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Comparative Effectiveness Of Modelling Technology Of Instructional Media On The Junior Secondary Students Creative Arts In Abuja, Nigeria

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Abstract: The city of Abuja is blessed with rich tradition of creative modelling because of the availability of the modelling medium i.e clay. The introduction of plastercine a modern creative modelling medium of instruction, posed challenges to the students over the traditional medium. Therefore this study examines the comparative effectiveness of modern and indigenous creative modelling instructional media (clay and plastercine) on the junior secondary creative arts education in Abuja, Nigeria. Gender influence on students' performances was also examined. Three questions were raised and three hypotheses were tested using Analysis of Covariance. The study adopted quasi experimental design, of pre-test and post-test non-randomized control group. Sample comprised of 90 students drawn from three Junior Secondary Schools. Researchers' designed instruments of Clay-Plastercine Performance Test (CPPT), Clay substances and Plastercine material were treatment and test instruments. Finding indicated that there is no significant difference between the performance of students taught with clay and plastercine. Student gender was also not a factor in students' performance. Therefore, the recommendation was made that clay and plastercine should be encouraged for teaching creative modelling in Nigerian Junior Secondary Schools context.

Key words: Clay, Clay-Plastercine Performance Test, Gender, Modelling and Plastercine,

INTRODUCTION

Modelling is the act of producing 2 or 3 dimensional object from malleable substances. Modelling features prominently in Creative arts, Science and Technology. It performs religion, aesthetic, decorative and educative functions. The most known medium for modelling is clay. Clay is a natural resource from the earth surface that are of two types; the primary and secondary. The primary clay is called kaolin found at the site of formation and the secondary clay is a composition of particle of rock, minerals, decayed plants and animals. The clay features are of different colours, this depends on the colour at site. Clay have the chemical formula as $A1_20_3$-$2S0_3$-$2H_20$. The modelling with clay start from clay collection, preparation, preservation, designing, production and exhibition. Clay modelling is important and it is utilised in production of many things for example literature confirmed that Clay is even employed in the designing and producing car prototype. (Casson 1977; Sorby, & Veurink, 2010; Mathide 2014; Ogboji & Igbokwe 2014; Ogboji & Igbokwe 2014; Usman, Odewumi, Obotuke, Apolola, & Ogunyinka, 2014; Odewumi , Okeke, Abdulhammed, Uzoma, Okuche, 2015). Plasticine is a modern modelling media, that has the components of wax-based, calcium salts, principally calcium carbonate, petroleum Jelly. A long chain of aliphatic acid, added resulting a very soft, plastic, for the easy modelling. The plastercine is characterised of gradual drying process, this uniqueness make it distinct and differ from other modelling educative media (Brodie, 1993; Vazquez, Sweeney, Wallace, Wolff, Ober & Altan, 1996; Kothar and Luckham 2014; Obasuyi, 2016) Studies confirmed that modelling is used in educating learners. For example, modelling is used for study of snakes and birds. Also, for creating artificial animals and eggs that serve as prey. In the same vein, modelling promotes effortless way of teaching and learning of industrial and mechanical tools. In essence, it is useful for crafts in creative and visual arts (Golomb, 1989; Kridli & Orady, 2003; Moore & Robinson 2004). Modelling brings into reality household, decorations and kitchen utensils (Ibrahim-Banjoko, 2009). A technique of developing and creating educational material, tools and equipment in Mechanical Engineering (Abdullah, Muda & Samad 2008). Biological Sciences creates lizards with mode on imitation of the habitat selection (Steffen, 2009). Studies in Ecology, employed modelling in forming reptile and amphibian (Harper and Pfennig 2007), salamanders, and toads (Saporito 2007; Noonan & Comeault 2009). Productions of different signs, punctuation marks, numerals and alphabets in different languages for educational purposes (Marshall & David, 2005). In essence, Clay and plastercine modelling provides teaching and learning material for both children and adult. Students creates modelling objects in clay and plastercine which elicits happiness regardless of their impairment (Marshall 2003; Tomascoff 2004; Warwick, 2005 & Jaramillo, 2008). On Gender and modelling, studies stressed that female students frequently respond to the ads by introducing their personality attribute to modelling. Women modelling works shows facts of woman exhibiting characteristics like hairdo, Jewries; earrings and necklaces (Freedman 1994; Andersson & Andersson 2009). Girls and boys were free to engage in forming different 3 dimensional modelling objects from clay, but the craft is mostly consider to be that of male than female, whereas, female are producer of modelling objects from clay for domestic uses (Trinity Session

