Effect of Multimedia-Animated Instructional Strategy on Upper Basic III Students’ Interest, Achievement and Retention in Basic Science

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ABSTRACT

This study investigated the effect of multimedia-animated instructional strategy on the interest, achievement and retention of upper basic III students in Basic Science. The sample for study comprised Sixty-five upper basic III Basic Science students from two intact classes purposively selected from two private co-education schools in Federal Capital Territory, Abuja, Nigeria. Three research questions guided the study and three null hypotheses were tested at 0.05 level of significance. Two instruments were used for data collection namely; Students’ Interest in Basic Science rating scale (SIBS) and Basic Science Achievement Test (BSAT). The reliability of SIBS was determined using Cronbach Alpha and the coefficient obtained was 0.76 while Kuder-Richardson formula 21 (K-R21) was used to determine the reliability of BSAT and the reliability coefficient was found to be 0.83 implying that the instruments were reliable enough for the study. Descriptive statistics of mean and standard deviation were used to answer the research questions while Analysis of Covariance (ANCOVA) was used to test the research hypotheses at 0.05 alpha level of significance. The findings of this study revealed significant differences in the interest, achievement and retention of upper basic III students taught Basic Science concept using Multimedia-animated Instructional Strategy. Based on the findings, it was recommended that; Basic Science teachers should incorporate multimedia-animated instructional strategy for the teaching and learning of Basic Science.

Keywords: Achievement, Basic Science, Instructional Strategy, Interest, Multimedia-animated and Retention

INTRODUCTION

Science and technology education form the foundation for sustainable national development by protecting human societies from ignorance, illiteracy, disease and poverty. The teaching of science begins from pre-basic level through to tertiary institutions. Science education is meant to expose the learners to scientific nature (facts, principles and concepts), processes, attitudes and the equip learners with skills of professional scientist (Osokoya, 2013). The success of any educational enterprise in this modern age of advanced technology is in terms of technologies and or media employed to ensure maximum cognitive development or advancement of learners. Multimedia aids in education could be define as the various electronic and technological devices employed by the teacher/ learner to enhance the interest, acquisition and retention of knowledge. These include print media like newspapers, magazines, journals and books. Electronic media include; Television, Radio, Slide, CD Rom, Projectors, CDs, DVDs and interactive media like cell phones and the internet. Multimedia combines five basic types of media into the learning environment: text, video, sounds, graphics and animation, thus providing a powerful new tool for education (Nwanekezi & Kalu, 2012).

Researches have shown that the quality of learning can be significantly enhanced when ICT is used as an intellectual multi-tool adaptable to learners needs (Furo, 2015; Nwafor & Okoi, 2016; Gambari & Yusuf, 2017; Samuel, 2018). Gyang (2008) referred to this as: critical thinking, information skill,
higher level conceptualization and problem solving. It has been observed that average school age child spends much time watching television; playing video games and exploring other electronic media devices, including the cell phones. These exploration and manipulation have been found to stimulate interest and create enabling environments for learning to take place both inside and outside the classroom, it is also makes learning easier and knowledge more easily retained (Nwanekezi & Kalu, 2012). Moreover, Akbiyik and Akbiyik (2010) are of the view that critical thinking, decision making, reflective thinking and creative thinking are various forms of cognitive learning outcomes of multimedia aids.

The basic school stage is the formative stage of an individual. At this stage, audio and visual impressions made on a child in the process of teaching and learning leaves a long-lasting effect on the educational development of the child. Children are naturally curious and inquisitive about their environment. They are observant, persistent and enjoy entertaining learning experiences (Nwanekezi & Kalu, 2012).

Basic Science education’s purpose is to train students to acquire proper understanding of basic principles as well as application. It is also aimed at developing appropriate scientific skills and attitudes as a prerequisite for future scientific activities. To achieve these objectives, active participation and collaborative learning activities become imperative and these need functioning instructional media to make Basic Science instruction effective (Osokoya, 2013; Oni, 2014; Samuel, 2017).

