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EFFECT OF GAME-BASED LEARNING STRATEGY ON PUPILS' ACADEMIC ACHIEVEMENT IN MATHEMATICS IN AGBANI LOCAL GOVERNMENT EDUCATION AUTHORITY

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ABSTRACT

This study explored the effect of game-based learning strategy on pupils' academic achievement in Mathematics in Agbani Local Government Education Authority of Enugu State. Two research questions and three null hypotheses guided the study. Quasi-experimental research, specifically pre-test post-test non-equivalent control group design was adopted for the study. The population consisted of 4,292 primary five pupils (2096 males and 2196 females) in the 167 public primary schools in the area. A multi-stage sampling procedure was used to select a sample size of 174 (71 males and 103 females). Mathematics (Geometry) Achievement Test (MAT) was used for data collection. The validity of the instrument was established using experts in the field of early childhood education, measurement and evaluation and a primary school Mathematics teacher. Kudder-Richardson Formula 20 (KR-20) was used to establish the reliability of MAT which yielded a reliability index of 0.86. Mean and standard deviation were used to answer the research questions while Analysis of Covariance was used to test the hypotheses at 0.05 level of significance. The analysis was carried out using SPSS version 23.0. Findings of the study revealed among others that game-based learning strategy had a significant positive effect on pupils' academic achievement in Mathematics when compared to conventional teaching method. Male pupils taught Mathematics using game-based learning strategy achieved higher than their female counterparts taught the same way but there was no significant difference in the performance. It was concluded that game-based strategy seems to enhance male pupil's academic achievement in Mathematics due to the kind of game (board and card) they are exposed to than female pupils in primary schools. This implies that primary school teachers should set activities to arouse female pupil's interest in participating in games in the classroom. The study recommended among others that primary school teachers should be encouraged to adopt game-based instructional strategies to enable pupils have deeper understanding of Mathematics and for them to see Mathematics as an interesting and friendly subject.

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Keywords: Primary Education, Mathematics, Academic Achievement, Game, and Game-Based Learning Strategy

Introduction

Primary education is the first formal schooling system a child is exposed to after home education. It welcomes the child to the process of socialization under the tutelage of a teacher. Primary education is a pupil-centred environment that prepares and grooms the mind of a child for future academic endeavours. According to the Federal Republic of Nigeria (FRN, 2013), primary education is the education given in an institution for children aged six to 11 plus. FRN recognizes the importance of primary education and as a result, gave it prominence in the National Policy on Education as one of the levels of programmes in the Nigerian educational system. Currently, Nigeria operates 9-3-4 educational system. Primary education is embedded in the 9-3-4 system as Lower Basic (Primary 1-3), Middle Basic (Primary 4-6); which runs up to Upper Basic (Junior Secondary 1-3). The 9-Year Basic education emphasizes value re-orientation, poverty eradication and employment generation capabilities in learners, where science, technology, mathematics, vocational education and training are specifically designed to provide the contents, learning experiences and skills for the socio-economic transformation of the Nigerian nation (Igbokwe, 2015). The structure of the 9-Year Basic Education Curriculum was such that subject offered ranged between 10 and 16 from Primary I to JSS III and almost every subject stands on its own. For example, Basic Science, Basic Technology, Physical and Health Education, Computer Studies, Civic Education, Home Economics, Agricultural Science, Business Studies and Christian Religious Studies/Islamic Studies were all separate subjects (FGN, 2008).Across the Lower Basic (Primary 1-3), Middle Basic (Primary 4-6) of the 9-3-4 education system, Mathematics, English language and one major Nigerian language (Hausa, Yoruba or Igbo) are among the core subjects offered by every pupil in the primary school system.

Mathematics is the science of numbers and shapes. Mathematics is not only considered as an important subject in all the levels of education, but also regarded as the father and queen of all science subjects. According to Anaduaka and Okafor, (2013), Mathematics is seen as a body of knowledge essential for the achievement of scientific and technological nation. The diversity of Mathematics lays a good foundation for accurate scientific and technological enhancements. Since Mathematics is known to be at the foundation of science and technology, it means that the level of social and economic development of any country is closely

connected with the level of development in the mathematical sciences (Kuku, 2012). The importance of Mathematics does not only lie in its contributions to scientific and technological development but also in its utility in day-to- day interactions at the market places, transportations, business of all sorts by both literate and illiterate members of the society (Golji and Dangpe, 2016). However, there seems to be a negative attitude among pupils towards mathematics in primary schools due to the teaching methodologies adopted by teachers. The traditional teaching method usually employed by primary school teachers is filled with too much talking and writing which makes pupils to fear and to some extent have phobia towards learning Mathematics. This traditional method of instructional delivery makes the pupils to be passive listener in the teaching and learning processes rather than be active which affects their academic achievement negatively.

