Effects of Audio, Video Demonstrations and Spatial Ability on Students’ Performance in Theory Test in Throwing on a Potter’s Wheel

Frederick Amunabo Okwo ¹, Saibu Alasa ²

¹Department of Arts Education, University of Nigeria, Nsukka, Enugu State, Nigeria
²School of Art and Industrial Design, Auchi Polytechnic, Auchi, Edo State, Nigeria

Abstract: The study examined the effects of audio, video demonstrations and spatial ability on students’ performance in theory test in throwing on a potter’s wheel. The investigation was guided by three research questions and five hypotheses. The study was a true experimental, employing the randomized post-test only control group design. Sixty three (63) students comprising of fifty four (54) male and nine (9) female who were randomly assigned to treatment group constitute the population. Two instruments were used for data collection: Throwing Achievement Test (TAT) and the Revised Minnesota Paper Form Board Test (RMPFBT). The research questions were answered using means and effect size was used to compare the mean. The hypotheses were tested at 0.05 level of probability using ANOVA. The internal consistency reliability of the TAT was 0.90 for the theory test. The findings showed that video demonstration is as effective as the conventional face-to-face and audio demonstrations techniques, students with high spatial ability and female students had higher mean scores in theory tests with non-substantial effect size. It was recommended that video should be employed by lecturers to inculcate theoretical knowledge on students throwing on a potter’s wheel.

Keywords: Audio/Video demonstrations, Potter’s wheel, spatial ability, throwing

1. Introduction

Throwing is one of the most exciting production techniques employed in the production of ceramics ware. It is a systematic process of manipulating a ball of clay on a potter’s wheel to produce a vase [1]. A potter’s wheel is a mechanical device powered manually or electrically by kicking at the wheel pedals to rotate anti-clock wise in order to shape ceramics ware [2, 3]. The beginner potters consider throwing very discouraging as a result of the initial difficulties and failures they encounter in the course of acquiring the knowledge and skills of throwing. The conventional technique of teaching throwing is the verbal instruction and the face-to-face demonstration techniques. These techniques does not provide the students with adequate guidance, assistance, demonstration and time by the lecturer to students involve in throwing, thereby resulting in poor students achievement in theory of throwing. The use of media of communication such as audio and video presentations may help to provide the required guidance, assistance, demonstration and time by lecturer to students in throwing thereby improving their achievement in throwing theory. It may further provide the students the opportunity to replay any segment of the instruction at leisure time thereby aiding students understanding as well as improving their achievement in theory tests in throwing. Audio presentation appeals to the sense of hearing only while Video presentation appeals to both the senses of hearing, sight and motion [4]. These variables may interact with spatial ability which is the ability to perceive the construction of an object in both two and three dimensions to enhance student achievement in theory in throwing on a potter’s wheel [5]. The general purpose of this study is to examine the effects of video and audio demonstrations and spatial ability on students’ achievement in theory test on throwing in a potter’s wheel. Specifically the study determined the: (i) effect of audio, video and conventional demonstrations on students achievement in theory test in throwing on a potter’s wheel (ii) influence of spatial ability on students’ achievement in theory test in throwing on a potter’s wheel (iii) influence of gender on students’ achievement in theory test in throwing on a potter’s wheel (iv) interaction effect of mode of presentation and gender on students achievement in theory test in throwing on a potter’s wheel (v) interaction effect of mode of presentation and spatial ability on students achievement in theory test in throwing on a potter’s wheel. Three research questions and five hypotheses guided the study.

2. Research Questions

To guide this study, the following research questions were raised:

1. What are the effects of video, audio and the conventional presentation modes on students mean achievement scores in theory test?
2. What is the influence of spatial ability on students mean achievement scores in theory test?
3. What is the influence of gender on students mean achievement scores in theory test?

2.1 Hypotheses

The following null hypotheses were formulated and tested at 0.05 level of significance:

1. The effects of video, audio and conventional face-to-face presentation modes on students mean achievement scores in theory test is not significantly different
2. The influence of spatial ability on students mean achievement scores in theory test is not significantly different
3. The influence of gender on students mean achievement scores in theory test is not significantly different
4. There is no significant interaction effect of mode of presentation and spatial ability on students mean achievement scores in theory test.
5. There is no significant interaction effect of mode of presentation and gender on students mean achievement scores in theory test.

3. Materials and Methods

3.1 Research Design

The study was a true-experiment, employing the randomized post test-only control group design.

3.2 Area of Study

The study was conducted in Auchi Polytechnic, Auchi in Edo State.

3.3 Population

The target population was all the sixty three (63) National Diploma two (ND 11) students of the Department of Painting and General Art of 2009/2010 academic session consisting of fifty four (54) males and nine (9) females randomly assigned to treatment conditions.

