CHALLENGES OF GAME-BASED LEARNING STRATEGY IN TEACHING MATHEMATICS IN PRIMARY SCHOOLS IN NKANU WEST LOCAL GOVERNMENT AREA OF ENUGU STATE

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Abstract

The study was designed to determine the challenges of game-based learning strategy in teaching mathematic in primary schools in Nkanu West Local Government Area of Enugu State. Three research questions guided the study. Descriptive survey research design was adopted. The population of the study comprised of 665 primary school teachers in 54 public primary schools in Nkanu West Local Government Area of Enugu State. A sample of 200 primary school teachers was used for the study using simple random sampling technique. The researchers developed an instrument titled "Challenges of Game-Based Learning Strategy in Teaching Mathematics in Primary School (CG-BLSTMPS)" Questionnaire. The instrument was validated by three experts. Cronbach Alpha was used to measure the internal consistency and co-efficient of 0.92, 0.77 and 0.79 were obtained with an overall co-efficient of 0.83. Data collected were analyzed using weighted mean to answer the research questions and standard deviation to determine the homogeneity or otherwise of the respondents' views. Findings of study revealed that teachers do not use the available games such as circle race game, binary tic tac game geo-board game among others to teach mathematics in primary schools. Findings of the study also revealed that teachers are faced with challenges of using game-base to teach mathematics which includes; lack of teacher's knowledge or proficiencies on the use of game, inadequate time for instruction of using game and large class size among others. The study also disclosed that adequate spaces for game should be provided to enable teachers use game in teaching mathematics and gaming materials such as software, hardware, slide, and boards among others should be made available for teachers to use in teaching mathematics among others. Based on the findings, it was recommended among others that Enugu State Government in conjunction with Parent Teachers Association (PTA) should provide adequate and functional game materials and infrastructural facilities in primary schools in order to enable teachers use diversify strategy to teach mathematics to pupils for better understanding which will stimulate effective teaching and learning process.

Key words: Primary Education, Mathematics, Teaching Strategy and Game-Based

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 education that prepares and grooms the mind of a child for future academic endeavors. The Federal Republic of Nigeria in the National Policy on Education (2013) defined primary education as the education given in an institution for children aged six to 11 plus. It went further to explain that the rest of the education system is built upon it and is the key to the success or failure of the whole system. This is evident by the fact that, basic literacy and numeracy skills as well as sound attitudes are developed in the right way in primary education. In primary schools, 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.

Mathematics is not only considered as an important subject in primary schools but also regarded as the father of all science subjects. Mathematics is a science subject that deals with the counting and measuring of numbers. Mathematics, according to Gouba (2008) deals with logical reasoning and quantitative calculations. Mathematics is a body of knowledge essential for the achievement of scientific and technological nation (Anaduaka, Okafor & Uche, 2013). In Nigeria, despite the fact that the government has clearly confirmed the importance of Mathematics by making it a core and compulsory subject at primary school levels, primary school pupils are yet to understand or grasp the rudiments or components of primary school Mathematics (Akinsola, 2010). In primary school, Mathematics is broken down into six themes, which are Numbers and Numeration, Basic Operations, Measurement, Algebraic Process, Practical and descriptive geometry and Everyday Statistics. The way in which pupils understands any of the theme of mathematics is dependent on the teaching strategies employed by teacher in the classroom. In education, teaching strategies are the major instruments used in achieving the goals of any subject matter.

Teaching strategy may be defined as the selection of activities and techniques by teachers to help learners achieve pre-determined instructional objectives (Onokpaunu, 2016). Teaching strategy is a general plan which includes all the parts of the teaching situation; namely: the objectives, teaching methods, teaching aids and evaluation strategies (Pei-Shi, 2012). According to Taylor (2009), teaching strategies is seen as the principles used for instruction. Taylor further stressed that the type of teaching strategy adopted depends on the knowledge and skills the teacher is trying to convey. Similarly, Olawodun (2009) stated that teaching strategies refer to the techniques used by

the teachers in the classroom, his/her activities, behaviours and actions taken for effective teaching of pupils. Teaching strategies determine the classroom tactics a teacher may take to achieve learning objectives. Teaching strategies cannot operate in a vacuum, they require certain factors to support their effectiveness. Hence, Norman (2011) posited that teaching strategies involve the use of all instructional materials, facilities and other resources available to a teacher in order to meet the instructional needs of all pupils and enable them progress from dependent to independent learners.

