

EFFECTS OF CAMTASIA VIDEO AND POWERPOINT PRESENTATIONS ON SENIOR SECONDARY SCHOOL STUDENTS' ACADEMIC ACHIEVEMENT IN CIRCLE GEOMETRY IN ENUGU EDUCATION ZONE

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Abstract

The study investigated the effects of Camtasia Video and PowerPoint Presentations on senior secondary school students' academic achievement in circle geometry. Two research questions and two null hypotheses guided the study. The design adopted for this study was a quasi-experimental research design. The population of this study comprised 2271 co-educational SS2 students in the 19 co-educational public secondary schools in Enugu Education Zone. The sample for this study was 91 SS2 students drawn through a multistage sampling procedure. One instrument was used for data collection: Circle Geometry Achievement Test (CGAT). The instrument was face-validated by three experts. Content validity was obtained using a table of specifications. The reliability of CGAT was determined using the Kuder-Richardson formula 20 (K-R20) with an index value of 0.74. The method of data collection was direct administration. Mean and standard deviation were used to answer the research questions, while analysis of covariance (ANCOVA) was used to test the hypotheses at a 0.05 level of significance. The findings of the study revealed that Camtasia video presentation significantly improved students' academic achievement more than those taught using PowerPoint Presentations. However, this study found no significant interaction effect between instructional strategies and gender or students' achievement in Circle Geometry.

Keywords: Camtasia video presentation, powerpoint presentation, mathematics, circle geometry

Introduction

Technological advancements have revolutionized human lifestyles and educational practices. The application of technology has brought about some circular objects (CD plates, gas burners, and the face of a wall clock) in the Nigerian environment because of knowledge of circle geometry and its theorems. The application of technology has brought about some technological instructional strategies, which involve PhotoMath, GeoGebra, Mathway, and Camtasia video presentations (CVP), PowerPoint Presentations (PPP), among others. Empirical evidence has shown that many researchers have tried several instructional strategies and methods to address the issues of poor academic achievement in circle geometry, yet the issue persists. Integrating Camtasia Video and PowerPoint Presentations in mathematics classroom instruction could be very effective in enhancing students' academic achievement in Mathematics.

Mathematics is practiced in our everyday life in the form of counting and arithmetic. Mathematics is the science of numbers, quantities, and magnitudes, which holds immense significance in various disciplines (Schenkel, 2020). Therefore, Mathematics is the science of numbers that helps students develop mental discipline, logical and rational thinking skills, which facilitates the students' development. The importance of mathematics helps to integrate the students' intellectual knowledge into accomplishing career goals that can make the students self-reliant and also help them to

develop problem-solving skills for solving daily critical life issues, academic and daily activities calculations like planning and budgeting to save costs, and many more (Nebeolisa, 2025). Since human development relies heavily on the importance of Mathematics, it is of great importance that the Federal Republic of Nigeria (FRN, 2014), in its National Policy on Education, stated that mathematics should be one of the core subjects for students at basic and post-basic levels of education. In senior secondary school mathematics, contents such as algebra, calculus, number theory, analysis, probability and statistics, and also geometry (trigonometry, Coordinate Geometry, Transformation Geometry, and Circle Geometry) are taught.

Circle geometry is the theoretical aspect of geometry, which involves the proof of theorems, properties of a circle, and its parts. Chemuka (2017) revealed that the complexity could be a result of the deductive nature, abstractness, and rigorous process of solving geometry problems. Empirical evidence shows that some research has been conducted to help improve students' achievement in circle geometry. Mathematics students' poor achievement, especially in circle geometry problems in external examinations like the West African Secondary School Certificate Examination (WASSCE), is becoming alarming and unsatisfactory. This disheartening situation calls for immediate attention because it is a downward trend in the Nigerian education system (Onah et al., 2020; & Ugwuanyi, Okeke, & Asomugha, 2020). Corroborating the above statement, the West African Secondary School Certificate Examination (WASSCE) Chief Examiner's Report shows inconsistencies and fluctuations in students' academic achievement in mathematics, especially in concepts like circle geometry, as a result of poor knowledge of circle geometry theorems and a lack of in-depth knowledge of circle geometry. The percentage of students who scored below had a credit pass in general mathematics based on the WASSCE criterion grading in mathematics includes: 81.17% (2021), 76.36% (2022), 79.81% (2023), 72.12% (2024), 38.32% (2025) (Nwachukwu, 2025; Aneshe-Otakpa, 2023). These contribute to the poor academic achievement of students in Circle Geometry.

