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Audio-Visual and Motion Pictures Teaching Resources on Biology Students' Academic Achievement on Digestive System in Uyo Municipality, Akwa Ibom State

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ABSTRACT

The study investigated the effect of audio-visual and motion pictures teaching resources on Biology students' academic achievement on digestive system in Uyo municipality. To guide the study, three research questions and three null hypotheses were raised, formulated and tested at 0.05 level of significant. The study adopted a quasi-experimental design. The population of the study was 3,592 SS2 students and the sample size of 92 students were assigned into experimental and control groups. A simple random technique was used in determination of the sample. Researchers made test, Biology Achievement Test in digestive system (BATDS) with a reliability coefficient of 0.89 was used after validation using Kuder- Richardson formula-20. The students in the 3 secondary schools were randomly assigned to two experimental groups and a control group. In each group, the students were taught by the research assistants in their intact classroom setting using validated researchers' made lesson notes for the respective groups. The data generated from pre-test and post-test were analyzed using descriptive analysis and Analysis of Covariance (ANCOVA). The findings from the results of data analysis showed that students taught audio-visual and motion pictures teaching resources achieved significantly better than those taught with lecture notes teaching resource. The findings also showed no significant difference between the mean achievement scores of male and female Biology students taught audio-visual and motion pictures teaching resources. Based on the findings, it was recommended that Biology teachers should make use of audio-visual and motion pictures teaching resources in the teaching of digestive system in secondary schools and both male and female students should be encouraged to participate in the teaching of Biology.

Introduction

Biology is the scientific study of life, and its primary goal in education is to help students comprehend its concepts, principles, theories, and laws. The Biology curriculum has four main objectives, as outlined by the National Policy on Education (FRN, 2013): equipping students with appropriate laboratory and field skills, providing meaningful and relevant knowledge, imparting scientific knowledge applicable to health, agriculture, and daily life, and fostering functional scientific attitudes. These goals, however, cannot be fully achieved through conventional teaching resources, such as lecture notes, which are commonly used in Biology classrooms.

Lecture notes are written records that teachers use during classes or lectures for presentation purposes. Udoh (2021) argued that this approach is teacher-centered, emphasizing that the teacher holds primary responsibility in the learning environment. Umanah and Akpan (2024) further noted that teachers control the classroom and direct all activities, with students typically seated at desks facing the teacher. In this setting, students passively absorb information while the teacher actively presents it using chalk and a duster. According to Anidu and Udoh (2021), this method of lesson delivery, which lacks proper materials, is ineffective for teaching procedural concepts, such as the digestive system.

The digestive system, or gastrointestinal tract, is a long, twisting tube that starts at the mouth and ends at the anus. Bowen (2020) explained that the mouth marks the beginning of the digestive tract, followed by the pharynx (throat). From there, food travels to the esophagus, a muscular tube extending from the pharynx to the stomach. The stomach is a sac-like organ with strong muscular walls, and food then moves to the small intestine, which consists of three segments: the duodenum, jejunum, and ileum. The small intestine is a long, loosely coiled tube in the abdomen. Three organs—the pancreas, liver, and gallbladder—assist the stomach and small intestine in digesting food. After nutrients are absorbed, the remaining food moves to the colon or large intestine, a muscular tube that connects the cecum to the rectum. The rectum is an 8-inch chamber connecting the colon to the anus, which is the final part of the digestive tract and consists of pelvic floor muscles and two anal sphincters (Ekon & Udoh, 2021). Despite this clear understanding of the digestive system, students have consistently underperformed academically.

Poor academic performance in Biology is a widespread issue in secondary schools within Uyo municipality, as reflected in WAEC reports and public concerns about declining educational standards. This issue is particularly evident in the lack of adequate laboratories and teaching facilities necessary

for science students. The achievement of students in Biology, particularly in the Senior Secondary Certificate Examination (SSCE), has been unsatisfactory for many years. Scholars have identified various factors contributing to this problem, including the availability of textbooks, laboratory apparatus, and other learning resources, all of which significantly impact student performance in Biology exams (Akanwa, Ndirika, & Udoh, 2018; Chazan, 2022).

Teaching resources can be defined as part of instructional process which are used by teachers to disseminate information, message and idea or which make possible communicable in the teaching process. Udoh and Ekon (2018), Udoh (2021) acknowledged that teaching resources are such used by the teachers to aid explanations and make learning of subject matter understandable to student during teaching learning process. It is divided into major categories, namely: audio, visual, audio-visual resources, motion pictures and ICT (Information and Communication Technology).

