



**EFFICACY OF MULTIMEDIA
ELEMENTS ON STUDENTS'
ABILITIES IN CREATIVE ARTS
IN ANDONI EDUCATION**

ZONE, RIVERS STATE, NIGERIA

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Abstract

This study investigated the efficacy of multimedia elements on students' abilities based on interest and performance in Creative Arts within Andoni education zone, Rivers State. Quasi-experimental research design was adopted in this study. The population for the study was 1,183 students in the 13 public Junior Secondary Schools two JSSII in Andoni education zone. Purposive sampling was used to sample two schools. 183 JSSII students from the two sampled schools participated in the study. Creative Arts Interest Inventory (CAII), Creative Arts Performance Test (CAPT) and Students' Ability Test (SAT) were developed by the researchers and used for data collection. CAPT and SAT reliability was computed using Kuder-Richardson (K-R20) reliability method and a reliability index 0.73 and 0.83 was obtained for CAPT and SAT respectively. The internal consistency of CAPT and CAII was tested using Pearson Product moment correlation

coefficient and $r=0.72$ and 0.87 were obtained for CAPT and CAII respectively. Treatment for the two experimental groups were text-audio instruction for group 1 and audio-video instruction for group 2, the two groups serves as control to each

Keywords: Students'
Abilities, interest,
performance,
Multimedia Elements.

other. Mean, Standard Deviation were used to answer research questions while ANCOVA was used to test the hypotheses at 0.05 level of significance. The study revealed that high ability students (mean gain= 29.52) outperformed their low ability (mean gain=24.38) in the two groups. Therefore, the researchers recommends that when using multimedia approach, students' ability should not demine the type of multimedia to adopt.

Introduction

Teaching is a multimedia venture, hence teachers speak loud, draw images, and write on the board to enhance students' learning. The presentation of synchronized audio, text and images to facilitate effective instruction is regarded as multimedia approach, what has changed overtime is the evolving technologies available for information delivery (Mbaba, et al., 2020). This understanding erased the contestation on whether Multimedia should be used in the context of education (Li, & Petersen (2022). A lot of studies were done to ascertain and to determine the justification for multimedia usage in schools as there are several multimedia devices in use for information delivery, but teachers are skeptical on how effective it can be applied in the

classroom. For example, video based instructions has been introduced in classroom lesson presentation in schools for decades (Obagah & Prisibe, 2017). Yet not many countries in Africa have fully adopted its usage, not to talk about the supply of the required devices for its use in schools. As a result, information on the use of multimedia in schools has been sketchy and thus the call for more studies that may support and convince stakeholders on way forward in multimedia usage. Very many people sees multimedia as mere devices, hence many studies has been focused on test of the devices and its effectiveness in teaching and learning and very little is said about the component or elements of multimedia. But, the elements of multimedia determine the effectiveness of a device, hence the need to test the efficacy of the elements of multimedia in lesson delivery.

Statement of the Problem

The challenge of improving the performance of students across subject areas have been additional task of teachers' overtime. As a result the use of different technologically driven approach have been adopted for the teaching of many subjects. Technology on its own is a welcome development to teachers but do all the technology driven approaches show same efficacy when used to teach every subjects? Equally, there seems to be a gap in the performance of low and high ability students in CCA, though different researchers recognized the place of learning ability as a determining factor in projecting the extent a students could perform academically. But, with the use of Multimedia element such as text-audio or audio-video instruction packages, it is not certain what should be the efficacy of these packages on students with high or low learning abilities. Will the low ability learners performed better than the high ability learners? or will the use of text-audio or audio-video packages make a significant difference in the performance of the respective students' abilities? These issues prompt the need for this study.

Purpose of the study: This study seek to determine the:

1. efficacy of multimedia elements (text-audio and audio-video) on students' abilities based on performance;
2. efficacy of multimedia elements on the interest of students with high and low abilities.

Research Questions: The following questions were used to direct this study

1. What is the efficacy of multimedia elements (text-audio and audio-video) on students' abilities based on performance?
2. What is the efficacy of multimedia elements on the interest of students with high and low abilities?

