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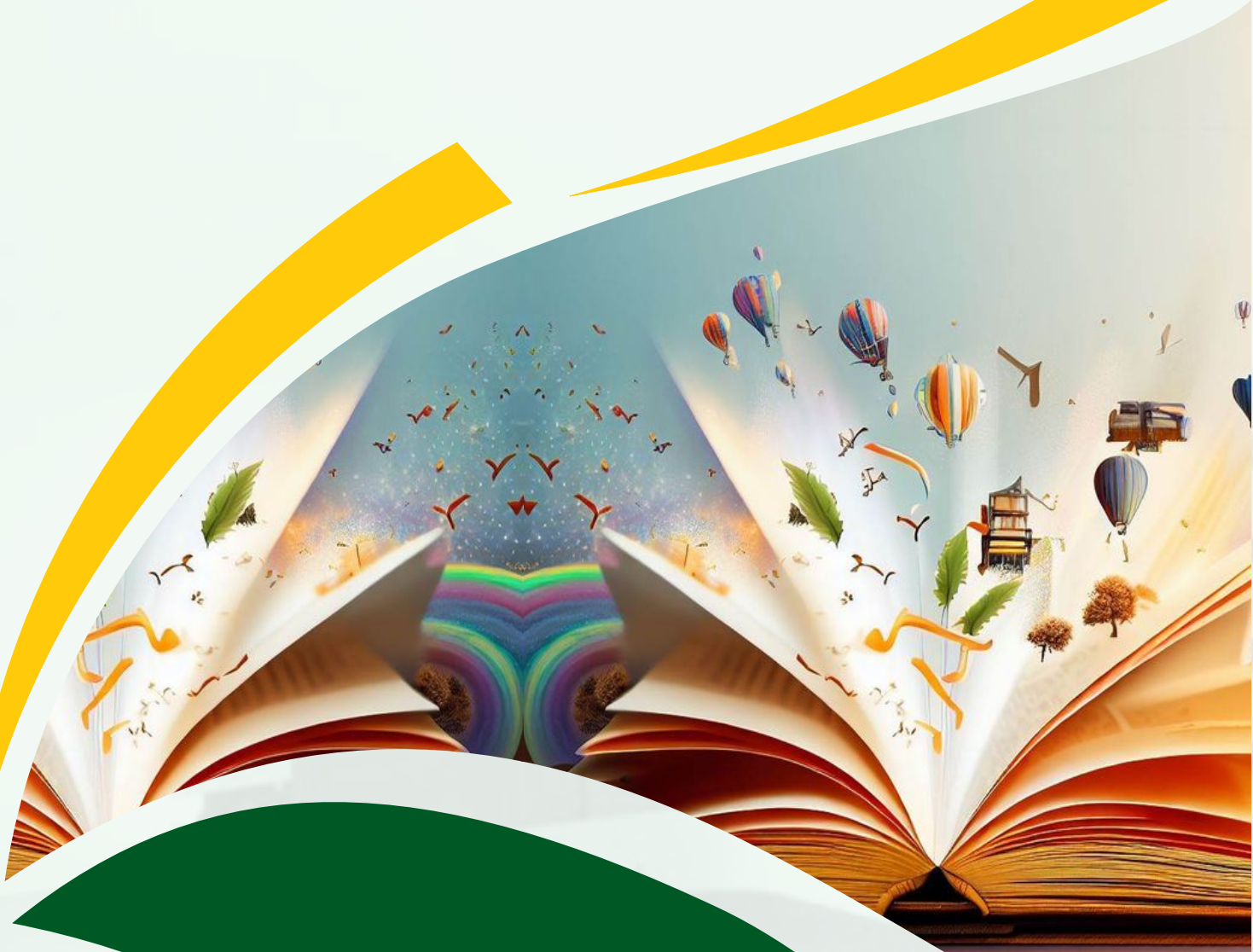

