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BRIDGING THE GAP IN SENIOR SECONDARY SCHOOL STUDENTS' ACHIEVEMENT IN NUTRIENT CYCLES USING PRE-LESSON VIDEO AND POWERPOINT PRESENTATION APPROACHES

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Abstract
Poor students' achievement in WASSC Biology examinations led to this study on bridging the gap in senior secondary school students' achievement in nutrient cycles using pre-lesson video and PowerPoint presentation approaches. Guided by three research questions and hypotheses, the study was conducted in public secondary schools in Nsukka Local Government Area. A pre-test, post-test non-equivalent control group quasi-experimental design was adopted. The population comprised 2,173 SS2 Biology students (M=1,014; F=1,159), and a sample of 120 SS2 Biology students (M=49; F=71) drawn using purposive and simple random sampling techniques. Data were collected with Nutrient Cycles Achievement Test (NCAT) which was face validated by experts and had its content validity established using table of specification. Its internal consistency reliability value was 0.80 determined using K-R_{20}. Mean and standard deviation were used to answer the research questions while ANCOVA was employed to test the null hypotheses at 0.05 level of significance. The findings showed that students taught nutrient cycles using the pre-lesson video approach had a significantly higher mean achievement gain than those taught with the PowerPoint presentation approach. Although female students had a slightly higher mean achievement difference than their male counterparts, ANCOVA results indicated that gender had no significant influence on students' achievement in Biology. There was no significant interaction effect of teaching approaches and gender on students' achievement in Biology. Based on these findings, it is recommended among other things that teachers should adopt the pre-lesson video approach to engage students meaningfully and prepare them in advance for new learning.

Keywords: Pre-Lesson video approach, PowerPoint presentation approach, biology, gender, achievement

Introduction

The situation of students' achievement in the West African Senior School Certificate Biology Examination is worrisome. This is propelled by students' expression of weaknesses in some Biology topics such as nutrient cycles as stated in WAEC Chief Examiner's reports (2015 & 2019). Bridging such achievement gap requires Biology teachers to adopt in their instructional processes; common cutting-edge technology and innovation that tends to provide diverse, engaging, and accessible learning tools that take care of students' learning styles and promotes their greater understanding of lesson contents. Among the common cutting-edge technology and innovation in public secondary schools in Nigeria are lesson videos and PowerPoint presentation approaches. This stimulated the investigation on bridging the gap in senior secondary school students' achievement in Biology nutrient cycles using pre-lesson video and PowerPoint presentation approaches. Biology as the branch of science that systematically studies living things, covers what happens at cellular, tissue, organ, and organ systems levels of organization of life. A strong foundation in biology can help students make informed decisions about their future career paths and how to best contribute to society.

Biology is very important for socio-economic development of a nation (Abubakar, Ogunseye & Ogunode, 2021). The teaching/learning of Biology across secondary schools in Nigeria is guided by a planned Biology curriculum.

The Biology Curriculum in Nigeria is divided into themes. Such themes are: the organisation of life, organisms at work, the organism and its environment, and continuity of life (Nwoke & Uitto, 2014). These themes have different topics subsumed in them which they expose students. Nutrient cycle as a topic for instance is under the theme, organism and its environment. Comprehensive learning of biology at secondary school level prepares students to acquire: adequate laboratory and field skills, meaningful and relevant scientific knowledge, ability to apply scientific knowledge to everyday life, and reasonable and functional scientific attitude (NERDC, 2014). The biology curriculum is therefore designed to provide students with comprehensive understanding of biological principles and processes, skill acquisition and development of desirable attitudes that geared toward attainment of the biology curriculum objectives as well as improvement in students' learning outcomes such as achievement in biology.

