

Effect of Animation on Students' Performance and Retention of Production of Electricity in Ikwerre Local Government Area, Rivers State.

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Keywords:

Production of Electricity, Animation, Performance, Retention.

Abstract

The study investigated the effect of Animation on students' performance and retention of the concept of Production of Electricity in Ikwerre Local Government Area, Rivers State. Quasi-experimental, pre-test post-test design was adopted. Two research questions and two hypotheses guided the study. The population of the study was 1520 Senior Secondary School 2 (SS2) science students from public secondary schools in Ikwerre Local Government Area of Rivers State. A sample of 155 science students in their intact classes were selected from two randomly selected Secondary Schools for the study. The two validated research instruments for the study were Production of Electricity Performance Test and Production of Electricity Retention Test. The Research Questions were answered using mean and percentage while Analysis of Covariance was used to test the Hypotheses. The findings of the study revealed that the use of Animation enhanced the performance and retention more than Lecture method. A significant difference was also found between students taught using animation and those taught with lecture method in their performance and retention in favour of students taught using animation. Based on the findings, it was recommended that Animation should be used in teaching concepts in Science and should be included as a teaching strategy in the Curricula of science subjects

Introduction

Electricity is a form of energy resulting from flow of charges (Anyakoha, 2016). It can be generated from natural sources, such as natural gas, coal, solar energy, nuclear energy, wind energy, hydro and thermal energy. Electricity is needed and utilized in so many areas of life. It is needed daily at home as a source of energy and to perform many functions every day, such as lighting, heating, cooling and cooking as well as in operating various electrical appliances. Electricity is needed in the agricultural sector to reduce labour during cultivation and harvest, to power equipment developed to conserve and store agricultural crops, and also in the processing of agricultural produce for human consumption which will lead to food security.

It is needed in the medical field to power technology used in the diagnosis, and treatment of various illnesses which will lead to reduction of mortality rate in the society. It is needed in the Industry and Engineering sector to fabricate and operate several technology, machines, appliances and gadgets that will make human tasks easier to perform. It is needed in the Information and Communication Technology (ICT) sector for effective communication and passage of information in the society. It is needed in the educational sector to develop and operate several innovations in the teaching and learning process. It is also needed in the commercial sector, transportation and entertainment. There is virtually no aspect of life in which electricity is not needed.

Despite the need for electricity, the generation of electricity in Nigeria has been grossly inadequate. Meanwhile, the knowledge of the production of electricity afforded through the study of science in the Secondary School is a strong foundation for higher studies which can lead to national development especially in the energy sector which handles the generation of electricity. However, the issue of the methods or strategies used in the transfer of the knowledge of science concepts have been a great concern. Many researches have shown that Lecture method which is a teacher-centered method is still widely used by teachers (Bakare, 2011; Aderounmu & Obafemi, 2015; Odey, Arikpo & Oko, 2021). These researches have also confirmed from their discoveries the inadequate nature of Lecture method in inculcating the desired knowledge to the learners thereby advocating for the use of learner-centered methods and strategies.

One of such learner-centered strategy is Animation which is the use of computer to manipulate electronic images in order to create moving images. In animation, successive drawing or models are photographed to create an illusion of movement (Heinich, Molenda & Russel, 1999). According to Mayer (2014), in multimedia learning such as in the use of animation, students learn through pictures and words which may be written, printed or spoken. Mayer (2014) lamented that teaching has been dominated by verbal learning and pointed out that leveraging on the advent of computer graphics and visualization technologies, a deeper learning is enabled by combination of words and pictures afforded by animation. Rieber (2005) similarly noted that animation is a tool that encourages students to learn. Kim, Yoon, Whang and Tversky (2007) however noted that animation may negatively affect comprehension as it may distract the attention of students and interfere with deeper processing of knowledge. They pointed out that the effect of animation on comprehension may vary depending on the difference in the need of individual learner as determined by factors such as age spatial ability and cognition.

Mayer (2009) found that use of animation yielded a better performance in students in the test of transfer of problem solving than use of words alone. Etim, Itighise, and Ema (2016) found that the use of slow-motion educational animation enhanced academic performance of students in Business Studies when compared with expository teaching method. Falode, Sobowale, Saliu, Usman and Falode (2016) found a significant difference between students taught animal physiology using computer animation instructional package and those who were taught using lecture method in favour of those taught using computer animation instructional package. Edo (2017) in the same vein, found that computer animation had significant positive effect on students' academic performance.

Furthermore, Josiah (2017) discovered a significant difference in achievement between students taught Biology using computer animation and those taught using static graphics in favour of those taught using computer animation. Ugwuanyi, Okeke, Nnamani, Obochi, and Obasi (2020)

found that animated power point presentation significantly enhanced the academic performance of students in Physics than the presentation that was non-animated. Similarly, Ahmed and Inti (2021) found that students taught Auto Braking system using computer animation had a higher academic achievement than those taught using conventional teaching method.

