

Effect of YouTube and Recorded Video Instructional Media on Academic Performance of Biology Students in Ibesikpo Asutan Local Government Area

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ABSTRACT

This study was carried out to investigate the effect of YouTube and recorded video instructional media on academic performance of Biology students in Ibesikpo Asutan Local Government Area. The study employed a quasi-experimental design with a pre-test, post-test non-equivalent control group design. The population of the study consisted of 977 Senior Secondary School Two (SS2) students in the seven (7) public Secondary Schools in the study Area for 2025/2026 session. A total of 93 students formed the sample of this study. Simple random sampling technique was used to select the two schools used for the study. The instrument used for data collection was Biology Performance Test (BPT) developed by the researcher. The instrument was presented to an expert in Biology Education, who scrutinized the items, while content validation was done by an expert in Measurement and Evaluation all from Akwa Ibom State University. The reliability of the instrument was determined using Kuder Richardson formula 20, and the coefficient obtained was 0.85. The data generated were analyzed using mean, standard deviation, and ANCOVA. The results revealed that there was a significant difference in the mean performance scores of Biology students taught the concept of heredity using YouTube and recorded video instructional media in favour of those taught with YouTube videos. Also, there was no significant difference in the mean performance scores of male and female Biology students taught the concept of heredity using YouTube and recorded video instructional media. It was concluded that YouTube may offer certain advantages in delivering scientific content, potentially due to its interactive, engaging, and visually rich format, which may be more conducive to understanding complex concepts like heredity. it was recommended among others, that Biology teachers should adopt the use of instructional media such as YouTube, as it helps teachers develop videos based contents of the courses in various series and upload it for students to watch and make comments where necessary.

Introduction

Science is a systematic investigation of nature which is based on the view of understanding the nature of life and its connections towards the provision and serving of human needs. It is an organized body of knowledge in the form of concepts, laws, theories, and generalizations. Science plays an indispensable role in national development, innovation, and global competitiveness (Umoetuk et al., 2025). Edikpo et al. (2024) comment that science is provided at the basic, senior secondary, and tertiary levels in Nigeria and in different specialized fields including medicine, forestry, agriculture, biotechnology, and nursing. Furthermore, the impact of science has contributed to the development of nations of the world. With the rapid involvement of nations in the scientific and technological advancement coupled with the globalization of science learning and emphasis on scientific literacy of the citizenry for useful living in the society, making science a solid foundation lay on students in secondary schools who have passion for science in the senior secondary level of education as it serves as a core curriculum in the national policy of education at the basic level of education (Obodo & Ani, 2023).

Biology is an important subject in the secondary school curriculum, and it deepens man's future to a large extent based on scientific advances & development of productive activity. It is the foundation of sciences and a prerequisite subject for many fields of learning, contributing immensely to the scientific and technological growth of a nation (Atabang, et al., 2024). It is also the gateway of science that is studied at all levels of education to prepare students for the core science subjects at higher institutions. Moreover, the study of Biology helps equip students with useful skills, concepts, principles, and theories that will enable them face the challenges of science subjects in the future and also provide opportunities for students to actually study science as opposed to learning about science through its Practical activities. It engages people to understand the world around them and so have the ability to make informed choices about their healthcare, the environment, and the society in which they live (Umoh, 2021).

Despite Biology being a core science subject in secondary schools, there is continued evidence of poor student performance in the subject (Ukpong et al., 2026; Umoh, 2018). This alarming rate of poor performance in Biology external examinations and at all levels may be due to several factors, such as: a lack of enough qualified and experienced Biology teachers, school location, teacher sex, the type and nature of public examination items, and teachers' difficulties in teaching most Biology concepts (Edikpo et al., 2024; Ntegwung et al., 2026). Furthermore, Umanah and Atabang (2025); Udu (2017); and Arop et al. (2015) opined that several variables have been highlighted as major contributors to students' poor performance in science, but one of the most commonly stated issues is the use of ineffective instructional media in the teaching and learning of Biology in secondary school. Udo and Umoh (2024) assert that students performed poorly when answering questions based on Biology-related concepts. Thus, this has been a major problem to be tackled. Therefore, there is a need to adopt other technology-based instructional media, such as YouTube and video recording, among others, to enhance traditional strategies in this modern era. According to Sunday et al. (2025a), technology-supported instructional media can provide learners with visual and interactive representations that help bridge the difficulty of understanding abstract scientific phenomena.

