

## **Influence of multimedia use on academic performance of biology students - a case study of a municipality in Alimosho, Lagos, Nigeria.**

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### **Abstract**

The performance of students in biology for some years now in standardized examinations has created great concern among educators and other stake holders. Several efforts have been made to ameliorate this discouraging situation. This study investigated the influence of multimedia use on academic performance of biology students - a case study of a municipality in Alimosho, Lagos, Nigeria. A descriptive survey design was adopted. A sample 400 students, 200 each from public and private schools, participated in the study they were selected using simple random sampling technique. Structured questionnaire validated by computer and biology experts was used to generate pertinent data. Two hypotheses were tested at .05 level of significance Cronbach Alpha method used obtain a reliability of 0.7. The data were analyzed using T-test and Chi-square statistics. The result of the study showed that students taught biology using video based learning performed maximally better than their counterparts taught using the traditional teaching method. More so, the female students exposed to the treatment outperformed their male counterparts. It is therefore recommended that teachers should adopt this method of teaching to facilitate learning and enhance the overall performance of the student. School curriculum should be restructured to make the application of technology in instructional delivery compulsory.

**Keywords:** video-based learning, multimedia, academic performance

### **Background of the Study**

Technological advancement is crucial in today's digital world. Without physical boundaries, people can share and receive information from anywhere on Earth. Students have access to lectures and materials used in foreign universities. Ololube (2017) argues that, from a pedagogical standpoint, the modernization of the means of communication and the spread of information has opened up exciting new possibilities in the classroom. Technologies for manipulating the transmission of information are included in the broader category of "Information and Communication Technologies (ICT)," as are those for transmitting voice and/or visual information via microphones, cameras, speakers, and telephones/mobile phones (Osu, Udosen, & Akpan, 2013). The incorporation of ICT is an additional perk that contributes to the development

of a beneficial educational setting. It has become effective in the classroom due to its multimodal approach to teaching and learning. Students access information using multimedia devices.

The term "multimedia device" refers to any electronic gadget that can play more than one digital media format at once. The primary function of multimedia is for the purpose of communication. Its characteristic features such as interactivity, adaptability, visualization, and integration of different media improve learning and cater for students' unique needs. Thus, students' individual differences and learning style are effectively addressed.

The use of multimedia in teaching and learning is highly effective and efficient (Aloraini, 2015). Multimedia products and online services can be used in innovative and purposeful ways in the classroom. Teaching and learning across disciplines and topics can be aided by the use of multimedia (Inceday, 2018). This is because its resources can be utilized in numerous instructive modalities. Some students learn best through reading, others through listening, and still others through watching. Furthermore, educational history data suggests that science is consistently ranked first among all school subjects because of its crucial role in human development, academic achievement, and environmental safeguarding.

Biology is one of the most studied scientific disciplines because of its relevance to students' everyday lives, its uniqueness as a field of study, and the connections it provides to other areas of study (Yeboah, 2014). Its prominent place among the natural sciences makes it an essential foundational subject for many other fields, including medicine, agriculture, dentistry and others. The significant emphasis placed on biology and science courses at the elementary and secondary levels accurately reflects the subjects' vitality in modern society. According to Gambari et al. (2014), the field of biology is crucial to the achievement of global social, economic, and political goals. Therefore, efforts should be made to arouse the interest of the students most essentially by adopting a

teaching method that is not only engaging, but facilitates learning and enhances performance.

This view is supported by Richard Mayer (Moreno & Mayer, 2000), the proponent of the cognitive theory of multimedia learning, the theoretical framework that guided this study. Propounded in the 1990, the theory emphasized that students learn better with words and pictures. In other words, that when students use visuals and text together to study, they retain more information and learn more quickly. He noted that students should be more engaged in the learning process by designing instruction that sensitizes more in them. Adegoke (2011) added that learning which engages more of the senses results in greater retention. Integrating multimedia learning tools into conventional classrooms would improve instruction by encouraging students to take an active role in their education (Son & Simonyan, 2016). The era of teachers as the only repository of knowledge is fading as multimedia education is fast becoming the norm.

Gender has been an inconclusive issue of interest to researchers and other stakeholders in education. Gender equality is one of the Sustainable Development Goals (SDGs). Nevertheless, most societies prevent the female gender from participating in, and benefiting from certain development efforts (Fatokun & Odagboyi, 2010). Therefore, speculating the effectiveness of using multimedia on the achievement of male and female students is worthwhile.

However, the influence of gender could be put under control with the features of multimedia package such as self-pacing, privacy of instruction, self-directed learning and visualization. Visual perception according to Adebayo and Oladele, (2016) is the most developed sense in human. Learning through visualization helps students to build a mental representation of difficult concepts in their long-term memory. In this way, abstract concepts can be made clearer, easier, and more meaningful.

## **1.2 Statement of the Problem**

Academic underperformance in science subjects like biology has reached dangerous levels as

claimed by Sola and Ojo (2017). In Nigeria, the low interest and success of practical biology in particular, has raised concerns among biology teachers. If this development continues unchecked, it may encourage the students to start drifting into the arts and social sciences. The situation worsens by the fact the most teacher still use the conventional teaching methods to deliver lessons to students at this digital age. Jegede (2014) argued that teachers' knowledge of science and the quality of their instruction are reflected in their students' grades. Something critical must be done urgently.

