Effect of Game Teaching Method on Students Mathematics Achievement in Aboh-Mbaise Local Government Area, Imo State

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ABSTRACT
The study investigated effect of game teaching method on students’ mathematics achievement using the concept of algebra (quadratic equation). Specifically the study focused on determine the difference between students taught concept of algebra using game teaching method and expository method. Quasi-experimental design was adopted in the study. The population size was all the senior secondary school one students in Aboh Mbaise Local Government Area in Imo State. The sample size was 120 students comprising 70 males and 50 females in four schools in Aboh Mbaise Imo State using purposive sampling technique. The instruments used for data collection were Quadratic equation achievement test (QAT). The reliability coefficient of the instruments was established using pearson’s product moment correlation which yielded 0.76 coefficient value. Data collected were analyzed Mean and standard deviation. The result of the analyses revealed that students taught the concept of quadratic equation using game teaching method achieved better than their counterparts who were taught using expository method. The study therefore recommended that Mathematics teachers should adopt game teaching method in teaching the concept of quadratic equation in secondary schools. The study included that, games as instructional strategy facilitates students’ academic achievements on quadratic equation better than the use of expository strategy.

Keywords: Mathematics achievement, game teaching method, students

INTRODUCTION
Mathematics without doubt remains very important to all disciplines and fields of human works and study (Odili, 2006). It has continued to play significant role in the development of both individuals and nations. Therefore, for any nation to survive and develop, it has to improve on its teaching and learning of mathematics which is the basis for technological development (Azuka, 2001). This is the reason why mathematics is one of the compulsory subjects at secondary school level.

According to the National Policy on Education (FRN, 2013) Mathematics is included on the six compulsory subjects every students must take in group “A”. This policy also makes mathematics an important subject in the current structure of the national education that is every child must study it for six years in lower basic (basic 1-6), three years in upper basic (basic 7-9) and three years in Senior Secondary School as compulsory subject.

Educational Game has been defined as “an enjoyable social activity with goals, rules, and educational objectives” (Steven and Cary, 1994). Also, Game is a “system in which players engage in artificial conflict, defined by rules that result in a quantifiable outcome” (Steven and Cary, 1994). Several definitions of a game have been offered. The most mathematical games are those in which the structure and rules of the game are based on mathematical ideas and where winning the game is directly related to understanding the mathematics. A game is a type of play that follows a set of rules, aims at a definite goal or outcome and involves competition against other players or against barriers imposed by nature of the game itself. A game is a contest (play) between adversaries (players) operating under constraints (rules) in order to achieve an objective (winning or payoff). Games are
competitive interactions among participants to achieve pre-specified goals. These interactions may enhance co-operation among individuals or group. Mathematical games can take the form of puzzles, fallacies or any type of mathematics which provides amusement or curiosity. Such games provide enjoyment and recreation. They also stimulate mathematical thinking and also generate excitement and spirit of competition. Mathematical games provide reinforcement to both losers and winners. For the winners, for instance, they will endeavor to maintain their lead while the losers will try to overcome their defeats. Games help in releasing tension, clearing boredom and providing an environment where the student can develop his skills and acquire more knowledge. Games and mathematics are related because each has rules which involve experiences, drill and practical applications.

Akinsola and Animasahun (2008) conducted a study to determine the effect of game environment on student’s achievement and attitude to mathematics in schools in Osun State, using a sample of 147 students in senior secondary school discovered that students’ poor academic achievement in mathematics is partly due to the method of teaching used. The findings also revealed that the use of games environment led to improved achievement towards mathematics. Akinsola and Animasahun in the study also indicated that the teacher’s role is not simply that of a facilitator whose task is to provide a suitable environment in which students are presented with new opportunities for learning, but his task included encouraging students’ motivation so that their academic performance could be improved. The findings also reviewed that a significance difference exists between the experimental and control groups in relation to the achievement of individuals and behavior toward Mathematics.

Ifamuyiwa (2004) reported that pupils are inadequately exposed to mathematical experiences in the early formative stages of life. In consequence, children get to the secondary school discouraged rather than encouraged in mathematics learning. The overall effect of this is unattractive learning situation, lack of understanding of mathematical concepts, and hatred for the subject among students. The problems associated with Mathematics learning in schools had been enumerated as content issues, curriculum integration, pedagogical problems, students’ factor, teachers’ factor and more (Odili, 2006). Government had partially resolved the problems associated with curriculum integration by ensuring that experts in Mathematics and Mathematics education nationwide came together to produce a befitting school curriculum for the subject at all levels (NERDC, 2012). Notwithstanding, the problem of the teachers’ factor had continued unabated. It is believed strongly that these problems can be resolved through adequate search for methods that will help teachers and students to excel in Mathematics teaching and learning. Undoubtedly a single teaching method of Mathematics concept for proper understanding of the learner had proven inadequate. The question now is what method would actually prove effective to achieve result? Would combination of methods be effective to achieve result? The answer to these questions makes a study of this nature necessary.