Achievement is a product of learning which is commonly measured using examination or continuous assessment. Bichi, Hafiz and Abdullahi (2017) defined academic achievement as the outcome of education as well as the extent to which a student achieves the educational goals. Thus, achievement is an important variable in educational researched studies. However, the WAEC chief examiner's reports (2022 & 2023) indicated that students' achievement in biology at the West African Senior School Certificate Examination is poor. Among the Biology contents students usually express weaknesses as reported by the WAEC Chief examiners' reports (2015 & 2019) is nutrient cycles. It was discovered that each year a question is asked on nutrient cycles, they usually express some weaknesses. This could be the way lessons on nutrient cycles are taught. Davies (2020) attributed the poor performance in biology to lack of interest in the subject, difficulty in understanding of the material, inadequate study skills, lack of access to resources, lack of motivation and teacher's support as well as poor use of teaching methods. Thus, the teaching method used by teachers during instructional process especially the innovative ones become necessary.

Teaching methods are the methods or procedures for transmitting lesson contents to learners in an organized manner. Innovative teaching methods are proactive approaches for delivering lesson contents to learners. The essence is to ensure that learners take full responsibility of their learning and actively pursue their learning objectives with the teacher acting as a facilitator. Mandula, Meda and Jain (2012) stated that innovative pedagogy is a creative use of the right teaching methods and learning materials for students' benefit. Innovative teaching practices are characterized by student-centred classroom, industry-based learning, project-based learning, facilitated peer-tutoring, integrated studies, mind maps, role playing, audience response systems, and application of technology to promote 21st century skills among others (Ugwu & Nzewi 2015). One of the most popular innovations in teaching is the use of technology. Teaching with technology engages students with different kinds of learning styles and involved activity-based learning. Technology tends to make learning materials more engaging as it involves the use of multimedia.

Multimedia involves the use of more than one medium. Multimedia is the combination of more than one media such as text (alphabetic or numeric), symbols, images, pictures, audio, video, and animations usually with the aid of technology for the purpose of enhancing understanding (Guan, Song & Li, 2018). The multisensory nature of multimedia makes it to stimulate multiple senses of the audience at a time which cognitive theory of

multimedia learning advocates. The cognitive theory of multimedia learning as propounded by Mayer and Moreno in 1999, stated that deeper learning occurs when information is presented as text and graphics rather than text alone. The theory appeared to relate to this study because pre-lesson videos combine words and images which are capable of making the students learn meaningfully as the theory upheld. In biology learning, multimedia could stimulate students' senses and allow diverse interactions between the students and teacher. These could make biology teaching more attractive, engaging and boosts understanding thereby making learning meaningful and authentic. Sousa, Richter and Nel (2017) averred that multimedia elements are of paramount importance in teaching of science as they help to present different phenomenon and process vividly, simulate complex contents and reduces abstraction. Thus, some concepts which appeared abstract to students could become clearer and better retained. Examples of multimedia learning include PowerPoint presentation and lesson/instructional videos.

PowerPoint is part of the Information and Communication Technology (ICT) programme developed by Microsoft. Its presentation could be regarded as a good instructional medium and a key to facilitate an effective teaching/learning process. PowerPoint instructional package is an innovative teaching strategy that could integrate words, audio and images in the course of being used by a teacher to teach the students (Ugwuanyi, Okeke, Nnamani, Obochi & Obasi, 2020). PowerPoint instructional package is predominantly used by instructors in any computer; in combination with Liquid Crystal Display (LCD) projector to display lessons on the wall while supporting such with oral description and explanations (Sewasew, Mengestie & Abate, 2015). Sewasew *et al.* pointed out that using this technology to support lessons is advisable from pedagogical point as teaching/learning process is simplified and facilitated very well. Anigbo and Orie (2018) added that PowerPoint as a computer software allows the user to create slides with recordings, narrations, transitions and other features in other to present information that could enhance students' learning. Some studies have upheld the use of PowerPoint during instructional processes. For examples: Ngonso, Egielewa, and Nyong (2018) maintained that PowerPoint helps to improve students' learning capacity. It gives the user the opportunity to incorporate visual and auditory aspect to a presentation. In the same vein, Effiong and Ekpo (2016) opined that PowerPoint package could be used to support the teacher during the presentation of information, enhances successful presentation of lesson, as well as enhances students' engagements. Learning contents on the projector screen during PowerPoint presentation could be attractive to the learners and sustain their attention during lessons. PowerPoint is also advantageous as it helps in spell check, allows the user to add, correct, and make changes to the lesson contents with its printed version which could be useful to the students. Apart from PowerPoint, there are also lesson videos.