Academic achievement is a mark of success for learners, teachers and schools because it is usually measured by external examination or continuous assessment. However, primary school pupils' academic achievement in Mathematics has not been satisfactory (Norman, 2011). Document cited by the researcher in the Examination and Statistics office of the Ministry of Education, Enugu State testify that pupils' achievements in Mathematics in Common Entrance Examination in Agbani Local Government Education Authority from the year 2018 to 2022 is not encouraging. 50 percent and above is considered as high achievement while below 50 percent is considered low achievement. In 2018, 11,200 candidates sat for the Common Entrance Examination. Out of this number, 39 percent scored high while 61 percent scored low. In 2019, 10,014 candidates sat for the examination. Out of this number, 41 percent scored high and 59 percent scored low. In 2020, out of the 10,589 candidates who sat for the examination, 44 percent scored high while 56% scored low. In 2021, out of the 9,986 candidates who sat for the examination, 38 percent scored high and 62 percent scored low. In 2022, 10,758 candidates sat for the examination, out of this number, 46 percent scored high while 54 percent scored low.

The persistent poor achievement of pupils in Mathematics has been attributed by researchers such as Dorgu, Omoro and Nato, Asikhia (2018) and many others as the lack of teacher's knowledge on the subject matter, inadequate teaching materials, pupil's attitude towards the subject, the teaching method employed by teachers among others. These identified problems that could be responsible for the poor academic achievement of pupils in Mathematics calls for closer look on the methods employed by teachers in the classroom. Dorgu (2015) identified teaching methods to include; discussion method, the study-assignment method, seminar method, demonstration method and conventional method among others.

Conventional teaching method entails the use of board with chalk followed by dictation. This is supported by Achuonye (2015) who observed that conventional method is very prevalent in primary schools in Nigeria. The reasons for utilizing conventional teaching method includes; it saves time, permits flexibility, requires less rigid space, permits adaptability and permits versatility. Despite the reason for utilizing the method, it has some disadvantages. In conventional method, learners are more passive than be active, the cooperation and interaction between the teachers and the pupils are minimal. Yap (2016) stressed that in conventional teaching method, instructor initiate discussion in the classroom and focus exclusively on knowing the content in textbooks and notes. The author added that this method of teaching limit the room for more creative thinking and also seldom consider individual differences. Similar to this, Feider and Silverman cited in Farha (2016) argued that conventional teaching method makes pupils uninterested in class, discouraged, bored and do poorly in test. The conventional teaching method gives Mathematics an abstract outlook to primary school pupils and could be responsible for their poor achievement in handling Mathematics questions in external examinations. These short comings of the conventional method have led to some innovative, pupil-centred and activity-based teaching strategies such as game-based, self- instructional, think-pair-share, jig-saw among others. These innovative teaching strategies would make primary school pupils acquire basic analytical skills while participating actively in the process of understanding the components of primary school Mathematics than mere sitting down and listening to their teacher's instructional delivery. Naturally, primary school pupils tend to learn faster in a playful atmosphere due to their age and one of such atmospheres is learning through games.

A game is a physical or mental competition conducted according to rules with the participants in direct opposition to each other. According to Agwagahas cited in Akinsola and Frederick-Jonah (2014), 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. The importance of introducing games to mathematical instruction, according to Kankia (2008) is that, they relax tension, clear boredom, foster environment where teaching and learning are pleasant, interesting, exciting, stimulating, motivating and at the same time academically rewarding. Without doubt, the fun and carefree element embedded in games makes it an interesting learning strategy in the classroom.