**Purpose of the study**

The key purpose of this study is to examine the effect of Games strategies on Senior Secondary students’ retention in mathematics. The study specifically sought to:

1. Compare the achievement of students on the concept of (Algebra) quadratic equation in mathematics when taught using game and the expository method
2. Determine the difference in achievement of male and female students in quadratic equation in mathematics when taught using game and when taught with the expository method

**Research Question**

The following research questions were formulated to guide the study

1. What is the difference in the achievement of students on the concept of (Algebra) quadratic equation in mathematics when taught using game and the expository method?
2. What is the difference in the achievement of male and female students in quadratic equation in mathematics when taught using game and when taught with the expository method?

**Hypotheses**

- There is no significant difference in the achievement of students on the concept of (Algebra) quadratic equation in mathematics when taught using game and the expository method
There is no significant difference between the achievement of male and female students in quadratic equation in mathematics when taught using game and when taught with the expository method.

**METHODOLOGY**

The research design adopted for this study is quasi-experimental. It implies intact classes in non-randomized pre-test, post-test control group design. The population of this study comprised 850 senior secondary school one (SSS1) students in Abob Mbaise Local Government Area in Imo State. Simple random sample was used to select 4 secondary schools among the ten senior secondary schools in Abob Mbaise Local Government Area in Imo State. Two intact SS1 Classes in each of the sampled schools were used for the study. One hundred and twenty (120) Senior Secondary School One (SSS1) students (male and female) for 2016/2017 academic session. Fifty (50) student formed the experimental group in which thirty (30) were male and twenty (20) were female. The control group comprised of 70 students. The instrument used for data collection was Achievement Test in Quadratic Equation (ATQE). The research instrument contained 20 multiple choice questions. Each item had four (4) options A, B, C, and D with only one correct answer after validation. The questions were drawn mostly from past WASSCE, NECO and UTME Examination question papers. The draft of the instrument was submitted for validation to two (2) lecturers in the department of science education and the researcher’s supervisor, Rivers State University. To further strengthen the research instrument, cronbach alpha was used to determine the reliability coefficient of the instrument, which resulted to 0.87. The coefficient value obtained guaranteed the reliability of the instruments since it is of a high degree. Each correct answer was scored five (5) marks and incorrect answer zero (0) mark. This gave the maximum score of one hundred percent (100%) and minimum score of zero percent (0%). The lesson packages prepared by the researcher were used in the teaching of quadratic Equation based on the two (2) instructional strategies used. The packages contained the same concepts, but with different instructional approaches with respect to experimental group. ATQE was administered to both groups to obtain their level of achievement before treatment was given to both groups and instrument was re-administered. The data collected were analysed using descriptive statistics (mean and standard deviation). Hypotheses were tested at 0.05 level of significance.

**RESULT AND DISCUSSION**

**Research Question 1 :** What is the difference in the achievement of students on the concept of (Algebra) quadratic equation in mathematics when taught using game and the expository method?

**Table 1: Mean and Standard Deviation of Students’ Pre-test and Post-test scores by Instructional strategies**

<table>
<thead>
<tr>
<th>Teaching Method</th>
<th>N</th>
<th>( \bar{X} )</th>
<th>SD</th>
<th>( \bar{X} )</th>
<th>SD</th>
<th>Gain in Mean</th>
</tr>
</thead>
<tbody>
<tr>
<td>Game</td>
<td>50</td>
<td>20.08</td>
<td>13.30</td>
<td>63.40</td>
<td>14.76</td>
<td>43.32</td>
</tr>
<tr>
<td>Expository/lecture</td>
<td>70</td>
<td>19.40</td>
<td>9.95</td>
<td>42.61</td>
<td>13.88</td>
<td>23.21</td>
</tr>
<tr>
<td>Total</td>
<td>120</td>
<td>19.68</td>
<td>11.23</td>
<td>51.27</td>
<td>14.25</td>
<td>31.59</td>
</tr>
</tbody>
</table>

**Source:** Field Survey, 2019.

In Table 1, the mean gain (post-test, pre-test mean difference) for game is 43.32, and expository is 23.21. These results indicated that students taught with game had higher mean gain than expository/lecture method.
Research Question 2: What is the difference in the achievement of male and female students in quadratic equation in mathematics when taught using game and when taught with the expository method?

