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Effect of Youtube Instructional Video Package on Students' Achievement in Physics

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ABSTRACT

Studies on poor performance of students' in physics have shown that students have difficulties in the subject especially topics under mechanics. Several studies which attempted to address the difficulties of Imo State secondary school students' in selected topics in mechanics (Projectile motion, linear momentum, velocity-time graph and acceleration) used other approaches except YouTube instructional video package. Therefore, the study aimed at investigating the effect of YouTube instructional video package on students' achievement in physics. The study was led by two null hypotheses and two research questions. The design of the study was quasi-experimental; specifically, the pre-test, post-test; non-randomized control group design. The study's population consists of 7,703 physics students within SS11. The sample size consisted of 188 SS11 physics students who were randomly drawn from four coeducation secondary school in the study area. Physics Achievement Test (PAT) was used for data collection. Kunder Richardson 20(K-20) was used to determine the reliability index which was found to be 0.96. The data collected were evaluated using mean and standard deviation which answered the study questions; while the hypotheses were tested at 0.05 level of significance using analysis of covariance (ANCOVA). The findings of the study revealed that the associated probability (0.00) at F-Cal of 562.32 was less than 0.05 level of significant set as bench mark for taking decision, the null hypotheses were rejected. It suggests that the mean achievement scores of physics students taught with a lecture method and those taught with a YouTube instructional video package differ significantly. Therefore, the study revealed that the use of YouTube Instructional Video Package improved the mean achievement scores of students in physics than the use of Lecture Method. Also, the results from the study showed that the associated probability (0.42) at F-Cal of 0.63 was greater than 0.05 level of significance, the null hypotheses was accepted. Indicating that the mean achievement scores of male and female students do not vary significantly when taught physics using YouTube Instructional Video Package. Based on the findings of this study, the following recommendations were made; use of lecture method of teaching should be de-emphasized in secondary schools as that does not contribute much in students' achievement in physics. The use of YouTube instructional video package should be incorporated into Physics instruction on a regular basis.

Keywords: YouTube Instructional Video Package, Lecture Method, and Achievement

Introduction

Science and technology are fundamental to modern society, serving as the cornerstone of national progress and global standing. For Nigeria to secure its rightful place among the nations, leveraging advancements in science and technology is crucial. This underscores why there is a growing national focus on enhancing science education at all levels in Nigeria, with a particular emphasis on Physics. The increasing interest reflects recognition of the critical role that effective teaching and learning in science plays in fostering national development and progress. Chief Examiners of West African Examination Council highlighted students' weaknesses in mechanics, such as projectile motion, linear momentum, velocity-time graph and acceleration, which invariably affect their overall result at the senior secondary school certificate examination (SSCE). Studies abound which attempted to proffer solutions to students' poor achievement in physics. Most of the studies concurred that the problem identified could be solved by the teachers' choice of appropriate method of teaching. There is need therefore; to search for a better method that will demystify physics. This is to ensure that students achieve and understand what they are expected to learn in a given lesson for resultant achievement in SSCE

However, it is believed that students need to be guided properly through appropriate teaching methods to enhance performance in Physics. Studies like Njoku (2018) and Ada (2017) found that Nigerian teachers continue to teach physics principles using lecture methods, which essentially consist of talk-and-chalk presentations. In lecture teaching methods, the teacher is the central focus, who talks to passive students. It does not promote meaningful learning nor does it foster critical thinking and students' participation in the teaching and learning process (Njoku 2018; Ada, 2017). However, emerging trends in education are changing the setting for teaching and learning with new tools such as YouTube Instructional Video Package (Peter, 2020).

YouTube instructional video package is social networking website in which individual or organization with internet access can upload videos that can be seen by viewers. As a learning aid, the YouTube instructional video package gives students the added benefit of allowing them to further study the

subjects covered in class after class. To facilitate students' understanding of Physics' concepts in which students view as difficult, YouTube instructional video package may invariable enhance students understanding in the concepts of projectile motion, linear momentum, velocity-time graph and acceleration (Effiong 2021).