Achievement is an act of accomplishing a goal or target. Academic achievement refers to the extent to which a learner benefits from academic instruction in any given learning environment (Dhull & Rohtash, 2017). Operationally, academic achievement is the extent to which a student achieves aligned long-term educational goals through the completion of classwork, assignments, tests, projects, presentations, and examinations. Academic achievement in circle geometry is the ability of mathematics students to study and recall the circle geometry properties, theorems, and proofs, and be able to communicate their pedagogical knowledge during any circle geometry task (Tella, 2023). Academic achievement in circle geometry is the extent to which mathematics students show mastery of the acquired knowledge in circle geometry. Studies have shown that several factors may affect students' academic achievement in circle geometry such as persistent use of traditional conventional method which is teachers centered, students' negative attitudes towards circle geometry, shortage of professional mathematics teachers, and lack of teachers' use of innovative teaching strategy in this technological society (Oguguo, Uzor, Ezechukwu, Ene, Okeke, & Nzeadibe, 2020; Tshabalala & Ncube, 2016). Setiyani, Sumarwati, Amiruddin and Himawan (2022) revealed that the Camtasia-supported model improved mathematical understanding, which significantly improved their academic achievement in mathematics. Another study in contradiction revealed that there were no significant differences seen between the treatment and comparison groups on the other portions of the unit exam, or in their final grades in the Undergraduate Physiology Courses to improve their achievement using Novel Camtasia Videos (Miller,

2015). The gap in the above studies was created using a technological teaching strategy. Therefore, there is a need to delve into technological instructional strategies such as Camtasia Video Presentation.

Camtasia is a software application package used to create videos and presentations to create interactive media, videos, and record activities on desktops. Camtasia is a software application developed and owned by TechSmith Corporation since October 28, 2002, to date (TechSmith, 2015). Camtasia is available in English, French, German, Japanese, Portuguese, Spanish, and Chinese versions. Camtasia video is a software program that runs in the background silently, capturing everything that appears on the screen and saving the students as a video file (Fraser, Ngoon, Dontcheva, & Klemmer, 2019). Camtasia video can be used as a teaching tool in mathematics to make mathematics video lessons through the aid of some audio-visual media tools like sounds, films, videos, slides, and films and may more (Sulistya, 2018). This video presentation package has features and steps used in creating the videos.

Camtasia application packages have some features used in making videos. These features include: Recorder, Voice narration, Export, Project media file, Cursor effect, Visual effect, transition effect, animation effect, Caption display, and Scissors icon (Asih & Tantri, 2019). TechSmith (2015) stated that the steps a teacher can use in creating an instructional video are as follows: install the Camtasia application on the computer, input the objective for installing the application (the teacher can select the option of preparing an instructional lesson). After installation, the teacher inputs and stores all the necessary materials to be used for the study in the project media file. Click on New Project to start a new project and start recording using the recorder and voice narration features. After the recording process, the teacher will edit the video, cut out some unnecessary information using the scissors, and leave the authentic ones to avoid misinterpretation, which is a common problem in learning circle geometry. A study stated that there is a significant effect on the motivation and achievements of Biology Learning Media Using Camtasia Application (Indah, Indayana, & Miza, 2024). The findings are congruent with a study by Laelasari, Arfiyanti, Nuryanti, Widodo, and Arigiyanti (2018), which showed that there was contradictory literature that says that no significant differences were seen in the use of Novel Camtasia Videos to improve the achievement of At-Risk Students in Undergraduate Physiology Courses. The existing gap necessitated the need to achieve a significant effect on students' academic achievement using Camtasia videos, which may be difficult without knowledge of PowerPoint.