The 21st century classroom is emphasizing on the need to move from the traditional instructional strategies to pupils' oriented strategies where pupils are encouraged to process academic information on their own. Examples of these teaching strategies include; think-per share, self-instructional, game-based, peer tutoring among others. In this paper, game-based was discussed. In primary schools, the use of non-traditional instructional strategies such as game-based learning helps to inculcate creativity skills among pupils and also equips them to have a firsthand information or knowledge in any subject matters.

Game-based learning strategy is the use of games to reinforce, motivate and promote learners to learn so as to achieve the instructional goals. Trybus (2015) posited that Game-based learning strategy is the process of using certain gaming principles and applying these principles to real-life settings/situation in order to engage users and motivate them to learn for effective teaching-learning processes. Game-based involves engaging pupils with the use of educational materials in a playful and dynamic way. Game-based learning is not just creating games for pupils to play, it is designing learning activities that can incrementally introduce pupils to certain concepts, and guide users towards an end goals. Also, 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 the course of teaching and learning primary school Mathematics because pupils are subjected to mathematical exercises through active participation with their hands, head and heart in a safe environment.

Game-based learning strategy is essential in teaching and learning processes as it increases overall motivation of pupils, helps pupils in problem-solving, increases class cooperation and makes

pupils have fun and be happy among others. Agwagah (2001) identified some of the importance of game as; games get pupils actively involved in the learning activities, and this will help to overcome apathy and indifference, with game the lesson can be pupil centred, games offer means of helping students continuously learn new concepts and reinforce certain previously learned skills. Other importance includes; games provide strong motivation for students to commit themselves wholeheartedly to the learning experience, the motivation is often enhanced by the competitive element and games encourage creative thinking in students, stir the sense, stimulate inquisitiveness and promote understanding of the world. Despite the importance of game in teaching and learning process, primary school teachers are still faced with certain challenges that militates the use of game in teaching mathematics. Game-based learning has a huge potential to positively impact pupils learning but it is difficult to effectively integrate game in teaching mathematics to pupils if teachers are not knowledgeable enough on how to use the game which will negatively affect pupil's performance in mathematics (Demirbilek & Tamer, 2010). Pupils still see mathematics as a difficult subject to be passed and as such run away from mathematics classes. Also, the performance of pupils in mathematics both in internal and external examination is not encouraging. Document cited by the researchers in the course of this study, in the Examination and Statistics office of the Ministry of Education, Enugu State shows that pupils' achievements in Mathematics in Common Entrance Examination in the area from the year 2014 to 2018 is not encouraging. In 2014, 11,200 candidates sat for the Common Entrance Examination. Out of this number, 39 percent scored high while 61 percent scored low. In 2015, 10,014 candidates sat for the examination. Out of this number, 41 percent scored high and 59 percent scored low. In 2016, out of the 10,589 candidates who sat for the examination, 44 percent scored high while 56% scored low. In 2017, out of the 9,986 candidates who sat for the examination, 38 percent scored high and 62 percent scored low. In 2018, 10,758 candidates sat for the examination, out of this number, 46 percent scored high while 54 percent scored low (Enugu State Examination Development Centre, 2018). Therefore, it is against this background that this study was designed to determine the challenges of game-based learning strategy in teaching mathematics in primary schools in Nkanu West Local Government Area 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 are shaping the systems of the world and as such, the teacher should use technological educational materials to teach pupils mathematics for better understanding. Considering the premium status of primary school Mathematics in the preparation of future mathematicians, scientists and technologist, 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 strategies to pupil-centred strategies in order to make the instructional contents of primary school Mathematics friendlier to pupils. Although, there are calls for the application of gaming instructional strategies in teaching Mathematics because it is suitable for the age of primary school pupils and increases their understanding but its effectiveness requires empirical evidence. Furthermore, the National Policy on Education (NPE) stipulated that play of which game is part of it can be used to teach children but the problem now is are teachers implementing it? In addition, teacher's proficiencies in using game to teach children and availability of game materials among others also need to be ascertained. These problems prompted the researchers to determine the challenges of game-based learning strategy in teaching mathematics in primary schools in Nkanu West Local Government Area of Enugu State.