3.4 Sample and Sampling Technique

The sample was made up of sixty three (63) students who were randomly assigned to treatment conditions. Stratified random sampling technique was adopted to assign the male and female to treatment groups. The female were assigned to group first and then the male. To be assigned to a group, ballot slips labeled Experimental 1 (E 1), Experimental 2 (E 2) and Control (C) groups were prepared, mixed together and students were asked to pick from them.

3.5 Instrument for Data Collection

Two instruments were used for data collection: Throwing Achievement Test (TAT) consisting of theory test and the Revised Minnesota Paper Form Board Test (RMPFBT). The theory test consists of five short answer questions aimed at testing students understanding of the instruction while the RMPFBT consist of 64 multiple choice items in a reusable test booklet, arranged in order of increasing difficulty in which the subjects are expected to mark his or her choice on a separate answer sheet from the options provided among five complete figures from separate component shape.

3.6 Development of Instructional Materials

Four instructional materials namely lesson plans, lesson scripts, audio and video recorded lessons were developed by the researcher in company of two research assistants in the field of ceramics and educational technology each. The audio and video recorded programmes which were developed from the lesson plan and scripts respectively were recorded in the Department of Mass Communication and Ceramics Studio of Auchi Polytechnic, Auchi. The studio equipment, tools and materials were sourced locally.

3.7 Validation of Instrument

The instrument, the instructional materials and marking schemes were face validated by four experts, two in ceramics and two in educational technology. They examined the structure of the theory test to determine the extent to which it reflected the content and instructional objectives as spelt out in the National Board for Technical Education (NBTE) syllabus on throwing. The experts also examined the distribution of scores in relation to the answers to the questions. Their comments guided the production of the theory test and the marking scheme. The face-to-face demonstration lesson plan, the video and audio scripts were also examined to ensure that their contents are as prescribed in the curriculum.

3.8 Reliability of Instrument

Scorer reliability coefficient of 0.90 was determined for the theory using Pearson Product Moment Correlation while that of RMPFBT ranged from 0.81-0.91 [6].

3.9 Scoring of the Instruments

One scorer scored the theory and the RMPFBT.

3.10 Experimental Procedures

The experiment was conducted under the supervision of two lecturers who worked in company of the researcher. Two weeks was sent aside for the research. On first day of contact with the students they were subjected to spatial ability test to determine their spatial ability level and grouped into high, average or low spatial ability. The conventional face-to-face group was exposed to the verbal instruction and physical demonstration technique; they were given opportunity to ask questions. The audio group had the opportunity of listening to the instruction several times and asked questions as well. The video group on the other hand, had the opportunity of viewing, pausing, muting, questioning, reviewing or replaying any part of the instruction not understood. At the end of the instruction/demonstrations, the students were subjected to theory test and were scored using the marking scheme provided to ensure objectivity and minimize bias. The scores of each student in the three groups were collated, the mean calculated and recorded. The mean serves as the post-test scores which provided information on students’ achievement in theory test in throwing on a potter’s wheel.

3.11 Statistical Analysis

Means were used to answer the research questions. Effect size was calculated and used to compare the means. Effect size of .50 indicates that the difference is important and substantial [7]. The hypotheses were tested at 0.05 level of probability using analysis of variance (ANOVA).

4. Result and Discussion

The presentation of results or findings was guided by research questions and hypotheses.
Research Question 1: What are the effects of video, audio and the conventional presentation modes on students mean achievement scores in theory test?

Table 1: Mean and Standard Deviation of Students’ Achievement in Theory Test by Treatment Groups

<table>
<thead>
<tr>
<th>Groups</th>
<th>No of Students (N)</th>
<th>Mean Score (X)</th>
<th>Standard Deviation (S. D.)</th>
<th>Effect Size (Δ)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Experimental 1</td>
<td>21</td>
<td>18.81</td>
<td>7.66</td>
<td>-0.46</td>
</tr>
<tr>
<td>Experimental 11</td>
<td>21</td>
<td>19.52</td>
<td>5.42</td>
<td>-0.31</td>
</tr>
<tr>
<td>Control</td>
<td>21</td>
<td>21.00</td>
<td>4.73</td>
<td>-</td>
</tr>
</tbody>
</table>

The result in Table 1 shows that students in the control group achieved a higher mean score of $\bar{X} = 21.00$ and a standard deviation of 4.73 than their counterpart in experimental 1 (audio demonstration) with a mean score of $\bar{X} = 18.81$ and standard deviation of 7.66 and experimental 11 (video demonstration) with a mean score of $\bar{X} = 19.52$ and standard deviation of 5.42. Although the result indicates that students in the conventional face-to-face demonstration group appeared to have performed better than those in audio and video group respectively in throwing theory, the effect size of both the audio and video over the conventional face-to-face demonstration is less than 0.50. The effects of audio and the conventional face-to-face demonstration, video and the conventional face-to-face demonstration techniques in theory test are comparable and the difference cannot be said to be substantial.

