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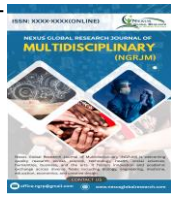

Research Article

Effect of You-Tube Videos-added Instruction on Students' Conceptual Understanding of Selected Secondary School Physics Content in Ikom Education Zone of Cross River State, Nigeria

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ABSTRACT

The study was carried out to find the Effect of You-tube Videos-Aided Instruction on Students' Conceptu+al Understanding of Selected Secondary School Physics Contents. Two (2) research question, two (2) hypotheses were raised, answered and tested at 0.5 level of significance. Quasi-experimental design was employed by using pre-test post-test control group. Population is 1,945 SS2 Physics students in 109 public Secondary Schools in Ikom Education Zone of Cross River State. A sample size of 280 Students from 10 schools using multistage sampling technique and intact classed was used. The instrument, Physics Conceptual Understanding Test (PCUT), was validated by science education experts. A reliability coefficient of r=0.96 was calculated using Kuder Richardson formula 20(KR-20). Mean and standard deviation were used to answer the research questions while analysis of covariance test statistics (ANCOVA) was used to test the hypotheses. The result revealed that, You-tube videos-aided instruction has a far more positive effect on students' conceptual understanding of selected physics content than lecture method. It was recommended among others that, policy makers and curriculum planners in the Ministry of Education should, as a matter of urgency, include in Physics curriculum content You-tube (version 2.0) videos as one of the instructional material for teaching Physics. Thereafter, monitoring on absolute compliance should follow, as this will lead to an improvement in students' conceptual understanding.

Key words: *YouTube Instruction, Conceptual Understanding, Physics Education, Quasi-Experimental Design, ANCOVA Analysis.*

1. Introduction

With the passage of time, different methods and techniques have entered into the field of education, and teachers are now using different kinds of teaching aids to make their teaching effective. Teaching aids arouse the interest of learners and help the teachers to explain the concepts easily. Undoubtedly, visual aids are those instructional aides which are used in the classroom to facilitate teaching and learning process. Audiovisual aids refer to the tools, materials, and equipment used to enhance learning and communication experience by combining auditory and visual elements [1].

Current mediated realities and the proliferation of user generated online content have introduced multiplicity of measures for publishing and accessing instructional aids. These instructional aides are made available through technology. Technology has been an important part of our daily lives. From older generation to the younger generation, technology is used immensely. One of the greatest inventions is digital technologies. The existence of digital technologies such as the internet has given birth to a new generation of literate individuals called the Net Generation [2]. From Net Generation, moving to the

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Millennials and finally, the latest generation, that is called the Nintendo, the Generation Alpha and the Generation Z, were born at and after the turn of the era of the millennium. He asserted that, Generation Z is a generation that will never get a chance to know and experience life without the Internet. The internet has become one of the important elements in their life. Hence, their learning styles could be different in their own ways from the previous generations.

Through internet, social networking has developed. Among the social networking website include; Flipped classroom, podcast, wiki, blog, and You-tube video. YouTube videos is preferred to other social medial network website because of its dual functional capacity namely; video sharing platform, and video aided instruction (version 2.0), as against other social media website with version 1.0. In this case, You-tube video website has the ability to meet with user's needs to share their unique videos to their viewers or subscribers and students can download educational videos and watch to facilitate their conceptual understanding. It has brought great changes to education. It has provided teachers a unique instructional aid or style with various golden chances to upgrade the quality of the teaching and learning process in the classroom.

Today, all over the world, a frequently stated primary goal of every physics course is for students both male and female, urban and rural to learn and be able to apply the major concepts and principles of physics. In spite of this, many factors indicate that this goal is not accomplished in the majority of physics classrooms. The challenge in physics courses is to convince the audience that physics is rewarding, fun, useful, and most of all a worthwhile endeavor which can be achieved if Audio-Visual (A.V) elements like You-tube videos are applied in the art of teaching [3]. If we fail in this, or if we neglect the teaching of these physics in an enhanced manner it will be at our own grave peril, non-fertile Physics education, and the physics enterprise as a whole will be affected.

