International Journal of Scientific Research in Science and Technology
Available online at : www.ijsrst.com
Print ISSN: 2395-6011 | Online ISSN: 2395-602X doi : https://doi.org/10.32628/IJSRST5231047

A Survey on The Effects of Using Videos in Biology Lessons on Student Performance

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ARTICLEINFO

Article History:

Accepted: 01 July 2023
Published: 14 July 2023

Publication Issue
Volume 10, Issue 4
July-August-2023

Page Number
118-132

ABSTRACT

A compelling and motivating approach should be supported in the information and communication technology-driven 21st century to aid students in learning more effectively. Due to its beneficial effects on the teaching and learning process, the use of multimedia in education has demonstrated its significance. The study investigated an examination of how the use of multimedia in a biology lesson affected students' performance. Three senior high schools' worth of 200 students were chosen at random, and they were divided into three groups at random. The study's quasi-experimental pre-post-control group design was used. While the control group received conventional care, the experimental groups were trained via multimedia presentations. The course of treatment lasted for 12 weeks. As data collection tools, the Biology Achievement Test (BAT), which was also validated, was examined for dependability using the Crombach alpha, which produced a result of 0.92, and the Validated Attitude Towards Biology Scale (ATBS), which produced a Crombach alpha of 0.86. Both descriptive and inferential statistics were used to analyze the acquired data. The findings showed a statistically significant difference between the forms of instruction and the learning outcomes of the students. Students receiving multimedia-assisted instruction performed better than their peers receiving traditional instruction. Therefore, it is advised that multimedia assisted instruction be implemented in the senior high school biology curriculum to enhance students' learning results.

Keywords : Video, Survey, Biology, Students, performance, Senior high, school

I. INTRODUCTION

The majority of modern technical advancements are founded on the backbone of science. Since the world is becoming more scientific and science plays a significant role in every aspect of life, nations around the world, including Ghana, are working hard to improve technologically and scientifically.

According to Owolabi (2004), science is a crucial component of human society. Its effects are seen in every aspect of human existence, and they are so pervasive that they are closely related to how a country develops. The study of science has greatly benefited humanity. For instance, thanks to scientific developments, life has become much simpler for people. Human needs have been minimized to the absolute minimal.

Biology is a branch of science that explains how life came to be. It is a branch of natural science that focuses on the study of living things, including their shapes, structures, and functions as well as their heredity. It is a foundational science subject that provides the groundwork for comprehending the intricate workings of an organism's various body parts. According to Taiwo & Emeke (2014), the study of biology exposes students to the world of self-knowledge as well as the nearby and faraway environment. Its introduction in the Senior High School (SHS) curriculum in Ghana may have its roots in this. The goals of teaching biology in the SHS in Ghana include providing students with competent laboratory and field abilities in biology, knowledge that is meaningful and applicable, and the capacity to apply scientific knowledge to daily life in areas such as agriculture and the health of the individual and the community.

According to Ogunbote and Adesoye (2006), multimedia technology gives learning experiences a new dimension since ideas are presented and understood more easily when they are supported by images and animations. It goes on to say that it has been proven that learners retain more knowledge when a range of senses are used to make an influence on it. Intense experiences also help with retention and recall by involving the social, emotional, and intellectual senses.

Despite the the importance of science and the significance of biology instruction in SHS for fostering personal growth, numerous studies (WAEC, 2011; Taiwo & Emeke, 2014) document persistently subpar performance on the part of students in both internal and external exams. According to the WAEC Chief Examiners' Report from 2014, there has been a decline in students' biology achievement over time. Only 35.74%, 35.61%, 33.57%, 33.94%, and 33.87% of the more than one million students who sign up for biology each year were successful at the A-C6 level in 2010, 2011, 2012, 2013, and 2014, according to the data.

Studies on the subject (Arslan, 2006; Kuş, 2006; Tankut, 2008; Akbaba, 2009; Yeşiltaş, 2010), technology use in Biology lessons is beneficial. For instance Dönmez and Oruç (1994, cited in Oruç and Ulusoy, 2008) talks about research studies in the United States are paramount as well, and its ripple effects in Ghana could be seen lately (cited in Oruç and Ulusoy, 2008). Based on these, it seems conceivable to integrate students into technological implementations to leverage technological possibilities to reach information and bring them to information more. Multimedia is one of the ways that technical possibilities and education are combined.

