

Effect of Chat Generative Pre-Trained Transformer(ChatGPT) on Secondary School Students' Academic Achievement and Interest in Geometry

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Abstract

The study determined the effect of ChatGPT on academic achievement and interest of students' in geometry. Four research questions and six hypotheses were formulated, tested at 0.05 level of significance. The design adopted for this study was quasi-experimental (non-equivalent control group). The researchers sampled 205 students from a population of 20,074 Senior Secondary School Two (SSS2) students in public secondary school in Abia State. Geometry Achievement Test (GAT) and Geometry Interest Scale (GIS) with reliability indices of 0.75 and 0.82 respectively, were used for data collection. Mean, standard deviation and Two-way Analysis of Covariance (ANCOVA) were used for data analysis. Results from data analysis revealed that: the students taught geometry using ChatGPT achieved more than those taught with Conventional Method(CM); $F(1, 200) = 284.014$, $p = .0005$, effect size = 0.67, no influence of gender on students' academic achievement scores in geometry; $F(1, 200) = 7.062$, $P = 0.009$ and no interaction effect of strategy and gender on students' mean academic achievement score $F(1, 200) = 0.011$, $P = 0.915$. Similarly, students taught geometry using ChatGPT expressed more interest in geometry than those taught with CM; $F(1, 200) = 1030.263$, $p < .0005$, effect size = 0.837, no influence of gender on students' interest scores in geometry; $F(1, 200) = 8.523$, $P = 0.008$ and no interaction effect of strategy and gender on students' mean interest score $F(1, 200) = 0.787$, $P = 0.376$. Based on the findings, the recommendation was that ChatGPT should be used to teach geometry in secondary schools.

Keywords: Chat Generative Pre-Trained Transformer(ChatGPT), students' academic achievement, interest, secondary school and geometry.

Introduction

The poor achievement of students in mathematics, particularly in geometry, has become a major concern in many educational systems. Geometry, which involves the study of shapes, sizes, angles, and spatial relationships, is often seen as abstract and challenging by many learners. Geometry gives learners the ability to think logically and creatively; and it constitutes 38% of the Mathematics curriculum in secondary school (Njoku and Emeka, 2024). Geometry is the study of size, shape, angle and surfaces of 2-dimensional and 3-dimensional shapes (Kurumeh, et al. as cited in Njoku et al, 2023). Jacob, et al. as cited in Njoku et al, (2023) highlighted the importance of geometry by stating that the application

of geometry cuts across various areas of life such as Computer Aided Design (CAD), modeling, robotics, medical imaging, computer animation and visual presentation.

Apparently, geometry is essential to life. In spite of this remarkable importance of geometry not only in making one think logically but also in industry; secondary school students have over and again shown significant weaknesses in geometry (WAEC Chief Examiners Report, 2016 - 2023). It is worthy to note that students' achievement in Mathematics specifically in May/June West African Senior School Certificate Examination (WASSCE) for a period of eight years in Nigeria(WAEC, 2016-2023) improved above 50%,



except in the year 2018 when the percentage of students' achievement decreased to 49.98 %.The detail analysis of the result shows that the percentages of candidate who registered for the examination and passed at credit level and above (A1 –C6)in 2016, 2017, 2018, 2019, 2020, 2021, 2022 and 2023 are 52.97, 59.22, 49.98, 64.18, 65.24,81.70,76.36 and 79.81 respectively. The improvement of students' achievement in General Mathematics notwithstanding, WAEC chief examiners in mathematics reported that candidates still perform poorly in questions drawn from geometry particularly those involving circle and tangent to a circle theorems (WAEC, 2018-2023). Consequently upon this is that candidates avoid questions drawn from geometry(Njoku & Emeka, 2024).This has contributed to persistently low academic achievement in geometry(WAEC, 2018-2023). This perception has also led to a decline in students' interest in geometry, which in turn affects their engagement, motivation, and overall achievement in mathematics.