PowerPoint is a Microsoft application presentation package that can be used for teaching and learning, just like Camtasia video presentation. On April 20th, 1987, Robert Gaskins and Dennis Austin created Microsoft PowerPoint at a company called Forethought, Inc., for the Macintosh only, eventually acquired by Microsoft in 1989 for Macintosh and for Windows in 1990 (Microsoft PowerPoint, 2016). PowerPoint is a learning approach used in teaching concepts like circle geometry by visually illustrating complex theorems using diagrams and step-by-step constructions that aid conceptual clarity (Nebeolisa, 2025). Alim (2018) stated the steps in PowerPoint making, and they are as follows: install the PowerPoint application on the computer, select the slide of choice to start, add the design of choice, create a title page, add more slides based on the content, add recording when necessary, and then add animation and transition of choice. Sequel to a study carried out by Mba, Nebeolisa, and Oguguo (2022), the researchers opined that the academic achievement of students taught approximation of numbers using PowerPoint was significantly enhanced over the conventional method. A contradictory study by Leon' and García-Martínez (2021) revealed that access to PowerPoint slides developed by

teachers had no significant impact on student achievement. Given the gap amongst these studies, there is a comparable impact on students' academic achievement in circle geometry despite the similarities and differences among the technological teaching strategies.

PowerPoint presentation (PPP) and Camtasia Video presentation (CVP) have some similarities, like multimedia integration, visual presentations, student-friendly, animation transition effects, and both encourage self-paced learning. The instructional difference between CVP and PPP is that CVP displays video pages (recorded videos) for teaching because it allows instructional editing to eliminate any known errors or incorrect statements during content explanation before using the content to teach (Ratu & Komara, 2021). This may help to prevent the problem of misinterpretation and misunderstanding of complex concepts like circle geometry, which is a concern for this study. On the other hand, Miller (2015) asserted that PowerPoint displays pages in slides even when recorded videos are included; it does not allow instructional editing, which may contain some errors during content explanation before using the content to teach, which may result in misinterpretation and misunderstanding of complex concepts like circle geometry, which is a concern to this study. Research showed that Mathematics teachers' competency in the usage of technology teaching strategies to teach circle geometry may enhance students' academic achievement irrespective of gender.

Gender is a social construct used to describe either a male or a female. Gender is a phenomenon in which individuals identify as male (masculine) or female (feminine) in an environment, depending on the biological sex, sex-based social structure, culturally identified traits, features, roles, influences, expectations, responsibilities, and behaviours (Mba, Nebeolisa, & Oguguo, 2022; World Health Organization, 2017). Consequently, gender is used to identify male and female differences based on their attributes and roles. Gender is a questionable issue in the world we live in, due to gender disparity, which has been a problem for students' motivation and academic achievement in the educational system.

The society views mathematics as a masculine subject. There has been some disparity in the academic achievement of male and female mathematics students. A study shows that there was no significant difference in students' academic achievement using multimedia materials based on gender in Circle Geometry (Akinoso, 2018). In contradiction, Agommuoh and Nzewi (2015) showed that there is a significant difference in the mean interest and achievement scores of male and female students taught physics using videotaped instruction and the learning cycle constructivist model. The gaps in the reviewed studies underscored the need not only to investigate the effect of Camtasia video presentation on senior secondary school students' academic achievement in circle geometry in Enugu Education Zone, but also the extent to which these effects depended on gender influences.

Statement of the Problem

Mathematics students' poor achievement, especially in circle geometry in external examinations like the West African Examination Council (WAEC), is becoming alarming and unsatisfactory. WAEC Chief Examiners reported the students' weakness in circle geometry. Empirical evidence has shown that many researchers have tried several instructional approaches, strategies, and methods to address the issues of poor motivation and academic achievement in circle geometry, yet the issue persists. This has been a worry for mathematics teachers, researchers, and stakeholders, leading to several suggestions for improvement. The study wants to know if these two instructional strategies, Camtasia

video presentation and PowerPoint presentation, could help solve the students' poor academic achievement in circle geometry. Hence, the present study then deemed it fit to bridge the gap, and this made the researcher investigate the effects of Camtasia Video and PowerPoint Presentations to determine which is more effective in enhancing senior secondary school students' academic achievement in circle geometry in Enugu Education Zone. The main purpose of this study was to investigate the effect of Camtasia Video and PowerPoint Presentations on senior secondary school students' academic achievement in Circle Geometry in Enugu Education Zone.

Research Questions

The following research questions guided the study;

1. What is the mean achievement scores of students taught circle geometry using Camtasia Video Presentation and PowerPoint Presentation?
2. What is the mean achievement scores of male and female students taught circle geometry using Camtasia Video Presentation and PowerPoint Presentation?

Hypotheses

The following null hypotheses (H_0) are formulated for the study and will be tested at a 0.05 level of significance.

