it shows that there is significant difference between the mean scores of the students'.

$H0_2$: There is no significance difference in the mean scores of male and female secondary school biology teachers on the extent to which the use of blended learning approach influence academic achievement of biology students taught 'Genetics' in senior secondary schools in Obio-Akpor local Gov't Area.

Table 4: A t-test Statistical Analysis of Students' Responses on Mean Scores of Senior Secondary School Male and Female on the Extent to which the Use of Blended Learning Approach influence Academic Achievement of Biology Students Taught 'Genetics in Biology

	N	Mean	Standard Deviation	Standard Error	t-value Value	Df	P-(Sig//2 Tailed)	Alpha Level
VAR0001 1.00	16	334.0000	65.86450	16.46612	-8.40	30	.000	0.05
VAR000 2.00	16	1191.1250.	415.22771	100.44662				

Decision: Looking at the table 4 above, it revealed that P-value (.000) is less than the alpha level (0.05) that means the null hypothesis is significant. This also means that there is significant

difference between the mean scores of the male and female students' responses on genetics in senior secondary school Biology in Obio-Akpor Local Government Area of Rivers State.

Major Findings

- The use of blended learning method helped SS 11 physics students in the experimental group to record improved academic achievement than those in the control group, as this method of instruction motivated those in the experimental group to understand and contend with the practical illustrations of the processes involved in genetics
- The use of lecture method in instructional development is not motivating as does blended learning instructional approach
- Male SS 11 biology students made higher academic achievement than their female counter part when exposed to learning using blended instructional delivery strategy.
- The use of blended learning approach aids retention and recall in the experimental groups of SS 11 biology students.

Discussion of Research Result

The present world of information and communication technology (ICT), challenges modern school teachers to explore alternative means of communicating curriculum content in biology to learner. There is now an emerging technology such as the blended learning. Using the method of blended learning has been proven to enhance student engagement in the learning process, foster critical thinking, and improve learning outcomes. To reap the benefits of blended learning, instructors must create an interactive, supportive, and collaborative learning environment. In 2010, the U.S Department of Education released a meta-analysis on the subject, and their findings revealed that it was not online learning that was superior as a medium, but rather the combination of all the elements that produced learning advantages hence, blended learning is important and helps student engagement in the learning process and claim that their learning is maximized when they are given the opportunity to be actively involved in their learning. Meaningful learning is not likely to occur if students are not active participants but merely passive recipients of information (Garrison & Vaughan, 2019).

Unfortunately, most biology teachers in public secondary schools in Obio-Akpor local government area of Rivers State have not embrace learning genetics in biology through blended learning method due to frequent use of lecture method of learning, making students to lack interest, lack of android/labtop computers, lack of data, internet problems, among other challenges. Consequence upon these, the situation led to poor achievement of our biology students in both internal and external examinations. Teaching and learning of genetics in biology course, in the 21st century requires new approach which has to do with project-centric pedagogical approach', being one of the instructional strategies or techniques factored by educational technologists, among other techniques to facilitate biology students' understanding of concepts. Biology teachers are expected to use this exciting instructional technique, blended learning approach to accommodate individual learning style of the students, encourage improved academic achievement, mastery learning, among other advantages of blended learning method (Yu & Wang 2024).

There are learner expectations from modern teachers so biology teachers would have to engage in learning approaches that encourages active learning which in turn promote enhanced academic achievement, retention and stimulates transfer of conceptual knowledge when applied in problem solving situations hence, studies show that it is an instructional approach that engages students actively in interactive classroom activities and provides formative assessment

(assessment for learning), resulting in better conceptual learning than the one achieved by a highly rated traditional lecturer (Thai, Wever & Valcke, 2024).

SUMMARY, CONCLUSION AND RECOMMENDATIONS

Summary

In the present dispensation, teachers have alternative teaching and learning approaches. The teacher uses different approaches and strategies to teach in order to make their learners active. One of the aims of Education is to inspire and enable individuals to develop their abilities to the highest potential levels throughout lifetime, so they can grow intellectually, well equipped for work, and contribute effectively to society and achieve personal fulfillment, thereby improving their knowledge and understanding for their own sake and to render the application of the knowledge to the growth of the economy and society (Bonk & Graham, 2021). The present world of information and communication technology (ICT) has prompted alternative means of communicating curriculum content to learners in various subject areas including biology. There is now an emerging technology such as the blended learning.

Furthermore, the biology students, when armed with knowledge of blended learning technology can: Identify problems and needs in biology, formulate questions and design specification in biology, Collect, select and organize information and contrast information on biological concepts, interpret information in biology, and Search for solutions or designs which could be adapted to apply in problem solving in biology. Most of the schools in Obio-Akpor local government area do not have well equipped biology laboratories and the few that have the well- equipped laboratories may not have teachers that can conduct the practical or demonstrate all the steps for students to observe and follow suit. ICT has created valuable and advance methodology to resolve instructive matters and the rising demand learning in support. The importance of blended learning sharing instructional approach to teaching and learning of biology was noted and argued that blended learning method may be used in a way that stimulates student participation in the learning process. Most teachers of biology may not have been aware of the potentials of blended learning during instructional development hence the researchers' choice to investigate into the effect of blended learning on Academic Achievement of SS11 Biology Students in Obio-Akpor Local Government Area.

Conclusions

The use of conventional teaching method in biology lessons by teachers is not helping SS 11 students to better comprehend abstract concepts in biology as there is the urgent need for both biology teachers and students to explore the use of blended learning approach to cater for learners' peculiarities. The strongly study held that there is statistical significant improvement in students' achievement in genetics after exposure to blended learning instruction. There is no statistically difference in the achievement of boys and girls when exposed to blended learning.

Recommendations

Base on the findings and conclusions, the researchers recommended the following:

- Students of biology in public secondary schools in Obio-Akpor local government area of Rivers State should avail themselves of the rich opportunities offered by blended learning technology to embrace learning of biology via genetics for enhanced academic achievement
- Biology teachers in public secondary schools in Obio-Akpor local government area of Rivers State should encourage students to use blended learning approaches in solving learning problems and collaborative learning in biology to aid retention and recall.
- Biology teachers and students should be exposed to workshops on the use of

blended learning approach in teaching and learning of biology concept,

- Biology teachers should plan their biology lessons very well before engaging the students in problem solving projects learning with instructional objectives well stated and followed up.
- Biology teachers in secondary schools in public secondary schools, particularly in Obio-Akpor local government area should ensure proper evaluation of the teaching – learning process as to achieve their lesson objectives in biology.
- Rivers State government should increase teachers' salary so they would be happy to teach students biology, and integrate blended approach during instructional delivery.
- Rivers State government should employ educational technologists to provide support services to biology teachers on the use of modern teaching techniques like blended learning.

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