

1 **Creative Game Approach and Academic Achievements in The Teaching of SS1 Geometry**
2 **in Port Harcourt Local Government Area**
3

4 **ABSTRACT**

5 This study examines the effect of Creative Game Approach on Academic Achievement in the
6 teaching of SS1 Geometry in Port Harcourt Local Government Area of River state. A sample
7 size of 160 SS1 students was used for the study. Three research questions were asked while
8 three hypotheses were formulated and tested. Geometry Achievement Test (GAT), a 40-item
9 instrument was developed by the researcher. The instrument was validated by experts in
10 Mathematics education, and measurement and evaluation, while the reliability was established
11 using test-retest and co-efficient index of 0.86 was determined using Pearson product moment
12 correlation. Mean and Standard deviation was used to answer the research questions while
13 Analysis of Covariance (ANCOVA) was used to test the hypotheses formulated at 0.05 level of
14 significance. The result revealed a significant difference in the achievement mean scores of
15 students taught geometry using creative game approach and those taught using conventional
16 method. It equally showed a significant difference in the Mathematics ability of students taught
17 using creative game approach, also showed no significant difference in the achievement mean
18 scores of male and female students. Based on the findings, it was recommended among others
19 that Mathematics teachers be effectively trained to use different educational creative activities,
20 like games and so on when teaching Mathematics concepts for problem-solving,
21 communication, reasoning and connection skills which are necessary for the attainment of
22 better academic achievement in the subject.

23 **Keywords:** Creative Game Approach, Academic Achievements, Teaching of SS1 Geometry
24
25

26 **INTRODUCTION**

27 The pertinent virtue of mathematics as well as its contributions to the development of mankind
28 has earned the subject the prominence it enjoys among other science subjects.

29 Over the years, the performance of senior secondary school students in Mathematics calls for
30 concern. However, in spite of the importance and efforts made to bring about improvement in
31 students' achievement or performance in Mathematics, students still exhibit poor performance
32 in the subject. This constant poor performance in Mathematics has been attributed to so many
33 factors which include among others; the nature of the subject, the design of the curriculum
34 involving teaching methods and approaches, the quality of teachers and

Comment [ao1]: Efforts by who?

Comment [ao2]: Cite or provide evidence.

35 learners' characteristics. Awodeyi, (2003), respectively maintained that the poor performance
36 of students in Mathematics is due to teachers' inability to introduce life experience or examples
37 from the environment of the learners in teaching Mathematics.

Comment [ao3]: Is this true after 16 years?

38 Ogunkunle, (2007) argued that most teaching is usually devoid of life experiences. It is usually
39 characterized by memorization of formula, reasoning in abstract terms without reference to
40 happenings in the immediate environment. Teachers often teach Mathematics without adopting
41 approaches, methods and strategies that stimulate students' interest, bring in full participation
42 that allows them to critically think out ideas and solutions to Mathematical problems. The
43 students also come into class with an already biased conception of Mathematics as a very
44 difficult subject, very abstract and therefore hard to understand. This makes the weaker
45 students feel anxiety towards Mathematics and this anxiety affects their achievement in the
46 subject. The idea of using a teacher-centred strategy in teaching Mathematics has been widely
47 condemned. The instructional method is didactic in approach and results in low retention of
48 concepts, memorization of rules, theorems and lack of application into problem-solving.
49 According to Adenuga, (2012), students learn, explore Mathematical concepts, and verify
50 Mathematical facts and theorems through a variety of activities using different materials. The
51 creative approach of teaching is all about the teaching of Mathematics with variations and
52 innovations. Creative approach can be in different dimensions, like games, play, drama, use of
53 modern technology and stories.

Comment [ao4]: Provide some insight into creative games and justify why they are issues warranting research.

54 **Statement of the Problem**

55 The teaching of Mathematics to secondary school students faces the problem of poor
56 application of instructional materials and right teaching methods or approaches. Odili, (2006),
57 Ogunkunle and Adaramola, (2007) respectively pointed out that teaching as being practised
58 today in Mathematics has been found ineffective. This results in a noticeable poor achievement

59 both in internal and external exams. Hence this study looked into geometry as a branch of
60 senior secondary school Mathematics where students' faces more problems in understanding.

61 **Objectives of the Study.**

62 The specific objectives of the study are;

163 To find out if difference exists in the achievement mean scores of students taught Mathematics
64 using creative game approach and those taught using the conventional approach

265 To determine the achievement, mean scores of students with different Mathematics abilities
66 taught using creative game approach.