H₀₁: There is no significant effect on the mean achievement scores of students taught circle geometry using Camtasia Video Presentation.

H₀₂: There is no significant effect on the mean achievement scores of male and female students taught circle geometry using Camtasia Video Presentation.

Methods

The present study adopted a quasi-experimental research design. Specifically, a pre-test, post-test, non-equivalent control groups design was used for the study. The population of this study consisted of 2271 coeducational public senior secondary school two (SS2) mathematics students (969 males and 1302 females) in the 19 coeducational public secondary schools in Enugu Education Zone. The sample size for this study is 91 (44 males and 47 females) SSII mathematics students. The study adopted a multistage sampling procedure comprising simple random sampling and purposive sampling. This study was carried out in four stages: Firstly, a simple random sampling (balloting without replacement) was used to select two Local Government Areas (LGAs) namely Enugu North and Enugu East out of the three LGAs in Enugu Education Zone. Secondly, purposive sampling was used to select one co-educational school from each of the selected LGAs. Thirdly, a simple random sampling (balloting without replacement) was used to select one intact class from each of the selected co-educational schools. Finally, a simple random sampling (balloting without replacement) was used to randomly assign School A to experimental Group A, with treatment using Camtasia Video Presentation (CVP), while School B was assigned to experimental Group B, with treatment using PowerPoint presentation (PPP). This helped to ensure uniformity across the experiment. Circle Geometry Achievement Test (CGAT) was the instrument used for data collection in this study. The Circle Geometry Achievement Test (CGAT) consists of 50 multiple-choice items. The Circle Geometry Achievement Test (CGAT) were validated by three (3) experts, all from the Faculty of Education, University of Nigeria, Nsukka. The Kuder-Richardson Twenty (K-R₂₀) formula was used to determine the reliability coefficient of CGAT, which yielded an index value of 0.74. The method of data collection was direct administration. This study experiment lasted for 7 weeks for both Camtasia Video Presentation (CVP) and PowerPoint Presentation (PPP). The first week was used for introduction, training of the research assistants and administration of CGAT pre-test. The treatment lasted for the next 5 weeks which involved teaching Circle, Chord, and three

Circle theorems. Last week, which is week 7, was used for post-test. Mean and standard deviation were used to answer the research questions while Analysis of Covariance (ANCOVA) was used in testing the hypotheses at an alpha level of 0.05 level of significance.

Results

Research Question One: What are the effects of Camtasia Video Presentation (CVP) and PowerPoint Presentation (PPP) on achievement scores of students in Circle Geometry?

Table 1: Pre/Post-test Mean Achievement scores of Camtasia Video Presentation (CVP) and PowerPoint Presentation (PPP) Groups in Circle Geometry

Strategy	N	Pre-Achievement		Post-Achievement		Mean Gain
		Mean	SD	Mean	SD	
Camtasia Video	44	22.89	4.99	42.70	4.06	19.81
PowerPoint	47	18.70	5.94	34.77	5.17	16.07

Table 1 revealed that at pre-test, the mean achievement scores of Camtasia Video Presentation (CVP) group is ($M = 22.89$, $SD = 4.99$) and ($M = 42.70$, $SD = 4.06$) at the post-test, while the mean achievement scores PowerPoint Presentation (PPP) group at pre-test is ($M = 18.70$, $SD = 5.94$) and ($M = 34.77$, $SD = 5.17$) at post-test. The mean gain for CVP = 19.81 and PPP = 16.07.

Hypothesis One

H₀₁: There is no significant effect of Camtasia Video Presentation (CVP) and PowerPoint Presentation (PPP) on achievement scores of students in Circle Geometry.

Table 2: Summary of Analysis of Covariance (ANCOVA) of Students' Post Achievement scores by Instructional Strategy and Gender

Source	Type III Sum of Squares	Df	Mean Square	F	P-value	Eta Squared	Dec
Corrected Model	1539.62	4	384.90	18.09	0.00	0.46	
Intercept	8723.01	1	8723.01	409.90	0.00	0.83	
Pre-Achievement	0.01	1	0.01	0.00	0.98	0.00	
Instruction	1221.91	1	1221.91	57.42	0.00	0.40	S
Gender	93.72	1	93.72	4.40	0.04	0.05	S
Instruction * Gender	11.57	1	11.57	0.54	0.46	0.01	NS
Error	1830.14	86	21.28				
Total	138987.00	91					
Corrected Total	3369.76	90					

a. R-Squared = 0.46 (Adjusted R Squared = 0.43),

Key: S=Significant, NS=Not Significant, Dec.= Decision

($F(1, 86) = 57.4$, $P = 0.00 < 0.05$, $\eta^2 = 0.40$). Since the p-value of 0.00 is less than the 0.05 level of significance, with an effect size (32%), the null hypothesis was therefore rejected.