Hypotheses: the following hypotheses were formulated to guide the study

Ho₁: No substantial difference in the efficacy of multimedia elements on performance of students based on abilities.

Ho₂: No significant difference in the interest scores of students with low and high ability taught Creative Arts with multimedia elements

Literature Review

Multimedia can be seen and defined in two major ways; one as a deliberate combination of several media such as text, audio, video, animation, graphics and others to facilitate information delivery

(Babiker, 2015). It is defined as an integration of multiple media elements (audio, video, graphics, text, animation, etc.) into one whole for the purpose of creating more advantages to both teachers and learners than when one media element is introduced (Slipa, & Sunta, 2016; Wardii, 2018). In the second approach of this definition; Multimedia is seen as the use of computer to present and combine text, graphics, audio and video with links and tools that allow the user navigate, interact, create and communicate effectively (Hastic, Ward, & Boruk, 2016). Multimedia is the combination of various digital media, into cohesive interactive presentation to deliver a message to an audience through the computer. Mayer, (2001) noted that an “instructional delivery involving the use of VCD/DVD, Power point or 16mm film, for example, is a Multimedia presentation”(p. 44).

From the earlier definition as stated above, Multimedia involves the use of interactive elements such as graphics, text, video, sound and animation that are harmonized and used in lessons delivery (Hsu, Huang, & Hsiebi 2014). While the later lay emphasis on the use of communication media and devices. Thus, what makes multimedia is the combination of the interactive elements such as text, video, sound/audio, graphics/pictures/ charts and animation and others, where text gives written information, video provides still and motion visuals, graphics/pictures presents still visuals and animation is used to demonstrate or illustrate a concepts usually organized and presented through VCD, DVD or multimedia projector (Hastic, et al., 2016). Therefore, for this study emphasis is laid on the use of interactive elements hence it is these interactive elements that is being converged and delivered to learners through multimedia devices.

The use of multimedia elements in teaching and learning is aimed at improving students' academic performance. Though, students' performance being low or high can be predictable as natural phenomena in schools (Mbaba, & Jimoh, 2022). Andresen, and Brink, (2013) affirmed that multimedia elements can be used to foster the learning of subject matters and cross-curricular topics; hence multimedia possesses the ability to provide feedback tailored to the needs of students. Multimedia is an instrument that improves teaching and learning as it supports teachers lesson preparation and presentation, it enhances students learning at their pace because it support information delivery through convincing approach and perfect assessment tools (Akinoso, 2018; Pervitha et al., 2018; Shakll, et al., 2020).

Cognitive ability on the other hand, involves perception, logical thinking, reasoning, memory, language and problem-solving ability that allows people to analyze, evaluate, think abstractly and occasionally challenge the information that are given by teachers, parents, peers and the media (Brock et al., 2016). Artistic ability is the skills and talent to create fine works of art such as painting, drawing, sculpture, graphics, music and others. There are advantages associated with the identification and grouping of students' ability, these benefits differs based on the form of ability grouping employed (Bygren, 2016).

Ability grouping is the practice of dividing students for instruction on the basis of their perceived capacities or skills peers for learning. Lots of investigations have been done for years to determine the efficacy of ability grouping on learners (Steenbergen-Hu et al., 2016). Yet the questions arising from its usage remain unaddressed as the outcomes of studies were not consistent (Hastc, et al., 2016). Thus, does ability influence students' interest and performance when multimedia elements such as text-audio and audio-video are deployed in teaching? This question triggered this study.

More so, interest can be seen as feeling or emotion that direct where and what attention should be concentrated (Mbaba, et al., 2018). Interest in learning can be individual interest, situational interest and interest induced by psychology state. Interest have a significant role in learning and

it's critical in the progress of individual cognitive ability. Xiang, et al., (2005) reported that interest emerged as the most important intrinsic motivation construct for predicting future intention. Therefore, students' interest in a topic or subject becomes part of the determinant factor in ensuring effective learning (Mbaba, et al., 2022). But, in this study it is not clear if the use of multimedia elements in teaching could make a significant difference in driving students' interest in learning, hence the need for this study.