Lesson video stimulates both the auditory and visual senses. Lesson video is tied to specific instruction and is directed to a target audience (Olelewe, Dong, Abdullahi & Nwangwu, 2023). Video instructional package is a kind of multimedia that can transmit verbal and non-verbal information with the combination of audio and visual materials (Akinbadewa & Sofowora, 2020). Video instructional package develops continuity of thought and offers a reality of experience that could motivate learners during instruction (Gambari, Shittu, Daramola & James, 2018). Hapsari and Hanif (2019) opined that learning is strongly influenced by the use of instructional video that has attractive package; containing animated images and practice questions which make students to learn. Evi-Colombo, Cattaneo and Bétrancourt (2020) maintained that the technical and pedagogical affordances of video

annotation make it easier to install and operate as well as easily followed package by learners. Hoogerheide, Visee, Lachner, and van Gog (2019) upheld that generating an instructional video as homework activity is both effective and enjoyable. Instructional videos are called pre-lesson videos when students watch them before the lessons.

Pre-lesson video helps students gain prior knowledge of the lesson topic before attending such a lesson, thus, allowing them to grasp key concepts beforehand. This could make in-class discussions more effective as students come prepared with foundational knowledge. Videos use animations, storytelling, and even real-world examples which tend to make learning more engaging. Gambari, Shittu, Daramola and James (2018) asserted that the video lesson is played on a video-player connected to a television monitor or watched by learners using computer facilities in the schools. While watching pre-lesson videos, students could pause, rewind, and re-watch content at their own pace (Shedrack & Robert 2016). These could make the topic clearer and more comprehensible to them. Pre-lesson video approach could be particularly beneficial to slow learners as it combines auditory and visual information that strengthen long-term recall. Akinbadewa and Sofowora (2020) added that despite the gains of video instructional package in learning, lesson videos should not be seen as a substitute for the teacher but a complementary tool for teaching and learning. Some studies conducted on effect of instructional videos on students' achievement were found to be effective (Ezechi & Anyanwu, 2022; Oluikpe, Ugwu & Ossai, 2023; Ojo, Olabiyi, Ojo-Lawal, & Ambode, 2023; Nwaokolo & Olawumi, 2024; Ojo, Oluwasola, Omosholape & Olorunleke, 2024). However, those studies were in different subject areas, have different content domains, and location. Moreover, such studies were not on pre-lesson videos and they compared instructional video with conventional lecture method that is not closely related which could be the source of the noticed improvement. This study tried if pre-lesson videos and PowerPoint presentation approaches could help to improve students' achievement in Biology. The effect of Pre-lesson videos and PowerPoint presentation approaches as multimedia teaching approaches could vary between students' gender.

Gender is the assignment of roles to individuals which is culturally determined. Gender is the social attributes and roles associated with being either male or female. It is the characteristics of women, men, girls and boys that are socially constructed (World Health Organization [WHO], 2024). These attributes lead to differences in behaviour and characteristics between men and women (Akabogu & Ajiwoju, 2015). Society often assigns different roles which engender different behavioural patterns based on gender. In learning across schools, studies have shown mixed results regarding the influence of gender on students' academic achievement. For instance, females may express more inclination in topics related to human biology and health while males may gravitate toward topics like animal biology or ecology (Thelwall, Bailey, Tobin, & Bradshaw, 2018). Also, girls might benefit more from collaborative and discussion-based learning environments while boys might do better in competitive and individual-focused settings (Feng, Luo, Li, Chen, & Song, 2023). However, it has been advocated that teaching approaches to be used by teachers ought to be those that encourage learning equally irrespective of gender. Thus, this determined the achievement scores of students taught nutrition cycles using pre-lesson videos and those taught using PowerPoint presentation approaches, the influence of gender on students' achievement in nutrient cycles and the interaction effect of teaching approaches and gender on students' achievement in nutrient cycles.