In this study, academic achievement in geometry is the success in geometry after being taught circle theorem and tangent to a circle and measured with geometry achievement test. Interest is a key factor in successful learning. When students are genuinely interested in a subject, they are more likely to invest time, ask questions, seek solutions, and persist through challenges. However, in many Nigerian classrooms, the teaching of geometry remains largely theoretical, teacher-centered, and reliant on outdated methods that do little to spark curiosity or stimulate enthusiasm among learners. As a result, students frequently disengage from geometry lessons, viewing them as boring or irrelevant (Njoku & Okigbo, 2021). With recent advancements in digital technology and Artificial Intelligence (AI), new educational tools are emerging that could help address these challenges. One such tool is ChatGPT.

Chat Generative Pre-Trained Transformer (ChatGPT) is an AI-powered conversational agent developed by OpenAI. Chat Generative Pre-Trained Transformer (ChatGPT) respond to user queries in real-time, break down complex ideas, and engage learners in interactive dialogue (Njoku & Emeka, 2024). The introduction of AI tools into education presents an opportunity to address some the challenges students encounter by offering individualized assistance, step-by-step solutions, and alternative explanations outside the traditional classroom setting (Nja, et al, 2024). With increasing internet penetration

and smart phone use among students in Nigeria, AI tool like ChatGPT has become more accessible, potentially influencing how students learn and perform academically.

Empirical studies that investigated the actual effect of ChatGPT on students' academic achievement and interest—particularly in mathematics. For instance, Aliyu and Ibrahim (2024) investigated the impact of ChatGPT-assisted learning on secondary school students' academic achievement in mathematics. The study revealed that students who were taught mathematics using ChatGPT demonstrated improved achievement in algebra and geometry. Outside Nigeria, Chen et al. (2023) conducted an experimental study in Taiwan on the use of ChatGPT to assist high school students in solving geometry problems. The findings showed a significant improvement in students' test scores, especially among low-performing students who benefited from the step-by-step guidance provided by ChatGPT. Similarly, the study conducted by Asare, et al (2023) on the effect of ChatGPT on mathematics performance and reported that students' interest in mathematics increased significantly when they taught with ChatGPT.Egara and Mosimege (2024) further explored the integration of AI-Based ChatGPT into Mathematics Instruction and found improved student engagement and teaching effectiveness with ChatGPT use in Nigerian secondary schools. However, Pardos and Bhandari (2023) carried out a study on the learning gain differences between ChatGPT and human tutor generated in algebra. The finding shows that human tutor strategy led to higher learning gains than ChatGPT-generated strategy, even though that both were effective. This goes to show that the findings on effect of ChatGPT in mathematics are inconclusive and this has created a need for further investigation in this study. Also, Adebayo and Balogun(2019)determined the effect of digital learning tools(mobile-based learning platforms) on student interest in geometry among secondary school students in Lagos State. The findings of the study indicated that students who used mobile-based learning platforms, including AI-powered applications, reported significantly higher levels of interest and engagement in geometry lessons compared to those in traditional classrooms. Furthermore, gender disparities in students' academic achievement and interest in mathematics remain a persistent concern.

Some studies suggest that male students perform better in geometry, others indicate no significant difference. For instance, Adewale (2022)

reported that males students often outperform females in geometry tasks. In contrast, Chika and Bello (2023) reported no significant gender differences in achievement when instructional methods were inclusive and technologically driven. In another study, Umeh and Okoro (2024) examined gender influence in the use of AI learning tools, such as ChatGPT and found that male and female benefited academically and showed great increase in interest in learning. It remains unclear whether the integration of ChatGPT into geometry instruction would influence male and female students differently in terms of achievement and interest. Therefore, this study seeks to address this gap by investigating whether the use of ChatGPT significantly affects the academic achievement and interest of secondary school students in geometry and to determine whether gender influences the academic achievement and interest of secondary school students in geometry.

Statement of the Problem

Mathematics remains one of the most challenging subjects for secondary school students in Nigeria, with geometry being a particularly difficult area students do not achieve well. Over the years, examination body such as WAEC has consistently reported low achievement in mathematics, especially in geometry-related questions. This poor academic achievement has been attributed to several factors. With the rapid evolution of technology in education, artificial intelligence (AI) tools like ChatGPT have emerged as potential supplements.

Studies have shown that ChatGPT could serve as an effective support system for improving students' academic achievement and interest in geometry. However, despite the research finding, there is a lack of empirical research in the area of the study, that evaluates the actual effect of ChatGPT on academic achievement and interest, particularly in geometry. This study seeks to address this gap by investigating whether the use of ChatGPT significantly affects the academic achievement and interest of secondary school students in geometry. Therefore, the problem of this study is, what is the effect of ChatGPT on academic achievement and interest of secondary school students in geometry?