Purpose of the Study

The main purpose of this study is to determine the challenges of game-based learning strategy in teaching mathematics in primary schools in Nkanu West Local Government Area of Enugu State. Specifically, the study sought to:

1. Determine the available games that teachers use in teaching mathematics in primary schools in Nkanu West Local Government Area of Enugu State.
2. Determine the challenges of game-based learning strategy in teaching mathematics in primary schools in Nkanu West Local Government Area of Enugu State.
3. Determine the possible solutions to the challenges of game-based learning strategy in teaching mathematics in primary schools in Nkanu West Local Government Area of Enugu State.

Research Questions

The following research questions were raised for the study;

1. What are the available games that teachers use in teaching mathematics in primary schools in Nkanu West Local Government Area of Enugu State?
2. What are the challenges of game-based learning strategy in teaching mathematics in primary schools in Nkanu West Local Government Area of Enugu State?
3. What are the possible solutions to the challenges of game-based learning strategy in teaching mathematics in primary schools in Nkanu West Local Government Area of Enugu State?

Method

The study was designed to determine the challenges of game-based learning strategy in teaching mathematics in primary schools in Nkanu West Local Government Area of Enugu State. Three research questions were raised for the study. Descriptive survey research design was adopted. The population of the study comprised of 665 public primary school teachers in the fifty-four (54) public primary schools in Nkanu West Local Government Area. Using simple random sampling technique of balloting without replacement, 200 teachers were selected as the sample for the study.10 teachers each were selected from 20 schools out of the 54 public primary schools in the area. The researchers developed an instrument titled "Challenges of Game-Based Learning Strategy in Teaching Mathematics in Primary School (CG-BLSTMPS)" Questionnaire. The questionnaire contained 28 items on a 4-point rating scale of Strongly Agree (SA-4 points), Agree (A-3 points), Disagree (D-2 points) and Strongly Disagree (SD-1 point) for the three clusters. Face and content validity of the instrument was determined by three experts; two in the Department of Early Childhood and Primary Education and one in Measurement and Evaluation in the Department of Educational Foundation all from the Faculty of Education, Nnamdi Azikiwe University, Awka. Cronbach alpha was used to obtain reliability coefficients of 0.92, 0.77 and 0.79 with overall coefficient of 0.83 for the three clusters of the instrument. The data collected were analyzed using mean (x) to answer the research questions and standard deviation to determine the homogeneity or otherwise of the respondents' views. In analyzing the mean ($\bar{x}$), value of 2.50 and above was regarded as agreed and value below 2.50 was regarded as disagreed.

Results

Research Question 1: What are the available games that teachers use in teaching mathematics in primary schools in Nkanu West Local Government Area of Enugu State?

Table 1: Respondents Mean Ratings on the available games that teachers use in teaching mathematics in primary schools. (N = 200)

S/N	Available games that teachers use in teaching mathematics includes	Mean ($\bar{x}$)	SD	Decision
1.	I use circle race game to teach pupils mathematics.	1.97	0.92	Disagree
2.	I use slide game to teach mathematics to pupils.	2.20	0.47	Disagree
3.	I use binary tic tac toe to teach mathematics to pupils.	2.36	0.58	Disagree
4.	I use tertries game to teach pupils mathematics.	2.09	0.76	Disagree
5.	I use mathematics on the globe game to teach mathematics to pupils.	2.14	0.39	Disagree
6.	I use power tac toe to teach pupils mathematics.	1.99	0.45	Disagree
7.	I use geo-board game in teaching mathematics to pupils.	1.99	0.81	Disagree
8.	I use card game in teaching pupils mathematics.	1.97	0.50	Disagree
Cluster Mean		2.09	0.61	Disagree