Research Questions

The following research questions guided the study:

1. What are the mean achievement scores of students taught nutrition cycles using pre-lesson videos and those taught using PowerPoint presentation approaches?
2. What is the influence of gender on students' achievement in Nutrient Cycle?
3. What is the interaction effect of teaching approaches and gender on students' achievement in nutrient cycles?

Hypotheses

The study tested the following null hypotheses at 0.05 level of significance

$H0_1$. There is no significant difference in the mean achievement scores of students taught nutrient cycles using pre-lesson videos and those taught using PowerPoint presentation approaches.

$H0_2$. There is no significant influence of gender in students' achievement in nutrient cycles.

$H0_3$. There is no significant interaction effect of teaching approaches and gender on students' achievement in nutrient cycles.

Methods

This study employed pretest-posttest non-equivalent group quasi-experimental design. It was carried out in Nsukka Local Government Area of Enugu State with the population of 2,173 (M=1,014; F=1,159) SS2 Biology students and a sample of 120 (M=49; F=71) SS2 Biology students drawn using purposive and simple random techniques. The instrument for data collection was Nutrient Cycles Achievement Test (NCAT) developed by the researchers. It has two sections, A and B. Section A covered the respondents' demography, such as gender while section B contained 20 multiple choice questions. Each question has options lettered A-D such that one option is the answer. In scoring the instrument, any correct option attracts one mark while incorrect answer attracts zero. The instrument was face-validated by three experts for clarity and appropriateness of the questions as well as timing. Its content validity was determined using table of specification. The instrument was subjected to internal consistency reliability using K-R_{20} which gave a value of 0.80 showing that the instrument was reliable. After training of the research assistants (Biology teachers) in the four sampled schools on how to teach with Pre-lesson videos and PowerPoint presentation instructional approaches as well as on the administration of the instruments, they were given the already written lesson plans and were informed on when to start and end the experiment Before treatment began, students in both groups were given pretest using NCAT. Thereafter, students in both groups were taught four lessons on nutrient cycles using pre-lesson video and PowerPoint presentation approaches respectively. Thereafter, posttest was given to both groups. Some extraneous variables such as Hawthorne effect among others were controlled. The data were analyzed using SPSS version 20. Mean and standard deviation were used to answer the research questions while the analysis of covariance (ANCOVA) was used to test the null hypothesis at 0.05 level of significance.

Results

The mean achievement scores of students taught nutrient cycle using pre-lesson videos and those taught using PowerPoint presentation approaches

Table 1: Mean achievement and standard deviation scores of students taught nutrient cycle using pre-lesson video and those taught using PowerPoint presentation approaches

Treatment Group	Sample (n)	Pre-test Mean ($\overline{X}$)	Pre-test Std. Dev. (SD)	Post-test Mean ($\overline{X}$)	Post-test Std. Dev. (SD)	Mean Difference
Pre-Lesson Video Approach	62	17.06	4.88	42.65	4.05	25.59
PowerPoint presentation Approach	58	13.83	4.12	27.69	3.57	13.86

Total n= 120

From Table 1 above, the pre-test mean achievement and standard deviation scores for students in the experimental group taught nutrient cycle by showing them pre-lesson videos before teaching are ($\bar{x}$ =17.06, SD=4.88) while the pre-test mean achievement and standard deviation scores for those in the control group taught nutrient cycle using PowerPoint presentation approach are ($\bar{x}$=13.83, SD=4.12). The post-test mean achievement and standard deviation scores for students in the experimental group taught nutrient cycle by showing them pre-lesson videos before teaching are ($\bar{x}$ =42.65, SD=4.05) while the post-test mean achievement and standard deviation scores for students taught nutrient cycle using PowerPoint presentation approach are ($\bar{x}$=27.69, SD=3.57). The mean difference between the post-test and pre-test scores which are 25.59 and 13.86 showed that the students in the experimental group taught using pre-lesson video approach performed better than the students in the control group taught using the PowerPoint presentation approach.

Hypothesis One ($H0_1$): There is no significant difference in the mean achievement scores of students taught nutrient cycle using pre-lesson videos and those taught using PowerPoint presentation approaches.