367 To determine the achievement, mean scores of male and female students taught Mathematics
68 using creative approach.

69 **Research Questions**

70 To achieve the objectives of the study, the following research questions were addressed;

171 What is the effect of creative game approach on students' achievement in Mathematics?

272 How does creative game approach affect students Mathematics abilities?

373 What is the achievement level of male and female students taught using creative game
74 approach?

75 **Research Hypotheses**

76 The following hypotheses guided the study.

77 H_{01} : There is no significant difference in the achievement mean scores of students taught
78 mathematics with creative game approach and those taught with conventional approach.

79 H_{02} : There is no significant difference in the achievement mean scores of students with
80 different mathematics abilities taught using creative game approach.

81 H_{03} : There is no significant difference in the achievement mean scores of male and female
82 students taught mathematics using creative game approach.

83 **METHODOLOGY**

Comment [ao5]: Your statement should aptly describe the current state of **Academic Achievements in The Teaching of SS1 Geometry** and raise questions that interface the sub-variables of creative games and academic performance.

84 The study is quasi-experimental design. The population of this study consists of 4075 SS1
85 students in Port Harcourt Local Govt. The sample size was 160 SS1 students including boys
86 and girls in their intact classes. The instrument was Geometry Achievement Test (GAT) with
87 distinctly designed lesson package on creative game teaching approach and conventional
88 teaching approach. The test consists of 40 items on geometrical concept taught in responses to
89 the two teaching approaches; which are creative game and traditional approaches. The
90 instrument was for both pretest and posttest. The Reliability coefficient of the instrument was
91 determined using the test-re-test and Pearson product moment correlation was used to calculate
92 the internal coefficient of 0.86. The instrument was validated by my lectures of Curriculum
93 Studies and Educational Technology in faculty of Education.

Comment [a06]: Are they test experts?

94 The students used for the study were grouped into the experimental group and control group. a
95 pretest was administered to them. The result of the pretest was used to classify the students into
96 three groups; those that scored within 0-49 were grouped as Low Mathematics Ability (LMA)
97 students, while those that scored within 50-69 were grouped as Average Mathematics Ability
98 students (AMA) and those that scored 70 and above were grouped as High Mathematics
99 Ability (HMA) students. The experimental group were taught using game approach while the
100 control group were taught using conventional approach.

101 To the experimental group, identification matico game was used for the game approach. At the
102 end of the lessons, students were given a geometry achievement test (GAT) as a posttest and the
103 result was used for analysis. Data Analysis; research questions were answered using mean and
104 standard deviation, while the null hypotheses formulated were tested using analysis of
105 covariance (ANCOVA) at 0.05 alpha significant level.

106 **RESULT PRESENTATION.**

107 **Research Question one**

108 RQ1. What is the effect of creative game approach on students' achievement in Mathematics??

109 **Table 1.** Mean and standard deviation (SD) of pre-posttest scores of Experimental (EG) and
 110 Control (CG) groups as measured by GAT.

Group	N	Pretest		Posttest	
		Mean	SD	Mean	SD
EG	82	43.9	14.5	69.7	12.6
CG	78	43.6	14.9	48.7	17.4
Mean diff.	-	0.3	-	21.0	-

111
 112 The result of Table 1 shows that the pretest mean achievement scores of the control group was
 113 (43.6) with standard deviation of (14.9). After the treatment, the use of conventional approach
 114 in teaching, the control group mean GAT score for posttest was (48.7) with SD of (17.4) while
 115 the pretest mean GAT score of experimental group was (43.9) with SD of (14.5), after the
 116 administration of treatment which was the use of creative game approach in teaching, the
 117 posttest mean GAT score increased to (69.7) with SD of (12.6). The result indicated that the
 118 experimental group outperformed the control group with an achievement mean gain of (21.0).

119 **Research Question Two.**

120 RQ2. How does creative game approach affect students Mathematics abilities?

121 **Table 2.** Mean and SD of pre-post GAT scores of students of low Mathematics ability (LMA),
 122 Average Mathematics Ability (AMA) and High Mathematics ability (HMA) of Experimental
 123 group.

Group	N	Pretest		N	Posttest		Mean Diff.
		Mean	SD		Mean	SD	
LMA	50	34.8	9.0	8	46.6	1.2	11.8
AMA	26	57.1	5.2	29	62.3	5.4	5.2

HMA	6	72.8	1.0	45	79.0	7.1	6.2
TOTAL	82	164.7	15.2	82	187.9	13.7	23.2

124

125 The result of Table 2 shows the pretest GAT mean score of LMA to be (34.3) with SD of (9.0)
 126 while AMA has a mean score of (57.1) with SD of (5.2) and HMA has a mean score of (72.8)
 127 with SD of (1.0). The posttest result of LMA mean score was (48.6) with SD of (1.2) while
 128 AMA has a mean score of (62.3) with SD of (5.4) and HMA has mean score of (79.0) with SD
 129 of (7.1). The result showed an increase in achievement mean scores of the three levels of
 130 mathematics ability. There was an increase in the number of students in AMA and HMA with
 131 a reduction in the number of students in LMA when the pretest and posttest number and mean
 132 scores are compared. This means that there is an improvement in the Mathematics abilities of
 133 students taught with creative game approach.