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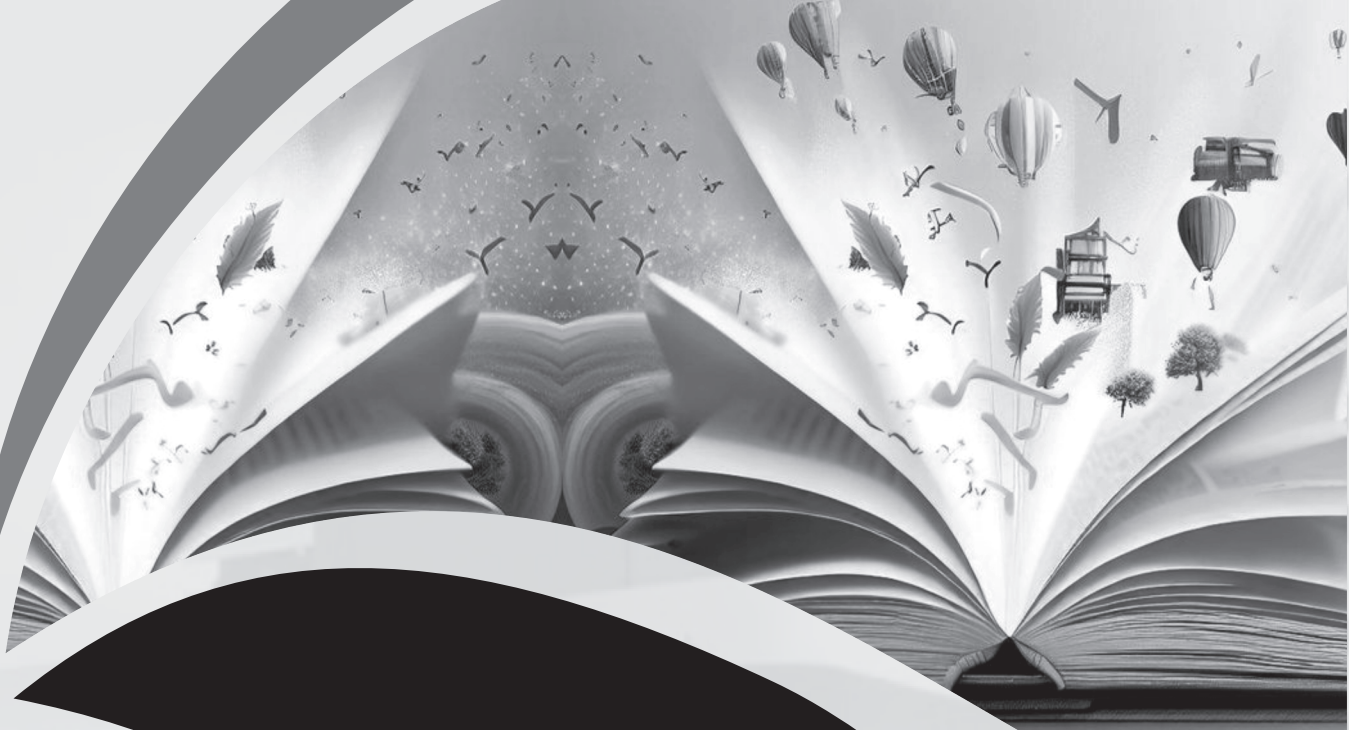

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EFFECTS OF AUDIO-VISUAL INSTRUCTIONAL MATERIALS ON STUDENTS' ACADEMIC PERFORMANCE IN MATHEMATICS IN OGBOMOSO SOUTH LOCAL GOVERNMENT AREA OF OYO STATE, NIGERIA

OLATUNJI OLUSUJI
Osun State College of Education, Ilesa

Abstract
The study determined the effect of application of audio-visual instructional materials in the teaching of Mathematics in Ogbomoso South Local Government Area of Oyo State, Nigeria. It also determined if sex has interaction effect on the effect of instructional materials on students' academic performance in Mathematics in senior secondary schools in the study area. The study adopted pretest, posttest, control non-equivalent group quasi experimental research design. One hundred and fifty students were sampled for the study using multistage sampling procedure. The sample was group into experimental and control group. Those in the experimental group were exposed to the instructional materials while the control was taught using the traditional method. Mathematics Achievement Test, a standardized past WASSCE past question was used for data gathering. Analysis of data showed that there is no significant difference in the academic performance of students exposed to audio visual instructional materials and those that were not ($F_{(1,149)} = 1.947$; $p = 0.165$). Also, sex has no interaction effect on the effect of instructional materials on academic performance in Mathematics in the study area (($F_{(1,149)} = 0.941$; $p = 0.334$; $\eta = 0.06$). the study concluded that audio visual instructional materials did not significantly influenceacademic performance in Mathematics in Ogbomoso South Local Government Area.