An object in motion like a projectile is one that is launched or projected into the air while only being accelerated by gravity. According to Anyakoha (2016), any projectile in flight is concurrently doing two tasks: (i) travelling horizontally at a steady speed and (ii) accelerating upward and downward. There are three basic components of projectile motion which are; time of flight, range and maximum height. The evidence from West African Examinations Council Chief Examiners' Report (2022) highlighted students' weaknesses at Senior Secondary School Examination (SSCE) to be failure of students to determine the component of the velocity of a projectile at its maximum height which then affect their performance in physics including linear momentum.

Linear momentum is the product of its mass and its velocity. Momentum is a vector quantity whose direction is the direction of the velocity. Anyakoha (2016) explained how Sir Isaac Newton, who proposed three significant rules of motion known as Newton's rules of Motion, became the first person to discover forces connected to motion. WAEC Chief Examiners' Report 2021 and 2022 posited that students' inability to state the principle of conservation of linear momentum and zero recognition of the relationship between impulse and change in momentum affect their performance at senior secondary school examination, as well as the velocity-time graph.

Velocity-time graph is the plotting of velocity on the vertical axis against time on the horizontal axis. The slope of velocity–time graph represents acceleration as positive slope and deceleration as negative slope. The uniform velocity is the velocity of a moving body where equal distances are covered in equal time intervals. WAEC Chief Examiners Reports for 2018 and 2019 portrayed that students' poor interpretation and application of the concept of velocity-time graph, a clear demonstration of students' lack of understanding of this fundamental concept in Physics.

Acceleration is the rate of increase in velocity with time. That is, the speed at which velocity varies over time. A negative acceleration is the idea underlies slowing. The idea of acceleration is the basis behind the equations of motion. WAEC Chief Examiners' Report (2022) pointed out that students' weakness is the inability to recall and apply correct formulae to solve physics problems. For example, distinguishing between the general equations of uniformly accelerated linear motion and other equations in mechanics. Thus, proper understanding of the mathematical relationship of acceleration and deceleration was lacking among the Physics' students (WAEC Chief Examiners Report, 2022). The continued evidences of concepts identified by WAEC Chief Examiners Reports for several years gave rise to the choose of these topics, which led to the overall poor academic achievement in physics.

Academic achievement entails successful academic progress attained through effort and skill. It is the level of accomplishment or proficiency one has in an open academic area as opposed to one potential (Muhammad and Rafigue, 2018). Academic achievement is an educational goal that is achieved by an educational leader or institution over a period of time (Bossant in Muhammad & Mudassar, 2019). Hafeez (2021) described academic achievement as the outcome of the training imported to students by the teacher in school situation. According to the study mentioned above, physics students' academic success can be seen as an identifiable and quantifiable behaviour: Thus, academic achievement is obtained through the administration of achievement test, which could be either a teacher-made test or standardized achievement test. Academic achievement of student is a very important parameter of knowing how well the teacher teaches the subject matter to the students. Overachievers are students whose academic performance exceeds the expectations based on their activities, according to Gali (2019). Many research revealed variables that were responsible for the poor accomplishment of students in physics, Such variables include, government, curriculum, examination bodies, teachers, students, parents, home, text books, method of teaching and psychological factors (Alasoluyi, 2015; Alachi et al., 2021; Almasri, 2022). In as much as efforts are being made to enhance students' achievement in Physics, it is equally important to consider students' ability to retain what they have learned. it is equally important to consider boys and girls in the learning of the concepts in Physics.