Game is part and parcel of children's learning, research work conducted by Joiner, Iacovides, Owen, Gavin, Clibbery, Darling and Drew (2011) showed that 99

percent of boys and 94 percent of girls engage in interactive game play within and outside the school environment. The global appeal of gaming in the life of children and adults can be harnessed as a rich form of learning experience in a classroom. This learning experience can be called game-based learning strategy. Game-based learning is defined as an approach to learning with a type of game play that has defined learning outcomes; which is to balance subject matter with game play, the ability of the player to retain and apply the subject matter to the real world (Benoit, 2017). It combines multiple learning strategies into an effective means of acquiring, practicing and applying new knowledge. Game-based learning strategy enables pupils to work cooperatively and competitively with active participation and interaction in the course of discovering new knowledge.

Game-based learning strategy provides pupils with fun and conditioned academic exercise as a stress-free learning experience for them. In the same vein, Sadeghi and Dousti (2013) posited that:

> Game-based learning strategy entails increased learning efficacy, immediate feedback during game play; repetition, drill, and practice of essential language skills, pupils-centered learning, increased motivation, and an element of fun. Game- based learning strategy helps to remove the elements of difficulty in course of teaching and learning primary school Mathematics because it subjects pupils to mathematical exercises through active participation with their hands, head and heart in a safe environment (p 122).

More so, Agwagah in Usman and Nwoye (2010) asserted that teaching and learning Mathematics with games is helpful and arouses the interest of pupils in achieving better in Mathematics. In support, Akinsola and Frederick-Jonah (2014) asserted that another way to create and sustain pupils' interest permanently in Mathematics is by teaching Mathematics with varieties of methods, instructional materials and techniques, especially games. This apart from making Mathematics learning more interesting, it will improve pupils' achievement in Mathematics. It is important to mention that game-based learning strategies come in different forms and instructional settings. Examples of game-based learning strategies include go fishing game, clock game, dice games, online computer and mobile games, board and card games, pencil and paper games, egg in a crate game, and slide game approach among others. These games can be played by male and female pupils in primary schools. Specifically, the study focused on board and card game. Board and

card game is a type of game that has to do with the use pack of cards with mathematical problems written on the card and is being played on a board or desk. According Hunsucker (2016), board and card game is an analogue system designed to create a game play experience with the use of cards. The kind of cards used in board game is dependent on the kind of mathematical concepts that pupils are studying, and during the game, the board acts as an external representation of the game state. The board is placed in the center of the table in reach and view of all players. The board changes throughout the game as players take their turns and manipulate their positions in order to ensure that every pupil participates in the gaming. A team player with the highest number of wins automatically becomes the overall winner. The influence of gender on academic achievement would be investigated because previous studies; (Ibe, 2014; Nwagbo and Chekelu, 2011; Opara, 2011) indicated that academic achievement of pupils can also be influenced by gender.

According to Robertson (2012), boys prefer more challenging competitive games such as geo-board game and power tac toe game, board and card game, among others whereas girls prefer the more social related games such as ludo game, ayo game and slide game with less conflict. Although, Mathematics is usually given a masculine perspective, female pupils are gradually making massive impact across Science, Technology, Engineering and Mathematics (STEM) subjects across all levels of education. Some research found s significant differences in favour of boys, while a few in favour of girls and others are neutral (Akinsola and Frederick-Jonah, 2014). This situation calls for primary school teachers to set up a stimulating gaming environment that is developmentally appropriate for children so as to make each and every pupil learn the instructional contents of the subject matter without fears of stereotyping. The researcher observed that empirical investigation on the effects of game-based learning strategy on pupil's academic achievement in Mathematics has not been given adequate attention in Enugu state. It is against this background, that the researcher is motivated to find out the effect of game-based learning strategy on primary school pupils' academic achievement in Mathematics in Agbani Local Government Education Authority of Enugu State.

Statement of the Problem

Mathematics education is the bedrock of scientific and technological development in any country. Nigeria as a developing country needs Mathematics in order to stay in touch or compete with its counterparts in the recent scientific and technological innovations that is shaping the systems of the world. Despite the importance of Mathematics and a core subject learned from pre-primary to tertiary education, some primary school teachers in the study area seem to face many problems in teaching the

subject, such as inability of the teacher to diversify teaching methods which negatively affect the academic achievement of pupils in the subject. This problem appears to be caused by conventional teaching method mostly used in primary schools to teach Mathematics leading to a reduction in learners' active participation in the instructional process.