2003). The female, act of modelling assist greatly in forming the basis for anatomy studies, it also provides a foundation for learning, because this enabled them to visualised human body structure and features and how it all look like (Monsour, 2011). The development of two or more educative packages and comparison of their effectiveness has been reporting to improvement, speeds up learning rate, enhances better retention, and encourages the development of better attitude in learners. According to Alabi, Emmanuel, and Falode, (2015) study on the effects of videodisc mediated and computer assisted instructional packages on achievement of Junior Secondary School Mathematics students in Geometry in Minna, Nigeria. The findings showed that videodisc mediated instructional package performed significantly better than the Computer Assisted Instructional packages and the control group, while there is no significant difference in the mean achievement of male and female. However, the extent to which the comparative effectiveness of indigenous and modern modelling technology of instruction enhance learning on Junior Secondary Students in Nigeria, is still unknown. The study therefore investigated the comparative effectiveness of modern and indigenous instructional modelling media on the on Junior Secondary Students in Abuja. The study also examined the performances of junior secondary school students taught modelling with technology of Plastercine, Clay and those taught with conventional method.

Research Question

The study will answer the following question:

1. Is there any difference in the students' scores when they are taught with Modelling using Plastercine and Clay and those taught with Conventional method of teaching.
2. Is there any difference between the scores of male and female students taught with Modelling using Plastercine.
3. What is the difference between the scores of male and female students taught with Modelling using Clay?

Research Hypotheses

These hypotheses were tested at 0.05 level of significance in the study:

$H0_1$: There is no significant difference in the students' scores when they are taught with modelling instruction using Plastercine and Clay.

$H0_2$: There is no significant difference between the scores of male and female students' exposed to modelling instruction using Plastercine.

$H0_3$: There is no significant difference between the scores of male and female students' when they are exposed to modelling instruction using Clay.

Methodology

The research designed utilised for this study was the quasi experimental. This consists of the pre-test and post-test, non-randomized of the control group. This study consisted of three specific groups, divided into I, II and III, which are exposed to modelling technology of instruction with Plastercine, Clay and the conventional method. The sample for this study was all Junior Secondary School, class two (JSS II) students in the Federal Capital Territory, Abuja. Nigeria. Purposive sampling was utilised to select three school for study. A total number of ninety Junior Secondary Students II (Two) in Abuja Metropolis was sampled and they were total thirty students in each group which consisted of fifteen male and fifteen female. The criteria for selection of the schools and the students were based on the following; Schools that have being exposed to 9-year Basic Education Curriculum Examination (BECE) and having presenting candidates for creative arts examination for the past (10) ten years. Schools with qualified instructors handling effectively creative arts curriculum, and the availability and accessibility of Creative arts studio with electric and manual potter wheel. The selection of the creative arts students was done randomly from the schools purposively chosen schools. The experimental groups' for the study were group I (one) and II (two) which were exposed to through team teaching of Modelling with both technology of Platercine and Clay from the researcher and the resource personnel respectively. In the same vein, the control group was taught with conventional teaching method from a qualified creative arts teacher with appropriate modelling materials and tools. The main instruments of study were the Clay and the Plastercine, these were employed for modelling of different functional objects. The topic for the study were extracted from the Junior Secondary School Curriculum produced by the Federal Ministry of Education through the Nigeria Educational Research and Development Council (NEDEC) for Junior Secondary Schools in Nigeria. Therefore, the topics for the study were; Definition of clay, Sources of clay, Clay preparation, Modelling tools and modelling of functional objects. On the teaching guide, relevant textbooks, internet and experienced creative personnel were contacted to come up with a course wear on the given topics. The test instrument was the researcher designed Clay and Plastercine Academic Performance Test (CPAPT), which were twenty-five (25) multiple choice objective items, meant to determined a specific learning outcomes in relating to the topic and concept of the study. The data for testing the hypotheses were the learners scores obtained from the test administered, based on the learners performance in pre-test, that is before the treatment and the post-test which was after the treatment. The treatment in the study lasted for twelve periods of six weeks through teaching on both theory and practical with plastercine and clay on the specified topics. Learners were later engaged with summative test of post-test on usual paper pencil method. Clay and Plastercine Academic Performance Test (CPAPT) was pilot tested and found to satisfy the content, face and construct validity by a lecturer, specialised in Test Measurement and Evaluation in the Faculty of Education, Obafemi Awolowo University Ile-Ife, a lecturer of Educational Technology with knowledge of Creative and Visual arts at Department of Educational technology University of Ilorin, Nigeria. In the same vein, items analysis of the study instrument was also carried out purposely to determine the facility and discrimination indices, after which the final items for the instrument were selected. For the reliability of the study instrument, the instruments were administered to twenty students that were out of the study, in another Junior Secondary School, in a town in South-west Nigeria. The reliability coefficient

using the split-half approach and the Richard Kuderson formula 21CKR-2. The value obtained for the reliability coefficient was 0.77 and this was considered to be quite adequate for this study. The data for testing the hypotheses were collected from the pre-test and post-test at level of the significance adopted for the analysis was $P \leq 0.05$. This level of significance formed the basis for accepting or rejecting each of the hypotheses.