The alleged dominant public perception of physics as a difficult subject, tedious,3 abstract, and fundamentally irrelevant, have rendered our education without any meaningful feedback or interaction from the students and thus resulted to serious lack of conceptual understanding that give birth to poor learning outcome among school leavers and graduates. It has made students to be passive learners, who write down what they are told, without the ability to link conceptual idea with the associated physical situation, a 'plug and chug' approach to learning which make them not to have an in depth conceptual understanding of the concepts. Therefore, students who enter the class with some misconceptions leave the class with the same misconceptions since students are so rarely forced to put their conceptual knowledge to test [4]. Those who have been teaching physics also have some specific experiences: that a student can solve problems but cannot present a general view or a coherent opinion about them, and that majority of students have difficulties to memorize even in the specifically designed ideal courses without comprehending. Also, the national trend has been that approximately half have dropped the subject by the end of the second term. These students leave the subject out of frustration, citing the course to be too hard and the declining number of physics majors has been increasingly disturbing. This has been a course for concern to the public; as such, an insight to the cause of this decline, in their academic activity become imperative.

Prior to this, some factors responsible for the variation and fluctuation in students' performance had been identified and treated but there are other salient variables that have not be given due attention to the knowledge of this researcher. Among such variables are the use of You-tube videos aided instruction on students conceptual understanding, male and female conceptual different when taught with you-tube videos and lecture method and urban and rural conceptual different when taught with You-tube. Research studies has raised severally a number of questions as to what might be responsible for the decline in physics major and less science student's ratio in WAEC, GCE, and other external and internal examinations in all levels of education. This has also been of major concern to researchers, classroom teachers, parents, curriculum planners and education stakeholders at large. Each stake holder blaming the other and being confused on what might be the cause. Though, tireless effort has been made by education stakeholders to see the

end to this persistent problem but experience have shown that the efforts already made are not yet adequate as the status-quo had not changed and there is therefore, further need to seek other means of addressing this dilemma. It is based on this premise that the researcher sough to find out if the use of you-tube videos aided instruction can tame student's misconception or alternate conceptions of physics concepts, by improving students conceptual understanding and concept retention of selected secondary school physics content in Ikom Education Zone, Cross River State, Nigeria.

[5] defined Conceptual understanding to mean an integrated and functional grasp of physics ideas. Students with conceptual understanding know more than isolated facts and methods. They understand why a physics idea is important and the kinds of contexts in which it is useful. The concept gender, have been variously defined by education research scholars. Notable, among them is [6]; Gender refers to "the socially constructed characteristics of women and men – such as norms, roles and relationships of and between groups of women and men. It varies from society to society and can be changed.

2. Statement of the Problem

The alleged dominant public perception of physics as a difficult subject, tedious, abstract, and fundamentally irrelevant, have rendered our education without any meaningful feedback or interaction from the students and thus resulted to serious lack of conceptual understanding that give birth to poor learning outcome among school leavers and graduates. It has made students to be passive learners, who write down what they are told, without the ability to link the conceptual idea with the associated physical situation, a 'plug and chug' approach to learning which make them not to have an in depth conceptual understanding of the concepts. Therefore, students who enter the class with some misconceptions leave the class with the same misconceptions since students are so rarely forced to put their conceptual knowledge to test. Research studies has raised severally a number of questions as to what might be responsible for the decline in physics major and less science student's ratio in WAEC, GCE, and other external and internal examinations in all levels of education. This has also been of major concern to researchers, classroom teachers, parents, curriculum planners and education stakeholders at large. Though, tireless effort has been made by education stakeholders to see the end to this persistent problem but experience have shown that the efforts already made are not yet adequate as the status-quo had not changed and there is therefore, further need to seek other means of addressing this dilemma. It is based on this premise that the researcher sought to find out if the use of you-tube videos aided instruction can5 reduce student's misconception or alternate conceptions of physics concepts, by improving students conceptual understanding and concept retention of selected secondary school physics content.

3. Methodology

Quasi-experimental design using pre-test, post-test, control group variety was used for the study. The population for the study is one thousand nine hundred and forty-five (1,945) which comprised of all the senior secondary two (SS2) class offering Physics as a subject in all the 109 public Secondary Schools in Ikom Education Zone of central senatorial district, Cross River State. Using multistage sampling technique, ten (10) secondary schools were selected from the population of the study, the sample size of two hundred and eighty (280) Students were used for the study using an intact class. The research instrument was developed by the researcher for this study as Physics Conceptual Understanding Test (PCUT), that is: A multiple-choice objective test question approach, design by Timmermann Dion (2015), on multiple choice questions that test conceptual understanding was adapted. The objective is categorized in two tier. The first tier (item) of the question, ask students to apply their conceptual understanding to make a prediction about a specific situation. Thus, do not ask students to recite a law or rule but rather to apply a law or rule to a specific situation. The goal of the test question was to assess if the students knew that the colours they see can be reflected, thus absorbed. Which could have been directly asked for, rather, students were asked the question which requires them to apply as well as creative thinking which put their knowledge first, before given feedback, in other to test their in-depth knowledge about a particular concept. This has two positive

effects: On the one hand, do not only expect students to be able to recite the law in question, but rather to be able to apply it. Thus, it is only logical to also test for this. On the other hand, this makes it easy to generate a large amount of different questions about the same topic without the possibility for students to memorize the correct answer. One can simply exchange the situation when students have to make a prediction about the answers.