Research Question Two: What is the mean achievement scores of male and female students in Circle Geometry?

Table 3: Pre/Post-test Mean Achievement Scores of Male and Female Students in Circle Geometry

Strategies	N	Pre-Achievement		Post-Achievement		Mean Gain
		Mean	SD	Mean	SD	
Male	44	20.86	5.88	39.80	6.53	18.94

Female	47	20.60	5.90	37.49	5.55	16.89
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Table 3 shows that the male students had a pre-test mean achievement score of ($M = 20.86$, $SD = 5.88$) and a post-test is ($M = 39.80$, $SD = 6.53$). While, female students had a pre-test mean achievement score of ($M = 20.60$, $SD = 5.90$) and a post-test is ($M = 37.49$, $SD = 5.55$). The mean gains of 18.94 and 16.89 for the male and female students.

Hypothesis Two

H₀₂: There is no significant effect in mean scores of male and female students' achievement in Circle Geometry.

Table 2 indicated that gender had a significant effect on students' achievement in Circle Geometry ($F(1,86) = 4.40$, $P = 0.04 < 0.05$, $\eta^2 = 0.05$). Since the p-value of 0.04 is less than the 0.05 level of significance, with only 5% variance in students' achievement in Circle Geometry was attributed to gender then the null hypothesis (H_{02}) was therefore rejected.

Discussion

The findings of the study revealed that there was a significant difference between Camtasia Video Presentation (CVP) and (PPP) with a p-value < 0.05 . The reason for this study could help minimize the misinterpretation and also visualize explanation of the abstract concept of circle geometry. The result could also help the teachers to make the circle geometry explanation easier. This study is in conformity with Insorio and Macandog (2022), which reveals that video lessons complement module lessons, significantly motivating students and improving their achievement in mathematics. However, the findings of this study supported the findings of Mba, Nebeolisa, & Oguguo (2022), which revealed that there was a significant difference in the mean achievement score of students taught Approximation of numbers using PowerPoint presentation and those taught without PowerPoint presentation. Consequently, the present study disagrees with Miller (2015), which showed that there were no significant differences seen between the treatment and comparison groups on the other portions of the unit exam, or in their final grades in the Undergraduate Physiology Courses to improve their achievement using Novel Camtasia Videos.

Also, the findings of this study also showed that the male students slightly gained higher achievement than the males, and there was no significant difference between the male and female students' achievement in circle geometry. The reason for the findings could be to know if the concept of circle geometry is gender sensitive on the students' achievement in circle which helped to improve the students' achievement in circle geometry and it's not gender-biased due to the slight difference in achievement. The findings of this study support Uwase and Asuquo (2023) which revealed that the male students taught using e-learning to solve circle geometry significantly performed better than the female students taught using e-learning to solve circle geometry achievement test. Also, the findings of this study are in line with Gambari, Yusuf, and Balogun (2015), which showed that there was a significant effect on the students' achievement taught Technical Drawing using PowerPoint, and those taught PowerPoint based on the gender influence. The findings of this study do not align with Akinoso (2018), which revealed that there was no significant difference between the mean achievement scores of male and female students taught Circle geometry using multimedia materials (Videos).

Conclusions

In accordance with this study's findings, the researcher concluded that Camtasia Video Presentation (CVP) promoted students' academic achievement more than PowerPoint presentation (PPP) in Circle Geometry in Enugu Education Zone. It was

concluded that in order to improve the students' academic achievement CVP and PPP is critical. CVP is also critical for promoting gender equality in mathematics, especially in circle geometry.

Recommendations

The researcher made this recommendation based on the findings of this study:

Enlightenment campaigns, conferences, seminars, and workshops should be organized for mathematics students and teachers by the Federal and State Ministries of Education, Institutes of Education, Colleges of Education, stakeholders, and individual schools to create awareness on the effect of the innovative instructional strategies and then sensitize the adoption of these strategies in the various schools.

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