Table 2: ANCOVA showing significant difference in the mean achievement scores of students taught nutrient cycle using pre-lesson videos and those taught using PowerPoint presentation approaches

Tests of Between-Subjects Effects

Dependent Variable: Posttest

Source	Type III Sum of Squares	df	Mean Square	F	Sig.	Partial Eta Squared (η^2_p)
Corrected Model	6814.476[a]	4	1703.619	121.334	.000	.808
Intercept	7892.984	1	7892.984	562.147	.000	.830
Pretest	39.019	1	39.019	2.779	.098	.024
Group	4564.897	1	4564.897	325.117	.000	.739
Gender	24.662	1	24.662	1.756	.188	.015
Group * Gender	5.309	1	5.309	.378	.540	.003
Error	1614.691	115	14.041			
Total	158950.000	120				
Corrected Total	8429.167	119				

a. R Squared = .808 (Adjusted R Squared = .802)

Results shown in table 2 with regards to significant difference between the mean achievement scores of students taught nutrient cycle using pre-lesson videos and those taught using PowerPoint presentation approaches revealed that ($F(1,115) = 325.117$, $p = 0.000 < 0.05$, $\eta^2_p = 0.739$). Since the associated probability value of 0.000 is less than the 0.05 level of significance; the null hypothesis one ($H0_1$) which states that there is no significant difference in the mean achievement scores of students taught nutrient cycle using pre-lesson videos and those taught using PowerPoint presentation approaches, is rejected. In addition, the effect size ($\eta^2_p = 0.739$) shows that 73.9 percent variance in students' achievement in nutrient cycle was attributed to the treatment (showing of pre-lesson videos before teaching). The inference drawn is that students taught using pre-lesson videos approach significantly improved in their achievement in nutrient cycle than those students taught using PowerPoint presentation approach.

The influence of gender on mean achievement scores of students in nutrient cycle

Table 3: Mean and standard deviation scores of students' achievement in nutrient cycle as influenced by gender

		Pre-test		Post-test		
Gender	**N**	**Mean (X̄)**	**SD**	**Mean (X̄)**	**SD**	**Mean Difference**
Male	41	16.93	6.04	35.85	8.85	18.92
Female	79	14.76	3.84	35.19	8.24	20.43

Total n= 120

Table 3 on the influence of gender on students' achievement in nutrient cycle shows that male students taught nutrient cycle have pre-test mean and standard deviation scores as ($\bar{x}$=16.93, SD=6.04) and post-test of ($\bar{x}$=35.85, SD=8.85) while the female students taught nutrient cycle have pre-test mean and standard deviation scores of ($\bar{x}$=14.76, SD=3.84) and post-test of ($\bar{x}$=35.19, SD=8.24). The mean differences between the post-test and pretest scores are 18.92 and 20.43 respectively indicating that the female students had a slightly higher mean difference in their achievement than the male students in nutrient cycle.

Hypothesis Two: There is no significant influence of gender on mean achievement scores of students in nutrient cycle.

Results shown in table 2 with regards to null hypothesis two which determines if there is significant influence of gender on the mean achievement scores of students in nutrient cycle revealed that ($F(1,115) = 1.756$, $p = .188 > 0.05$, $\eta^2_p = .015$). Since the associated probability value of 0.188 is greater than the 0.05 level of significance; the null hypothesis two (H_{02}) which states that there is no significant influence of gender on the mean achievement scores of senior secondary school students in nutrient cycle is not rejected. In addition, the effect size ($\eta^2_p = 0.015$) shows that 1.5 percent variance in students' achievement in nutrient cycle was attributed to the treatment. Thus, gender has no significant influence on the mean achievement scores of students in nutrient cycle.