Multimedia-animated instructional strategy embraces the use of animation and cartoon style for its effective delivery. It allows for incorporation of moving pictures and sound into the lesson, which extends teachers abilities to present materials that encourage student interaction with the subject matter (Dike, 2008). The use of multimedia-animated instruction reduces the learning task and time; it creates room for consistency and learning mastery by increasing retention, safety and motivation. Learners enjoy interactive learning through cartoon teaching since it is efficient, effective and flexible. It facilitates communication and appeals to senses of sight and hearing at the same time, it provides concrete basis for the comprehension of abstract concepts and makes for a more meaningful and permanent learning (Staylor, 2002; Kellerman, 2004).

Researchers (Samuel, 2018; Ikwuka & Samuel, 2017; Owolabi & Oginni, 2014; Nwanekezi & Kalu; 2012; Ayotola & Abiodun, 2010; Akbiyik & Akbiyik, 2010) observed that science students exposed to multimedia and computer animation method of instruction had higher interest, achievement and retention of science concepts taught.

Interest is considered to be the feeling of an individual towards a particular object or an activity. It means that a child will develop interest in any object or activity that is found to be attractive or stimulating. Therefore, in a classroom situation, the learner will be attentive during a lesson only if the instruction is appealing to the learner (Nwachukwu, 2013; Danjuma, 2015).

Achievement is the action of accomplishing an academic task successfully. Its purpose is to find out the stand of a student at a given moment (Akani, 2017). It has to do with testing the knowledge acquired by the student which helps the teacher and the student to evaluate and predict the degree of learning attained. It is useful in testing the retention of information and skill. It is also a determinant of the efficacy and efficiency of a given instruction (Kabutu, Oloyede & Bandele, 2015).

Retention is the ability to hold, keep or recall past experience and reproduce a learnt concept when the need arises (Bukunola & Idowu, 2012). It is an important variable in learning because only a learnt experience is recalled, learning cannot be said to have taken place if there is no proper retention. The ability of students to recall past learnt Basic Science concepts as an objective of the Basic Science teaching and learning process may likely enhance achievement in the subject. For so long, researchers have been keen on knowing what could be done by teachers to enhance maximum retention of knowledge or skills long after they have been acquired whether in the classroom or outside the classroom (Azuka, 2012).

**Purpose of the Study**

The purpose of this study is to investigate the effect of multimedia-animated instructional strategy on the interest, achievement and retention of upper basic III students in Basic Science. Specifically, the study sought to:

1. determine the effect of multimedia-animated instructional strategy on the interest of upper basic III students in Basic Science.
2. determine the effect of multimedia-animated instructional strategy on the achievement of upper basic III students in Basic Science.
3. determine the effect of multimedia-animated instructional strategy on the retention of upper basic III students in Basic Science.

**Research Questions**

The following research questions guided the study:

1. What is the mean interest scores of upper basic III students taught Basic Science using multimedia-animated instructional strategy?
2. What is the mean achievement scores of upper basic III students taught Basic Science using multimedia-animated instructional strategy?
3. What is the mean retention scores of upper basic III students taught Basic Science using multimedia-animated instructional strategy?

**Hypotheses**

The following hypotheses were tested at 0.05 level of significance:

**H₀₁**: There is no significant difference in the mean interest scores of upper basic III students taught Basic Science using multimedia-animated instructional strategy.

**H₀₂**: There is no significant difference in the mean achievement scores of upper basic III students taught Basic Science using multimedia-animated instructional strategy.

**H₀₃**: There is no significant difference in the mean retention scores of upper basic III students taught Basic Science using multimedia-animated instructional strategy.

**Scope of the Study**

The study focused on the effect of multimedia-animated instructional strategy on upper basic III Basic Science students in Abuja, Nigeria. The content scope was; Circulatory System.

**METHODOLOGY**

Quasi experimental research design was employed for the study. The sample for study comprised Sixty-five upper basic III Basic Science students from two intact classes purposively selected from two private co-education schools in Federal Capital Territory, Abuja, Nigeria. The schools were purposively sampled based on equivalence in laboratories, ICT facilities and manpower. The schools were randomly assigned to experimental groups (taught using Multimedia-animated Instructional Strategy (n = 30)), and the control group (taught using Guided Discovery (n = 35)).