Audio-visual teaching resources are educational materials designed to engage both the senses of hearing and sight, such as films, recordings, and photographs used in classroom instruction, as well as materials from library collections. The combination of visual and auditory stimulation is particularly effective because it appeals to two of the most important senses simultaneously (Agwu & Ogohi, 2019; Jameel, 2016). Learning and understanding appear to be enhanced when multiple senses, such as sight and hearing, are activated by media. When used effectively, these resources can spark interest and motivate students to learn. They make learning more tangible and lasting by providing concrete experiences, rather than relying on abstract thinking. Audio-visual aids can reinforce learning by stimulating, motivating, and capturing the attention of students during the instructional process. As such, these resources are crucial tools for teaching subjects such as digestion, helping to improve both teacher efficiency and student academic achievement (Ekanem & Obodom, 2017). They make learning more engaging, practical, realistic, and attractive, and allow both teachers and students to actively and effectively participate in lessons.

Motion pictures are another valuable teaching resource that can enhance the learning experience. These consist of a series of pictures projected on a screen in rapid succession, creating the illusion of movement by showing objects in slightly different positions (Jameel, 2016). Due to their ability to provide an accurate visual representation, high-quality educational motion pictures can be an effective tool for overcoming language barriers (Agwu & Ogohi, 2019). Additionally, motion pictures can have a significant impact on both male and female students in Biology education.

Gender refers to the social roles and characteristics associated with being male or female, as defined by society. According to Udoh, Udo, and Anidu (2019), gender encompasses the norms, behaviors, and roles assigned to each sex, as well as their relationships with one another. As a social construct, gender varies across societies and can evolve over time. Students also navigate gender roles, which include the behaviors, attitudes, and expectations associated with being male or female. These differences can affect physical behavior, social interactions, academic motivations, and decision-making. Such dynamics often place girls at a disadvantage in classroom interactions, particularly in science-related subjects. Akpan and Udoh (2022) suggested that gender reflects specific cultural patterns of behavior attributed to different sexes.

1.2 Statement of the Problem

Biology is a natural science subject that equips students with essential laboratory and field skills, as well as scientific knowledge applicable to health, agriculture, and daily life matters. It also fosters the development of functional scientific attitudes. However, over the years, students' academic performance in Biology has consistently fallen below public expectations. The Senior Secondary School Examination Chief Examiner's Report (2020) highlights poor achievement in Biology, indicating that many students struggle to perform well in the subject. Observations and reports suggest that achieving high academic performance in Biology has become increasingly difficult for students in recent times.

Researchers have identified several factors contributing to this poor academic achievement, including student-related factors, classroom dynamics, and teacher-related factors, such as instructional methods and teaching resources used in lesson delivery. It has been suggested that the teaching resources employed by teachers are not adequately suited to the needs of the students. Given the concern about students' poor academic performance, the researchers deemed it necessary to investigate the impact of audiovisual and motion picture teaching resources on students' academic achievement in the topic of the digestive system in secondary schools within Uyo municipality.

Research Questions.

The following research questions were raised to guide this study.

- What is the difference in the mean achievement scores of Biology students taught the concept digestive system using audio-visual, motion pictures and those taught using lecture notes teaching resources?
- What is the difference in the mean achievement scores of male Biology students taught the concept digestive system using audio-visual, motion pictures and those taught using lecture notes teaching resources?
- What is the difference in the mean achievement scores of female Biology students taught the concept digestive system using audio-visual, motion pictures and those taught using lecture notes teaching resources?

Research Hypotheses

The following null hypotheses were formulated and tested at 0.05 level of significance to guide the study.

1. There is no significant difference in the mean achievement scores of Biology students taught the concept of digestive system using audio-visual, motion pictures and those taught using lecture notes teaching resources

2. There is no significant difference in the mean achievement scores of male Biology students taught the concept of digestive system using audio-visual, motion pictures and those taught using lecture notes teaching resources

3. There is no significant difference in the mean achievement scores of female Biology students taught the concept of digestive system using audio-visual, motion pictures and those taught using lecture notes teaching resources

Methodology

The study adopted a non-randomized pretest-posttest control group design within the framework of a quasi-experimental approach, involving three groups: two experimental groups and a control group. Experimental Group 1 was taught the digestive system using audio-visual teaching resources, Experimental Group 2 was taught using motion pictures, and the control group (Group 3) was taught with lecture notes. This design was deemed appropriate as the students were taught in their intact classroom settings.