Considering the premium status of primary school Mathematics in the preparation of future mathematicians, scientists and technologists, the persistent poor academic achievement of pupils in the subject needs urgent intervention. Hence, teachers are encouraged to shift from the conventional or teacher-centred teaching method to pupil-centred and activity-based teaching method in order to make the instructional contents of primary school Mathematics friendly to pupils. Again, much is not yet known on the effect of game-based learning strategy on pupils' academic achievement in Mathematics in primary schools in Agbani Local Government Education Authority of Enugu State. There seems to be paucity of empirical studies on the effect of game-based learning strategy on pupils' academic achievement in Mathematics in the area hence the need for this study.

Purpose of the Study

The purpose of the study was to determine the effect of game-based learning strategy on pupils' academic achievement in Mathematics in Agbani Local Government Education Authority of Enugu State. Specifically, the study determined the:

1. Difference between mean achievement scores of primary five pupils taught Mathematics with game-based learning strategy and those taught with conventional method.
2. Difference between mean achievement scores of male and female primary five pupils taught Mathematics with game-based learning strategy.
3. Interaction effect of instructional methods and gender on academic achievement of primary five pupils in Mathematics

Research Questions

The following research questions guided the study:

1. What is the difference between mean achievement scores of primary five pupils taught Mathematics with game-based learning strategy and those taught with conventional method?
2. What is the difference between mean achievement scores of male and female primary five pupils taught Mathematics with game-based learning strategy?

Hypotheses

The following null hypotheses were tested at 0.05 level of significance:

1. There is no significant difference between the mean achievement scores of primary five pupils taught Mathematics with game-based

learning strategy and those taught with conventional method.

2. There is no significant difference between the mean achievement scores of male and female primary five pupils taught Mathematics with game-based learning strategy.
3. There is no interaction effect of instructional methods and gender on academic achievement of primary five pupils in Mathematics.

Research Methods

The study was designed to determine the effect of game-based learning strategy on pupil's academic achievement in mathematics in Agbani Local Government Education Authority, Enugu State. Two research questions and three hypotheses tested at 0.05 level of significance guided the study. The study adopted a quasi-experimental design by applying 2 by 2 factorial, specifically, non-randomized control group, pre-test and post-test design. The population of this study comprised 4,292primary five pupils (2,096 males and 2,196 females) in the 167 public primary schools in Agbani Local Government Education Authority of Enugu State (Source: Planning, Research and Statistics Department, Ministry of Education, Enugu State, 2019). The sample of the study comprised 174 (71 males and 103 females) primary five pupils from four primary schools in intact classes in Agbani Local Government Education Authority of Enugu State. The experimental group schools comprised 78 pupils (30 males and 48females) while the control group schools comprised of 96 pupils (41 males and 55 females). In selecting schools to participate in the study, purposive sampling and simple random sampling techniques were used.

The instrument for data collection used for the study was Mathematics (Geometry) Achievement Test (MAT). The researchers constructed the MAT which comprised 20 items taken from National Common Entrance Examination past questions on four topics in Mathematics as contained in the primary five Mathematics curriculum namely; volume, capacity, weight and time.Three experts validated the instrument, two expert from the Department of Early Childhood and Primary Education and another from Measurement and Evaluation in the Department of Educational Foundations, all from Faculty of Education, Nnamdi Azikiwe University, Awka. In a bid to ascertain the reliability of the instrument designed for the study, the researchers conducted a pilot study with 40 primary five pupils using the intact class in Udi Local Government Education Authority of Enugu State who were not part of the research population using Cronbach alpha with reliability coefficient of 0.78 which shows that the instrument was reliable. Mathematics Achievement Test (Geometry) (MAT) was administered to the two groups before the commencement of the experiment as a pre-test by the researcher in order to ascertain pupil prior

knowledge in the selected Mathematics concepts of study. After the pre-test the treatment followed immediately for the two groups.