Gender disparity in education especially in science courses is a worldwide phenomenon. Alachi, Opara, and Bardi (2021: Pg4) mentioned that some courses, like physics, chemistry, and mathematics, are branded as male, according to Fatokum and Odagboyi. whereas others, including English language, economics, and secretarial studies, are associated with women.. Gender stereotyping affects social, economic, political, and scholastic accomplishment, especially in the domains of science and technology, according to Nnorom, Alachi, and Anozie in Alachi, Ilo, Alison, and Inyama (2022). Research like Emeka (2016) demonstrated that the traditional method used to teaching physics is not gender-inclusive. Both male and female students benefited from e-learning in terms of learning outcomes and physics curiosity, according to Almasri (2022). These researches evidenced that some teaching methods close the gender gap in science achievement, worthy of note is that both male and female are attracted to digital processes. Therefore, it is necessary to look at how students' performance in projectile, linear momentum, velocity time graph, and acceleration is affected by using YouTube instructional packages. These areas are considered very important in Physics teaching and learning and feature prominently in WAEC examination questions.

Statement of the Problem

West African Examination Council chief examiners emphasised that students' deficiencies in mechanics, including projectile motion, linear momentum, velocity-time graphs, and acceleration, always have an impact on their final score in the senior secondary school certificate test (SSCE). Studies abound which tried to propose remedies for the low physics achievement of the students. Most of the studies concurred that the problem identified could be solved by the teachers' choice of appropriate method of teaching. There is need therefore; to search for a better method that will demystify physics. This is to ensure that students achieve and understand what is anticipated of them to learn in a given lesson for resultant achievement in SSCE. This prompted the quest for an innovative method like the YouTube instructional package. In other nations, the YouTube educational package has grown and gained broad acceptance. Educators in those countries believe it works so well in improving achievement of all categories of students in science subjects.

However, there is scant or no evidence in the literature to support the use of YouTube instructional packages in physics education, with respect to determining their effects on students' academic performance, regardless of gender. Therefore, the goal of the current study is to ascertain how the YouTube instructional package affects the physics proficiency of senior secondary school students.

Research Questions

The study is designed to seek answers to the following questions

1. What is the mean achievement score of students taught Physics using YouTube instructional video package and those taught with lecture method?
2. What is the mean achievement score of male and female students taught Physics using YouTube instructional video package?

Research Hypotheses

The following null hypotheses guided the study and at .05 level of significance.

HO_1: There is no significant difference in the mean achievement scores of students taught Physics using YouTube instructional video package and those taught with lecture method.

HO_2: There is no significant difference in the mean achievement scores of male and female students taught Physics using YouTube instructional video package

Methodology

The study is quasi-experimental research design. Specifically, pre-test post-test control group design since intact classes were used.

Area of the Study

This study was conducted in Nigeria's Imo State. Imo State is located in the country's southeast (Nigeria). Geographically, it is situated in Nigeria's eastern region. With an estimated 98% of the state's population speaking Igbo, Imo State is a largely Igbo-speaking state. Their main religion is Christianity.

Sample and Sampling Technique

The sample size consisted of 188 SS11 physics students who were randomly drawn from four coeducation secondary school in the study area. The choice of SS11 was due to the fact that the topics covered were in SS11 scheme of work. This was done using multi-stage sampling technique. Using basic random sampling (balloting without replacement), one Education Zone had been selected from Imo State's six Education Zones. The selection of only co-educational schools was purposive. This is to provide classes where boys and girls work side by side under the same teacher, with the same classroom condition. For an in-depth study and to avoid interclass discussion, 4 out of the 66 co-educational schools were selected from different LGAs in the Zone using simple random sampling techniques in each case. The sample was drawn to provide bases for choosing only one school from each local government area. Two entire classes were chosen from each of the four schools that were sampled. Additionally, basic random sampling (balloting without replacement) was used to choose the intact classesA control group B (traditional lecture group: 47 males and 46 females) received one intact class, whereas experimental group A (YouTube group: 50 males and 45 females) received another intact lesson.