Research Design/ Methods

Quasi-experimental research design with pretest and posttest was adopted in this study. There were no control group hence the two groups serves as control to each other. The population of the study was made up of 13 Junior Secondary Schools in Andoni education zone with 1,183 JSSII students. Purposive sampling was used to sample two Junior Secondary schools out of the 13 schools. The sampled Junior Secondary schools are Government Junior Secondary School Asarama and Community Junior Secondary School Uyenada, Andoni LGA, Rivers State. The two secondary schools met the set conditions such as availability of multimedia projector, generator, CCA teacher(s) and having conducive and technology friendly classrooms. All students in JSS II in the two schools were involved in the study. Each of the two schools were assigned a group, hence GJSS Asarama was assigned Text-Audio (Group 1) and CJSS Uyenada assigned Audio-Video (Group 2). The two groups have 97 and 83 students respectively. There were two sets of students in each group, text-audio had 63 low ability and 34 high ability, while Audio-Video had 58 low ability and 28 high ability. CAPT and CAII was administered to all 183 students in the two schools as pretest, CAPT and CAII were reshuffled and re administer after six weeks of treatment as posttest. Students 'Ability Test was used to determine the ability level of the students in both groups, it was administered once before the experiment and marked over 100%, students who scored 60% and above were regarded as high ability students while those that scored 40% and below are rated low ability.

Preparation of the Instrument

The treatment instruments comprises of multimedia element (text-audio) instruction and audio-video instruction. The packages were developed by the researchers from JSSII CA syllabus. The multimedia packages have introduction, content, conclusion and assessment questions for each lesson. There were three units that were subdivided into two topics each in the packages. The digital text-audio was projected through the multimedia projector to group 1. Multimedia digital audio-video were also designed in line with the same units and topics for experiment group 2 and presented in the classroom using multimedia projector. These multimedia packages were designed with the assistance of professionals and specialist including digital video camera operator, researchers (instructional designer) and a system programmer. The instructional designer ensured that the packages reflect the objectives of each topics. The topics covered were: colour and colour mixing, art design, pattern making, making of greeting cards and principles of tie and dye (textile design) theory and practical.

The instruments that were used for collecting data in this study were Creative Arts Performance Test (CAPT), Creative Arts Interest Inventory (CAII) and Students' Ability Test (SAT). Developed by the researchers in line with JSSII syllabus CAPT comprises of forty (40) multiple choice items selected from JSSII syllabus. Creative Art Interest Inventory (CAII) is a 15-items interest scale on

Cultural and Creative Arts developed by the researchers. It has a four point response scale of strongly agreed = 4, agreed = 3, disagreed = 2 and strongly disagreed = 1. The respondents were to indicate their degree of agreement or disagreement on a number of statements, positive and negative alike on Cultural and Creative Arts in general. Students' Ability Test (SAT) instrument was also developed to determine students' ability in painting, drawing and creative skills etc. Thus the test comprises of twenty (20) sub objectives questions to answer all. SAT is scored over 100% and students that scored 60 and above were rated high ability while those that scored from 40 and below were rated low ability.

Validity of the Instrument

Face validity was given to Cultural and Creative Art Interest Inventory (CCAI), Creative Arts Performance Test (CAPT) and Students Ability Test (SAT) by experts in Cultural and Creative Art and specialist of Educational Technology from the Department of Arts Education University of Nigeria Nsukka and one Cultural and Creative Arts teacher from Government Junior Secondary School, Ngo Andoni LGA, Rivers State. These specialists determined the suitability of the instructional packages in the area of clarity, simplicity and the coverage of the contents. **Reliability of the Instrument**

CAPT, CAI and SAT were tested at Government Junior Secondary School Ngo in Andoni LGA. GJSS Ngo was chosen because it was not part of the schools for the study. The reliability of CAPT was computed using Kuder-Richardson (K-R20) reliability method which yielded a reliability index of 0.73, Kuder-Richardson (K-R20) was used because the items were scored dichotomously. Creative Arts Interest Inventory (CAI) internal consistency was ascertained using the Cronbach Alpha Statistic which yielded a reliability index of 0.80. The Cronbach Alpha Statistic was used because the items were polychotomously scored. The reliability of Students' Ability Test (SAT) was computed using Kuder-Richardson (K-R20). It was used because the items were scored dichotomously. The reliability index of 0.83 was established for SAT. The test of stability for both CAPT and CAI were computed using test-retest method. Pearson Product Moment correlation coefficient was applied and the coefficients for CAPT and CAI were 0.72 and 0.87 respectively, the high reliability indexes for the instruments indicated that they are reliable.