Table 1 shows the mean scores of the available games used by teachers in teaching mathematics in primary schools in Nkanu West L.G.A. The cluster means score of 2.09 implies that the respondents do not use the available games in teaching mathematics in primary schools. This is because the mean scores of all the items are below 2.50. The standard deviation which falls between 0.39 to 0.92 shows that the respondents were homogeneous in their opinions.

Research Question 2: What are the challenges of game-based learning strategy in teaching Mathematics in primary schools in Nkanu West Local Government Area of Enugu State?

Table 2: Respondents Mean Ratings on the challenges of game-based learning strategy in teaching mathematics in primary schools (N = 200)

S/N	Challenges of game-based learning strategy in teaching mathematics in primary schools includes	Mean ($\bar{x}$)	SD	Decision
9.	Inadequate gaming materials such as software, hardware, slide, and boards among others.	3.13	0.63	Agree
10.	Inadequate space for game.	3.23	0.27	Agree
11.	Lack of teacher's knowledge or proficiencies on the use of game	3.42	0.81	Agree
12.	Inadequate time for instruction of using game.	3.35	0.49	Agree
13.	Large class size.	3.37	0.52	Agree
14.	The cost associated with developing a game	3.35	0.70	Agree
15.	Creating a gaming atmosphere that is adapted to all the learner's ability.	3.38	0.46	Agree
16.	Combining engaging game with achieving the curriculum.	3.40	0.22	Agree
17.	Teacher's behavior management.	3.40	0.83	Agree
18.	Teacher's negative feelings towards using games in the classroom.	3.33	0.74	Agree
Cluster Mean		3.34	0.57	Agree

Table 2 shows the mean scores of the challenges of game-based learning strategy in teaching mathematics in primary schools in Nkanu West L.G.A. The cluster means score of 3.34 implies that the respondents agreed that all the items so stated are the challenges of game-based learning strategy in teaching mathematics. This is because the mean scores of all the items are above 2.50. The standard deviation which falls between 0.22 to 0.83 shows that the respondents were homogeneous in their opinions.

Research Question 3: What are the possible solutions to the challenges of game-based learning strategy in teaching Mathematics in primary schools in Nkanu West Local Government Area of Enugu State?

Table 3: Respondents Mean Ratings on the possible solutions to the challenges of game-based learning strategy in teaching mathematics in primary schools (N = 200)

S/N	Possible solutions of the challenges of game-based learning strategy includes	Mean ($\bar{x}$)	SD	Decision
19.	Making available gaming materials such as software, hardware, slide, and boards among for teachers to use in teaching mathematics.	2.64	0.61	Agree
20.	Providing adequate spaces for game to enable teachers use game in teaching mathematics.	3.00	0.42	Agree
21.	Teacher's knowledge or proficiencies on the use of game can be improved through attending workshops and seminars.	2.55	0.70	Agree
22.	Providing adequate time for instruction when using game in teaching any concept in mathematics.	3.17	0.43	Agree
23.	Discouraging the use large class size to enable teachers handle pupils effectively when using game to teach mathematics.	2.88	0.26	Agree
24.	Improvising game materials by head teachers and teachers in teaching mathematics.	2.95	0.80	Agree
25.	Teachers creating a gaming atmosphere that will accommodate the entire learner's ability during mathematics instructions.	2.73	0.58	Agree
26.	Teachers' making sure that pupil understands one concept effectively before going into another concept.	3.22	0.65	Agree
27.	Positive Teacher's behavior management in teaching mathematics.	3.31	0.83	Agree
28.	Teachers having interest towards using games in the classroom.	3.46	0.53	Agree
Cluster Mean		2.99	0.55	Agree

Table 3 shows the mean scores of the possible solutions to the challenges of game-based learning strategy in teaching mathematics in primary schools in Nkanu West L.G.A. The cluster means score of 2.99 implies that the respondents agreed that all the items so stated were the possible solutions to the challenges of game-based learning strategy in teaching mathematics. This is because the mean scores of all the items were above 2.50. The standard deviation which falls between 0.26 to 0.83 shows that the respondents were homogeneous in their opinions.