Score of pre-tests was used to determine if there is significant difference in the subjects' entry level before the experiment. The pre-test was administered in the first week. The experiment took four weeks for the experimental and control groups. After treatment, the two groups took MAT as post-test. For MAT, the test score is the total number of items correctly answered out of 20 objective test items. Pupils' response was scored as five (5) when they correctly get any answer and zero when they fail it. MAT scores were the total number of questions correctly answered. The maximum score was hundred (100) which is 5 by 20 while the minimum score was 50. Scores obtained from post-test were used to measure academic achievement difference, if any, due to the type of treatment received by each group. Extraneous variables such as teacher variable, effect of pre-test on posttest and randomization that might influence the outcome of the study were controlled by the researchers. Research questions were answered using mean, while Analysis of Covariance (ANCOVA) was used in testing the hypotheses at 0.05 level of significance. For the research questions, if the mean of the post test is greater than the pretest, then it has a positive effect but if the mean of the posttest is less than the pre-test, then it has a negative effect. The reason for adopting the ANCOVA procedure for testing the hypotheses was to help eliminate any initial differences in the entry abilities of the participants that extraneous-variable control measures could not properly address. In this case, the pretest scores were used as covariate measures on the posttest scores. If the p-value < 0.05, reject H_o and if p-value is ≥ 0.05, accept H_o.

Presentation of Results

Research Question 1: What is the difference between the mean achievement scores of primary five pupils taught Mathematics with game-based learning strategy and those taught with conventional method?

Table 1: **Difference between the mean achievement scores of pupils taught Mathematics using game-based learning strategy and conventional teaching method**

		Mean		Mean		
Experimental	78	35.86	6.68	72.19	10.11	36.33
Control	96	32.54	5.99	43.62	8.43	11.08
Mean Difference		**3.32**		**28.57**		**25.25**

Table 1 shows that at pre-test, the mean achievement scores of pupils in the experimental (treatment) group and control

group were 35.86 and 32.54 respectively. However, in post-test, the experimental group had mean achievement score of 72.19 while the control group had 43.62. Also, the mean gain score of the experimental group of 36.33 is higher than the control group of 11.08. In effect, the mean achievement scores of pupils taught Mathematics using game-based learning strategy is higher than those taught with conventional method. The standard deviation on the pre-test scores of pupils in the experimental and control groups are 6.68 and 5.99 and are 10.11 and 8.43 in the post-test. This indicated that there are no much differences in the variability of their scores judging from the closeness of their standard deviation scores.

Research Question 2: What is the difference between mean achievement scores of male and female primary five pupils taught Mathematics with game-based learning strategy?

Table 2: Difference between the mean achievement scores of male and female primary five pupils taught Mathematics with game-based learning strategy

Source of Variance	N	Pre-test Mean	Pre-test SD	Post-test Mean	Post-test SD	Mean Gain
Male	30	26.05	5.31	63.48	7.11	37.43
Female	48	22.89	4.72	59.07	6.92	36.18
Mean Difference		**3.16**		**4.41**		**1.25**

Table 2 shows that at pre-test, the mean achievement scores of male pupils in the experimental (treatment) group were 26.05 while female pupils were 22.89. However, at post-test, male pupils' mean academic achievement score was 63.48 while female pupils were 59.07. The table shows that the mean gain score of male pupils was 37. 43 and female pupils was 36.18 with an overall mean gain difference is negligible. In essence, game- based learning strategy has a small effect on the academic achievement of male pupils than female pupils in Mathematics. Table 2 also shows a pre-test and post-test standard deviation of 5.31 and 7.11 for male pupils and 4.72 and 6.92 for female pupils in game-based learning strategy respectively. This indicated that there is no much difference in the variability of male and female pupils' academic achievement mean scores judging from the closeness of their standard deviations.

Hypothesis 1: There is no significant difference between the mean achievement scores of primary five pupils taught Mathematics with game-based learning strategy and those exposed to the conventional method.

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Table 3: ANCOVA for testing significant difference between the mean achievement scores of primary five pupils taught Mathematics using game-based learning strategy and those taught with conventional method

Source	SS	Df	Mean Square	Cal. F	Sig.	Decision
Corrected Model	51266.024[a]	2	4233.75	23.143	.000	
Intercept	480381.289	1	480381.289	127.180	.000	
Pretest	38711.975	1	38711.975	206.152	.000	
Method	2974.126	1	2974.126	79.106	.000	S
Error	4214.476	171	319.864			
Total	50918.37	174				
Corrected Total	71680.421	173				

a. R Squared = .654 (Adjusted R Squared = .639) S = Significant, NS = Not Significant

Data in Table 3 showed that there is a significant main effect of the treatment which accounted for 65 percent of the variance in the achievement scores of the pupils, F (1, 171) = 79.106, P (0.000) < 0.05. Since the p-value is less than the level of significance, the null hypothesis was rejected. This implies that there is a significant difference between the achievement mean scores of pupils taught Mathematics using game-based learning strategy and those taught with conventional teaching method. This is in favour of game-based learning strategy group.