Instrument for Data Collection

The Physics Achievement Test (PAT) was employed as a data collection tool. To ascertain whether the items in the PAT were appropriate, content validity was applied using the test blueprint. Each of the validators was given the topic of the research, purpose of the study, research question hypotheses for the face validity. Projectile, linear momentum, velocity-time graph, and acceleration were all covered in the 50-item, multi-choice, objective Physics Achievement Test, which was created by researchers using West African Examination Council (WAEC) historical questions from 2000 to 2019. The reason for the these topics was based on Reports by WAEC Chief Examiners on students' weakness in mechanics such as linear momentum, projectile motion, velocity-time graph and acceleration which invariably affect their overall results in SSCE.

Reliability of the Instrument

A pilot study was conducted to test the research instruments' dependability. Kuder Richardson 20 (k-20) reliability testing was used to assess internal consistency. Hence, the Physics Achievement Test which is 50 item multiple-choice objective test with four options each were administered and the KR-20 gave a reliability of 0.96..

Method of Data Analysis

Mean and standard deviation were used to answer the two research questions. For the two null hypotheses, Analysis of Covariance (ANCOVA) was used to test each of them at p =<0.05 (5%) level of significance. Hence, hypothesis that is greater than 5% or P=>0.05 was accepted and hypothesis that is less than 5% that is P=<0.05% will be rejected

Results

Table 1

Pre-test and Post–test Mean Scores of YouTube Instructional Video Package and the Control Groups in the Achievement Test

		Pre-test		Post-test		Gain	Gain Scores
Group	**N**	$\bar{x}$	**SD**	$\bar{x}$	**SD**	**Scores**	**Difference**
Experimental	95	31.84	4.61	63.45	6.91	31.61	24.17
Control	93	32.33	3.76	39.77	8.72	7.44	

***N** = Number of students, $\bar{x}$ = Mean and SD = Standard Deviation

From Table 1, experimental group had a post-test mean achievement score of 63.45 with standard deviation of 6.91 and a pre-test mean score of 31.84 with standard deviation of 4.61 (mean gain = 31.61), while control group had a post-test mean achievement score of 39.77 with standard deviation of 8.72 and a pre-test mean score of 32.44 with standard deviation of 3.76 (mean gain=7.44), given a mean difference of 24.17 in favour of the experimental group, this indicates that using YouTube instructional video package is effective on students' achievement in physics. Hence, YouTube Instructional Video Package (YIVP) as a form of educational technology is more effective in enhancing students` achievement in Physics.

Table 2: Analysis of Covariance (ANCOVA) of the Significant Difference in the Mean Achievement Scores of Students Taught Physics using YouTube Instructional Video Package and those Taught with Lecture Method

Source	Type III Sum of Squares	Df	Mean Square	F	Sig.
Corrected Model	28956.330[a]	4	7239.082	149.387	.000
Intercept	1699.966	1	1699.966	35.081	.000
Pretest	2575.413	1	2575.413	53.147	.000
Method	27249.497	1	27249.497	562.327	.000
Gender	30.914	1	30.914	.368	.425
Method * Gender	4.062	1	4.062	.084	.773
Error	8867.899	183	48.458		
Total	541093.000	188			
Corrected Total	37824.229	187			

The results in Table 2 indicate that the mean achievement scores of students taught Physics using the YouTube Instructional Video Package and those taught using the Lecture Method differed by an F-cal of 562.327 with an associated probability of.000. Since the associated probability (.000) was less than 0.05 level of significant set as the bench mark for taking decision, the null hypothesis (Ho_1) was rejected. The rejection of hypothesis 1 suggests that students who were taught physics using a YouTube instructional video package and those who were taught using lectures had significantly different mean achievement scores. The experimental group benefited from the difference.

Table 3

Pre-test and Post-test Mean and Standard Deviation Scores of Male and Female Students Taught Physics using YouTube Instructional Video Package in the Achievement Test.