Purpose of the Study

The purpose of the study was to determine the effect of ChatGPT on secondary school students' academic achievement and interest in geometry. Specifically, the study was to determine the:

1. mean achievement score of students taught using ChatGPT and those taught with Conventional Method (CM).
2. mean interest score of students taught using ChatGPT and those taught using CM.
3. influence of gender on the mean achievement scores of students taught geometry.
4. influence of gender on the mean interest scores of students taught geometry.
5. interaction effect of teaching strategy and gender on mean achievement score of students in geometry.
6. interaction effect of teaching strategy and gender on mean interest scores of students in geometry.

Research Questions

1. What are the mean achievement score of students taught using ChatGPT and those taught with Conventional Method (CM)?
2. What are the mean interest score of students taught using ChatGPT and those taught using CM?
3. What are the mean achievement scores of male and female students taught geometry using ChatGPT and those taught using CM?
4. What are the mean interest scores of male and female students taught geometry using ChatGPT and those taught using CM?

Null Hypotheses

1. There is no significant difference between mean achievement score of students taught using ChatGPT and those taught with Conventional Method (CM).
2. There is no significant difference between mean interest score of students taught using ChatGPT and those taught using CM.
3. There is no significant influence of gender on the mean achievement scores of students taught geometry.
4. There is no significant influence of gender on the mean interest scores of students taught geometry.

5. There is no interaction effect of teaching strategy and gender on mean achievement score of students in geometry.
6. There is no interaction effect of teaching strategy and gender on mean interest scores of students in geometry.

Research Methods

The quasi-experimental design, precisely the non-equivalent control group design which consists of a pre-test and post-test was adopted in this study. Non-equivalent control group design is a design whereby two or more intact groups/classes that are not equivalent, are randomly assigned to treatment groups, and thereafter, test is administered to the various groups/classes as pretest before the treatment and as posttest after the treatment (Nworgu, 2018). The population of the study was 10,074 Senior Secondary two (SS2) in public secondary schools in Abia State, Nigeria. Using multi-phase sampling procedure involving purposive sampling and simple random sampling techniques, a sample of 205 SS2 students was selected.

The instruments used for data collection was Geometry Achievement Test (GAT). Geometry Achievement Test (GAT) was adapted from West African Examination Council(WAEC) past question paper based on the topics chosen for the study. GAT consists of two parts, A and B. Part A is the preliminary part which made provisions for getting bio-data of the participants. Part B contains 50-item multiple-choice questions with four response alternatives A-D. The Kuder-Richardson (KR-20) was used to establish the reliability (internal consistence of the instrument) which revealed a reliability coefficient of 0.78 for internal consistency. Pearson Product Moment Correlation was also employed to obtain correlation co-efficient of 0.81 for temporal stability of the instrument. In view of these indices, GAT was considered adequate for this study.

The second instrument used for data collection was Geometry Interest Scale (GIS), adapted from Abugu (2017). The instrument is a 30 item structured questionnaire made up of two sections - A and B. Section A was used to obtain bio data of the respondents while Section B was drafted to elicit information from students to determine the students'

interest before the treatment and after the treatment. The reliability measure of internal consistency of GIS was established using Cronbach Alpha analysis which yielded the reliability coefficient of 0.75. The sum of the weighted alternatives a student select is the students score.

In the schools sampled for the study, two intact classes were randomly assigned to the experimental group and control group. In the schools assigned to experimental group, only students who had android phones participated in the study. The teaching tools used in the experimental groups was ChatGPT strategy. The regular Mathematics teachers in the experimental groups were coordinated by the researchers on how to use ChatGPT strategy in teaching geometry and it lasted for three days. The teacher used the first lesson to introduce ChatGPT strategy to the students in experimental groups. The students were guided to on how to download and install ChatGPT. The students in control group were taught with conventional method but with validated Lesson Plan on Geometry.