Hypothesis Testing and Result

Hypothesis 1: There is no significant difference in the scores of students when they are taught with modelling instruction using Plastercine and Clay.

In order to find out if the mean difference between the groups is statistically significant, ANCOVA was carried out. This hypothesis was tested at 0.05 level of significance as made known in Table 1.

Table 1: ANCOVA result of the post-test mean scores of Plastercine Group 1, Clay Group 2, and the control group 3.

Source	Type III Sum of Squares	Df	Mean Square	F-value	P-value
Corrected Model	10.806[a]	2	5.403	.734	.489
Intercept	.358	1	.358	.049	.827
Covariance	10.734	1	10.734	1.459	.238
Treatment	2.701	1	2.701	.367	.550
Error	198.661	27	7.358		
Total	1736.00	30			
Corrected Total	209.467	29			

Table 1 shows Analysis of Covariance (ANCOVA) results of the post-test mean achievement scores of Clay group, Plastercine group and Control Group. The results yielded an F - Value of 1.562 and a P- value of .223. The result implies that there is no significant difference between post-test mean achievement scores of Clay group, Plastercine group and control group. Therefore, the null hypothesis is accepted. To ascertain the means scores, of Plastercine Group, Clay Group, and the Control group. The means scores of the groups are: Plastercine Group (10.93), Clay Group (11.63), and Control group (10.80). That is the clay group performed the best with the highest means of 11.63 followed by the plastercine with 10.93 and the clay group with 10.80. The summary of the means and standard deviation of the post-test of Plastercine group, Clay group and Control group are shown in Table 2 below.

Table 2 :

Mean scores and standard deviation of the post-test of Plastercine group, Clay group and Control group

Table 2

Variable	N	Mean(x)	SD
Plastercine Group	30	10.93	2.83
Clay Group	30	11.63	2.40
Conventional Group	30	10.80	1.03

Table 2 shows the mean scores and standard deviation of the plastercine group 1, clay group 2, and the control group. From the results, Experimental (Group 1) Plastercine Group (M = 10.93, SD = 2.38); Experimental (Group 2) Clay Group (M = 11.63, SD = 2.40) and Control Group (M = 10.80, SD = 1.03) respectively. However, the clay group has the highest means with 11.63, follow by the plastercine group with 10.93 and conventional group with 10.80.

Hypothesis 2: There is no significant difference between the scores of male and female students' exposed to modelling instruction using Plastercine.

To test this hypothesis 2, Analysis of Covariance (ANCOVA) statics was used, to compare the male and female students taught modelling using Plastercine**.** The hypotheses were tested at 0.05 level of significance as shown in Table 3.

Table 3: ANCOVA result of the post-test mean scores of male and female students taught Plastercine.

Table 3

Source	Type III Sum of Squares	Df	Mean Square	F-value	P-value
Corrected Model	12.247[a]	2	6.123	.973	.406
Intercept	.598	1	.598	.095	.763
Covariance	9.941	1	9.941	1.580	.233
Treatment	1.491	1	1.491	.237	.635
Error	75.486	12	6.291	.973	.406
Total	652.000	15			
Corrected Total	87.733	14			

Table 3 shows Analysis of Covariance (ANCOVA) results of the post-test mean achievement scores of male and female students and the calculated F value of .237 is not significant because the significant value of .635 is greater than 0.05 alpha levels. The result implies that there is no significant difference between post-test mean scores of the male and female when they were exposed to Clay and Plastercine. That is, male students' scores did not differ significantly from the female students scores when both were taught using Clay and Plastercine. Therefore, the null hypothesis is not rejected. This means that there was no significant difference in the performances of male and female students taught with plastercine. However, comparing the means scores, female students with plastercine (12.60) performed slightly better than male students (10.67). The means and standard deviation of the post-test of male and female students taught modelling using plastercine shows in Table 4 below Table 4: Mean scores and standard deviation of the post test of male and female students taught modelling using plastercine

Table 4

Variable	N	Mean (x)	SD
Male students taught modelling with plastercine	15	10.67	1.88
Female students taught modelling with plastercine	15	12.60	2.53

Table 4 shows the mean and the standard deviation of male and female students taught with Plastercine. The mean of the male is 10.67 with standard deviation 1.88 while that of the female mean is 12.80 with standard deviation of 2.53. The female has the highest means of 12.60 over the male of 10.67.

Hypothesis 3: There is no significant difference between the scores of male and female students' when they are exposed to modelling instruction using Clay.