In support of the relevance of technology-based instructional media to Biology learning, Moffat et al. (2023) found that students taught the circulatory system using instructional media packages performed differently from those exposed to alternative media packages. This need for technology-supported media is further supported by evidence from Biology education. Etukakpan et al. (2025) found that computer simulation was more effective than guided discovery in teaching cell structure, suggesting that technology-mediated visualization can support students' understanding of Biology concepts. Recent evidence also suggests that computer-supported instructional approaches can provide interactive and multimedia learning experiences that make difficult scientific concepts more accessible to learners (Sunday et al., 2025b). Itighise (2016) reported that innovative teaching methods should be adequately utilized for an effective teaching and learning process. Achimugu et al. (2022) posited that the use of video- or audio-taped recordings, YouTube, and other instructional media is one of these interactive approaches to improve the teaching and learning of Biology.

YouTube is an international phenomenon and an online instructional medium used in traditional classrooms to transform passive secondary school classrooms into active ones, where all students are carried along in the lesson (Ezeudu & Jolaosho, 2020). It has high potential to improve students' learning skills. YouTube is an engaging and entertaining learning medium in classroom settings (Imathiu, 2018). Launched in 2005, it is a site where individuals and groups can record and share their own videos at little or no cost. It provides students with authentic situations and everyday clips that help them gain a better understanding of science concepts. YouTube is an instructional medium that provides students with good knowledge and understanding of their lessons. It is a website that enables free video sharing and makes it easy to watch videos online (Fedrick et al., 2020). Itighise (2024) and Zboun et al. (2018) posited that many universities have established their own channels on YouTube to view their lecture videos, and that YouTube is available for students and teachers to use effectively in and out of the classroom to help students learn, stimulate class discussions, and achieve learning goals.

Itighise (2024) further reported that the use of instructional media, including pictures, phototext discussions, and online file content sharing, enhances the academic performance of teacher trainees in universities in South-South Nigeria. Learners use YouTube instructional media as a learning tool that helps them achieve a clearer understanding of science-related subjects, and after class, they can access

the topic studied in the classroom for better understanding of the subject (Ezeudu & Jolaosho, 2020). YouTube, being very popular, has become one of the most-used websites and a large resource for educational content. The site has millions of videos tagged as educational, many of them uploaded by teachers, students, and researchers (Hicks, 2015). YouTube is not only meant for digital entertainment but is also a great environment for learning and should be used in eLearning. Studies have shown that the use of instructional media such as YouTube has improved achievement and students' performance (Edache-Abah and Mumuni, 2019). Berk (2019) also asserted that the use of YouTube instructional media in a science class will help improve presentations, since more senses are engaged. The author further added that schools should add instructional media to their science classrooms to grab students' attention, focus, and concentration, generate interest in the class, improve attitudes toward content and learning, and make learning fun. This will go a long way in building the scientific attitude in students.

Video is a powerful medium that can shape and reveal the minds and hearts of many learners in modern educational development. Video is known as recorded moving images that appeal to the sense of sight (Edem & Ekon, 2020; Wordu & Itighise, 2020). Recorded video is a rich and powerful medium used in teaching and learning science-related subjects. It presents video and information in an attractive and consistent manner. According to Ekwueme et al. (2016), video tape instruction (VTI), especially video recording, is an instructional medium that assists learners in organizing their thoughts while observing the pictorial presentation in the watched clip. Itighise and Umanah (2019) asserted that the flipped classroom and recorded video improve students' academic performance in secondary school if effectively utilized. Furthermore, recorded instructional video has strong potential to strengthen the teacher-student communication channel and, as a result, improve students' learning ability and performance (Achimugu et al., 2022). The study focused on Jean Piaget's cognitive theory.