Geometry Achievement Test (GAT) was administered on the students before the treatment started as pre-test by the research assistants and the scores obtained were recorded by the researchers. After the treatment, GAT was re-arranged starting with the items from the bottom to the top, the section's names were changed from section A and B to section C and D and the options to each of the items were swooped and then administered to the same students as post-test.

Method of Data Analysis

The data obtained from this study were cleaned to ensure that there were no outliers in the data. Thereafter, the data were analyzed with mean, standard deviation and Two-way Analysis of Covariance (ANCOVA). Mean and standard deviation of achievement scores were used to answer the research questions while Two-way Analysis of Covariance (ANCOVA) was used to test the hypotheses. The hypotheses were tested at 0.05 level of significance. The decision was that, if the p-value is less than or equal to the significant value of 0.05($P \leq 0.05$), the null hypothesis is rejected; otherwise ($P > 0.05$) it is not rejected.

Results

Research Question 1: What are the mean achievement score of students taught using ChatGPT and those taught with Conventional Method (CM)?

Table 1

Mean achievement score of students taught using ChatGPT and Conventional Method(CM)

Source of Variation	N	Pre-test		Posttest		Mean(\bar{X})		Gain
		\bar{X}	SD	\bar{X}	SD			
ChatGPT	109	15.68	8.50	61.62	7.25			45.14
CM	96	15.85	8.21		46.23	9.58		30.38

Table 1 shows that students who were exposed to ChatGPT had pre-test mean score of 15.68 with a standard deviation of 8.50 and mean post-test score of 61.62 and standard deviation of 7.25 while their counterparts who were taught using CM had mean pre-test score of 15.85 with a standard deviation of 8.21 and mean post-test score of 46.23 with standard

deviation of 9.58. Mean gain academic achievement scores of 45.14 and 30.38 for students who were exposed to ChatGPT and CM respectively indicating that students who were exposed to ChatGPT had higher mean academic achievement scores than their counterparts exposed to CM.

Research Question 2: What are the mean interest score of students taught using ChatGPT and those taught using CM?

Table 2

Mean interest score of students taught using ChatGPT and Conventional Method.

Source of Variation	N	Pre-test		Posttest		Mean(\bar{X})		Gain
		\bar{X}	SD	\bar{X}	SD			
ChatGPT	109	21.55	3.50		53.81	3.43	32.26	
CM	96	21.51	3.21		28.45	5.58	6.93	

The result in Table 2 shows that the pre-test mean interest score of students taught geometry using ChatGPT is 21.55 and standard deviation of 3.51 while the students taught geometry with CM obtained a pre-test mean interest score of 21.51 and a standard deviation of 3.21. The result further shows that the post-test mean interest score of students taught geometry with ChatGPT is 53.81 with a standard deviation of 3.43 whereas the students taught geometry

with CM obtained a posttest mean interest score of 28.45 and a standard deviation of 5.58. The result further indicates that the mean gain interest score of students taught geometry with ChatGPT is 32.26 while that of students taught geometry with CM is 6.93. Thus, the students exposed to ChatGPT had higher mean gain interest score than the students exposed to CM.

Research Question 3:What are the mean achievement scores of male and female students taught geometry using ChatGPT and those taught using CM?

Table 3

Mean achievement score of male and female students taught using ChatGPT and Conventional Method.

Source of variation	Gender	N	Type of Test	\bar{X}	SD
ChatGPT	Male	54	Post-test	15.47	8.50
			Pre test		
			Mean Gain		
CM	Male	51	Post-test	46.80	10.37
			Pre test		
			Mean Gain		
	Total	105			
ChatGPT	Female	55	Post-test	61.47	6.92
			Pre test		
			Mean Gain		
CM	Female	45	Post-test	45.60	7.92
			Pre test		
			Mean Gain		
	Total	100			

The result presented in Table 3 reveals that the male students exposed to ChatGPT had a pretest mean achievement score of 15.47 with a standard deviation of 8.50 and a posttest mean achievement score of 61.77 with a standard deviation of 8.67. The mean gain achievement score of male students exposed to ChatGPT was 46.30. The female students exposed to ChatGPT had a pretest mean achievement score of

15.23 with a standard deviation of 8.33 and a posttest mean achievement score of 61.47 with a standard deviation of 6.92. The mean gain achievement score of female students exposed to ChatGPT was 46.14. This, therefore, means that male students exposed to ChatGPT achieved slightly higher than their female counterparts exposed to ChatGPT.