Numerous variables have been suggested as the cause of pupils' poor achievement in biology. These variables include the caliber of the teacher (Akinsolu, 2010; Anita, 2013), school-related variables (Mushtaq & Khan, 2016), textbook kinds (MeenuDev, 2016), and teaching approach (Owusu, Monney, Appiah, & Wilmot, 2010), among others. However, research have indicated that the predominant technique of teaching in science classrooms in Ghana is the main reason why pupils perform poorly in science classes (Ukoh & Adewale, 2014).

Since teachers' instructional strategies are not always backed by pertinent teaching resources, they have come under fire. It is typically based on "chalk and talk" techniques, with no teaching materials that provide sufficient illustrations to help the student comprehend the scientific subject. Due of their high cost and lack of ability to improvise, educational materials are rarely used in classrooms by teachers. This study is being conducted to ascertain on an examination of how the use of multimedia in a biology lesson affected students' performance.

The teaching of biology should be carefully planned to foster meaningful learning that might raise students' performance in order to successfully accomplish the admirable goals of teaching and learning biology in Senior High School. Biology instruction that promotes comprehension and substantive learning may include using the right techniques. It is possible to implement the UNESCO suggestion from 2002 on strengthening science education in biology instruction: diversifying subject matter and delivery methods, encouraging experimentation and innovation, and disseminating and exchanging information. Technology integration in biology instruction will enable the diversification of topics, approaches, and innovations. Technology is one significant difference between the present age and eras that came before it. Schools' multimedia resources should be in line with their needs and goals. According to Richter, Sousa, and Nel (2019), teachers should create collaborative, engaging learning spaces for their students while maintaining a professional learning atmosphere in the classroom. Teachers are paying close attention to pedagogies and technological applications to enhance learning in a supportive atmosphere. The progress of reaching the desired learning outcome is greatly aided by multimedia tools. The accessible multimedia resources ought to be matched to the lesson's goal and the behavior of the students. This investigation also considers the study conducted by Wang (2008) in Singapore, where he looked into environments in middle-class neighborhoods, matching educational environments in different types of institutions (good, middle-class, and low-quality), and diverse educational streams. It was discovered that there are significant differences in the use of instructional media in various school types.

There have been substantial changes in the way education is delivered with the introduction of multimedia technologies in higher education. The invisibility of the digital age has ensnared pupils of the present day, rendering the old teaching approach in the Ghanaian educational system no longer seem ineffective. The shortcomings of conventional teaching methods have been addressed by multimedia technology, which also gives pupils a variety of learning chances.

There is a strong need to switch to technology integration strategies as a new type of pedagogy because the current teaching strategies commonly used for teaching science have failed to improve problem-solving abilities, curiosity, and critical and logical thinking among the science students (Shan & Khan, 2015). Since teaching primarily entails the transfer of information through communication, a paradigm change in the integration of information and communication technology (ICT) is especially important.

These days, information and communication technology (ICT) is nothing new. ICT seems to be a force that has altered many elements of life, in some mysterious way. We are all currently residing in the information and communication era. ICT is more creative and could improve methods for deep learning. With high-speed communication links carrying data, voice, and video, communication technology includes all forms of technology used to create, store, and transmit information (such as business data, video, audio, still images, text, and photos, etc.). Multimedia is used when more than one of these is used in the communication process.

Multimedia, according to Ogunbote and Adesoye (2006), gives learning experiences a new dimension since it makes concepts easier to present and comprehend when they are combined with images and animations. Additionally, they claim that learning through several senses helps pupils retain information more permanently and that the intensity of the learning experience aids in evoking memories by engaging the social, emotional, and intellectual senses. Multimedia technologies have been defined in various ways over the years. Multimedia has also been referred to as audiovisual technologies, hypermedia, training materials, intelligent teaching systems, etc. by other authors.

According to Keller (2009), multimedia is a synergistic fusion of computer, digital video, audio, information, and telecommunications technologies. Keller goes on to say that the hardware and software required to develop and run the programs are both a part of the multimedia application. Multimedia software is an application that needs a written manual to guide the hardware system's operation. While the multimedia equipment itself merely consists of a computer system's physical characteristics that carry out a written command. For developing animation, graphics/image editing, audio editing, text formatting, maintenance, and multimedia creation, the software and multimedia equipment are actual tools.