In the second tier (item), students have to choose one of several statements to justify their understanding made in the first tier. Ideally, the items in this second tier, that is, the reasons offered to the students, are simple, factual statements that are either true or are believed to be true by many students. In this context the students affirm his/ her conceptual understanding level (deeper knowledge) only when the student got tier two of the question correctly. Otherwise it is assumed that the students who got only one tier correct have rot knowledge, misconception or alternate conception on that particular concept. Options distractor are based on student's misconceptions. When grading, only a question where both, the first and the second tier, are marked correctly will be counted as correct. This combination of two items allows to better test students' conceptual understanding than with just the first item. The instrument consisted of 50items objective test questions for section B. Section A consist of the respondents' personal data. Face and content validity was done by two Lecturers of Science Education in the Department of Physical Science Education and educational technology, and a reliability coefficient "r=0.96" was calculated using Kuder Richardson formula 20(kr-20).

The researcher with the help of a research assistant, administered the pre-test and were retrieved immediately. The treatment group were taught for 40 minutes within a durational period of six weeks, with selected physics concepts of; refraction of light, dispersion (colours) of light, electromagnetic waves, and reflection of light and the use of physics instructional material: downloaded into available students' android phones and for schools with functional projector facilities, a display of burn YouTube videos compact disk, congruent to the selected physics concepts), was used. A post-test administered within six weeks and were also retrieved immediately. Mean and standard deviation were used to answer the research questions raised, while the hypotheses were tested at 0.05 level of significance using Analysis of covariance test statistic respectively.

4. Result and discussions

Research questions one: What is the level of students' conceptual understanding when taught the concept of refraction of light using YouTube and conventional teaching method?

Table 4.1: Adjusted mean and standard error of students' conceptual understanding of the concepts of refraction of light when taught with You-tube videos and lecture method

Treatment	Mean	Std. Error	Difference between
You-tube aided Instruction	43.821	.236	24.964
Lecture method	18.857	.236	

The table above shows that the adjusted mean score for students taught refraction of light with You-tube videos incorporated in the instruction is far higher than that of those taught with lecture method by as much as 24.964. This means that You-tube aided instruction has a far more positive effect on students' conceptual understanding of the selected Physics content than the lecture method

Hypothesis One: There is no significant difference in mean scores of students' conceptual understanding after being taught the concept of refraction of light using YouTube videos and conventional teaching method.

Table 4.2: Summary of the ANCOVA of teaching method and students' conceptual understanding of selected Physics concepts

Source	Type III sum of Squares	Df	Mean Square	F	Sig.	Partial Eta Squared
Corrected Model	43578.418a	2	21789.209	2791.228	.000	.953
Intercept	11177.808	1	11177.808	1431.893	.000	.838
Pretest	3.243	1	3.243	.415	.520	.001
Treatment	43442.809	1	43442.809	5565.085*	.000	.953
Error	2162.350	277	7.806			
Total	320743.000	280				
Corrected Total	45740.768	279				

*p <.05

The hypothesis was tested with Analysis of Covariance (ANCOVA) statistic since the dependent variable is continuous with a covariate that is also continuous and the independent variable is categorical. The results of data analysis are shown in

Table 2.

The results in Table 3 indicate that the calculated F value for treatment is 5585.085 and is statistically significant (p=.000) at .05 significance level and (1, 277) degrees of freedom. That means there is a significant difference in the mean scores of students' conceptual understanding of Physics content under You-tube videos-aided instruction and lecture method of teaching. Therefore, the null hypothesis is rejected.

There is a significant difference in the effects of You-tube videos-aided instruction and lecture method on students' conceptual understanding of the selected Physics content when the effect of pre-treatment knowledge of the students is removed. The adjusted mean conceptual understanding of the selected Physics concepts for students taught with You-tube videos (43.821) is significantly higher than that of those taught with lecture method (18.857). Going by the partial eta squared value (.953), 95.3 % of the variance in students' conceptual understanding of Physics content can be accounted for by instructional method.