Research Question 4:What are the mean interest scores of male and female students taught geometry using ChatGPT and those taught using CM?

Table 4

Mean interest score of male and female students taught using ChatGPT and Conventional Method.

Source of variation	Gender	N	Type of Test	\bar{X}	SD
ChatGPT	Male	54	Post-test	21.47	4.50
			Pre test		
			Mean Gain		
CM	Male	51	Post-test	28.75	5.37
			Pre test		
			Mean Gain		
	Total	105			

ChatGPT	Female	55	Post-test	53.98	6.92
			Pre test	21.63	6.33
			Mean Gain	32.35	
CM	Female	45	Post-test	28.22	6.92
			Pre test	21.40	4.21
			Mean Gain	7.82	
	Total	100			

The result presented in Table 4 reveals that the male students exposed to ChatGPT had a pretest mean interest score of 21.47 with a standard deviation of 4.50 and a posttest mean interest score of 53.65 with a standard deviation of 5.67. The mean gain interest score of male students exposed to ChatGPT was 32.18. The female students exposed to ChatGPT had a pretest mean interest score of 21.63 with a standard

deviation of 6.33 and a posttest mean interest score of 53.98 with a standard deviation of 6.92. The mean gain interest score of female students exposed to ChatGPT was 32.35. This result shows that female students exposed to ChatGPT had a slightly higher interest than their male counterpart exposed to ChatGPT.

Testing Null Hypotheses

Hypothesis 1: There is no significant difference between mean achievement score of students taught using ChatGPT and those taught with (CM).

Table 5

Summary of two-way ANCOVA of achievement score of students taught geometry using ChatGPT and CM.

Source	Type III Sum of Squares	df	Mean Square	F	Sig.	Partial Eta Squared
Corrected Model	21555.429 ^a	4	5388.857	135.085	.000	.730
Intercept	16304.236	1	16304.236	408.705	.000	.671
PRETEST	9437.388	1	9437.388	236.571	.000	.542
STRATEGY	11330.011	1	11330.011	284.014	.000	.587
GENDER	281.735	1	281.735	7.062	.009	.034
STRATEGY * GENDER	.457	1	.457	.011	.915	.000
Error	7978.493	200	39.892			
Total	636638.000	205				
Corrected Total	29533.922	204				

a. R Squared = .730 (Adjusted R Squared = .724)

The result in Table 5 shows that there is a significant main effect of ChatGPT on students' academic achievement in geometry; $F(1, 200) = 284.014$, $p = .0005$, effect size = 67.0. The null

hypothesis was therefore rejected. Thus, there is significant difference between the mean academic achievement scores of students who were taught geometry using ChatGPT and those taught using CM.

Hypothesis 2: There is no significant difference between mean interest score of students taught using ChatGPT and those taught using CM.

Table 6

Summary of two-way ANCOVA of interest score of students taught geometry using ChatGPT and CM.

Source	Type III Sum of Squares	Df	Mean Square	F	Sig.	Partial Eta Squared
Corrected Model	13458.825 ^a	4	3364.706	269.137	.000	.843
Intercept	2212.603	1	2212.603	176.982	.000	.469
PREINTEREST	389.918	1	389.918	31.189	.000	.135
STRATEGY	12880.174	1	12880.174	1030.263	.000	.837
GENDER	106.549	1	106.549	8.523	.008	.041
STRATEGY * GENDER	9.840	1	9.840	.787	.376	.004
Error	2500.366	200	12.502			
Total	254574.000	205				
Corrected Total	15959.190	204				

a. R Squared = .843 (Adjusted R Squared = .840)

Table 6 reveals significant main effect of ChatGPT on students' interest in geometry; $F(1, 200) = 1030.263$, $p = .0005$, effect size = 83.7. The null hypothesis was therefore rejected. Thus, there is significant difference between the mean interest scores of students who were taught geometry using ChatGPT and those taught using CM. The result indicates that students who were taught geometry using ChatGPT had higher interest in geometry than those taught using CM.

Hypothesis 3: There is no significant influence of gender on the mean achievement scores of students taught geometry.