Keywords: Academic, performance, Audio-visual, Instructional Materials, Students

Introduction:

The poor academic performance of students particularly in secondary schools has been traced to several factors. These factors include teachers' methodology of teaching, inadequate instructional materials, large class teaching, dilapidated infrastructure, inadequate qualified teachers, poor attitude of students, teachers' attitude and commitment among others. The poor academic performance has resulted into high dropout rates among students (Akintitan, 2021). These dropouts constituted a menace to national developments. These students are readily available in the hand of unscrupulous politicians to foment troubles and disrupt public peace. They engage in nefarious activities such as gangsterism, prostitution, robbery, smoking, internet fraudster and so on.

Teachers' quality determines the quality of education in a country. Teachers' quality can be determined by teachers' academic qualifications, effectiveness in classroom management, mastery of subject matter and ability to integrate appropriate instructional materials to classroom instructions. Teaching without instructional material can be compared to cooking without salt. Instructional materials are essential for effective instructional delivery.

Instructional materials according to Asogwa et al (2021) are materials or tools locally made or imported that could make tremendous enhancement of lesson impact if intelligently used. Wang et al (2021)define instructional materials as any materials that are intended to provide learning opportunities for students which include curricula and supplemental materials that are recommended, or provided by districts or schools and materials that teachers locate or create themselves .It was described by Farhang (2023) as resources or materials use by teachers during presentation of lessons so as to enhance students' understanding of concepts that appears abstract and making it real.Agina-obu (2005) in Asogwa et al (2021) define instructional materials as concrete or physical objects which provide sound, visual or both to the sense organs during teaching. Asogwa et al (2021) noted that instructional materials facilitate learning of abstract concepts by helping to concretize ideas

and stimulate learners' imagination. Instructional materials are highly essential effective in making abstract concepts realto the students and therefore makes achieving objectives of classroom instructions realisable.

Nwagba et al (2021) emphasized application of instructional materials in classroom instruction. Some of the benefits of integrating appropriate instructional materials as identified by Nwagba et al (2021), Ibe et al (2021) and Azubuike (2025) include better academic performance of students, improved students' attitude to learning, enhanced effective classroom management and better students' engagement. It is therefore pertinent that appropriate instructional materials are employed in classroom instructions. Instructional materials when not effectively introduced could serve as distraction to the students. What is supposed to aid students' learning outcomes could produce negative effects on the students if the right instructional material is not identified and if not appropriately introduced.

Instructional materials can be categorized into visual, audio and audio-visual. It can also be categorized as electronics or non-electronics. Audio visual instructional materials can also be presented in the form of multimedia or hypermedia. Multimedia involves the use of two or more media of communication such as text, pictures, video, animations and so on. Hypermedia involves linking several media to one another. This study investigated the effect of electronic audio-visual materials on students' academic performance in Mathematics.

Mathematics is an elite subject that students perceived as abstract. High failure rate is always recorded among the students in external examinations like the examination organized by West African Senior Secondary School Certificate Examinations (WASSCE) and National Examinations Council (NECO). The poor academic performance in the subject is traceable to the traditional talk and chalk method of teaching, inadequate use of instructional materials among others. Considering the role of Mathematics in students' securing admission to higher institutions of learning in Nigeria, all hands must be on deck in ensuring that appropriate audio-visual instructional be identified to aid students' academic performance in the subject.

Students' performance in Mathematics remains poor in external examinations in Nigeria. Less than 30% of students have consistently been recording credit pass in the subject in the last five years and also the students' performance in quadratic equation is generally poor (Babatunde, 2023; WAEC Examiner's Report, 2023). Effective use of Audio-visual material is opined could help in enhancing students' attitude towards the subject and hence enhance the students' academic performance in the subject.

Study conducted by Agah et al (2024) showed that application of audio-visual materials significantly supports the academic performance of senior secondary school studentsin Yola Education Zone, Adamawa State. The results also showed that there is no significant difference in academic performance occurs between boys and girls when the audio-visual materials were used. The study conducted by Ngozi et al (2022) on the application of audio visual resources in teaching geometry in primary schools in Owerri Municipal Council Area of Imo State showed that pupils taught with audiovisual aided instruction performed better than those taught with conventional method. The mean performance scores of both male and female pupils improved significantly by the use of the audio-visual resources aided instruction. The study recommended that mathematics teachers at the primary school level should apply audio visual resources in teaching mathematics especially in geometry as it enhances pupil's performance . The study determined if similar effect can be produced in the teaching of quadratic equation in Osogbo South Local Government Area of Oyo State.