Multimedia is thus defined as a system of information transmission that integrates several diverse types of communication. Text, audio, video, still images, sound, animation, images, and interactive information can all be included in multimedia. Computer-delivered information can be any combination of the aforementioned. Multimedia, according to Malik & Agarwal (2012), is the fascinating mix of computer hardware and software that enables the integration of text resources, audio, animation, graphics, and video to create powerful presentations on a budget-friendly desktop computer. Neo (2007) supports this assertion by stating that multimedia consists of texts, images, sound, animation, and video, some or all of which are arranged into a logical program. It is clear from the definitions that multimedia entails the exchange of information through a variety of venues. These components (such as sound, animation, text, audio, image, graphic, and video, etc.) could be integrated and applied to the teaching of biology in a classroom setting.

Multimedia has the ability to engage the audience's senses in several ways at once due to its multimodal nature. If used in biology classes, it could arouse the senses of the students and promote interaction between them and the lecturers. These could improve the appeal and excitement of biology lessons for students as well as their motivation and comprehension, making learning more authentic and meaningful. This is supported by the claims made by Altherr, Wagner, Ecker & Jold (2004) and Sousa, Richter & Nel (2017) that multimedia elements are of utmost importance in science teaching because they enable the vivid presentation of various phenomena and processes, the simulating of complex materials, and the presentation of various levels of abstraction. As a result, some ideas that students first found abstract might now be better understood and remembered. This might enhance students' academic performance and enthusiasm toward learning the subject. However, due to the global degree of technological advancement and integration in education, Ghanaian high schools have not consistently used multimedia to teach biology.

There is a propensity for improvements in academic performance and attitude as students' interest rises, understanding improves, and retention capacity rises (Gilakjani, 2012). This is consistent with Mantei's (2000) observation that using power point presentations to teach science helps students' attitudes about the subject. According to Shah and Khan (2015), attitude is a learned propensity to react favorably or unfavorably to a circumstance, an occasion, or a person. It is an inclination to view things, people, or events favorably or unfavorably. Experiences in various learning environments frequently lead to the

development of a student's attitude toward a particular subject. As a result, a student's attitude plays a critical role in their success in a topic. Separate studies by Shah, Iqbal, and Rauf (2010), Soomro, Qaisrani, and Uqaih (2011), and Shah and Khan (2015) note that a student's attitude toward learning science courses affects academic progress. Learning and idea understanding are facilitated using multimedia computer learning. The use of multimedia in computer education, according to Surjono (2015), improves students' comprehension of certain theme content. When students create a mental representation based on the words, images, and voices that are offered to them, multimedia learning takes place (Mayer, 2003).

Students' attitudes about scientific classes may or may not differ based on gender. The studies on the prevalence of disparities between male and female students' views on biology are conflicting. While some academics hold the belief that gender has no bearing on students' attitudes on biology (Ahmad & Asghar, 2015), others disagree (Usak, Prokop, Tuncer & Chuda, 2009).

This study looked into an examination of how the use of multimedia in a biology lesson affected students' performance.

Research Purpose

This research purpose was to investigate an examination of how the use of multimedia in a biology lesson affected students' performance.

The study specifically looked at the impact of:

1. Text on Screen, graphics, static photos, video packages, the instructor's explanation, and posttest results for those who received conventional instruction.
2. Text on Screen, graphics, static photos, video packages, the instructor's explanation, and pretest results for those who received conventional instruction.
3. Conventional method

Research Questions

The project aims to answer the following questions, among others:

1. Do the groups of students' learning performance before receiving treatment differ in any way?
2. Do the groups of students' learning performance After receiving treatment differ in any way?

Research hypotheses

The following null hypotheses were evaluated at a significance level of 0.0.

1. On Students' learning performance, treatment had no relative impact.
2. Gender has no discernible influence on pupils' learning performance.
3. On Students' learning performance, treatment and gender do not interact.

Method and Procedure

A quasi-experimental pretest-posttest control group design was used in the investigation.

Population Sample

All Senior High School (SHS) 2021-2022 biology students in Asante Mampong located in the north - east of Kumasi, Ghana made up this study.

Research Design, Sample and Sampling Techniques

Two Hundred (200) respondents were chosen at random from four different schools. These schools were chosen on purpose for the study and had suitable information and communication technology facilities. From each of the four schools, a random sample of 50 pupils was chosen.