Experimental Procedure

CAI and CAPT were used as pre-test, the items on the CAI and CAPT were reshuffled and used as post-test. SAT was also administered to the two groups to determine students' ability (low or high ability). The result of SAT was used to determine the ability of students as high or low (students that scored 60 and above were rated high while 40 and below rated low ability). Treatment was administered to the students in the both groups for six weeks. Group 1 treated with Text-Audio instruction presented in the classroom through multimedia projector and Group 2 had Audio- Video Instruction also presented to the second class through multimedia projector. Both packages are in videos, but the significant difference was that group 1 had text – audio, which means they can only hear the voice of the teacher and see the text displayed on the screen only. While group 2 were exposed to audio-video instruction, which means they heard the teacher and see the practical presentations but without text messages. In summary both groups had audio elements while text and video were assigned to group 1 and 2 respectively. The practical activities were also supervised and marked by the classroom teachers of the schools.

Data Analysis

The data collected from the study were analyzed using Mean, Standard Deviation and ANCOVA. Analysis of Covariance (ANCOVA) with pre-test as a covariate was used to test the hypotheses formulated for the study at 0.05 level of significance.

Results

RQ 1 What is the efficacy of multimedia elements (text-audio and audio-video) on students' abilities based on performance?

Table 1: Influence of Multimedia Elements, Ability Level and Students' Performance

Multimedia	Pretest		Posttest		Mean Gain		
						Ability Level	N
Text Audio							
Low	63	31.44	8.89	52.12	7.55	20.68	
High	34	31.28	8.37	55.34	8.29	24.06	
Audio-Video							
Low	58	31.30	8.19	59.72	9.22	28.42	
High	28	33.46	10.82	69.61	6.79	36.15	

Table 1 above showed pretest mean score for text-audio group: Low ability $m=31.44$ $SD=8.89$ and post-test mean $=52.12$ $SD=7.55$ and a mean gain of 20.68. High ability students in the same group had pre-test mean $=31.28$ $SD=8.37$ with a post-test mean $=55.34$ $SD=8.29$ and a mean gain of 24.06. The low ability students in the audio-video group had a pretest mean score $=31.30$, $SD=8.19$ with posttest mean $m=59.72$, SD of 9.22 and mean gain of 28.42. High ability counterparts in the same group had pretest-test mean scores $=33.46$ $SD=10.82$ and posttest mean scores $m=69.61$, $SD=6.79$, and mean gain $=36.15$. The differences in the mean gains are large. Since high ability students outperformed their low ability counterparts in the two groups out rightly, it indicates that multimedia elements does not influence ability rather students' abilities influences performance in Creative Arts. Hence the high abilities performed better than their counterparts in the two groups.

RQ 2: What is the efficacy of multimedia elements on the interest of students with high and low ability?

Table 2: Mean Interest Scores and Standard Deviation of low and high ability Students

Ability	N	Pretest		Posttest		Mean Gain
		Mean	SD	Mean	SD	
Low Ability	121	25.32	3.06	41.77	6.64	16.45
High Ability	62	26.35	4.80	42.71	7.57	16.36

Tables 2 shows the pretest and posttest mean interest scores and standard deviations of students with low and high abilities taught Creative Arts. The pretest interest mean score of low ability students is 25.32 with SD of 3.06 while that of the high ability students is 26.35 with $SD=4.80$. The posttest mean interest score of low ability students is 41.77 with $SD=6.64$ and the posttest mean interest score of high ability is 42.71 with $SD=7.57$. The low ability students had a mean gain of 16.45 while high ability students had a mean gain of 16.36. The result shows that the interest of the low ability students improved slightly than their high ability counterparts.