Research question 2: What is the influence of spatial ability on students mean achievement scores in theory test?

Table 2: Mean and Standard Deviation of Students Achievement in Theory Test Due to Spatial Ability

<table>
<thead>
<tr>
<th>Groups</th>
<th>No of Students (N)</th>
<th>Mean Score (X)</th>
<th>Standard Deviation (S. D.)</th>
<th>Effect Size (Δ)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Average</td>
<td>22</td>
<td>18.18</td>
<td>7.47</td>
<td>0.33</td>
</tr>
<tr>
<td>High</td>
<td>41</td>
<td>20.63</td>
<td>5.01</td>
<td>0.33</td>
</tr>
</tbody>
</table>

The result in Table 2 shows students’ achievement in theory test due to spatial ability. The result indicates that students with high spatial ability had a higher mean score of $\bar{X} = 20.63$ and standard deviation of 5.01 than students with average spatial ability with a mean score of $\bar{X} = 18.18$ and a standard deviation of 7.47. Although the result indicates that students with high spatial ability performed better in throwing theory, the effect size between high and average spatial ability students’ is less than .50. This shows that the performance of students with high and average spatial ability in theory test is comparable and the difference cannot be said to be substantial.

Research Question 3: What is the influence of gender on students mean achievement scores in theory test?

Table 3: Mean and Standard Deviation of Students’ Achievement in Theory Test According to Gender

<table>
<thead>
<tr>
<th>Groups</th>
<th>No of Students (N)</th>
<th>Mean Score (X)</th>
<th>Standard Deviation (S. D.)</th>
<th>Effect Size (Δ)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Male</td>
<td>54</td>
<td>19.44</td>
<td>6.21</td>
<td>0.38</td>
</tr>
<tr>
<td>Female</td>
<td>9</td>
<td>21.78</td>
<td>4.68</td>
<td>0.38</td>
</tr>
</tbody>
</table>

The result in Table 3 shows that female students had a higher mean score of $\bar{X} = 21.78$ and standard deviation of 4.68 than male students with a mean score of $\bar{X} = 19.44$ and a standard deviation of 6.21. The effect size is less than .50. This indicates that the achievement of male and female students in theory test on throwing on a potter’s wheel is comparable and the difference is not substantial. The female students cannot be said to have performed significantly better.

$H_{01}$: The effects of video, audio and conventional face-to-face presentation modes on students mean achievement scores in theory test are not significantly different.

Table 4: Analysis of Variance of Students Theory Test Scores by Mode, Spatial Ability and Gender

<table>
<thead>
<tr>
<th>Source</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>364.80</td>
<td>11</td>
<td>33.16</td>
<td>.89</td>
<td>.55</td>
</tr>
<tr>
<td>Intercept</td>
<td>11697.50</td>
<td>1</td>
<td>11697</td>
<td>314.63</td>
<td>.00</td>
</tr>
<tr>
<td>Group</td>
<td>37.81</td>
<td>2</td>
<td>18.91</td>
<td>.51</td>
<td>.60</td>
</tr>
<tr>
<td>Spatial Ability</td>
<td>.418</td>
<td>1</td>
<td>.418</td>
<td>.01</td>
<td>.92</td>
</tr>
<tr>
<td>Gender</td>
<td>73.17</td>
<td>1</td>
<td>73.17</td>
<td>1.97</td>
<td>.17</td>
</tr>
<tr>
<td>Group Spatial Ability</td>
<td>51.72</td>
<td>2</td>
<td>25.86</td>
<td>.70</td>
<td>.50</td>
</tr>
<tr>
<td>Spatial Ability Gender</td>
<td>27.38</td>
<td>2</td>
<td>13.69</td>
<td>.37</td>
<td>.69</td>
</tr>
<tr>
<td>Error</td>
<td>1896.08</td>
<td>51</td>
<td>37.18</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Total</td>
<td>26904.00</td>
<td>63</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Corrected Total</td>
<td>2260.89</td>
<td>62</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Data in Table 4 shows that for the effect of mode of presentation (audio, video and the conventional face-to-face demonstration) on students achievement in theory test, F = 0.51, P=0.60. Therefore, the effect of mode on students achievement score in theory test is not significant at P < .05. The null hypothesis is not rejected. There is no significant difference in the mean achievement scores of students’ exposed to audio, video and the conventional face-to-face demonstration technique in theory test in throwing on a potter’s wheel.
**Ho1**: The influence of spatial ability on students mean achievement scores in theory test is not significantly different.