Research Instrument

The study's data were gathered using two specially created instruments:

1. Biology Achievement Test (BAT)
2. Biology Students' Attitude Questionnaire (BSAQ)

BAT was composed of 50 objective questions on the chosen subject, Regulation of Internal Environment, that were constructed using historical West African Senior Secondary School Certificate Examination

questions by the West African Examinations Council. The items were created using the distribution and Bloom's taxonomy. It underwent peer review for construct validity and content. Thirty SHS students who were not participating in the study were given the test to determine its reliability. Using Kuder Richardson 20 (KR 20), the dependability was 0.78. Twenty-five questions on the attitudes of SHS students made up the BSAQ. Thirty students who were not included in the study participated in a validation exercise with the instrument. Using Cronbach Alpha, the dependability coefficient was 0.81.

Results and Findings

According to the research questions posed and the hypotheses advanced, the study's findings were presented.

FQ1 : Do the groups of students' learning performance before receiving treatment differ in any way?

Table 1. Students' performance at before treatment

Understanding Levels	Mean	SD	Position
Conventional	21.66	3.19	2nd
Using Video	23.46	7.34	1st
Not Using Video	20.23	4.93	3rd

In table 1, students who were taught using video had the highest average mean performance (23.46), followed by those who were taught using the traditional (Conventional) technique with an average mean performance of (21.66), and those who were taught without using video had the lowest average mean performance (20.23).

FQ2 : Do the groups of students' learning performance After receiving treatment differ in any way?

Table 2. Students' performance at before treatment

Understanding Levels	Mean	SD	Position
Conventional	21.84	6.15	3rd
Using Video	24.78	7.29	1st
Not Using Video	23.61	5.93	2nd

In table 2, students who were taught using video had the highest average mean performance (24.78), followed by those who were taught without using video with an average mean performance of (23.61), and those who were taught using the conventional (traditional) had the lowest average mean performance (21.84).

Ho1: On students' learning performance, treatment had no relative impact.

Table 3. Treatment's impact on the learning performance of students

Source	Type III Sum of Squares	df	Mean Square	F	Sig.
Corrected Model	170.476[a]	2	85.238	2.276	.111
Intercept	494.592	1	494.592	13.101	.002
Pretest	93.743	1	93.742	2.503	.118
Group	158.816	1	158.815	4.239	.045

Error	2322.908	62	37.466		
Total	38039.000	65			
Corrected Total	2493.385	64			

a. R Squared =.039 (Adjusted R Squared =.018)

An F (2, 150) 2.706 was not significant, according to table 3 above, with a value of. 07 at 0.05 alpha level. Since the significant value of.07 is more than the 0.05 alpha level (.141 > 0.05), the null hypothesis one was accepted on this basis. Therefore, there was no difference between Experimental I, Experimental II, and Control groups in terms of the major effect of treatment on students' learning performance.

Ho2: Gender has no discernible influence on students' learning performance.

Table 4. Treatment's impact on the learning performance of gender

Gender	Mean	Std. Error	95% Confidence Interval	
			Lower Bound	Upper Bound
Female	22.577[a]	1.295	20.230	24.877
Male	26.325[a]	1.270	23.989	28.550

a. R Squared = .068 (Adjusted R Squared = .038)

The table showed a F (1, 64) 4.24 with a significance level of 0.05 and a significance value of.04. Given that the significant value of.04 is smaller than the 0.05 alpha level (.04 < 0.05), the null hypothesis is rejected. Therefore, when subjected to treatment, gender had a substantial impact on students' learning performance. The posttest mean score test was followed up with pairwise comparisons to determine where the significant difference was present. Table 5 shows the mean scores for the two groups.

Table 5. Effects of various treatments on gender difference

(K) gender	(L) gender	Mean Difference. (K-L)	Std. Error	Sig.[b]	95% Confidence Interval for Difference[b]	
					Lower Bound	Upper Bound
Female	**Male**	-4.816[*]	1.906	.058	-8.323	-.208
Male	**Female**	4.816[*]	1.906	.058	.208	8.323

Table 6 Gender mean variations based on treatment groups.

Source	Type III Sum of Squares	df	Mean Square	F	Sig.
Corrected Model	258.476[a]	5	51.695	1.740	.130
Intercept	1768.592	1	1768.592	46.579	.000
Pretest	34.743	1	34.743	.810	.370
Gender	48.185	1	48.185	1.303	.256
Group	78.511	1	78.511	1.109	.333
gender * group	22.708	1	22.708	.661	.418
Error	2234.909	145	15.413		
Total	38039.000	152			
Corrected Total	2493.385	150			

according to the projected marginal means

***. The mean difference is significant at the .05 level.**

According to the data in the table, there were differences in the posttest means of male and female students who had received treatment, with the highest mean being (26.32) for males and (22.57) for women. Males so outperformed females in performance.