Ho: No substantial difference in the efficacy of multimedia elements on performance of students based on abilities.

Table 3: Summary of ANCOVA for mean performance Scores of Students taught CCA Multimedia Text-Audio and Audio-Video

Source	Type III Sum of Squares	Df	Mean Square	F	Sig.	Decision
Corrected Model	6741.810^a	8	842.726	12.734	.000	S
Intercept	39611.865	1	39611.865	598.563	.000	
Pretest	144.957	1	144.957	2.190	.141	
Ability	1504.959	1	1504.959	22.741	.000	
Error	11515.026	174	66.178			
Total	629723.040	183				
Corrected Total	18256.837	182				

a. R Squared = .369 (Adjusted R Squared = .340)

S – Significant ($p < 0.05$)

Table 3 shows the value of F for ability level as **22.741**. This value is significant at **0.000**. Since this significant level is less than 0.05 level of significance, the hypothesis is rejected. Hence, there is a significant difference in the mean performance scores of students with low and high abilities taught Creative Arts in junior secondary schools in favour of high ability.

Ho: No significant difference in the interest scores of students with low and high ability levels taught Creative Arts with multimedia elements.

Table4: Summary of ANCOVA for Mean Interest Scores of Students taught CCA with Multimedia elements Text-Audio and Audio-Video

Source	Type III Sum of Squares	Df	Mean Square	F	Sig.	Decision
Corrected Model	1469.635^a	8	183.704	4.342	.000	
Intercept	6895.825	1	6895.825	163.005	.000	
Pretest	18.561	1	18.561	.439	.509	
Ability	55.526	1	55.526	1.313	.254	NS
Error	7360.966	174	42.304			
Total	332988.000	183				
Corrected Total	8830.601	182				

a. R Squared = .166 (Adjusted R Squared = .128)

NS – Not Significant ($p > 0.05$)

Table4 shows that F-value for ability level is **1.313** and has a probability value of **0.254**. This probability value is greater than 0.05 level of significance; as a result, the null hypothesis is not

rejected. Therefore, there is no significant difference between the mean interest scores of students with low and high ability students across text-audio and audio-video group who were taught Creative Arts in junior secondary schools. Though slightly high interest was observed in favour of low ability, but it was not significant hence there was no interest difference among learners (Mbaba, et al., 2018).

Discussions

This study revealed that multimedia does not necessarily influence students' performance rather students' abilities do. As there was a significant difference in the mean performance scores of students with low and high abilities taught Creative Arts with text-audio and audio-video in favour of high ability. This finding was in congruence with that of Wardii, (2018) and Chen, (2014) whose investigations in students' ability grouping and their competence, showed that students with high ability engaged better in problem – solving than low ability students. There is a significant influence of multimedia package and ability level on the performance of students in Creative Arts. This is observable from the high performance of high ability students in text-audio and audio-video groups against the low ability students in both groups.

The finding of this study shows that the low ability students' interest improved slightly more than the high ability students' interest, though not significant. The implication of this finding is that the use of multimedia element text-audio or audio-video does not influence students' interest based on their abilities, hence there was no significant difference in their interest. This finding supports Abubakar, (2020) whose study on ability grouping came to the conclusion that interest of pupils were not influenced by the grouping. This is because students' interest could be influenced by psychological situation and such influenced is not determine by ability.

Conclusion

This study have revealed that ability level does influence academic performance when multimedia elements such as text-audio and audio-video instruction are used. The study also showed that multimedia element could not influence students' interest in CCA. Hence CCA is a practical lessons in most cases, using audio-video instruction could not introduce anything new, more than when the practical are done in real time, hence no influence was observed.

Recommendations

The researchers made the following recommendations based on the results of the study.

1. In using multimedia elements or approach for teaching, students' ability should not determine the type of multimedia to adopt
2. Teachers should encourage the use of Audio-video instruction as a supportive approach to classroom instruction.
3. The different topics in CCA should be developed using different multimedia elements to enable students use the mode or package they prefer.

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