Research Question Two: What is the level of male and female students' conceptual understanding different when taught the concept of refraction of light using YouTube videos and lecture method?

Table 4.3: Adjusted mean and standard error of male and female students' conceptual understanding of selected Physics content with You-tube videos-aided instruction.

	N	Adjusted Mean	Std. Error	Gender and Treatment 1	2	3	4
1. You-tube videos	92	43.21	.286	0	24.294	1.778	24.497
Male							
2.You-tube videos	94	18.921	.282		0	26.072	0.203
3.Lecture method	48	44.993	.397			0	26.275
Female							
4. Lecture method	46	18.718	.404				

As shown in table above, the difference in the adjusted mean scores between male students under You-tube videos-aided instruction and male and female students without you-tube videos aids are 24.294 and 24.497 respectively. Also the difference in the adjusted mean scores

of female students under You-tube videos-aided instruction and each of male and female students under lecture method are respectively 26.072 and 26.275. Similarly, the difference in the adjusted mean scores of male and female students under each of You-tube videos-aided instruction and lecture method are 1.778 and 0.203 respectively. Since these values differ, it means that gender and treatment (teaching method) have a combined effect on students' conceptual understanding of the selected Physics content

Hypothesis Two: There is no significant difference in the mean score of male and female students conceptual understanding after being taught the concept of refraction of light using YouTube videos and lecture method.

Table 4.4: Summary of the ANCOVA of male and female students' conceptual understanding of Physics content under You-tube videos-aided instruction and without You-tube videos Tests of Between-Subjects Effects
Dependent Variable: Conceptual understanding of Physics concepts

Source	Type III sum of Squares	Df	Mean Square	F	Sig.	Partial Eta Squared
Corrected Model	43578.418a	4	10919.686	1456.295	.000	.955
Intercept	11000.755	1	11000.755	1467.106	.000	.842
Pretest	6.894	1	6.894	.919	.338	.003
Treatment	39604.658	1	39604.658	5281.841	.000	.951
Gender	38.696	1	38.696	5.161	.024	.018
Treatment* Gender	60.853	1	60.853	8.116*		
Error	2062.023	275	7.498			
Total	320743.000	280				
Corrected Total	45740.768	279				

*p <.05

The hypothesis was tested with Analysis of Covariance (ANCOVA) statistic since the dependent variable is continuous with a covariate that is also continuous and the independent variables are categorical. The results of data analysis show that, the calculated F value for the interaction of treatment and gender is 8.116, which is statistically significant (p =.005) at .05 significance level and (1,275) degrees of freedom. That means there is a significant difference between male and female students' conceptual understanding of selected Physics content when taught with You-tube videos and lecture method. Therefore, the null hypothesis is rejected. Despite the significant difference, the partial eta squared value (.029) shows that the interactive effect of teaching method and gender on students' conceptual understanding is very small. Only 2.9 per cent of the variance in students' conceptual understanding of selected Physics content can be accounted for by the interactive effect of method and gender.

To determine the magnitude of the mean conceptual understanding scores of male and female students exposed to various treatments, a multiple classification analysis was done. The results show that, female students taught with You-tubevideos incorporated as instructional aids' have the highest adjusted mean score, followed by male students taught with You-tube videos. Also, to ascertain the point(s) of significant difference, a multiple comparison of the adjusted mean conceptual understanding scores of students under various teaching methods and school gender was done using the Bonferroni technique. The results show that, the mean conceptual understanding scores of the following pairs of gender and treatment groups are statistically significant (p < .05): male and female students taught with You-tube videos, male students taught with You-tube videos and male students

taught with lecture method, male students taught with You-tube videos and female students taught with lecture method, female

students taught with You-tube videos and male students taught with lecture method, and female students taught with You-tube videos and female students taught with lecture method. Only the difference between male and female students taught without you-tube videos is not statistically significant.

5. Discussions of findings

The result gotten from research question one as reflected in table 2 depict that there was positive effect in the level of student's conceptual understanding having been taught using YouTube videos with a mean gain of 24.964

The test of hypothesis as contained in Table 3 indicate that the calculated F value for treatment is 5585.085 and is statistically significant (P=.000) at .05 significance level and (1,277) degree of freedom. Therefore, the null hypothesis under investigation is rejected. That there is significant difference between the mean scores of students' conceptual understanding after being taught the concept of refraction of light using YouTube videos in teaching Physics concepts.