Hypothesis 3 was tested with ANCOVA and the result of the test is summarized in Table 5. The table shows that there is no influence of gender on students' achievement scores in geometry; $F(1, 200) = 7.062$, $P = 0.009$. Therefore, the hypothesis that there is no significant influence of gender on the mean achievement scores of students taught geometry was not rejected.

Hypothesis 4: There is no significant influence of gender on the mean interest scores of students taught geometry.

Hypothesis 4 was tested with ANCOVA in order to determine the influence of gender on students' interest scores in geometry and the result of the test is summarized in Table 6. Table 6 reveals that there is no

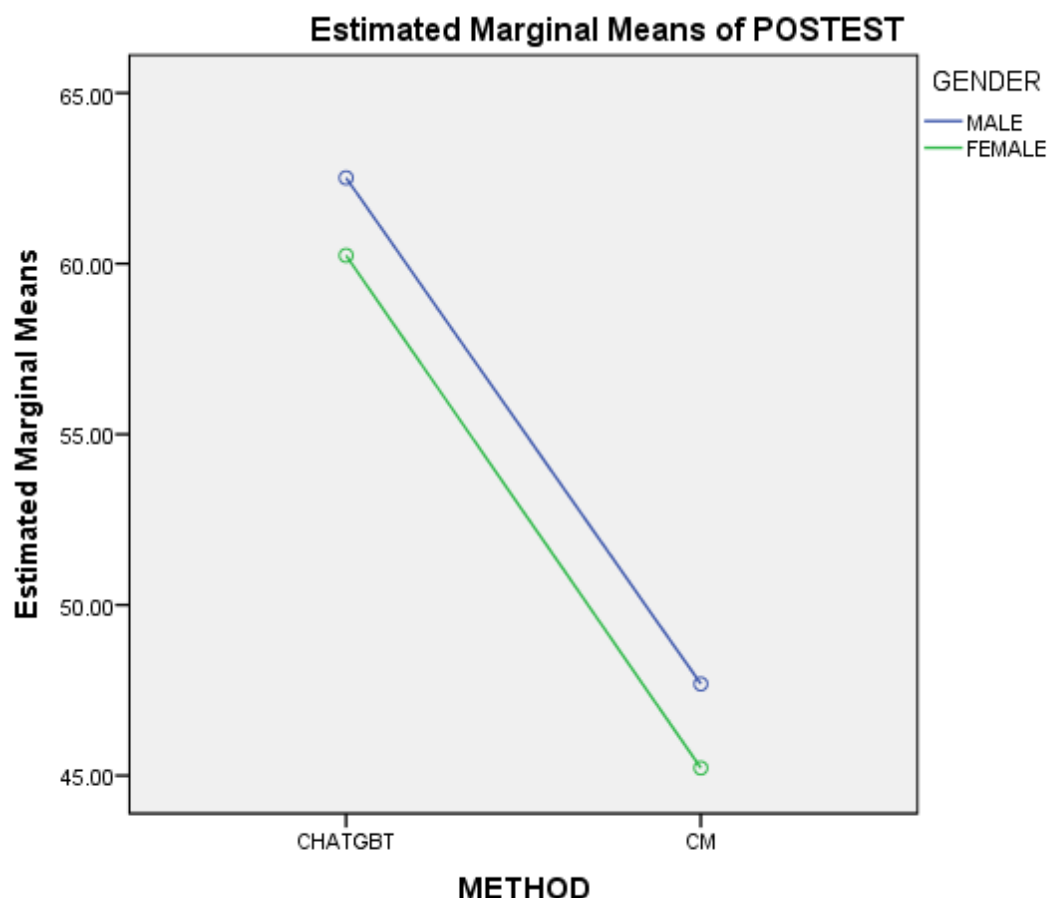
significant effect of gender on students' interest scores in geometry; $F(1, 200) = 8.523$, $P = 0.008$. The null hypothesis was not rejected.

Hypothesis 5: There is no interaction effect of teaching strategy and gender on mean achievement score of students in geometry.

Hypothesis 5 was tested with ANCOVA and the result of the test is summarized in Table 5. The result shows that there is no interaction effect of strategy and gender on students' mean academic achievement scores in geometry; $F(1, 200) = 0.011$, $P = 0.915$. The null hypothesis was not rejected. Therefore, there is no interaction effect of strategy and gender on students' mean academic achievement scores in geometry.