Discussion

Findings of the study in table 1 revealed that primary school teachers do not use the available games in teaching mathematics in primary schools in Nkanu West Local Government Area of Enugu State. They do not use the available games such as circle race game, binary tic tac, geo-board game among others. This finding is in accordance with Paul (2015), who posits that for games to be an effective way of teaching mathematics, teachers should be aware and use game or incorporate games into the teaching programme in order to stimulate pupils learning. The author further revealed that teachers do not incorporate games in teaching-learning process and because the teachers do not incorporate games in teaching mathematics pupils' performance in the subject tends not to be improved.

Findings of the study in table 2 revealed that primary school teachers are faced with challenges of using game to teach mathematics in primary schools in Nkanu West Local Government Area of Enugu State. These challenges include; lack of teacher's knowledge or proficiencies on the use of game, inadequate time for instruction of using game, large class size, the cost associated with developing a game and creating a gaming atmosphere that is adapted to all the learner's ability among others. This finding is in line with Denham, Mayben, and Boman (2016), who states that lack of teacher's knowledge or proficiencies on how to use game is one of the challenges that hinder teachers from using game in the classroom to teach pupils mathematics. Also, Odiagbe (2016) posits that the challenges of game-based learning strategy in teaching mathematics can be categorised as; infrastructural challenge, teachers challenge and environment challenge.

Moreso, the findings of the study in table 3 revealed some of the possible solutions to the challenges of game-based learning strategy in teaching mathematics. These solutions include; making available gaming materials such as software, hardware, slide, and boards and providing adequate spaces for game to enable teachers use game in teaching mathematics among for teachers to use in teaching mathematics among others. This finding is in accordance with Denham, Mayben and Boman (2016), who posits that teachers improve on their knowledge when they attend in-service training. This in-service training will enable them participate in activities that will help them to develop their knowledge and skills to not only to use commercially available games, but also to design their own games and teach pupils how to design games for effective teaching and learning process. The authors further revealed that through effective professional development,

teachers can improve on their technological, pedagogical, and content knowledge required to effectively use game into the classroom thereby increasing the chance of using game to positively improve pupil's performance in mathematics.

Conclusion

Teachers and learners are important subset of the educational system, and the interaction between them goes a long way in improving pupils' learning in any subject area. Based on the findings of the study, the researchers observed that primary school teachers do not use or incorporate the available games in teaching mathematics to pupils in primary schools. It was concluded that inclusion of games in the curriculum by curriculum experts will make teachers incorporate the use of game in teaching mathematics to primary school pupils. Also, supervising teachers by the head teachers to ensure that teachers incorporate games in teaching mathematics for better understanding will bring about effective and efficient learning outcomes in pupils learning of mathematics. Based on the findings of the study, the researchers observed that primary school teachers are faced with challenges in using game to teach mathematics to pupils. In addition, primary school teachers lack the requisite instructional competencies to integrate game in their instructional delivery. It was concluded among other that teachers attending in-service training will help them in improving their knowledge on how to use game to teach primary school pupils mathematics. With these observations, it was concluded that, the over reliance of primary school teachers on traditional method of teaching Mathematics will not instil creative thinking and problem solving abilities among pupils in handling mathematical problems in primary schools.

Recommendations

Based on the findings, the following recommendations were made:

1. Teachers should be encouraged to undergo in-service workshops and seminars to enable them acquire knowledge and skills on how to use game in order to deliver Mathematics effectively in primary schools.
2. Enugu State Government in conjunction with Parent Teachers Association (PTA) should provide adequate and functional game materials and infrastructural facilities in primary schools in order to enable teachers diversify their mathematics teaching for better understanding which will stimulate effective teaching and learning process.

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