The interaction effect of teaching approaches and gender on students' achievement in nutrient cycle

Table 4: Mean and standard deviation scores of students on the interaction effect of teaching approaches and gender on students' achievement in nutrient cycle

Treatment Group	Gender	n	Pre-test Mean (X)	Pre-test SD	Post-test Mean (X)	Post-test SD	Mean Difference
Pre-Lesson Video Approach	Male	20	21.00	4.57	44.20	2.73	23.20
	Female	42	15.19	3.81	41.90	4.39	26.71
PowerPoint presentation Approach	Male	21	13.05	4.54	27.90	3.59	14.85
	Female	37	14.27	3.86	27.57	3.59	13.30
Pre-Lesson Video Approach	Male	41	16.93	6.04	35.85	8.83	18.92
PowerPoint presentation Approach	Female	79	14.76	3.84	35.19	8.24	20.43

Table 4 on the interaction effect of teaching approaches and gender on students' achievement in nutrient cycle shows that male students in the experimental group taught nutrient cycle using pre-lesson videos approach have pre-test mean and standard deviation scores as ($\bar{x}$=21.00, SD=4.57) and post-test of ($\bar{x}$=44.20, SD=2.73) while the female students taught nutrient cycle using pre-lesson videos approach have pre-test mean and standard deviation scores of ($\bar{x}$=15.19, SD=3.81) and post-test of ($\bar{x}$=41.90, SD=4.39). The mean differences between the post-test and pre-test scores for male and female in this approach are 23.20 and 26.71 respectively. Results shown in table 2 with regards to null hypothesis three on the interaction effect of teaching approaches and gender on the mean achievement scores of students in nutrient cycle revealed that ($F(1,115) = .378$, $p = .540 > 0.05$, $\eta^2_p = .003$). Since the associated probability value of 0.540 is greater than the 0.05 level of significance; the null hypothesis three (H_{03}) which states that there is no significant interaction effect of teaching approaches and gender on the mean achievement scores of students in nutrient cycle is not rejected. In addition, the effect size ($\eta^2_p = 0.003$) shows that 0.3 percent variance in students' achievement in nutrient cycle was attributed to the treatment. Thus, there is no significant interaction effect of teaching approaches and gender on students' achievement in nutrient cycle. This is further shown in the interaction graph in Figure 3 below where there is no intersection between the gender lines.

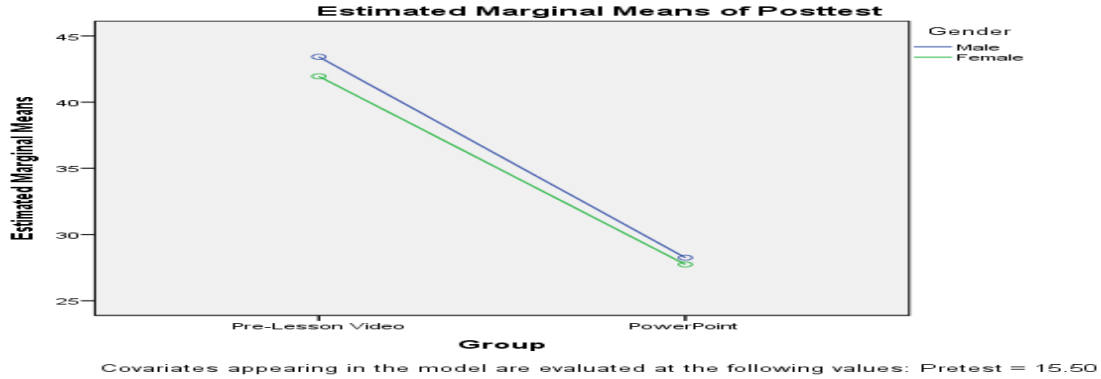

Figure 1: Interaction graph on interaction effect of teaching approaches and gender on students' achievement in nutrient cycle.

Discussion

The findings of the study revealed that Biology students in the experimental group taught nutrient cycles using pre-lesson videos approach had a higher mean achievement gain than those in the control group taught using PowerPoint presentation approach. The ANCOVA result of the first hypothesis ($H0_1$) further shows that Biology students taught using pre-lesson videos approach significantly improved in their achievement in nutrient cycles than those taught with PowerPoint presentation approach. The source of the difference in the mean gain could be because of the uniqueness of the pre-lesson videos that incorporated words, sound and attractive images that encouraged deep learning among learners as well as engaged them in critical thinking. Again, the pre-lesson videos made learning more interactive and enjoyable thereby increasing students' motivation and involvement in the learning. Also, when watching the pre-lesson videos before each lesson, students tend to write down some important points that enabled them come up with useful questions that helped the teacher guide them towards successful learning of the lesson contents in nutrient cycles during the classroom instructional process. In addition, by watching the pre-lesson video before the instructional process, students tend to link the learning materials to their existing knowledge thereby making them to learn meaningfully.