Perhaps by devising a teaching methodology that would engage the student's mind, heart, and muscles all at once. This will help to address the differences in the learning style of various students as well as make them grasp the scientific method and excel at qualitative analysis. This context informed the motivation for the investigation of how using multimedia resources might affect the academic outcomes of secondary school biology students.

Pursuant of this broad objective, the study sought to provide answers to the following research questions:

- i. what is the impact of video-based learning on the academic performance of biology students?
- ii. are there significant differences in academic performance between targeted biology students?

The following research hypotheses were tested at a 0.05 level of significance

**H<sub>01</sub>:** no significant difference existed on the performance of students taught biology using Video Based Learning (VBL) method and those taught using traditional methods.

**H<sub>02</sub>:** gender has no significant effect on the performance of students taught biology using Video Based Learning (VBL) method and those taught using traditional methods.

## Review of related Literature

The term "multimedia" is used to describe a presentation that incorporates more than one media format (Schwartz & Beichner, 2013). It includes visuals, sounds, moving pictures, and animations. The use of multimedia in teaching and communicating is growing in popularity. In the classroom, students can apply critical thinking and creativity when using multimedia and online resources. It is a powerful learning tool because of its ability to motivate students, personalize their learning experiences, and accommodate a wide range of learning styles and preferences (Aloraini, 2015). The settings, results, and subsequent actions can all be modified and viewed in real time. The package is highly flexible, allowing users to change the pace and frequency of iterations to suit their needs.

Many students use more than one method of learning, but everyone has at least one of the following preferences: knowledge gained through sight, sound, writing, or touch. Multimedia can be used to create a more all-encompassing curriculum that appeals to students with a variety of learning styles and to close the achievement gap between such students. By providing information in a number of formats, instructors hoped to help students become more flexible in their approach to learning (Morrison, et al. 2013). The shift away from textbooks and toward digital resources opens up new avenues for student participation and innovation in academic tasks. Technological advancements have expanded the range of possible methods for communicating ideas. Since many different types of media are combined into one, it stands to reason that multimedia has a more comprehensive approach to conveying information. As a result, it is being implemented in classrooms using different formats, Video Based Learning (VBL) inclusive.

VBL, as described by Cha (2014), is an innovative and collaborative platform where students can post, view, and discuss videos. Students can use videos as motivational tools in addition to using them in research to boost performance (Sherer P, and Shea, 2011). The video-based learning platform is already set up for users to watch, discuss, and add their own videos. Video-based learning is also

widely used in the classroom because it facilitates student-to-student communication, facilitates knowledge acquisition, and boosts students' academic performance.

According to research by Allcoathlenen (2018), the use of video-based learning has a profound positive effect on university students. Using VBL to its full potential can afford the students access to as much information as possible, facilitate their learning and enhance performance. Curry and Penman (2014) argue that technological advancement is essential to the success of any business. The same is true for education; modern tools are needed to improve the efficiency and precision of teaching and training. Advanced methods, as argued by Vessoyan, Stekkle et al. (2018), are necessary to raise students' proficiency levels. Martinez and Reason (2020) added that the use of technology, and especially video-based learning, has a positive effect on students' academic performance. Students can successfully use video-based learning for academic purposes, achieve a high level of understanding, and improve their academic performance (Tan & Pearce's, 2011). Moreover, this video-based learning is acknowledged as a powerful resource in higher education to improve students' varied abilities. Quality factors like functionality, maintainability, portability, ease of use, reliability, and efficiency are why students prefer video-based learning, say Ferhatoglu and Kudsioglu (2020). Students, in particular, are increasingly turning to video content as a means of acquiring knowledge.

Compared to engaging in physical activity, this provides educators with additional opportunities for instruction and student growth. Thus, this video guide will aid students in mastering the fundamentals of using computers and social media. Kousha (2012) added that watching a video of the event can help a student to remember it more clearly. VBL allows users to access education and training in non-traditional ways, including the uploading, viewing, and sharing of video clips (Budiastira, et.al., 2019). Students can also collaborate and learn from one another many subject areas especially biology through the use of online video learning platform.

Biology is an essential part of any academic curriculum. Science in general, from biochemistry to medicine to pharmacy to nursing, all incorporate biology in some way. Consequently, students who wish to take on these fields need to have a firm foundation in biology. Despite the subject's relative importance and popularity, as well as its practical relevance in everyday life, high school students' performance has been disastrous, according to a number of studies (Yusuf & Afolabi, 2010; Ahmed, 2008). Large classes, inadequate educational practices due to substandard science teachers, and inadequacy all contribute to the mystery of why students in biology and other science subjects perform so horribly academically. Since there is more shortage of scientific resources (Yusuf & Afolabi, 2010 et al.), online courses could be one solution to the problems that have plagued science education. Multimedia is dense with information because of the many forms of media it incorporates. Researchers have found that using multimedia in the classroom is effective for large groups of students, which has led to a shift away from more traditional methods of instruction (Persin, 2002). Multimedia training and instruction have been shown to be effective in varying contexts, but they consistently demonstrate the value of employing technological means of instruction.