There are arguments for and against the influence of sex on effect of technology on students' learning outcomes. Oyeniran and Oteyola (2023) in their study found that sex has no significant influence on the effect of computer-based simulations as well as video instructional packages on students' academic performance in Physics, Oteyola and Idowu (2014) posited that sex has no significant interaction effect on the influence of intelligent tutoring systems on students' attitude towards Physics, Oteyola et al (2015) also reported that sex as no influence on the effect of smart learning environment on students' academic performance in Mathematics.

It is therefore not out of place to ascertain if application of audio-visual materials in the teaching of Mathematics will follow the same trend.

Statement of the Problem

Students' academic performance in both Mathematics and English language in public secondary schools in Ogbomoso South Local Government of Osun State has been generally poor. The use of non-electronics and visual instructional materials in the form of charts, realia and diorama can be observed in some schools although these materials are usually inadequate. Integrating audio-visual elements in teaching Mathematics has not been practicable due to epileptic supply of electricity and non-availability ofcomputer, television or other play-in devices that can be used for audio-visual medium. This study therefore investigated the effects of audio-visual instructional materials in the teaching of Mathematics in the local government area. This is to ascertain if the efforts put into organising the equipment despite the constraints worth its application in teaching Mathematics in secondary schools in the local government area.

Purpose of the Study

The study aims at investigating effect of audio-visual materials on students' academic performance in Mathematics in senior secondary schools in Ogbomoso South Local Government Area of Oyo State. The specific objectives of the study are to:

(i) determine the effect of audio-visual instructional materials on secondary school students' academic performance in Mathematics in Ogbomoso South Local Government Area, Oyo State, Nigeria

(ii) assess if students' sex has interaction effect on the effect of audio-visual instructional materials on academic performance in senior secondary schools in Ogbomoso South Local Government Area.

Hypotheses

Two null hypotheses were formulated for the study

H_o1: There is no significant difference in the academic performance of students exposed to the audio-visual instructional materials and those taught using the talk and chalk method in Mathematics in Ogbomoso South Local Government Area of Oyo State:

H_o2: Sex has no interaction effect on the effect of audio-visual instructional on students' academic performance in the study area

Methodology

The study adopted the pretest, posttest, control non-equivalent group quasi-experimental research design. The population of the study comprised all senior secondary school students in Ogbomoso South Local Government Area of Osun State, Nigeria. One hundred and fifty students were selected from all the public secondary schools in the local government area using multistage sampling procedure. Two schools were purposively selected from all the public secondary schools in the study area. Two schools with access to electricity and that are relatively far from each other were selected. This is necessary to minimize interaction between students in the two schools. The schools were randomly assigned to experimental and control group by tossing a coin: The school that picked head was assigned to the experimental group while the tail was for the control. All the students that were willing to participate in the study from the selected schools were the sample. Mathematics performance Test (MAT) was used for data gathering. Fifty questions were selected from past WASSCE question papers across five years (2017 - 2022). The question selected were related to quadratic equation. The items were validated by three secondary school teachers. Lecturers in Department of Educational Technology and Library Studies, Obafemi Awolowo University, Ile Ife also appraise the suitability of the instrument for the study. Item Difficulty Index of the items in MAT were conducted. Items with IDI greater than 0.30 were removed from the instrument. Twenty items were randomly selected from the remaining 37 items. Since the items were selected from standardized

past WASSCE question paper, the reliability of the instrument was not determined. Participants consent was sought and they were not coerced. Students in the control group were taught quadratic equation using the conventional method while the same topic was taught in the experimental group using audio-visual instructional materials. The experiment lasted four weeks. Purpose of the experiment was explained to participant in the first week and personal identification number (PIN) was given to participants. They were to make use of the number during the pretest and posttest. Pretest was also conducted as part of the activities in the first week. Participants were taught the broad topic of quadratic equation using the respective modes (talk and chalk method for the control and audio-visual instructional materials for experimental) in the second week and the third week. Posttest was conducted in the fourth week. The results were collated and analyzed using analysis of covariant (ANCOVA) and 2-way analysis of variance (ANOVA).