The study sample consisted of 92 Senior Secondary Two (SS2) Biology students (both male and female) from three secondary schools in Uyo Municipality, Akwa Ibom State, during the 2022/2023 academic session. Biology teachers acted as research assistants. These research assistants were trained over a three-day period and were provided with detailed instructions and well-structured lesson packages on the concept of the digestive system. The researchers randomly assigned the three classes to the two experimental groups and the control group.

The teaching of the concept was conducted by the research assistants over a two-week period using the lesson packages developed by the researchers to ensure consistency across the groups. After the teaching sessions, a post-test was administered to all three groups. The activities of the groups were closely supervised by the researchers.

The data collected were analyzed using descriptive statistics (mean and standard deviation) and Analysis of Covariance (ANCOVA) to account for the pre-test effect. All hypotheses were tested at a 0.05 level of significance.

Results

Research Question 1: What is the difference in the mean achievement scores of Biology students taught the concept digestive system using audio-visual, motion pictures and those taught using lecture notes teaching resources?

Table 1:

Mean and Standard Deviation Scores of Students' Pre-test and Post-test Achievement taught Digestive system Classified by Teaching Resources.

Teaching Resources	Pre-test			Post-test		Mean Difference
	N	$\overline{X}$	SD	$\overline{X}$	SD	
Audio-visual	53	20.66	6.53	54.19	12.41	33.53
Motion pictures	55	24.89	4.78	56.47	17.50	31.58
Lecture notes	54	24.09	3.84	48.46	8.49	24.37

Table 1 shows the mean difference scores of students taught digestive system using audio-visual, motion pictures and those taught using lecture notes teaching resources. Students who were taught with audio-visual resource had the highest mean difference score of 33.53 followed by motion pictures with a mean difference score of 31.58 and then lecture notes teaching resource with 24.37 as the mean difference score.

Hypothesis 1

There is no significant difference among the achievement mean scores of Biology students taught the concept digestive system using audio-visual, motion pictures and those taught using lecture notes teaching resources

Table 2:

Summary of Analysis of Covariance (ANCOVA) of Students' Post-test Classified by Teaching Resources with Pre-test as Covariate

Source	Sum of Squares	Df	Mean Square	F-value	P-value
Corrected Model	3231.488[a]	6	538.581	3.092	.00[S]

Intercept	9811.569	1	9811.569	56.319	.00[S]
Pre-test (Covariate)	1378.192	1	1378.192	7.911	.00[S]
Resources (Main Effect)	2110.516	2	1055.258	6.057	.00[S]
Gender (Main Effect)	48.010	1	48.010	.276	.60[NS]
Resources * Gender	181.280	2	90.640	.520	.59[NS]
Error	27003.012	155	174.213		
Total	486247.000	162			
Corrected Total	30234.500	161			

* = significant at .05 level of significance, NS = Not significant at .05 level of significance

In Table 2, the calculated Probability value (P-value) .00 of the main effect of teaching resources is less than the declared Probability value (alpha level) .05. Therefore, the null hypothesis one is rejected. This implied that there exists a significant difference between the mean achievement scores of Biology students taught digestive system using audio-visual, motion pictures and those taught using lecture notes teaching resources. In order to determine the direction of significance, the scores were subjected to post hoc analysis as shown in table 3.

Table 3

Post hoc Analysis of Students' Post-test Classified by Instructional Strategy with Pre-test as Covariate

(I) Teaching Resources	(J) Teaching Resources	Mean Difference (I-J)	Std. Error
Audio-Visual	Motion Pictures	.790	2.79
	Lecture notes	8.186*	2.71
Motion Pictures	Audio-Visual	-.790	2.79
	Lecture notes	7.397*	2.55
Lecture notes	Audio-Visual	-8.186*	2.71
	Motion Pictures	-7.397*	2.55

* = significant at .05 level of significance

Table 3 shows the post hoc analysis scores of Biology students taught digestive system using audio-visual, motion pictures and those taught using lecture notes teaching resources. Students taught using audio-visual significantly achieved when compared with those taught using lecture notes teaching resource. Also, students taught using motion pictures significantly achieved when compared with those taught using lecture notes teaching resource. A non-significant difference existed between the achievement of students taught using audio-visual and motion pictures teaching resources.