Ho3: On Students' learning performance, treatment and gender do not interact.

Table 7 Effects of treatment and gender interaction

Gender	No	$\bar{x}$	SD	df	T	Sig
Male	72	26.9	16.86			
					6.38	0.00
				140		
Female	80	27.6	9.89			

a. R Squared = .061 (Adjusted R Squared = .026)

The table showed a F (1, 140) 4.24 with a significance value of.148 at 0.05 alpha level. So, on reason the null hypothesis is accepted since the significant value is greater than 0.05 alpha level that is (.418>0.05). There we can say there was no effects of treatment and gender interaction.

Ho4: The attitudes of male and female students on the use of multimedia in biology education has no relative difference.

Table 8. Shows the attitudes of male and female students toward the use of multimedia.

According to Table 8, t (140) = 0.00 and p = 6.38. In other words, the outcome of the 6.38 t-value with a 0.00 significance value was less than the 0.05 alpha threshold. In other words, the null hypothesis was rejected.

II. Discussion

The study's findings showed that students' learning performance before and after exposure to therapy differed. Students' academic performance and biological attitudes both improved. This demonstrates that the impact of multimedia in biology instruction was significant. The improved differences in the learning results are attributable to the usage of multimedia in biology instruction. The learning outcomes of the children in the usual group did not improve. The two treatment groups' instructional multimedia must have captured the interest and attention of the students in order to enhance learning performance. This corroborates Aloraini's (2012) argument that using multimedia to teach has a favorable impact on students' learning results, whereas using a traditional teaching approach shows no such improvement. However, there were no appreciable differences or effects of the multimedia on the students' learning results. The teachers' lack of proficiency may be the cause of this. Many biologists lack the essential abilities to effectively employ multimedia in their classrooms. This can be because biology classrooms do not yet include multimedia. This suggests that activities in biology classes are dominated by the blackboard and textbook. This is consistent with the statement made by Aduwa-Ogiegbaen & Iyamu (2005) that more than 90% of Nigerian public schools continue to use chalkboards and textbooks.

The study also showed that gender has a big impact on how well pupils learn. In comparison to female students, male students study more effectively. This could be the cause or effect of the rise in multimedia use among students.

The combined effect of gender and multimedia on students' learning results showed that these factors have no impact on those outcomes. This is consistent with the submissions from Erinoso (2008) and Ebo (2016). The results of Arigbabu & Mji (2004) and Bosede (2010), however, found that gender has an impact on students' academic progress in science and technology courses when using computer-mediated education, with male students performing better than their female counterparts.

III. Conclusion

The adoption and application of multimedia in biology instruction has a favorable effect on students' biology learning results. Multimedia lessons are more effective and easier for pupils to understand. It is superior to the traditional approach in terms of how well biology students' attitudes and cognitive development are being developed. The utilization of multimedia in the classroom is more appealing and encourages students to have a positive attitude toward learning biology, which enhances student performance.

However, since these resources are not easily accessible and teachers lack the abilities to improvise them, they are hardly used in the classroom. This demonstrates that the use of multimedia resources for teaching and learning in senior high schools is unavoidable. Additionally, it will significantly enhance and increase the effectiveness of teaching and learning.

IV. Recommendation

It is advised that biology be taught in senior high schools using multimedia in light of the study's findings. To do this, biology teachers must have the requisite training in order to develop the abilities needed to use multimedia to teach biology. This is crucial for preparing teachers to teach biology and for giving biology instructors in-service training. More multimedia resources should be used by science teachers to teach scientific concepts. The perception and attitude of science teachers toward multimedia tools should remain favorable. To advance their knowledge and abilities, science teachers should make an effort to attend seminars and workshops on

multimedia. The curriculum for undergraduate students and colleges of education should cover multimedia skills. Funds should be made available in education to support and promote the use of multimedia teaching resources, frequent workshops and seminars, and teacher incentives and allowances.

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Cite this article as :

Whajah Samuel Miezah, Gifty Whajah, "A Survey on The Effects of Using Videos in Biology Lessons on Student Performance", International Journal of Scientific Research in Science and Technology (IJSRST), Online ISSN : 2395-602X, Print ISSN : 2395-6011, Volume 10 Issue 4, pp. 118-132, July-August 2023. Available at doi : https://doi.org/10.32628/IJSRST5231047
Journal URL : https://ijsrst.com/IJSRST5231047