Results

$H_0$1: There is no significant difference in the academic performance of students exposed to the audio-visual instructional materials and those taught using the talk and chalk method in Mathematics in Ogbomoso South Local Government Area of Oyo State

$H_0$1 was formulated to achieve objective (i) of the study. Seventy-two students were in the experimental group while 78 were in the control. Analysis of Covariance (ANCOVA) was adopted in data analysis because the groups are non-equivalent. The hypothesis was tested at p = 0.05.

Table 1: ANCOVA of the difference in academic performance of students exposed to the audio-visual instructional materials and those that were not.

Dependent Variable: Posttest

Source	Type III Sum of Squares	df	Mean Square	F	Sig.
Corrected Model	195.881[a]	2	97.941	22.147	.000
Intercept	2643.084	1	2643.084	597.659	.000
Pretest	108.981	1	108.981	24.643	.000
Error	8.610	1	8.610	1.947	.165
Group	650.092	147	4.422		
Total	22494.000	150			
Corrected Total	845.973	149			

a. R Squared = .232 (Adjusted R Squared = .221)

The comparism of the posttest scores of students in the experimental group and the control with pretest as shown in Table shows no significant difference $F_{(1,149)} = 1.947$; $p = 0.165$). Since, $p > 0.05$, the hypothesis which state that there is no significant difference in the academic performance of students exposed to the audio-visual instructional materials and those taught using the talk and chalk method in Mathematics in Ogbomoso South Local Government Area of Oyo State is not rejected. Although, students in the experimental group had higher mean score (12.806) than the control (11.282), the difference is not significant. The outcomes can be as a result of the design of the audio-visual instructional materials. Clarke (2003) argued that technology is just recipe for enhanced learning outcomes, it is the strategies used in organising the recipe that determine its ultimate influence. This finding is not in agreement with Agah et al (2024) and Ngozi et al (2022). The reason for this could be due to the difference in the geopolitical zones and also because the study conducted by Ngozi et al (2022) was in primary schools.

$H_0$2: Sex has no interaction effect on the effect of audio-visual instructional on students' academic performance in the study area

Table 2: 2-Way ANOVA of the interaction effect of sex on effect of audio-visual materials on students' academic performance in Mathematics in secondary schools in Ogbomoso South Local Government Area of Oyo State

Dependent Variable: Posttest

Source	Type III Sum of Squares	df	Mean Square	F	Sig.	Partial Eta Squared
Corrected Model	210.167[a]	4	52.542	11.982	.000	.248
Intercept	2533.872	1	2533.872	577.867	.000	.799
Pretest	96.290	1	96.290	21.960	.000	.132
Group	11.799	1	11.799	2.691	.103	.018
Sex	9.638	1	9.638	2.198	.140	.015
Group * Sex	4.125	1	4.125	.941	.334	.006
Error	635.806	145	4.385			
Total	22494.000	150				
Corrected Total	845.973	149				

a. R Squared = .248 (Adjusted R Squared = .228)

2- Way ANOVA was used in analysing the interaction effect of sex on the effect of audio visual instructional materials on students' academic performance in Mathematics at 95% level of significant. The result showed that sex has no interaction effect on the effect of the instructional materials on secondary school students' academic performances in Mathematics in the study area ($F_{(1,149)} = 0.941$; $p = 0.334$; $\eta = 0.06$). Therefore, the hypothesis which state that sex has no interaction effect on the effect of audio-visual instructional on students' academic performance in the study area is not rejected. This agrees with Oteyola et al, (2023), Oyeniran et al (2023), Ngozi et al (2022) and Agah et al (2024). Audio visual instructional strategies across all geographical zones, level of education, preparation is not sex bias. This could be due to the fact that nearly every household in Nigeria has access to Television. The students are familiar to audio visual elements. New innovations generally influence perception and therefore have tendency to arouse students' interest. Audio visual seems not to influence the interest of the students' base on their sex and consequently has insignificantly effect on students' academic performance in the study area.

Conclusion

The study concluded that the instructional materials did not significantly aid students' academic performance in Mathematics and also that sex has no significant interaction effect on the effect of the audiovisual instructional material on students' academic performance in Mathematics in the study area.

Recommendations

The following recommendations are made in line with the findings of the study

(i) Studies to identified appropriate instructional materials to enhance senior secondary school students academic performance in Mathematics should be conducted.

(ii) The appropriate strategies for integrating audio visual materials in teaching Mathematics in senior secondary schools should also be determined.

(iii) All students irrespective of their sex should be allowed to employ the use of appropriate instructional materials in learning.

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