Data in table 4 shows that for the influence of spatial ability on students achievement in theory test, F = .01, P < .92. Therefore, the influence of spatial ability on achievement in theory test is not significant at P < .05. The null hypothesis is not rejected. There is no significant difference in the mean achievement scores of students with average and high spatial ability in theory of throwing on a potter’s wheel.

**Ho2**: The influence of gender on students mean achievement scores in theory test is not significantly different.

Data in Table 4 shows that for the influence of gender on students’ achievement in theory test, F = 1.97, P < .17. Therefore, the influence of gender on achievement in theory test is not significant at P < .05. The null hypothesis is not rejected. There is no significant difference in the mean achievement scores of male and female students.

**Ho3**: There is no significant interaction effect of mode of presentation and spatial ability on students mean achievement scores in theory test.

Data in Table 4 shows that for the interaction effect of mode of presentation (video, audio, and conventional face-to-face) and spatial ability on students’ achievement in theory test, F = 0.70, P<0.50. Therefore, the effect of technique of demonstration (audio, video and the conventional face-to-face) and spatial ability is not significant at P < .05. The null hypothesis is not rejected. There is no significant interaction effect of mode of presentation and spatial ability on students’ achievement in theory test in throwing on a potter’s wheel.

**Ho4**: There is no significant interaction effect of mode of presentation and gender on students mean achievement scores in theory test.

Data in table 4 shows that for the interaction effect of mode of presentation (video, audio, and conventional face-to-face) and gender on students’ achievement in theory test, F = .37, P < .69. Therefore, the effect of technique of demonstration (audio, video and the conventional face-to-face) and gender is not significant at P < .05. The null hypothesis is not rejected. There is no significant interaction effect of mode of presentation and gender on students’ achievement in theory test in throwing on a potter’s wheel.

6. Educational Implications of the Findings

Although the findings shows that students in the conventional face to face demonstration group had higher mean score in theory test, the effect size was not substantial. The educational implication of the finding therefore shows that the use of communication media such as audio and video presentation could facilitate the acquisition of theoretical knowledge as much as the application of the conventional face-to-face demonstration technique in throwing on a potter’s wheel.

7. Recommendations

1. Lecturers should adopt the use of communication media (video and audio presentation) in inculcating theoretical knowledge on students throwing on a potter’s wheel.

2. Resource centres should be established in learning institutions to encourage the development, storage and use of video, audio and other modern instructional technology media for instruction purposes.

References


Author Profile

Saibu Alasa (Ph.D) was born on 1st of October, 1963. He completed his Primary and Secondary Education at St. Pauls’ Anglican School, Idi-Oro, Lagos and Western Boys High School, Benin City in 1974 and 1979 respectively. Thereafter, he proceeded to Auchi Polytechnic, Auchi where he had his National Diploma in Painting and General Art, Higher National Diploma in Ceramic and the Technical Teachers Certificate in Education, Certificate in Community Banking and National Diploma in Banking and Finance in 1982, 1985, 1988, 1996 and 1998. He also poses a Post Graduate Diploma in Technical Education (PGDITED) from the University of Benin in 1994, a Master Degree in Educational Technology and Doctor of Philosophy in Educational Technology (Ph.D) from the University of Nigeria, Nsukka in 2002 and 2011. Presently, he is a Principal Lecturer in the Department of Ceramics Technology, Auchi Polytechnic, Auchi which he headed for two years and has been a lecturer for Twenty One years. He has participated in several exhibitions, seminars, conferences and workshops locally and internationally. He has to his credits; numerous publications in reputable journals, text books in Ceramics and Research. He is married with Four Children.

Professor Frederick Amunabo Okwo obtained B.Ed (Hons) in Educational Management/Physics, M.Ed and Ph.D in Educational Technology from the University of Ibadan, Nigeria. He was appointed Lecturer II at the University of Nigeria, Nsukka in 1992 and rose to the position of Professor in 2006. He has been five times head of department. Prof. F.A. Okwo has authored and co-authored two technical reports, over sixty research papers in journals, conference proceedings and books of reading and about fifty paper presentations at conferences. As a Consultant/Resource person to the National University Commission (NUC) in Nigeria, he has participated in many accredited and resource verification exercises of the Commission aimed at quality assurance of the university education in Nigeria. He has participated in assessment of best Ph.D
theses in Education organized by the NUC. He is a Consultant/Resource persons to other educational agencies such as the National Education Research and Development Council (NERDC), Abuja; Universal Basic Education Commission (UBEC), Abuja, and UNICEF. Prof. F.A. Okwo has supervised successfully more than fifty postgraduate projects and theses. His research interests are in the area of Institutional Design, Educational Management Technology and Science Education. He is married with children.