Jean Piaget's cognitive theory is a seminal framework in developmental psychology, offering a detailed explanation of how human intelligence evolves from infancy through adolescence. The theory identifies four distinct stages of cognitive development, each characterized by different abilities and modes of thinking. This understanding is critical for educators, especially when integrating modern educational tools like YouTube and video instructional media into the curriculum for Biology students. Understanding Piaget's stages of cognitive development is particularly relevant when assessing the impact of YouTube and video instructional media on the academic performance of Biology students. These students typically fall within the concrete operational and formal operational stages. During the concrete operational stage, children benefit immensely from concrete, hands-on experiences. Video instructional media can provide these visual and interactive experiences, making abstract scientific concepts more tangible and understandable. For example, videos that demonstrate scientific experiments or explain processes visually align well with the cognitive abilities of children in this stage, enhancing their comprehension and retention of information.

As students transition into the formal operational stage, their ability to grasp abstract concepts and think hypothetically improves. Video media can play a crucial role here by introducing complex scientific ideas in a visually engaging format. This not only aids in comprehension but also stimulates higher-order thinking skills such as analysis, evaluation, and synthesis. Videos can illustrate complex phenomena, present hypothetical scenarios, and encourage deductive reasoning, all of which are vital for students in the formal operational stage. Moreover, video instructional media can enhance engagement and motivation, which are essential for effective learning (Itighise & Wordu, 2018). Piaget emphasized that children are natural learners, motivated to explore and understand their environment. Engaging videos can capture their interest and make learning more enjoyable, thus fostering a positive attitude towards science education. Additionally, the ability to pause, rewind, and rewatch videos allows for self-paced learning, catering to individual cognitive development needs (Akpan, et al., 2025).

Furthermore, video media can provide repetitive and varied representations of scientific concepts, which helps consolidate understanding and improve memory retention. This aligns with Piaget's notion that cognitive development involves the reorganization of mental processes through active interaction with the environment. Integrating YouTube and video instructional media into Biology education aligns well with Piaget's cognitive theory. By providing visual and interactive learning experiences, enhancing engagement and motivation, and supporting self-paced learning, video media can significantly impact the academic performance of Biology students. Understanding the cognitive development stages of these

students enables educators to tailor their teaching strategies effectively, leveraging modern technology to foster a deeper understanding and appreciation of science.

Moreover, the use of instructional recording video in classrooms has increased in the past decade due to new forms of online learning (Akpan et al., 2025). Considering learning method in educational classes, recording video has been a long standing tradition. An empirical study conducted by Al zbon et al., (2018) posited that Video-recording has been used as an educational tool to assist in classroom teaching and it has a positive impact on students' academic performance. Arranging recording videos in clips or short and programmed structures helps the teachers and students in the teaching and learning processes (Itighise, 2024; Edem & Ekon, 2020). Therefore, video recording enhances comprehension. As instructional media devices including YouTube, video recording among others have become increasingly portable, and as they spread even further through young people's environments, anything that takes up this much space in young people's lives deserves full attention. Gender is another variable consider in this study.

Globally, promoting gender equality in science is currently used as a developmental strategy for socioeconomic development of any nation (Akpan & Akpan, 2017). Gender differences in learning science related subjects generated due to some genetic difference between females and males, and socio-cultural forces contributed to sex differences in achievement and ability which include: the effects of family; peer; school influences; training and experience; and cultural practices (Atabang & Umanah, 2024; Umanah & Akpan, 2024). Gender is the range of physical, biological, mental and behavioural characteristics pertaining to and differentiating between the feminine and masculine population (Adigun, et al., 2015). In a science and technology class, most girls see themselves inferior to the boys and may not also be motivated sufficiently for the learning process. While some researchers have examined general academic performance and students' attitudes without focusing specifically on gender in computer-based learning environments (Sunday et al., 2025b; Ntegwung, et al., 2026), others have looked directly at gender differences.