Two instruments were used for data collection namely; Students’ Interest in Basic Science rating scale (SIBS) and Basic Science Achievement Test (BSAT). SIBS contained 10 items designed to determine students’ interest in Basic Science. SIBS was rated using a four-point rating scale. The options were; Strongly agreed (SA) = 4 points, Agree (A) = 3 points, Disagree (D) = 2 points and Strongly Disagreed (SD) = 1 point. Basic Science Achievement Test (BSAT) was a 15-item instrument with options A – D in Circulatory System. The test was validated by experts in Science and Technology Education and were trial tested. The reliability of SIBS was determined using Cronbach Alpha and the coefficient obtained was 0.76 while Kuder-Richardson formula 21 (K-R₂₁) was used to determine the reliability of BSAT and the reliability coefficient was found to be 0.83 implying that the instruments were reliable enough for the study. Descriptive statistics of mean and standard deviation were used to answer the research questions while Analysis of Covariance (ANCOVA) was used to test the research hypotheses at 0.05 alpha level of significance.
RESULTS

Research Question One

*What are the mean interest scores of upper basic III students taught Basic Science using multimedia-animated instructional strategy?*

The data used to answer this research question is presented in Table 1.

**Table 1. Means and Standard Deviation of Students’ Interest Scores Exposed to Multimedia-animated Instructional Strategy**

<table>
<thead>
<tr>
<th>Group</th>
<th>Type of Test</th>
<th>N</th>
<th>Mean</th>
<th>SD</th>
<th>Mean gain</th>
</tr>
</thead>
<tbody>
<tr>
<td>Multimedia-animated Instruction</td>
<td>Pre-interest</td>
<td>30</td>
<td>24.63</td>
<td>3.01</td>
<td>35.92</td>
</tr>
<tr>
<td></td>
<td>Post-interest</td>
<td>30</td>
<td>59.92</td>
<td>2.81</td>
<td></td>
</tr>
<tr>
<td>Guided Discovery Method</td>
<td>Pre-interest</td>
<td>35</td>
<td>20.55</td>
<td>3.22</td>
<td>23.38</td>
</tr>
<tr>
<td></td>
<td>Post-interest</td>
<td>35</td>
<td>43.93</td>
<td>2.94</td>
<td></td>
</tr>
</tbody>
</table>

Table 1 shows that mean gain of the interest scores of students exposed to Multimedia-animated (35.92) was higher than those exposed to the Guided Discovery Method had the least (23.38).

Research Question Two

*What are the mean achievement scores of upper basic III students taught Basic Science using multimedia-animated instructional strategy?*

The data used to answer this research question is presented in Table 2.

**Table 2. Means and Standard Deviation of Students’ Achievement Scores Exposed to Multimedia-animated Instructional Strategy**

<table>
<thead>
<tr>
<th>Group</th>
<th>Type of Test</th>
<th>N</th>
<th>Mean</th>
<th>SD</th>
<th>Mean gain</th>
</tr>
</thead>
<tbody>
<tr>
<td>Multimedia-animated Instruction</td>
<td>Pretest</td>
<td>30</td>
<td>30.26</td>
<td>3.15</td>
<td>33.51</td>
</tr>
<tr>
<td></td>
<td>Posttest</td>
<td>30</td>
<td>63.77</td>
<td>3.04</td>
<td></td>
</tr>
<tr>
<td>Guided Discovery Method</td>
<td>Pretest</td>
<td>35</td>
<td>21.33</td>
<td>3.97</td>
<td>28.50</td>
</tr>
<tr>
<td></td>
<td>Posttest</td>
<td>35</td>
<td>49.83</td>
<td>2.89</td>
<td></td>
</tr>
</tbody>
</table>

Table 2 shows that mean gain of the achievement scores of students exposed to Multimedia-animated (33.51) was higher than those exposed to the Guided Discovery Method had the least (28.50).