Hypothesis 6: There is no interaction effect of teaching strategy and gender on mean interest score of students in geometry.

Hypothesis 6 was tested with ANCOVA and the result of the test is summarized in Table 6. Table 6 shows that there is no interaction effect of strategy and gender on students' mean interest scores in geometry; $F(1, 200) = 0.787$, $P = 0.376$. Therefore, the interaction effect of strategy and gender on students' mean interest scores in geometry. Furthermore, Figure 1 shows that the two lines are parallel, which indicates that there is no interaction between strategy and gender. The null hypothesis was not rejected.



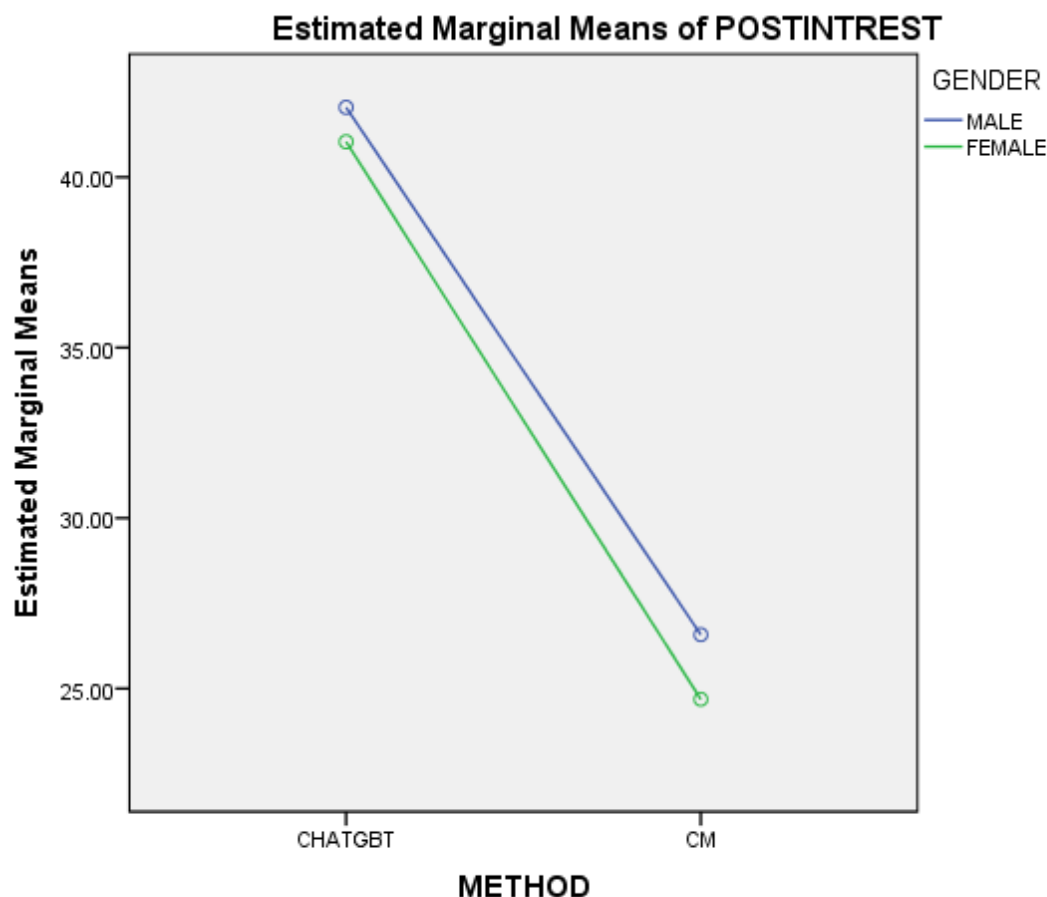
Covariates appearing in the model are evaluated at the following values: PRETEST = 20.7659

Figure 1
Profile plot of interaction effect of teaching strategy and gender on achievement scores of students.

Hypothesis 6: There is no interaction effect of teaching method and gender on mean interest scores of students in geometry.