The feeling of inferiority and lack of motivation may cause some female students to withdraw from learning tasks, thereby affecting their interest and achievement in science-related subjects. However, findings on gender and students' academic performance are inconsistent. Ukpong et al. (2026b); Umanah and Sunday (2025); Umanah and Sunday (2022) reported no significant difference between male and female students' academic performance, while Akpan and Akpan (2017) also found no disparity in the achievement of male and female students in Physics. Similarly, Moffat et al. (2023) found no significant gender effect on students' achievement in Biology when media instructional packages were used, while Etukakpan et al. (2025) reported no significant difference between male and female students' performance when computer simulation and other instructional approaches were used in Biology. In contrast, Ibok (2015) reported some differences in male students' problem-solving abilities. Babayemi (2014) asserted that gender had a significant main effect on students' achievement, with male students performing better than female students. These mixed findings indicate the need for further investigation of gender in technology-supported Biology instruction. However, little is known about how gender relates to students' performance when YouTube and recorded-video instructional media are used in teaching Biology. Therefore, the present study investigates the effects of YouTube and recorded-video instructional media on Biology students' academic performance in Ibesikpo Asutan Local Government Area, with gender as a moderating variable.

Statement of the Problem

Despite the importance of Biology as a key school subject in realizing any nation's scientific and technological aspirations, there is ample evidence of continued poor performance in the subject by Nigerian students. This alarming rate of students' underperformance in Biology external examinations and at all levels may be due to a number of factors such as: lack of enough qualified and experienced Biology teachers, school location, sex of teachers, type and nature of public examination items and difficulties with teacher's experience in teaching most of the Biology concepts Furthermore, several variables has been highlighted as a major contributor to students' poor performance in Biology, but one of the most commonly stated issues is the employment of ineffective instructional media in teaching and learning of Biology in secondary school. This has been a major problem to be tackled. Therefore, there is a need to adopt other instructional media that are technology-based such as YouTube, recording video

among others to enhance the traditional strategies in this modern era. Hence, this present study sought to investigate more on the impact of YouTube and recording video instructional media on academic performance of Biology students in Ibesikpo Asutan Local Government Area.

Purpose of the Study

The purpose of this study is to investigate the effect of YouTube and recording video instructional media on academic performance of Biology students in Ibesikpo Asutan Local Government Area. Specifically, the study sought to:

1. Determine the difference in the mean performance scores of Biology students taught the concept of Heredity using YouTube and recording video instructional media determine.
2. determine the difference in the mean performance scores of male and female Biology and students taught the concept of heredity using YouTube and recording video instructional media.

Research Questions

1. What is the difference in the mean performance scores of Biology students taught the concept of heredity using YouTube and recording video instructional media?
2. What is the difference in the mean performance scores of male and female Biology and students taught the concept of heredity using YouTube and recording video instructional media?

Hypotheses

1. There is no significant difference in the mean performance scores of Biology students taught the concept of heredity using YouTube and recording video instructional media.
2. There is no significant difference in the mean performance scores of male and female Biology students taught the concept of heredity using YouTube and recording video instructional media.

Methodology

The study adopted a quasi-experimental pretest posttest research design involving two distinct groups. The two groups were named the experimental group one and the experimental group two respectively. The experimental group one exposed the students to learning activities using YouTube instructional media while the experimental group two were taught using recording videos instructional media. This was carried out in Ibesikpo Asutan Local Government Area, Akwa Ibom State. The population of the study consisted of 977 Senior Secondary Two (SS2) students in 7 public secondary schools Ibesikpo Asutan Local Government Area. A total of 93 students formed the sample of this study. Simple random sampling technique was used to select the two schools used for the study. The instrument used for data collection for this study was Biology Performance Test (BPT) developed by the researcher. The instrument was administered to the two groups designed to measure students' performance on heredity.

The instrument was subjected to content and face validity. For face validity, an expert in Biology Education scrutinized the items while content validation was done by an expert in Measurement and Evaluation all from Akwa Ibom State University. The research instrument was subjected to trial testing to measure its internal consistency using 20 students in SS2 in a school entirely different from the sample of the study. The scores obtained was analyzed using Kuder-Richardson 20 formula. A letter of permission from the department of Science Education was presented by the researcher to the principals of the selected schools. When the request was approved, the researcher use two weeks for teaching before administering of the posttest. After collection and coding of the data mean and standard deviation were used to answer the two (2) research questions while independent t-test at 0.05 level of significance was used to test the three null hypotheses of this study. The obtained value was considered significance if it is greater than the critical value (table value) and reject if it is less than the critical value.