			Pre-test		Post-test		Gain	Gain Scores
Group	**Gender**	**N**	$\bar{x}$	**SD**	$\bar{x}$	**SD**	**Scores**	**Difference**
Experimental	Male	50	31.90	4.39	62.98	6.46	31.08	1.12
	Female	45	31.78	4.68	63.98	7.40	32.20	

The result presented in Table 3 shows that the male gender had a pretest mean achievement score of 31.90 with a standard deviation score of 4.39 and a posttest mean achievement score of 62.98 with a standard deviation score of 6.46. The difference between (gain scores) the pretest and posttest for male group taught Physics using YouTube Instructional Video Package was 7.20. The mean achievement score for the female gender was 31.78 on the pretest with a standard deviation of 4.68, and 63.98 on the posttest with a standard deviation of 7.40. The difference between (gain scores) the pretest and posttest mean score for the female group taught Physics using YouTube Instructional Video Package was 32.20. The difference in both gender gain scores was 1.12. The mean achievement scores for the posttest were higher than the mean scores for the pretest for both genders, with the female gender achieving a marginally more than the male's mean gain score. This indicated that YouTube Instructional Video Package appears to have increased both the male and the female students` achievement scores in Physics.

Hypothesis 2

H_{O2}: There is no significant difference in the mean ($\bar{x}$) achievement scores of male and female students taught Physics using YouTube instructional video package.

The result in Table 2 shows that an F-cal of .638 with associated probability value of .425 found in relation to the disparity in the mean achievement scores of male and female students who received physics instruction via the YouTube Instructional Video Package. The null hypothesis (Ho2) was accepted since the associated probability (.425) was higher than the significance level and criteria of 0.05 that is used to make decisions. This led to the conclusion that the mean achievement scores of male and female students who were taught physics using the YouTube Instructional Video Package did not vary significantly. This outcome further demonstrates that the YouTube instructional video package did not discriminate between male and female students in its use to improve students' physics performance.

Discussion of results

Evidence from the study demonstrated that students taught with a YouTube instructional video package had a higher mean achievement score than students taught with a lecture method. The analysis revealed that the use of YouTube video package improve the mean achievement score of students in physics than the use of lecture method. This conclusion was further supported by statistical evidence showing that the mean achievement scores of students taught physics utilising the YouTube instructional video package and those taught the lecture technique differ significantly. The result from the finding implies that YouTube instructional video package is more effective in enhancing students' achievement in physics. This finding is in agreement with Edache-Ahab and Dike (2019) and Mohammed, Samir and Shimma (2016) that YouTube improve students' performance. By implication, the finding of this study proves that YouTube instructional video package can be adopted to enhance students' achievement in physics.

The finding from the study shows that both male and female students taught physics using YouTube instructional video package, the posttest achievement mean were greater than the pretest achievement mean with female students having a higher mean gain. The results showed no discernible difference between the mean achievement scores of male and female students who were taught physics using an instructional package from YouTube. This finding is in line with Edache-Ahab and Dike (2019) who reveal that YouTube has no significant difference in the mean achievement score of male and female students in science. This is also in agreement with Stephen (2010) who reported that technological attitude on gender show no significant effect on students' achievement in physics. This indicate that both male and female achieve equally when taught with YouTube instructional video package.

Conclusion

Based on the result of the data analysis using the ANCOVA, The mean achievement scores of students who received physics teaching via the lecture technique and those who received instruction via the YouTube instructional video package were found to differ considerably, supporting the hypothesis.

There was no discernible difference in the mean achievement scores of male and female students who received physics instruction via the YouTube Instructional Video Package.

Recommendation

Based on the research findings, the following recommendation are made

1. Use of lecture method of teaching among Physics teacher should be de-emphasized in secondary schools as that does not contribute much in students' achievement in physics'
2. Physics teachers should be sent on refresher course as well as seminars and workshops periodically to update their knowledge and be exposed to techniques in teaching the subject – physics, YouTube instructional video package.

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