Research Question 2

What difference exists among the achievement mean scores of male Biology students taught the concept digestive system using audio-visual, motion pictures and those taught using lecture notes teaching resources respectively

Table 4

Mean and Standard Deviation Scores of Male Students' Pre-test and Post-test Achievement taught Digestive system Classified by Teaching Resources.

Gender (MALE)	Pre-test			Post-test		Mean Difference
	N	$\overline{X}$	SD	$\overline{X}$	SD	
Audio-visual	22	16.86	5.71	54.32	13.12	37.46
Motion pictures	23	26.26	4.14	56.57	17.15	30.31
Lecture notes	25	24.16	4.00	48.72	8.66	24.56

Table 4 shows the mean difference scores of male students taught digestive system using audio-visual, motion pictures and those taught using lecture notes teaching resources. Male students who were taught with audio-visual resource had the highest mean difference score of 37.46 followed by male

students taught by motion pictures with a mean difference score of 30.31 and then with male students taught with lecture notes teaching resource with 24.56 as the mean difference score.

Hypothesis 2

There is no significant difference among the achievement mean scores of male Biology students taught the concept digestive system using audio-visual, motion pictures and those taught using lecture notes teaching resources

Table 5:

Summary of Analysis of Covariance (ANCOVA) of Male Students' Post-test Classified by Teaching Resources with Pre-test as Covariate

Gender	Source	Type III Sum of Squares	df	Mean Square	F-value	P-value.
	Corrected Model	1235.860[a]	3	411.953	2.37	.07[NS]
	Intercept	4596.319	1	4596.319	26.50	.00[S]
	Pre-test	447.554	1	447.554	2.58	.11[NS]
Male	Resources (Main Effect)	1001.054	2	500.527	2.88	.06[NS]
	Error	11445.911	66	173.423		
	Total	209736.000	70			
	Corrected Total	12681.771	69			

* = significant at .05 level of significance, NS = Not significant at .05 level of significance

In Table 5, the calculated Probability value (P-value) .06 of the main effect of teaching resources is greater less than the declared Probability value (alpha level) .05. Therefore, the null hypothesis two is retained. This implied that there exists no significant difference between the mean achievement scores of male Biology students taught digestive system using audio-visual, motion pictures and those taught using lecture notes teaching resources.

Research Question 3

What difference exists among the achievement mean scores of female Biology students taught the concept digestive system using audio-visual, motion pictures and those taught using lecture notes teaching resources respectively

Table 6

Mean and Standard Deviation Scores of Female Students' Pre-test and Post-test Achievement taught Digestive system Classified by Teaching Resources.

Gender (FEMALE)	Pre-test			Post-test		Mean Difference
	N	$\overline{X}$	SD	$\overline{X}$	SD	
Audio-visual	31	23.35	5.74	54.10	12.11	30.75
Motion pictures	32	23.91	5.03	56.41	18.01	32.50
Lecture notes	29	24.03	3.77	48.24	8.49	24.21

Table 6 shows the mean difference scores of female students taught digestive system using audio-visual, motion pictures and those taught using lecture notes teaching resources respectively. Female students who were taught with motion pictures resource had the highest mean difference score of 32.50 followed by female students taught with audio-visual with a mean difference score of 30.75 and then with female students taught with lecture notes teaching resource with 24.21 as the mean difference score.

Hypothesis 3

There is no significant difference among the achievement mean scores of female Biology students taught the concept digestive system using audio-visual, motion pictures and those taught using lecture notes teaching resources

Table 7:

Summary of Analysis of Covariance (ANCOVA) of Female Students' Post-test Classified by Teaching Resources with Pre-test as Covariate

Gender	Source	Type III Sum of Squares	df	Mean Square	F-value	P-value
	Corrected Model	2004.703[b]	3	668.234	3.782	.01[S]
	Intercept	5133.339	1	5133.339	29.054	.00[S]
	Pre-test	939.714	1	939.714	5.319	.02[S]
Female	Resources (Main Effect)	1114.641	2	557.320	3.154	.04[S]
	Error	15548.025	88	176.682		
	Total	276511.000	92			
	Corrected Total	17552.728	91			

* = significant at .05 level of significance, NS = Not significant at .05 level of significance

In Table 7, the calculated Probability value (P-value) .04 of the main effect of teaching resources is less than the declared Probability value (alpha level) .05. Therefore, the null hypothesis one is rejected. This implied that there exists a significant difference between the mean achievement scores of female Biology students taught digestive system using audio-visual, motion pictures and those taught using lecture notes teaching resources. In order to determine the direction of significance, the scores were subjected to post hoc analysis as shown in table 8.