The findings are in line with the studies of Oluikpe *et al.* (2023); Ojo *et al.* (2024); and Ezechi and Anyanwu (2022) that video-assisted instructional package improved students' academic achievement. However, the findings of this study contradict the study carried out by Ojo *et al.* (2023) that students instructed via PowerPoint presentation attained a higher mean score compared to those taught using the digital instructional video approach in the achievement assessment. The contradiction could be because of the difference in subject areas. While their study was in Basic Technology, this study is in Biology. Basic Technology and Biology are two different subjects that have different objectives to which they expose the students. Furthermore, the findings of this study support Mayer and Moreno's cognitive theory of multimedia learning of 1999 that deeper learning occurs when words (audio) and images (visual) are combined than with either words or images alone. The pre-lesson videos watched by students had both audio and images combined which were believed to enable the learners learn profoundly as the theory maintained.

The findings of the study showed that female students had a slightly higher mean difference in their achievement than the male students in nutrient cycles. However, the hypothesis test ($H0_2$) using ANCOVA showed that gender has no significant influence on the mean achievement scores of students in nutrient cycles. This could be because both male and female students responded equally to watching of the pre-lesson videos which made them become more committed towards their learning thereby improving in their achievement in nutrient cycles. The results disagree with Oluikpe *et al.* (2023) who stated that male students exhibited a superior performance than their female peers when taught with video-based instruction. The disagreement could be because of the difference in subject areas. While their study was in essay writing in English language, this study is in nutrient cycles in Biology. Essay writing and nutrient cycles are in two different subject areas that have different objectives to which they expose the students. This slight difference between female and male students in this study which is not significant could be because the female students exhibited better note-taking skill while watching the pre-lesson videos which could be by taking detailed notes that they review later to fully understand some points in the lessons. Such habit could help them recall the materials and improved in their learning in nutrient cycles. As stated earlier that there was no significant influence of gender on students' achievement in

nutrient cycles. This finding agrees with Ojo *et al.* (2024) who stated that there was no significant gender difference in the achievement of students in Biology when taught with video-assisted instructional package. This shows that the impact of the treatment in nutrient cycles given using pre-lesson video is the same across gender. Thus, the finding is more generalizable and not biased by gender difference.

The ANCOVA result of the third null hypothesis showed that there is no significant interaction effect of teaching approaches and gender on students' achievement in nutrient cycles. This was further shown in the interaction graph in figure 3 where there was no intersection of the gender lines in the interaction graph. This could be because the pre-lesson videos approach is likely to engage both male and female students equally in nutrient cycles during learning process. As such, gender does not influence how the pre-lesson videos approach affects the achievement of students in nutrient cycles. This supports the findings of Ojo *et al.* (2024) that there is no significant interaction effect of teaching method and gender on the mean achievement scores of students. Thus, the efficacy of the pre-lesson video approach does not vary based on the gender of the students but both gender reacted similarly to the teaching approach used; indicating that the impact of the pre-lesson video on nutrient cycles is consistent across gender.

Conclusion

In conclusion, bridging the gap in senior secondary school students' achievement in nutrient cycles using pre-lesson video and PowerPoint presentation approaches as conducted in this study, showed that the pre-lesson videos approach improved students' achievement in nutrient cycles more than the PowerPoint approach without being gender discriminatory.

Recommendations

Based on the findings and their implications, the following are recommended:

1. Teachers should adopt the pre-lesson videos approach during teaching and learning process to engage students meaningfully and prepare them in advance for the new learning.
2. Government should provide educative lesson videos, functional computers and other ICT facilities across public secondary schools for effective integration of technology during instructional process.
3. The learners should be prepared in advance for the new lesson which promotes aids comprehension and fosters effective learning.

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