Hypothesis 5 was tested with ANCOVA and the result of the test is summarized in Table 3. Table 3 shows a non-significant interaction effect of method and gender on students' mean retention scores in geometry; $F(1, 235) = 0.159$, $P = 0.691$. The null

hypothesis was not rejected. Therefore, the interaction effect of method and gender on students mean retention scores in geometry is not significant. The result in Figure 2 reveals that the lines strategy and gender respectively are parallel. This means that there is no interaction between strategy and gender. The null hypothesis was not rejected.



Covariates appearing in the model are evaluated at the following values: PREINTEREST = 22.3561

Figure 2
Profile plot of interaction effect of teaching strategy and gender on interest scores of students

Discussion

The discussion of the findings that emerged from the analysis are presented. The findings show that the students who were exposed to ChatGPT had higher mean academic achievement scores than their counterparts exposed to CM. Similarly, ANCOVA result of the academic achievement test scores presented in Table 5 indicates that there is a significant difference between the mean academic achievement scores of students who were taught geometry using ChatGPT and those taught using CM. This finding may be attributed to the fact that students who had access to ChatGPT demonstrated improved understanding of geometric concepts due to the tool's ability to provide step-by-step explanations, real-time feedback, and simplified learning materials. This accessibility fostered greater student engagement and curiosity in geometry, especially for learners who

typically struggle with abstract mathematical ideas. This finding is in consonance with the findings of Aliyu and Ibrahim (2024) reported that students who were taught mathematics using ChatGPT demonstrated improved achievement in algebra and geometry. This finding is also in agreement with Chen et al. (2023) which stated significant improvement in students' test scores, especially among low-performing students.

The result from the data analysis of hypothesis two showed that students taught geometry using ChatGBT expressed more interest in geometry than those taught with CM. In other words, the students' interest in geometry increased immensely when taught using ChatGBT than when taught using CM. Students showed increased confidence and participation in class when ChatGPT was used as a supplementary learning aid. The interactive nature of ChatGPT helped to demystify difficult geometry problems and encouraged

independent study outside the classroom. The findings of this study is in line with Umeh (2023) which stated that students become more involved in classroom activities when they were taught with ChatGPT. The finding agrees also with Adeyemi and Salami (2023) who determined the effect of digital learning tools (mobile-based learning platforms) on student interest in geometry among secondary school students and reported that students who used mobile-based learning platforms, including AI-powered applications, had higher levels of interest and engagement in geometry lessons compared to those in traditional classrooms.

On the gender factor, the findings showed that male and female students who were exposed to ChatGPT had higher mean academic achievement score in geometry. Similarly, the male and female students who were exposed to CM had little increment in mean academic achievement scores. This was further subjected to hypothesis testing. Hence, the result in Table 5 shows that there is no significant influence of gender on mean academic achievement scores of students in geometry. In the same way, the findings on the influence of gender on interest scores of students show that male and female students who were exposed to ChatGPT had higher mean interest score in geometry. The male and female students who were exposed to CM had very small increment in mean interest scores in geometry. ANCOVA was used to test the hypothesis. The result reveals in Table 6 that there is no significant influence of gender on the mean interest scores of students in geometry. These findings complement the findings of Umeh and Okoro (2024) who examined gender influence in the use of AI learning tools, such as ChatGPT and reported that male and female benefited academically, but female students reported a greater increase in interest in learning. The findings show also that there is no interaction effect of strategy and gender on mean academic achievement scores of students in geometry. Similarly, the findings show that there is no interaction effect of strategy and gender on mean interest scores of students in geometry.

Conclusion

Based on the findings of this study, it is concluded that the use of ChatGPT is more effective in enhancing students' academic achievement in geometry as well as increasing their interest in geometry. Additionally, the results indicate that gender does not have a significant influence on students'

academic achievement scores or their interest in geometry. Furthermore, there is no interaction effect between instructional strategy and gender on students' academic achievement or interest in geometry.

Recommendations

From the findings of this study, the following recommendations are made:

1. Schools should integrate ChatGPT, into mathematics instruction especially in geometry topics to improve students' academic achievement.
2. Educators should employ ChatGPT in order to boost student interest and motivation in mathematics, especially geometry.
3. Mathematics educator should use gender-responsive teaching strategy like ChatGPT to help close performance gaps.
4. Teachers should adopt ChatGPT that appeals to diverse learning preferences.

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