Concerning retention, Hays (1996) found that low-spatial ability students who received presentations with animation made significantly greater gains in short and long term memory than those who did not receive presentation with animation. Similarly, Ejimonye, Ugwuanyi, Okeke, and Nwoye, (2020) found that students who were taught mathematical contents of Economics with two-dimensional animation technique had a better performance in post-test and follow-up than the students who were taught using the conventional method. Kim et al. (2007) found that animation made knowledge presentation more appealing, enjoyable, interesting and more fun to learn but did not affect comprehension test score. Similarly, Morrison and Tversky (2001) as well as Hegarty, Narayanan and Freitas (2002) did not find any differences in memory and comprehension between students taught using animation and those taught using static graphics.

Our nation is facing the problem of inadequate production of electricity despite the necessity of Electricity in everyday life and generally in national development. Also, West Africa Examination Council Chief Examiner's reports in the past years such as 2017 to 2019 have consistently revealed poor performance of student in the concept of Electricity. What could be the cause of this persistent poor performance? Could it be that the strategies and methods being used in transmitting the knowledge to the students are not effective? This study thus intends to investigate the effect of Animations on students' performance and retention in the concept of Production of Electricity.

Aim and objectives of the study

The aim of the study is to investigate the effect of Animations on students' performance and retention in the concept of Production of Electricity in Ikwerre Local Government Area of Rivers State. Specifically the study intends to:

1. investigate the effect of Animation on students' performance in the concept of Production of Electricity.
2. determine the effect of Animation on students' retention of the concept of Production of Electricity.

Research Questions

1. How does Animation affect students' performance in the concept of Production of Electricity?
2. What is the effect of Animation on students' retention of the concept of Production of Electricity?

Hypotheses

H₀₁: There is no significant difference between students taught using Animations and those taught with Lecture method in their performance in the concept of Production of electricity.

H₀₂: No significant difference exists between students taught using Animations and those taught with Lecture method in their retention of the concept of Production of electricity.

Methodology

The study adopted Quasi-experimental pretest post-test design. The population of the study was 1520 Senior Secondary School 2 (SS2) science students from public secondary schools in

Ikwerre Local Government Area of Rivers State. A sample of 155 science students in their intact classes were selected from two randomly selected Secondary Schools for the study. The group of students in one school constituted the Experimental group while the group of students in the second school constituted the control group. The instrument used to gather data on performance was a validated test titled "Production of Electricity Performance Test" (PEPT) while the instrument used to collect data for retention was "Production of Electricity Retention Test" (PERT). Each of the instruments contained 20 multiple choice questions, with four options of A-D. Each question was scored 5marks which gives a total of 100%.

The instrument- Production of Electricity Performance Test (PEPT) was administered to each of the two groups of students as Pretest before they were taught the concept of Production of Electricity. The Experimental group was taught using Animations while the control group was taught using Lecture method after which the Production of Electricity Performance Test (PEPT) was re-administered to each of the two groups of students as Post-test. Two weeks later, Production of Electricity Retention Test (PERT) was administered to the students. The Research Questions were answered using mean and percentage while Analysis of Covariance (ANCOVA) was used to test the Hypotheses at 0.05 level of significance.

Results and Findings

Research Questions 1: How does Animation affect students' performance in the concept of Production of Electricity?

Table 1: Mean and mean gain of students' performance scores in experimental and control groups.

Group/Strategy	N	Pre-test Mean	Post-test Mean	Mean Gain	Percentage Mean Gain
Experimental (Animation)	80	27.57	45.56	17.99	65.25
Control (Lecture method)	75	31.07	43.53	12.46	40.10

Table 1 showed that concerning performance, the students in the experimental group had a mean gain of 17.99 and a percentage mean gain of 65.25% while the students in the control group had a mean gain of 12.46 and a percentage mean gain of 40.10%. This indicates that the use of Animation enhanced the performance of the students in Production of Electricity.

Research Questions 2: What is the effect of Animation on students' retention of the concept of Production of Electricity?

Table 2: Mean and mean gain of students' retention in experimental and control groups.

Group/Strategy	Group	N	Posttest Mean	Post-post-test Mean	Mean Gain	Percentage Mean Gain
Experimental (Animation)	Experimental	80	45.56	47.19	1.63	3.58
Control (Lecture method)	Control	75	43.53	42.53	-1.00	-2.29

Table 2 showed that concerning retention, the students in the experimental group had a mean gain of 1.63 and a percentage mean gain of 3.58% while the students in the control group had a mean gain of -1.00 and a percentage mean gain of -2.29%. This indicates that the use of Animation enhanced the retention of Production of Electricity in the students.

Hypothesis 1: There is no significant difference between students taught using Animations and those taught with Lecture method in their performance in the concept of Production of electricity.