Results

Research question one: What is the difference in the mean performance scores of Biology students taught the concept of heredity using YouTube and recorded video instructional media?

Table 1: Mean and standard deviation of the mean performance scores of students on pretest posttest based on instructional media (N=93)

Instructional Media	N	Pretest		Posttest		Mean Gain Scores
		Mean	SD	Mean	SD	
Youtube	45	5.76	1.93	14.47	2.16	8.71



Recorded Video	48	5.85	1.69	13.21	2.74	7.36
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The result from Table 1 above revealed that the mean performance gains scores (8.71) of students taught the concept of heredity using YouTube instructional media is greater than the mean performance gain scores (7.36) of those taught using recorded video instructional media. This indicates that students taught the concept of heredity using YouTube instructional media performed academically better than their counterparts that were taught using recorded video instructional media. Hence, Youtube instructional media was found to be effective in enhancing students' performance in the concept of heredity.

Research question two: What is the difference in the mean performance scores of male and female Biology students taught the concept of heredity using YouTube and recorded video instructional media?

Table 2: Mean and standard deviation of mean performance scores between male and female students based on pretest posttest score on instructional media (N=93)

Instructional Media	Gender	N	Pretest		Posttest		Mean Gain Scores
			Mean	SD	Mean	SD	
Youtube	Male	17	5.8	1.7	14.4	1.9	8.6
	Female	28	5.7	2.1	14.5	2.3	8.8
Recorded Video	Male	22	5.8	1.6	12.7	3.0	6.9
	Female	26	5.8	1.8	13.6	2.5	7.8

The result in table 2 above shows that the mean performance gain scores (8.6) and (8.8) of male and female students taught the concept of heredity using YouTube is greater than the mean performance gain scores (6.9) and (7.8) of male and female students taught the concept of heredity using recording video instructional media. This result revealed that male and female students exposed to Youtube performed better than their male and female counterpart exposed to recorded video instructional. However, the performance of male and female students in each group were nearly at the same pace.

Testing the Hypotheses

Hypothesis one: There is no significant difference in the mean performance scores of Biology students taught the concept of heredity using YouTube and recorded video instructional media.

Table 3: Result of Analysis of Covariance (ANCOVA) on the difference in the mean performance scores of Biology students taught the concept of heredity using YouTube and recorded video instructional media

Source	Type III Sum of Squares	df	Mean Square	F	Sig.
Corrected Model	38.971 ^a	2	19.486	3.149	.048
Intercept	1438.155	1	1438.155	232.410	.000
Pretest	2.196	1	2.196	.355	.553
Instructional_Media	37.244	1	37.244	6.019*	.016
Error	556.921	90	6.188		
Total	18351.000	93			
Corrected Total	595.892	92			

a. R Squared = .065 (Adjusted R Squared = .045); *= Significant @0.05 level

Table 3 shows the result of Analysis of Covariance (ANCOVA) on the difference in the mean performance scores of Biology students taught the concept of heredity using YouTube and recorded video instructional media. The above shows that there is significant difference in the mean performance scores of Biology students taught the concept of heredity using YouTube and recorded video instructional media in favour those Youtube, $\{(F_{1,92}) = 6.019, P = 0.16.\}$ for instructional media. This implies that the null hypothesis one of the study is rejected at 0.05 level of significance.

Hypothesis Two: There is no significant difference in the mean performance scores of male and female Biology students taught the concept of heredity using YouTube and recorded video instructional media.