134 **Research Question Three.**

135 RQ3: What is the achievement level of male and female students taught using creative game
 136 approach?

137 Table 3. The Mean and SD of pre-post GAT scores of male and female students of
 138 Experimental group.

Group	N	Pretest		Posttest	
		Mean	SD	Mean	SD
Male	43	43.8	14.5	68.0	11.5
Female	39	44.1	14.8	71.3	13.9

139

140 The findings of Table 3 show that the pretest GAT mean score of male students was (43.8)
 141 with SD of (14.5), while that of female was (44.1) with SD of (14.8). The posttest GAT mean
 142 score for male students was (68.0) while that of female was (71.3) with SD of (13.9). There

143 was a slight mean difference of (3.3) between the female and male when compared but both
 144 showed an increase in their posttest which proved that creative game approach increases
 145 academic achievement of both male and female mathematics students.

146 **Research Hypothesis One.**

147 H_{01} : There is no significant difference in the achievement mean scores of students taught
 148 Mathematics with creative game approach and those taught with conventional approach

149 **Table 4: ANCOVA pre-post GAT result of Experimental and Control group**

Test of Between Subjects Effects

Dependent Variable: Achievement

Source	Type III Sum of Squares	Df	Mean Square	F	Sig.	Partial Squared	Eta Squared
Corrected Model	52561.782 ^a	2	26280.891	2908.586	.000	.974	
Intercept	3605.272	1	3605.272	399.006	.000	.718	
VAR00001	34837.682	1	34837.682	3855.593	.000	.961	
VAR00003	17110.568	1	17110.568	1893.679	.000	.923	
Error	1418.593	157	9.036				
Total	614486.000	160					
Corrected Total	53980.375	159					

a. R Squared = .974 (Adjusted R Squared = .973)

150
 151 From Table 4, the ANCOVA result analysis of GAT shows that the calculated significant value
 152 is (.000) which is less than the 0.05 accepted sig. value, therefore we reject the null hypothesis
 153 and accept the alternative proving that there is a significant difference between students taught
 154 geometry using creative game approach and those taught with the conventional approach.

155

156 **Research Hypothesis Two.**

157 H_{02} : There is no significant difference in the achievement mean scores of students with
 158 different Mathematics abilities taught using creative game approach.

159 **Table 5: ANCOVA result of Mathematics abilities of students in the Experimental group**

Tests of Between-Subjects Effects

Dependent Variable: Mathematics Abilities

Source	Type III Sum of Squares	Df	Mean Square	F	Sig.	Partial Squared	Eta Squared
Corrected Model	2470.810 ^a	3	823.603	335.758	.000	.967	
Intercept	47.214	1	47.214	19.248	.000	.361	
VAR00001	592.820	1	592.820	241.675	.000	.877	
VAR00003	158.005	2	79.002	32.207	.000	.655	
Error	83.401	34	2.453				
Total	136252.000	38					
Corrected Total	2554.211	37					

a. R Squared = .967 (Adjusted R Squared = .964)

160 The result of the analysis shows that the computed sig. value of (.000) is less than 0.05 alpha
 161 significant. This follows rejection of the null hypothesis and acceptance of alternative.
 162 Therefore, there is a significant difference between student's Mathematics ability and creative
 163 game approach.

164

165 **Research Hypothesis Three**

166 H03: There is no significant difference in the achievement mean scores of male and female
 167 students taught Mathematics using creative game approach.

168 **Table 6: ANCOVA result of male and female achievement in pre-post GAT**

Tests of Between-Subjects Effects

Dependent Variable: Gender

Source	Type III Sum of Squares	df	Mean Square	F	Sig.	Partial Squared	Eta Squared
Corrected Model	219.779 ^a	1	219.779	1.373	.245	.017	
Intercept	386041.579	1	386041.579	2411.966	.000	.969	
VAR00002	219.779	1	219.779	1.373	.245	.017	
Error	12484.108	78	160.053				
Total	399541.000	80					
Corrected Total	12703.887	79					

a. R Squared = .017 (Adjusted R Squared = .005)

169

170
171 The table result shows that the calculated sig. value of (.245) is greater than 0.05 alpha
172 significant. This follows acceptance of the null hypothesis indicating that there is no significant
173 difference in the achievement mean scores of male and female students taught Mathematics
174 using creative game approach.