Research Question Three

*What are the mean retention scores of upper basic III students taught Basic Science using multimedia-animated instructional strategy?*

The data used to answer this research question is presented in Table 3.

**Table 3. Means and Standard Deviation of Students’ Retention Scores Exposed to Multimedia-animated Instructional Strategy**

<table>
<thead>
<tr>
<th>Group</th>
<th>Type of Test</th>
<th>N</th>
<th>Mean</th>
<th>SD</th>
<th>Mean loss</th>
</tr>
</thead>
<tbody>
<tr>
<td>Multimedia-animated Instruction</td>
<td>Posttest</td>
<td>30</td>
<td>63.77</td>
<td>3.04</td>
<td>08.68</td>
</tr>
<tr>
<td></td>
<td>Post-posttest</td>
<td>30</td>
<td>55.09</td>
<td>3.18</td>
<td></td>
</tr>
<tr>
<td>Guided Discovery Method</td>
<td>Posttest</td>
<td>35</td>
<td>49.83</td>
<td>2.89</td>
<td>11.32</td>
</tr>
<tr>
<td></td>
<td>Post-posttest</td>
<td>35</td>
<td>38.51</td>
<td>2.54</td>
<td></td>
</tr>
</tbody>
</table>

Table 3 shows that mean loss of the retention scores of students exposed to Multimedia-animated (08.68) was lower than those exposed to the Guided Discovery Method had the least (11.32). The lower the mean loss, the higher the retention, and the higher the mean loss, the lower the retention.

Hypothesis One

There is no significant difference in the mean interest scores of upper basic III students taught Basic Science using multimedia-animated instructional strategy.

Data to test the hypothesis is presented in Table 4.
Table 4. Result of Analysis of Covariance of Basic Science Students’ Interest Using SIBS

<table>
<thead>
<tr>
<th>Source of Variation</th>
<th>Sum of Square</th>
<th>Df</th>
<th>Mean Square</th>
<th>F</th>
<th>Sig</th>
</tr>
</thead>
<tbody>
<tr>
<td>Corrected Model</td>
<td>851.221</td>
<td>2</td>
<td>420.810</td>
<td>15.610</td>
<td>.000</td>
</tr>
<tr>
<td>Intercept</td>
<td>301.710</td>
<td>1</td>
<td>301.710</td>
<td>51.021</td>
<td>.000</td>
</tr>
<tr>
<td>Pre-interest</td>
<td>20.431</td>
<td>1</td>
<td>20.431</td>
<td>9.804</td>
<td>.000</td>
</tr>
<tr>
<td>Group</td>
<td>45.324</td>
<td>1</td>
<td>45.324</td>
<td>21.004</td>
<td>.000</td>
</tr>
<tr>
<td>Error</td>
<td>529.009</td>
<td>50</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Total</td>
<td>1793.019</td>
<td>65</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Table 4 shows that the ANCOVA test is $F = 21.004$, $p < 0.05$. This implies that there is a significant difference in the mean interest scores of students exposed multimedia-animated. Therefore, the hypothesis was rejected.

**Hypothesis Two**

There is no significant difference in the mean achievement scores of upper basic III students taught Basic Science using multimedia-animated instructional strategy.

Data to test the hypothesis is presented in Table 5.

Table 5

<table>
<thead>
<tr>
<th>Source of Variation</th>
<th>Sum of Square</th>
<th>Df</th>
<th>Mean Square</th>
<th>F</th>
<th>Sig</th>
</tr>
</thead>
<tbody>
<tr>
<td>Corrected Model</td>
<td>907.019</td>
<td>2</td>
<td>510.821</td>
<td>45.980</td>
<td>.000</td>
</tr>
<tr>
<td>Intercept</td>
<td>420.239</td>
<td>1</td>
<td>429.054</td>
<td>39.345</td>
<td>.000</td>
</tr>
<tr>
<td>Pretest</td>
<td>31.720</td>
<td>1</td>
<td>31.720</td>
<td>11.011</td>
<td>.000</td>
</tr>
<tr>
<td>Group</td>
<td>49.810</td>
<td>1</td>
<td>49.810</td>
<td>79.221</td>
<td>.000</td>
</tr>
<tr>
<td>Error</td>
<td>459.087</td>
<td>50</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Total</td>
<td>1867.389</td>
<td>65</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Table 5 shows that the ANCOVA test is $F = 79.221$, $p < 0.05$. This implies that there is a significant difference in the mean achievement scores of students exposed multimedia-animated. Therefore, the hypothesis was rejected.