### **Methodology**

This study adopted a descriptive survey to generate pertinent data. The population includes all the biology students of public and private schools from a subset of Alimosho, Lagos State of Nigeria. A sample of 400 students, 200 each from public and private schools, participated in the study. They were selected using simple random sampling technique. A structured questionnaire validated by computer and biology experts was used to collect relevant data. Cronbach's alpha was used to determine the internal consistency of this instrument, yielding a coefficient value of  $r = 0.7$ . The data generated were analyzed using inferential statistics like T-Test and Chi-square statistical instruments.

## Presentation and Analysis

The research hypotheses formulated for this study guided the presentation and analysis of the data.

**H<sub>01</sub>: no significant difference existed on the performance of students taught biology using Video Based Learning (VBL) method and those taught using traditional methods.**

**Table 1**

**T-test analysis of performance differences between students who were taught biology via VBL and those taught using traditional method.**

Variables	T-cal	T-critical	Df	P	Interpretation	Decision
Student taught biology via VBL versus those taught with traditional way.	626.7	1.966	399	0.05	Significant	Rejected

(df =399) Critical Value = 1.966

As indicted in Table 1, the calculated value of 626.7 is larger than the critical value of 1.966 at a significant level of 0.05. Based on this, the null hypothesis was rejected. This implied that the students who were taught biology using video based learning performed maximally better than their counterparts taught using the traditional teaching method.



**H<sub>02</sub>: gender has no significant effect on the performance of students taught biology using Video Based Learning (VBL) method and those taught using traditional methods.**

**Table 2**

**Chi-square analysis of academic performance of students based on gender**

<b>Variables</b>	<b>N</b>	<b>Df</b>	<b>Cal X2 value</b>	<b>Crit. X2 value</b>	<b>Decision</b>
Performance of male and female students taught biology using Video Based Learning (VBL)	400	15	5461.09	21.026	Rejected

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(Df =15, Critical Value = 21.026)

Table 2 shows a Chi-square calculated value of 5461.09 and a critical value of 21.026 at a significant level of 0.05. Since the calculated value is greater than the critical value, the null hypothesis which stated that gender has no significant effect on the performance of students taught biology using Video Based Learning (VBL) method and those taught using traditional methods is hereby rejected. It can be concluded therefore, that gender influenced the outcome of students in both study groups.

### **Discussion**

In line with the result of testing the first null hypothesis, students learning biology through VBL didn't perform any worse than those taught the subject using the traditional method. The status quo of undue emphasis on the use of traditional method teaching by most biology teacher, was thus disproved. This breakthrough could not be unconnected with the fact that lessons learned through video platform were not only more accessible to learners, but addresses students with different levels of background knowledge. It has many positive effects on education, including the promotion of multisensory learning, enhancement of interactivity, increase in accessibility across multiple devices, improvement of technical skills, broadening of perspectives, and increase in inclusiveness.

The finding of this study corroborated the result of other previous studies. DeLoache and Korac (2003) posited that VBL helped students communicate and collaborate better, which in turn made them better equipped to handle common social issues. Using VBL to its full potential can afford the students access to as much information as possible, facilitate their learning and enhance their (Allcoathlenen, 2018). Martinez and Reason (2020) added that the use of technology, and especially video-based learning, has a positive effect on students' academic performance. Students can

successfully use it for academic purposes, achieve a high level of understanding, and improve their academic performance (Tan & Pearce's, 2011). Moreover, this innovative learning strategy is acknowledged as a powerful tool to improve students' varied abilities. Its functionality, maintainability, portability, ease of use, reliability, and efficiency are why students show preference for video-based learning (Ferhatoglu & Kudsioglu, 2020).

The second null hypothesis which stated that gender has no significant effect on the performance of students taught biology using Video Based Learning (VBL) method and those taught using traditional methods was tested. Based on the result, the hypothesis was rejected. Meaning that the way the teaching strategies influenced the performance of the male biology students was quite different from the way it influenced the performance of their female counterparts. The female students outperformed the males. This is likely because male students are easily distracted and lack proper attention. Though, Elinoso (2008) and Ebo (2009) disagreed with this view, Arigbabu and Mji (2004); and Bosede (2009) posited that male students tend to perform better than female students in computer-based instruction for science and technology courses.

## **Conclusion**

The performance of students in biology for some years now in standardized examinations has created great concern among educators and other stake holders. Several efforts have been made to ameliorate this discouraging situation. This study introduced the used of VBL as against the usual traditional teaching method with amazing results. It made biology classes more interesting and fostered a more optimistic mindset toward the subject, both of which contribute to higher levels of learning. The results of the research demonstrated that students exposed to this teaching strategy outperformed their counterpart taught using the traditional teaching method.

## Recommendation

It is therefore recommended that:

- 1 . teachers should adopt this method of teaching to facilitate learningand enhance the overall performance of the student.
2. School curriculum should be restructured to make the application of technology in instructional delivery compulsory.

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