Table 2: Mean and Standard Deviation of Students’ Pre-test and post-test Scores by Gender and Treatment

<table>
<thead>
<tr>
<th>Teaching Method</th>
<th>Male Pre-test</th>
<th>Male Post-test</th>
<th>Female Pre-test</th>
<th>Female Post-test</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>N</td>
<td>X̄</td>
<td>SD</td>
<td>X̄</td>
</tr>
<tr>
<td>Game</td>
<td>30</td>
<td>19.80</td>
<td>14.86</td>
<td>63.50</td>
</tr>
<tr>
<td>Expository/lecture</td>
<td>32</td>
<td>19.09</td>
<td>11.12</td>
<td>43.02</td>
</tr>
</tbody>
</table>


In Table 2, the mean gain (ie post-test – pre-test difference) for male students taught with games is 43.70 while the corresponding achievement gain for female students in the same group is 42.75. Similarly, the mean gain for male students in expository group is 23.93 while their female counterparts in the same group have mean gain of 22.60. The mean difference between the male and female in the two groups showed that gender has nothing to do with learning.

Hypotheses

Hypothesis One: There is no significance difference in the academic achievement of students taught quadratic equation using game and those taught using expository method.

Table 3: Summary of Analysis of Covariance (ANCOVA) of students’ post-test and pre-test scores classified by instructional strategies

<table>
<thead>
<tr>
<th>Sources of variance</th>
<th>Df</th>
<th>Sum of squares</th>
<th>Mean squares</th>
<th>Fcalc</th>
<th>Fcrit</th>
<th>Significance</th>
</tr>
</thead>
<tbody>
<tr>
<td>Between Groups</td>
<td>1</td>
<td>2921.14</td>
<td>2921.14</td>
<td>7.94</td>
<td>3.92</td>
<td>S</td>
</tr>
<tr>
<td>Within Groups</td>
<td>118</td>
<td>4317.18</td>
<td>367.94</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Total</td>
<td>119</td>
<td>46338.32</td>
<td>32289.08</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>


In Table 3, the calculated F-ratio ie Fcalc is greater than the F-critical ie Fcrit at $\alpha = 0.05$ level of significant. Therefore, the null hypothesis one is rejected. This implies that there exists a significant difference between the academic achievements of students taught quadratic equation using the two methods. Hence, instructional strategies have significant effect on students’ academic achievement in mathematics.

Hypotheses Two: There is no significant difference between the academic achievement of male and female students taught the concept of quadratic equation using h games and expository method.

Table 4 Summary of ANCOVA of Students Post-test and pre-test scores classified by instructional strategies

<table>
<thead>
<tr>
<th>Sources of variance</th>
<th>Df</th>
<th>Sum of squares</th>
<th>Mean squares</th>
<th>Fcalc</th>
<th>Fcrit</th>
<th>Significance</th>
</tr>
</thead>
<tbody>
<tr>
<td>Between Groups</td>
<td>3</td>
<td>2870.48</td>
<td>956.83</td>
<td>2.56</td>
<td>2.68</td>
<td>NS</td>
</tr>
<tr>
<td>Within Groups</td>
<td>116</td>
<td>43417.88</td>
<td>374.29</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Total</td>
<td>119</td>
<td>46288.36</td>
<td>1331.12</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>


As shown in Table 4, the computed F-ratio is less than the critical F-ratio, therefore, we accept the null hypothesis three. This implied that there is no significant difference in the achievement of male and female students taught the concept of quadratic equation using the two methods. Hence instructional strategies have no significant difference in students’ academic achievement by gender.
DISCUSSION OF FINDINGS
The findings of the results showed that there was significant difference between the achievement of students in quadratic equation when taught using game and expository method the students taught using game had higher mean gain than those taught using lecture method. The significant difference between the achievements of those taught using game in the study is in line with Adeniram (1994), Awodeyi (1999), Ibe (2010), Alemu (2010), Ogwuche (2012), and Akinsola and Animasahun (2008) who indicated that students taught using game performed significantly better in achievement than those taught using conventional method. In conclusion, the researcher concluded that appropriate use of methods have been found to be more important of students’ academic achievement. The results proved that properly used instructional strategies are predictor of students’ academic Achievement. Findings of the study also showed that there is no significant difference in the achievement of male and female students taught the concept of quadratic equation using game and expository method. This observation agrees with Abiam and Odok (2006), who found no significant difference in mathematics achievement between male and female students but disagrees with Egwasi (1980), Galadima (2003), Ekeh (2004) and Ifamuyiwa (2004) who observed that male students performed significantly better than their female counterparts in mathematics and science related courses.

CONCLUSION
Based on the findings of this study, it is hereby concluded that game enhances students’ academic achievement quadratic equation better than the use of expository/lecture method.

RECOMMENDATION
Based on the observations made and their educational implications, the following recommendations are made:

- Since game method of teaching enhances the students’ level of critical and reflexive thinking to solve mathematical problems, teachers are encouraged to adopt game teaching method in teaching mathematical concept
- Seminars, workshop and conferences should be organized more frequently for mathematics teachers to update their knowledge on the use of games
- Mathematics teachers should learn and download some mathematical games applications from the internet and encourage the students to do so since majority of the students have gadgets that have access to internet.

REFERENCES