The result of analysis from this hypothesis revealed that the use of You-tube videos-aided instruction in teaching and learning has a significant effect on students' conceptual understanding of selected physics content. Research had reviewed by various researchers that the use of YouTube-videos aids instruction stimulates critical thinking among students. This is in line with [7] whom observed that there are limitations to discerning a person's thoughts, but repeated patterns of responses (either in a single student or across many students at different times and places) can lead us to generate theories that explain other situations and, in some cases, have predictive power. For this submission the study resonated with earlier studies by [8] which shows that YouTube videos made the lesson more exciting and stimulating. [8] further maintained that the use of YouTube videos increased student engagement, critical awareness and facilitated deep learning. Furthermore, these videos could be accessed at any time of the day and from a place to suit the students. This result did not come as a surprise to the researcher as so many finding resonate with the result of this study. However, it was discovered that, this disparity in the conceptual understanding between the two groups (experimental and control group) was due to the fact that students in the experimental group, unlike those in the control groups, already had a mental picture of the YouTube videos instructional aid used by the teacher in lesson delivery, and this helps them to retain and acquire meaningful learning given in the conceptual understanding test.

The result of research question two as contained in table 3, shows that the mean score of male and female is 24.294 and 24.497 for both male and female taught without YouTube, 26.072 and 26.275 for both male and female taught with YouTube videos respectively. Similarly, the different in the adjusted mean scores of male and female students under each of YouTube videos-aids instruction and method are 1.778 and 0.203 respectively. Since these values differ, it means that gender and treatment (teaching method) have a combined effect on students' conceptual understanding of the selected Physics content. This shows that there was an improvement in the students' conceptual understanding six weeks after the pre-test.

The test of hypothesis two as contained in Table 4 indicate that the calculated F value for the interaction of treatment and gender is 8.116, and is statistically significant (P=.000) at .05 significance level and (1,275) degree of freedom. That means there is a significant difference between male and female students' conceptual understanding of selected Physics content when taught with You-tube videos. Therefore, the null hypothesis is rejected. Thereby, implying that the interaction of video instructional method and gender has a significant positive effect on students conceptual understanding of selected physics concept. The outcome of this result did not come as a surprise to the researcher, because it was expected that with the use of YouTube videos as an instructional aide in teaching, the disparity in term of physics conceptual understanding between male and female students as revealed by various researcher over the years may have been subdue, due to the modern and eclectic approach to teaching. This also agrees with the research carried out [9], that showed when students interact with their teacher and classmates, they create an opportunity to practice good dynamics, cooperative activities and team work. The

traditional classroom environment can be made to be very exciting for both male and female students when enhanced with materials like pictures, graphics and some online prints. In addition, this result is also in line with the study by [10] which showed that there was a progressive performance of both male and female students of Biology both in their mean scores. As well as, the findings of [11], which holds that gender has nothing to do with students' academic performance. However, is in contradiction to the findings of [12], Which revealed that there was no significant difference in the mean scores of both male and female students. Notwithstanding, the significant difference, the partial eta squared value (.029) shows that the interactive effect of teaching method and gender on students' conceptual understanding is very small. Only 2.9 per cent of the variance in students' conceptual understanding of selected Physics content can be accounted for by the interactive effect of teaching method and gender. However, it was discovered, through classroom interaction, that the female student's performed better than their male counterpart.

6. Summary/Conclusion of findings

i. There was an improvement in the level of student's conceptual understanding having been exposed to the treatment to all the selected Physics contents. The study shows that use of YouTube videos enhances students' conceptual understanding.

ii. The study has also shows that there was no significant difference in the mean scores of male and female students' conceptual understanding irrespective of their learning environment. Student gain high level of conceptual understanding when the traditional teaching method is blended with instructional technological materials such as YouTube videos

iii. Both male and female students conceptual understanding do not differ in their posttest mean scores after being exposed to treatment.

7. Recommendation

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

i. Policy makers and curriculum planners in the ministry of education should, as a matter of urgency, redesign the physics curriculum to make incorporation of YouTube video instructional aide in the teaching of selected physics concepts compulsory. Thereafter, monitoring on absolute compliance should follow, as this will lead to improvement in students' conceptual understanding in Physics.

ii. Physics teachers should, always incorporate YouTube video instructional aids in teaching, as this will not only bridge the gap between urban and rural students, but lead to an overall improvement in students' conceptual understanding in Physics.

The government, private institutions and philanthropic individuals should organize workshop/seminars for teachers on the need to incorporate YouTube video instructional aids into the teaching of Physics.

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