Table 4: Result of Analysis of Covariance (ANCOVA) on the difference in the mean performance scores of male and female Biology students taught the concept of heredity using YouTube and recorded video instructional media

Source	Type III Sum of Squares	df	Mean Square	F	Sig.
Corrected Model	10.372 ^a	2	5.186	.797	.454
Intercept	1425.326	1	1425.326	219.086	.000
Pretest	1.876	1	1.876	.288	.593
Gender	8.644	1	8.644	1.329*	.252
Error	585.520	90	6.506		
Total	18351.000	93			
Corrected Total	595.892	92			

a. R Squared = .017 (Adjusted R Squared = -.004); NS= Not Significant @0.05 level

Table 4 shows the summary of result of Analysis of Covariance (ANCOVA) on the difference in the mean performance scores of male and female Biology students taught the concept of heredity using YouTube and recorded video instructional media. The table show that the calculated p-value (.252) of gender is greater than 0.05, {(F_{1, 92}) = 1.329, P=.252}, it was concluded that there is no significant difference in the mean performance scores of male and female Biology students taught the concept of heredity using YouTube and recorded video instructional media. This implies that the null hypothesis two was accepted at 0.05 level of significance.

Discussion of Findings

The analysis of the results on the difference in the mean performance scores of Biology students taught the concept of heredity using YouTube and recording video instructional media. The result was in favour of students exposed to Youtube, as the student exposed to Youtube outperformed their counterparts exposed to video recorded instructional media. Hence, Youtube was found to be more effective in enhancing the academic performance of students in the heredity. This could be attributed to the fact that YouTube often offers a more engaging format with interactive elements such as animations, visuals, and the ability to pause, rewind, or use interactive quizzes. This dynamic environment can make complex topics like heredity more understandable and memorable. The finding of the study is in accordance with Haruna and Muhammed (2022) who found that YouTube as alternative instructional material improves students' performance. Atabang & Umanah (2024) whose findings revealed that students using animated based performed significantly better than those without animated.

The analysis of the results on the difference in the mean performance scores of male and female Basic science students taught the concept of heredity using YouTube and recorded video instructional media revealed that there is no significant difference in the mean performance scores of male and female Basic science and students taught the concept of heredity using YouTube and recorded video instructional media. Hence, Youtube and Recorded Video instructional media were found to be effective and gender friendly in teaching the concept of heredity in Basic Science. This was attributed to the fact that YouTube enables students to take control of their learning pace, rewatching sections or switching to other explanations if one doesn't resonate irrespective of gender. This result was in line with Ezeudu, Ezeudu & Jolaosho (2020) that YouTube instructional package and video is effective for improving both male and female students' achievement. It was also supported by Itighise (2024) who found that students exposed to dropbox file sharing performed academically better than their counterparts who were exposed to conventional method.

Conclusion

The study's findings provide valuable insights into the effectiveness of different instructional media on students' academic performance in Basic Science, specifically when learning the concept of heredity. The results indicate that students exposed to YouTube instructional media performed significantly better than their counterparts who learned through recorded video instructional media. This outcome suggests that YouTube may offer certain advantages in delivering scientific content, potentially due to its interactive, engaging, and visually rich format, which may be more conducive to understanding complex concepts like heredity. YouTube's format, which typically incorporates animations, visual aids, and the ability for students to pause, replay, and explore related content, likely contributes to this



observed improvement in learning outcomes. Overall, the results of this study underscore the potential of YouTube as an effective instructional medium for science education, especially for topics that benefit from visual and interactive explanations. The lack of gender-based differences in performance also supports the adaptability and inclusiveness of both YouTube and recorded video instructional media in diverse classrooms. These findings encourage educators to consider integrating YouTube and similar digital platforms into science curricula to enhance student engagement and understanding, particularly for challenging concepts like heredity.

Recommendations

- i. Biology teachers should adopt the use of instructional media such as You-tube as it helps teachers develop videos based contents of the courses in various series and upload it for students to watch and make comment where necessary.
- ii. Students should replay back lessons taught by the teacher through the platform as it enhances understanding of complex scientific concepts through engaging interactive content and re-engaging. It also Supports different learning styles, especially visual and auditory learners.
- iii. Educational planners should develop an online-based curriculum for lesson plans with the aims to improve learning outcomes.
- iv. Government should promote equity and enhances the quality of science education.

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