Hypothesis 2: There is no significant difference between the mean achievement scores of male and female primary five pupils taught Mathematics with game-based learning strategy.

Table 4: ANCOVA for testing significant difference between the mean achievement scores of male and female primary five pupils taught Mathematics with game-based learning strategy.

Source	SS	Df	Mean Square	Cal. F	Sig.	Decision
Corrected Model	25633.012[a]	2	329.116	18.142	.672	
Intercept	20190.644	1	20190.644	142.093	.684	
Achievement	1955.987	1	1955.987	44.265	.721	
Gender	1487.063	1	1487.063	8.552	.276	NS
Error	640.063	75	922.593			
Total	2107.238	78				
Corrected Total	35840.210	77				

a. R Squared = .137 (Adjusted R Squared = .116) S= Significant, NS = Not Significant

Data in Table 4 shows that there is no significant main effect due to gender on the achievement scores of the pupils, F (1, 75) = 8.552, P (0.276) > 0.05. Since the p-value is greater than the level of significance, the null hypothesis was therefore accepted. This implies that there is no significant difference between in the mean academic achievement scores of male and female pupils taught Mathematics using game-based learning strategy

Hypothesis 3: There is no interaction effect of instructional methods and gender on academic achievement of primary five pupils in Mathematics.

Table 5: ANCOVA result showing interaction effect of instructional methods and gender on academic achievement of primary five pupils in Mathematics.

Source	SS	df	Mean Square	F	Sig	Decision
Corrected Model	61998.124[a]	4	7130.003	84.509	.192	
Intercept	44163.111	1	44163.111	210.156	.496	
Pre-test	219840.176	1	219840.176	468.711	.649NS	
Method	41814.001	1	41814.001	204.720	.000 S	
Gender	3217.421	1	3217.421	56.483	.281	NS
Method * Gender	1663.108	1	1663.108	3.042	.744NS	
Error	5888.995	169	779.831			
Total	686541.002	174				
Corrected Total	60321.971	173				

a. R Squared = .317 (Adjusted R Squared = .268) S = Significant, NS = Not Significant

Data in Table 5 reveal that the F (1, 169) = 3.042, P=0.744 > 0.05. Thus, the null hypothesis has no interaction effect between treatments and gender on pupils' mean achievement scores in Mathematics was accepted. Therefore, there is interaction effect of instructional strategy and gender on pupils' academic achievement in Mathematics in Enugu State.

Discussion of Findings

The data gathered showed that pupils taught Mathematics with game-based learning strategy achieved better than those taught with the conventional teaching method. This indicates that game-based learning strategy is superior to the conventional teaching method in enhancing pupils' academic achievement in Mathematics in primary schools in Enugu State. This result tallies with the study of Ku, Chen, Wu, Lao and Chan (2014) which reported that game-based learning is more effective than pencil-paper based (traditional) learning processes for teaching Mathematics. The positive effect that game- based learning strategy has over conventional teaching method on pupils' academic achievement scores in Mathematics could be attributed to the fact that game-based learning strategy offers primary school pupils the opportunity of active participation in learning with the use of all their sense organs in the classroom. The study also revealed a significant difference between the achievement mean scores of pupils taught Mathematics using game-based learning strategy and those taught with conventional teaching method. This implies that game-based learning and conventional teaching method have different effect on pupils' achievement in Mathematics in primary schools in Enugu State and the difference is in favour of game-based learning strategy. The results of this study is in line with empirical studies of Ozgenç (2010) and Yilmaz (2014) which reported that game-based instruction positively increase students' academic achievement in Mathematics on the basis that games changed their attitudes towards studying the subject. The differential effect between game-based learning strategy and conventional teaching method could be attributed to the fact that using games in the classroom give pupils the opportunity to acquire the necessary mathematical knowledge and skills in an enjoyable setting that suits their mental state.