Table 3: Summary of ANCOVA of Students' performance in Production of electricity concept classified by instructional strategies.

Tests of Between-Subjects Effects

Dependent Variable: Post-test

Source	Type III Sum of Squares	Df	Mean Square	F	Sig.
Corrected Model	25473.441 ^a	2	12736.720	74.391	0.000
Intercept	15761.385	1	15761.385	92.057	0.000
Pre-test	25314.053	1	25314.053	147.852	0.000
Group/Strategy	893.754	1	893.754	5.220	0.024
Error	26024.301	152	171.213		
Total	359550.000	155			
Corrected Total	51497.742	154			

a. R Squared = 0.495 (Adjusted R Squared = 0.488)

Table 3 showed a significant value of $F_{(1,152)} = 5.220$, $p = 0.024$ ($p < 0.05$), the null hypothesis is thus rejected. Hence there is a significant difference between students taught using Animations and those taught with Lecture method in their performance in the concept of Production of electricity. The mean gain of 17.99 obtained by the students in the experimental group against the mean gain of 12.46 obtained by the students in the control group indicates that it was the group of students taught using Animation that contributed to the significant difference between the groups in their performance in the concept of Production of electricity.

Hypothesis 2: No significant difference exists between students taught using Animations and those taught with Lecture method in their retention of the concept of Production of electricity.

Table 4: Summary of ANCOVA of Students' retention of Production of electricity concept classified by instructional strategies.**Tests of Between-Subjects Effects****Dependent Variable: Post-post test**

Source	Type III Sum of Squares	df	Mean Square	F	Sig.
Corrected Model	33247.960 ^a	2	16623.980	179.726	0.000
Intercept	352.601	1	352.601	3.812	0.053
Post-test	31763.957	1	31763.957	343.407	0.000
Group/Strategy	814.983	1	814.983	8.811	0.003
Error	14059.459	152	92.496		
Total	284625.000	155			
Corrected Total	47307.419	154			

a. R Squared = 0.703 (Adjusted R Squared = 0.699)

Table 4 showed a significant value of $F_{(1,152)} = 8.811$, $p = 0.003$ ($p < 0.05$), the null hypothesis is thus rejected. Hence a significant difference exists between students taught using Animations and those taught with Lecture method in their retention of the concept of Production of electricity. The mean gain of 1.63 obtained by the students in the experimental group against the mean gain of -1.00 obtained by the students in the control group indicates that it was the group of students taught using Animation that contributed to the significant difference between the groups in their retention of the concept of Production of electricity.

Discussion of findings

The study found a significant difference between students taught using Animations and those taught with Lecture method in their performance in the concept of Production of electricity in favour of the group taught using Animation. The use of animation enhanced the performance of the students in Production of Electricity. This may be due to the fact that animation provides ways of presenting concepts in a more visual and real manner than lecture method which may have facilitated comprehension. This finding agrees with the discoveries of Etim, et al. (2016), Falode, et al. (2016), Josiah (2017), Edo (2017), Ugwuanyi, et al. (2020) as well as Ahmed and Inti (2021) found that animation enhanced the achievement of the students. The finding is however at variance with that of Kim et al. (2007) who found that animation did not affect comprehension test score.

Furthermore, the study revealed that a significant difference exists between students taught using Animations and those taught with Lecture method in their retention of the concept of Production of electricity. The use Animation enhanced the retention of Production of Electricity in the students. This finding may be due to the fact that the students enjoy and feel at home with animation and when compared with lecture method, animation is more interactive, entertaining, and easily attract the attention of students who are more likely to retain an experience they enjoyed. This finding is in consonance with that of Hays (1996) who found that low-spatial ability students who received presentations with animation made significantly greater gains in short and long term

memory than those who did not receive presentation with animation. It also agrees with Ejimonye, et al. (2020) who found that students taught the mathematical contents of Economics with two-dimensional animation technique had significantly post-test and follow-up mean achievement scores than those exposed to the conventional method. However, the finding is at variance with the findings of Morrison and Tversky (2001) as well as Hegarty, et al. (2002) who did not find any differences in memory and comprehension between students taught using animation and those taught using static graphics.

Implication of findings

The implication of the findings of this study is that if students are taught concepts in Science using Animation which they enjoy watching and are so familiar with, their performance and retention of scientific concepts will be enhanced. Also, a solid foundation will be built, on which the problem of inadequate production of electricity in our nation can be resolved.

Conclusion

It has been shown by this study that students' performance and retention in scientific concepts such as production of electricity can be enhanced when they are taught using Animation against the background of Lecture method which is still being used by many Science teachers. Science teachers therefore need to rise to this task of bringing scientific concepts to students' familiar zone.

Recommendations

Based on the findings of the study, it is recommended that

1. Animation should be used in teaching concepts in Science.
2. Use of animation should be included as a teaching strategy in the Curricula of Science subjects.

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