To test this hypothesis, Analysis of covariance (ANCOVA) statics was used, to compare the male and female students taught modelling using Clay**.** The hypothesis was tested at 0.05 level of significance as shown in Table 5. Table 5 ANCOVA comparison of the post test mean scores of male and female students taught modelling using Clay

Source	Type III Sum of Squares	Df	Mean Square	F-value	P-value
Corrected Model	5.093[a]	2	2.546	.370	.699
Intercept	8.925	1	8.925	1.296	.277
Covariance	2.842	1	2.842	.413	.533
Treatment	2.787	1	2.787	.405	.537
Error	82.640	12	6.887	.370	.406
Total	652.000	15			
Corrected total	87.733	14			

Table 5 indicates that the calculated F value of .405 is not significant because the significant value of .537 is greater than 0.05 alpha levels. The result implies that there is no significant difference between post-test mean scores of the male and female when they were exposed to Clay and Plastercine. That is, male students' scores did not differ significantly from the female students' scores when both were taught using Clay and Plastercine. Therefore, the null hypothesis is accepted. To ascertain where the significant different lies the means scores, of females students with clay (10.67) performed slightly better than male students (10.47). The summary of the Mean and standard deviation of the post-test mean scores of male and female students taught with clay shows in Table 6 below.Table 6: Mean and standard deviation of the post-test mean scores of male and female students taught with clay.

Variable	N	Mean(x)	SD
Male taught modelling with clay	15	10.47	3.02
Female taught modelling with clay	15	10.67	1.88

Table 6 shows the mean and Standard deviation of male female students taught with clay. The mean of the male is 10.47 with standard deviation 3.02 while that of the female mean is 10.67 with the standard deviation 1.88 respectively. However, the female has the highest means of 10.67 while male means was 10.47.

Discussion of the findings

Based on the findings, the hypothesis 1 shows the analysis of covariance (ANCOVA) on the performances of students taught using Clay, Plastercine as the control group. It has no significant differences and reflected in Table 1. Also, the result of analysis of covariance (ANCOVA) on the performances of male and female students' taught using Plastercine in hypothesis 2, with reference to Table 3 indicated no significant differences. In the same vein, the analysis of covariance on the performances of male and female students taught using Clay in table 5 with reference to hypothesis 3 indicated no significant difference. Therefore, the above reports favoured the finding of Antonishen, (2011) whose study revealed that the clay modelling has significantly improve in the achievement and value regardless of the learners. This finding also is in agreement with the findings of Ambose and Cheong, (2011) who submitted that students taught modelling with any malleable substances performed better and showed a significant improvement in the academic thus rendering learning positive. The findings corroborates with Abdullah, Muda and Samad (2008) whose finding established that clay modelling enhances and improves learning among the learners. Also, the result of this study conforms to the findings of GÜNEŞ and Handan (2010) who findings revealed that the modelling topics taught using Clay and Plastercine with theoretical and practical demonstrations are better retained in learners memory in comparing with others taught using other modelling instruction devices alone. Also, the researches on 3 Dimensional modelling with clay and plastercine confirmed the gains in training of the learners and bring out positive in the achievement of learners (Zuhal Ünan, 2015). In conclusion, the study revealed that although the supportive educational devices improve greatly the success level of the students and the utilisation of such supportive educational tools was more effective in practical oriented classes than other technology devices in teaching and learning alone. Also, it has been established that using Clay and Plastercine can improve students' retention in learning practical skills, increase students' motivation to theoretical works and successful level in modelling of both creativity oriented subjects like creative and visual arts as well as science and technology. In the same vein, it can be deduced that the use of Clay and Plastercine for different modelling enhances and promotes effective instructional delivery in respect of gender in the junior secondary schools. However, if Clay and Plastercine modelling can be utilised well and it can be useful to teach modelling and other related practical topics on junior secondary school curriculum within the Nigerian school content.

Conclusion

The result of the study brought about the following;

- The effect of using the Clay and Plastercine is positive and more effective in teaching modelling than the conventional method.
- The Clay and Plastercine has given both the male and female learners the privilege to learn at their own pace especially on the wheel.

- It was obvious from this study that the groups taught modelling with Clay and Plastercine performed significantly higher than those taught with conventional method.
- Gender was not a factor because it could not have annul the positive effect of the use Clay and Plastercine modelling as to bridge the gap of both male and female students.

Recommendations

Based on the outcome of this study, the following recommendations are made:-

- Creative arts teachers should endeavour to use Clay and Plastercine in presenting creative modelling lessons in Junior Secondary Schools classes.
- Nigerian public schools should be equipped with necessary modelling tools on clay and plastercine to facilitates easy modelling of creative objects and promote the potentials of modelling among the scholars.

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