Findings of the study disclosed that game-based learning strategy has a small effect on the academic achievement of male pupils than female pupils in Mathematics in primary schools in Enugu State. The finding agrees with Johnson (2018) who discovered a significant difference between male and female students taught Mathematics with game-based instruction in favor of the male students. The study indicated that the overall mean gain difference of 1.25 of male and female pupils taught Mathematics using game-based learning strategy is in favour of male pupils but the difference is negligible. This finding could be as a result of male pupils using games to compete more with their peers in the course of learning Mathematics than female pupils in the classroom. This finding is in tandem with the findings of Abonyi, Maduagwuna and Ugama (2014) who

discovered that game- based instructional strategy increases the mean academic achievement score of males than their female counterparts and the difference is negligible. Perhaps, male pupils interact with one another and use games more in studying Mathematics than female pupils. Furthermore, the study revealed no significant difference between the academic achievement mean scores of male and female pupils taught Mathematics using game-based learning strategy. This finding agrees with that of Adigwe and Okonkwo (2013) which disclosed that male and female students achieved highly with no significant difference in their mean scores when subjected under game-based instruction. This implies that game-based learning strategy is equally helpful to both male and female pupils in the course of learning Mathematics.

Outcome of the study showed that there are no interaction effects of instructional approach and gender on pupils' academic achievement score in Mathematics in primary schools in Enugu State. The result can be attributed to the integration of game activities in teaching Mathematics which was found to have positive effect on the male and female students' academic achievement (Turgut and Temur, 2017). This result corresponds with the findings of Okigbo and Okeke (2013) which indicated that there was no interaction effect between the achievement of male and female students when learning Mathematics under game- based instruction. The higher scores of male and female pupils in experimental and control groups is attributed to the game activities that the pupils were exposed since it allowed them to share their ideas and enjoy the game during the process of teaching and learning. The finding of the study showed that there is no interaction effect of instructional approach and gender on pupils' academic achievement score in Mathematics supports the study of Frederick-Jonah and Akinsola (2015) on the premises that there was no noticeable difference in the academic achievement scores of male and female pupils when exposed to game-based instruction and conventional teaching.

Furthermore, the study disclosed that there is no statistically significant interaction effect between game-based learning strategy and conventional teaching method and gender on pupils' academic achievement in Mathematics in primary schools in Enugu State. This finding tallies with Gloria, James and Afolabi (2013) and Akinsola and Frederick-Jonah (2014) which reported that interaction effect of game-based instruction and conventional teaching method and gender on students' achievement was not significant. On the contrary, the studies of Okonkwo (2012) and Ogosi (2015) disagree with the findings of the study by reporting an interaction effect between game-based learning strategy and conventional teaching method and gender on pupils' academic achievement in Mathematics. On the whole, the interaction effect of game-based instruction and conventional teaching method in the classroom has profound impact in children's ability to relate with numbers and solve mathematical problem within a short period of time (Trawick- Smith, Swaminathan and Liu, 2016).

Conclusion

Based on the findings and discussion of this study, the following conclusion were made; game-based method improves the academic achievement of pupils in Mathematics more than the conventional method, game-based method enhances male pupils' academic achievement in mathematics than female pupils. Furthermore, there is a significant difference in the mean achievement scores of pupils taught Mathematics using game-based method than those taught using conventional method in favour of the group taught using game-base method and gender has no significant effect on the achievement of pupils taught Mathematics with game-based method. Today, teaching and learning focuses on the learner which emphasizes the way pupils think and are active in the learning process. There is greater demand for game-based method as it enables pupils to be active in the classroom coupled with the fact that it leads to increased achievement of pupils in Mathematics. Hence, game-based method of teaching should be supported with efforts so as to enhance pupil's achievement in Mathematics. Thus, game-based instruction provides a social scaffolding platform for primary school pupils to explore and develop positive attitude towards Mathematical concepts in a competitive and cooperating teaching and learning environment.

Recommendations

Based on the findings and conclusion of the study, the following recommendations were made:

1. Primary school Mathematics teachers should be encouraged by head-teachers to adopt game-based instructional strategies in a competitive and collaborative manner to enable pupils have deeper understanding of Mathematics.
2. Primary school commissions should organize professional seminars, workshops, symposia and conferences for teachers in order to expose them to the instructional skill-sets and competencies required in using game-based instructional strategy in the classroom.
3. Primary school curriculum developers should incorporate the use of online and offline game-based instructional strategies for teaching Mathematics in primary schools to enable teachers and pupils appreciate the impact of games on the teaching and learning process in the classroom.
4. State government and non-governmental organizations should finance the designing, production and publication of different types of manual and online instructional games for teaching Mathematics across the basic level of education in Nigeria.

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