Table 8

Post hoc Analysis of Students' Post-test Classified by Instructional Strategy with Pre-test as Covariate

Gender	(I) Teaching Resources	(J) Teaching Resources	Mean Difference (I-J)	Std. Error	Sig.[b]
Female	Audio-Visual	Motion Pictures	-1.947	3.35	.56
		Lecture Notes	6.302	3.43	.07
	Motion Pictures	Audio-Visual	1.947	3.35	.56
		Lecture Notes	8.249*	3.40	.01
	Lecture Notes	Audio-Visual	-6.302	3.43	.07
		Motion Pictures	-8.249*	3.40	.01

Table 8 shows the post hoc analysis scores of female Biology students taught digestive system using audio-visual, motion pictures and those taught using lecture notes teaching resources. Female students taught using motion pictures significantly achieved when compared with those taught using lecture notes teaching resource. A non-significant difference existed between the achievement scores of female Biology students taught using audio-visual and motion pictures teaching resources.

Discussion of Findings

The post hoc analyses of students' scores on the digestive system concept revealed that those taught using audio-visual and motion pictures teaching resources significantly outperformed those taught with lecture notes. This suggests that audio-visual and motion pictures teaching resources are equally effective in teaching the digestive system in Biology. The improved academic achievement may be attributed to the fact that these resources allow learners to visualize abstract concepts and link them to prior knowledge, fostering a deeper understanding of the topic. Agwu and Ogochi (2019) and Chazan (2022) support this, noting that audio-visual and motion pictures help students understand complex scientific concepts through animation, making these concepts more tangible. The findings suggest that Biology teachers who use these resources make lessons more accessible, enabling students to better grasp and internalize the material. Consequently, the lack of such resources can negatively impact students' academic performance in Biology.

The study also revealed that there was no significant difference in the achievement of male students exposed to audio-visual, motion pictures, and lecture notes resources. This suggests that male students performed similarly across all resource types, a finding consistent with Ekanem and Obodom (2017), who observed no significant difference in male students' achievement in science when taught using models and charts. This aligns with Akanwa, Ndirika, and Udoh (2018) and Udoh (2021), who also found no significant difference in male students' performance in science. This indicates that male students, when provided with an appropriate learning environment and resources, perform equally well, as academic performance is largely determined by intellectual ability. However, this contradicts the findings of Chazan (2022) and Jameel (2016), who reported significant differences in male students' achievements when exposed to different instructional resources.

Regarding female students, the study found a significant difference in academic achievement between those taught using audio-visual and motion pictures resources compared to those taught with lecture notes. Female students who used audio-visual and motion pictures resources showed significantly better understanding of the digestive system concept. This is consistent with the findings of Udoh (2021), Akanwa, Ndirika, and Udoh (2018), who reported a significant difference in female students' achievement in science when using models and charts. However, these results contradict Akpan and Udoh (2022) and Jameel (2016), who found no significant difference in female students' achievement when using instructional resources. Furthermore, the findings disagreed with Udoh, Udo, and Anidu (2019), who found that female students performed better in chemistry using technological resources in electrolysis.

Conclusion

The use of audio-visual teaching resource to teach digestive system is as effective as the use of motion pictures teaching resource in the achievement of Biology students. There is no significant difference among the achievement mean scores of male Biology students taught the concept digestive system using audio-visual, motion pictures and those taught using lecture notes teaching resources but there is a significant difference among the achievement mean scores of female Biology students taught the concept digestive system using audio-visual, motion pictures and those taught using lecture notes teaching resources.

Recommendations

Based on the findings of this study, the following recommendations are made:

1. Biology teachers should endeavour to use student-centered teaching resources such as audio-visual and motion pictures teaching resources to enhance academic achievement in Biology concepts.

2. Teachers should not consider gender as a significant factor in students' academic achievement but should encourage both male and female students in their classes toward academic excellence irrespective of gender differences.

3. The school management boards and educational administrators should ensure that Biology laboratories are well equipped with modern teaching and learning resources and steady power supply to enable the teachers utilize audio-visual and motion pictures teaching resources with students in the context of real-world tasks or experience.

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