**Hypothesis Three**

There is no significant difference in the mean retention scores of upper basic III students taught Basic Science using multimedia-animated instructional strategy.

Data to test the hypothesis is presented in Table 6.
Table 6. Result of Analysis of Covariance of Basic Science Students’ Interest Using BSAT

<table>
<thead>
<tr>
<th>Source of Variation</th>
<th>Sum of Square</th>
<th>Df</th>
<th>Mean Square</th>
<th>F</th>
<th>Sig</th>
</tr>
</thead>
<tbody>
<tr>
<td>Corrected Model</td>
<td>919.077</td>
<td>2</td>
<td>403.081</td>
<td>41.912</td>
<td>.000</td>
</tr>
<tr>
<td>Intercept</td>
<td>397.001</td>
<td>1</td>
<td>397.001</td>
<td>251.110</td>
<td>.000</td>
</tr>
<tr>
<td>Posttest</td>
<td>21.090</td>
<td>1</td>
<td>21.090</td>
<td>10.512</td>
<td>.000</td>
</tr>
<tr>
<td>Group</td>
<td>33.421</td>
<td>1</td>
<td>33.421</td>
<td>55.610</td>
<td>.000</td>
</tr>
<tr>
<td>Error</td>
<td>501.751</td>
<td>50</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Total</td>
<td>1872.340</td>
<td>65</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Table 5 shows that the ANCOVA test is $F = 55.610$, $p < 0.05$. This implies that there is a significant difference in the mean retention scores of students exposed multimedia-animated. Therefore, the hypothesis was rejected.

**DISCUSSION**

The findings of this study revealed that the use of Multimedia-animated Instructional strategy had significant effect on upper basic III students’ interest in Basic Science. The students exposed to Multimedia-animated Instructional Strategy had significant interest than those taught using the Guided Discovery Method. This result is in agreement with the findings of (Samuel, 2018; Nwanekezi & Kalu; 2012) who reported that students taught science using Multimedia instructional strategy develop significant interest than those taught without.

In relation to achievement, the findings of this study revealed that the use of Multimedia-animated Instructional strategy had significant effect on upper basic III students’ achievement in Basic Science. The students exposed to Multimedia-animated Instructional Strategy had significant achievement than those taught using the Guided Discovery Method. This result is in agreement with the findings of (Ikwuka & Samuel, 2017; Owolabi & Ogonni, 2014; Akbiyik & Akbiyik; 2010; Ayotola & Abiodun, 2010) who reported in their various researches that students taught science using Multimedia instructional strategy and computer animation develop significant achievement than those taught without.

In relation to retention, the findings of this study revealed that the use of Multimedia-animated Instructional strategy had significant effect on upper basic III students’ retention in Basic Science. The students exposed to Multimedia-animated Instructional Strategy had significant retention than those taught using the Guided Discovery Method. This result is in agreement with the findings of (Samuel, 2018; Nwanekezi & Kalu; 2012) who reported that students taught science using Multimedia instructional strategy develop significant achievement than those taught without.

**CONCLUSION**

The findings of this study revealed significant differences in the interest, achievement and retention of upper basic III students taught Basic Science concept using Multimedia-animated Instructional Strategy.

**RECOMMENDATIONS**

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

1. Basic Science teachers should incorporate multimedia-animated instructional strategy which has been found to increase students interest, enhanced achievement and retention.
2. Government should ensure adequate provision of media aided instructional materials for the effective teaching and learning of Basic Science.
REFERENCES