175

176 **Discussion of findings.**

177 The first finding of the study revealed that the use of creative Mathematics games helps
178 students to improve in their academic achievement when it comes to learning of difficult
179 Mathematics concepts in geometry. The findings portray the situation in our secondary schools,
180 where the Mathematics teacher does not use effective teaching approach and method, rather,
181 they cling to the use of talk chalk approach in teaching mathematics. Jonah- Eteli (2007) in his
182 study portrayed this when he notes that “there has over the years been a decay of the traditional
183 approach to the teaching of Mathematics which encourages rote memorization”. Jonah- Eteli,
184 (2007) referred to this traditional approach for meaning, concepts and formulae. Mathematics
185 teacher teaches difficult concepts in geometry without using the appropriate approach that will
186 help the students attain academic achievement. The findings agree with the study of Ugwuanyi
187 and Uche, (2014) which concluded that the use of algebraic substitution game approach has a
188 positive influence on students’ both male and female achievement in algebra. The findings
189 support the work of Hong and Aqiu (2004) on academically gifted Mathematics students and
190 students with creative talent in Mathematics and found significant differences in cognitive
191 strategies with the creatively talented group being more cognitive resourceful. It also agrees
192 with the study of Ogunkunle and Adaramola, (2007) on teaching Mathematics through
193 Mathematical games and was concluded that the use of Mathematical games improves the
194 performance of students in the subject. This result also agrees with the work of Achor, Imoko
195 and Ajai (2010) who in their findings ~~concludes~~ conclude that the use of instructional materials

Comment [ao7]: Jonah was not cited in literature.

Comment [ao8]: Not cited in literature.

Comment [ao9]: Not cited in literature.

196 (manipulatives) such as games have a positive effect on students' academic achievement. This
197 means that the use of any of the dimensions of creativity in teaching enhances the achievement
198 of students in Mathematics, as teachers can use them to eliminate the abstractness in learning
199 Mathematics especially in geometry and facilitate understanding.

200 The second findings of the study proved that there was an improvement in students
201 Mathematics ability with a reduction in the number of Low Mathematics Ability students
202 (LMA) and increase in the number of Average Mathematics Ability (AMA) and High
203 Mathematics Ability (HMA) students. This proved that the creative game approach has a
204 positive influence on the student's level of Mathematics ability. The results confirmed the
205 creative game approach as a means for improvement of students with low ability. The
206 immediate feedback for error correction provided in the creative game may be the element that
207 makes students attain higher improvement. This is consistent with the results of previous
208 studies of McDaniel, Roediger, and Mc Dermoltt, (2007), which proved that immediate
209 feedback learning obtains more learning gain and better retention of knowledge.

210 This is also supported by Ku, O., Chen, S.-Y., Wu, D.-H., Lao, A.-C.-C., & Chan, T.-W.
211 (2014), in their study which concluded that game-based learning (GBL) is regarded as a
212 potential means in improving students level of Mathematics ability. As in the study, the
213 students with high and low levels of ability in the GBL group gained significant improvement
214 in confidence towards Mathematics. It also showed that low ability students in GBL group
215 attained better Mathematics performance than those in the paper-based setting.

216 The third findings of this study showed improvement in the achievement of male and female
217 students in geometry using creative game approach. Mathematics is not gender sensitive but if
218 appropriate teaching approach is used, students both male and female performs better. This
219 confirms Hyde, Fennema, and Lamon, (2010), that gender is insignificant in of students students'

Comment [ao10]: Cite properly without their initials. Not cited in literature.

Comment [ao11]: Not cited in literature.

220 achievement in Mathematics. This finding disagrees with the study of Akakabota, (2005) which
221 reported that boys do better in Mathematics than girls.

222

223 **Conclusion**

224 It was concluded based on the findings that the creative game approach improves
225 students' achievement and ability in geometry. Also that the use of the creative game
226 approach in the teaching of geometry is not gendered biased.

227 **Recommendation**

228 Following the conclusion of this study, the following recommendations were made.

- 229 1. Mathematics teachers should be encouraged and effectively trained on how to use
230 appropriate mathematics creative activities including different games and so on, in
231 teaching mathematics topics/ concepts in order to link learners past experiences and
232 daily activities with classroom instructions. This is believed will enhance problem-
233 solving, communications, reasoning and the needed connections, not just better
234 achievement in mathematics but also reliance.
- 235 2. Game approach can also be applied to other Mathematical concepts/topics to stimulate
236 interest and make available many simple ways of engaging learners.
- 237 3. Authors of Mathematics textbooks are encouraged to simplify more their textbooks by
238 involving game approach in most of the topics.
- 239 4. Stakeholders in Mathematics education should endeavour to organize workshops/
240 seminars where in-service mathematics teachers could be trained on the use of
241 mathematics games in teaching students.

242

243 **References.**

Comment [ao12]: What are the educational, pedagogical or curriculum implication of the findings?

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