

Full Length Research Paper

The roles of libraries in the use of games as strategy for pedagogy of primary science in schools

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This study investigates the effectiveness of games as technique for teaching and learning of primary science in schools and the role played by library services. Games, when carefully employed and executed serve as an integral part of teaching method and measure of effectiveness of instruction. Research has shown that educational games can have positive impacts on student learning and motivation. The success of a game played in an instruction class depends on the type of game selected, the development of learning outcomes, and the flexibility of the library in providing library unit that is equipped with multimedia equipments where learners can interact. The study was restricted to 600 male and female respondents' teachers in Ojo Local Education District of Lagos State, Nigeria. Data were collected through 18 items questionnaire. The three generated hypotheses for the study were rejected, while the results of the findings revealed that significant difference exists between factors influencing teachers' choice of game, its usefulness and problems hindering the effectiveness of game(s) for teaching and learning process of primary science in schools.

Key words: Educational games, academic libraries, library audio-visual unit, student learning, jeopardy, instructional materials/resources.

INTRODUCTION

A critical examination of the Nigerian Primary Science Core Curriculum reveals that science is an activity-oriented subject. Greater emphasis should be placed on doing than telling. The children should be immersed in an extended series of enriched experiences that could help to give them ample opportunity of self-discovery. However, as Lederman (1987) has noted, the transaction in primary science classroom does not reflect the activity orientation, but a read-about and tell-about teacher demonstration oriented course. The changing nature of scientific knowledge calls for the need to de-emphasize science as dogma. Science should be made more relevant to everyday life. James (2008) opined that in teaching learning process, we must remember that those

at the receiving end, that is learners must take delight in what we are teaching and in teaching science to students in particular, we must go extra mile with them involving all that is good in science. The use of game in teaching primary science is a resource or an equipment and material which the teacher can use to help the achievement of lesson objective (Maduabum, 1998). Game, in teaching/learning process is a scientific skill such as observation, identification, classification etc and is very important for laying a sound foundation for subsequent science.

A game can be defined as an activity that contains some or all of the following elements: rules, goals, challenges, fantasy, mystery, curiosity, competition, skills

(Rendel, 2001). Games that are adapted and used for educational purposes aim to have players achieve specific learning outcomes as the goals of the games. Over the past decade, educators have reported using games as instructional tools in a variety of disciplines. Koether (2003) described the use of a named game to teach students chemical information. Gublo (2003) used a trivia game to teach laboratory safety methods, while Grabowski et al. (2003), developed individual variations of a science themed jeopardy to improve student retention of content in the areas of organic, general and biochemistry. Games have also been used in psychology courses to teach students abnormal psychology diagnosis, theories of personality, and research methods (Merwin, 2003). For example at Owens library, Northwest Missouri State University, students engaged in a word find exercise or jeopardy-style game at the end of a two week library orientation instruction program in order to reinforce the topic that has been taught (Ury and King, 1995). Krajewski et al. (2002) described how freshmen at Simmons College played a game of library jeopardy during the second of two library sessions in order to find out about library services in a non-intimidating, fun manner. Interestingly, Rendell et al. (2001) conducted a survey of published research from 1963 to 1991 and find 67 empirical research studies that address the effectiveness of games versus traditional instruction in the areas of social sciences, mathematics, language arts, physics, biology and logic. Slightly more than thirty percent of these studies showed increase students learning from games in contrast to conventional instruction. Subsequent to the Rendell survey, studies shown increased knowledge retention by those using an educational game compared to those receiving conventional instruction (lecture and paper based materials). Educational games are beneficial to students because they address different learning styles or preferences, provide immediate feedback, increase student motivation, and enhance a student's overall learning experience, all of which increase the chance of a positive learning outcome for the student (Rendell et al., 2001). Other disciplines such as biology, nutrition and psychology have incorporated various types of games, such as wheel of fortune, bingo and cross word puzzles into post secondary classroom instruction. Science games can be grouped into competitive and non-competitive games. The competitive science games involve scoring. The scoring system has a fixed number of points. One player's success automatically leads to another player's loss. Non-competitive science games involve no scoring but self developed skill and mastery of subject matter to solve related problems.

Getting games at your library

The global community and the demands of the

information age have re-shaped librarianship and the use of technologies to acknowledge and enhance the economic, social cultural and communication revolution in today's world. There is a wide spectrum of types of games ranging from board games and card games to Web-based games and console games, and electronic games are just an extension of gaming activities already supported in libraries. Libraries that support the recreational needs of patrons through fiction or movies are simply extending these services to the popular entertainment media for a growing sector of the population. The concept of supporting gaming is one that most libraries have supported for some time. Gaming is a magnet that attracts library users of all types and, beyond its entertainment value, has proven to be a powerful tool for literacy and learning. In today's technology-driven world, where learning does not stop at the classroom, the role of libraries in supporting literacy and learning is more critical than ever before. Gaming for learning presents a tremendous opportunity for libraries to further literacy skills in children as well as adults. Numerous detailed examples of what libraries are already doing abound in public, school, and academic libraries. Librarians can reap positive gains by proactively, creatively, and above all affordably integrating gaming into the services and programs already offered at your library. The Case studies reveal that gaming programs often turn out to be among the most popular a library can offer. Libraries are turning more than ever to video games as a way to lure teenagers back inside their doors creating video game clubs, hosting tournaments and hoping the children will then begin to take advantage of everything else the libraries have to offer. Librarians are seeing benefits. Libraries are safe places for children and they give kids a place to gather and talk with friends. With the provision of the library audio-visual unit, Library can link on to the game board which is a web page projected on a screen, consisting of a simple table with the top row identifying the categories of players and additional rows for point values (<http://www.library.gsu.edu/jeopardy/music/>). In this game questions are read aloud, and the student selects the answer. The game board and scoring can be accomplished with more advanced technology and programming. This simple web page format allows librarians to construct the game, easily edit and customize the game board for different classes. In addition to the simple web page format, a template for a similar online jeopardy-style game has been created by the University Education Technology Science (UETS) at Georgia State University. This jeopardy-style game along with other games can be down loaded free of charge for educational use in the library (<http://www.gsu.edu/wwwets/instructionalsupport/learningobjects/finding.html>). Just as libraries have caused controversy in the past by adding fiction to their offerings and circulating recreational videos, libraries are creating controversy today by supporting gaming through in-house

gaming activities and circulation of gaming materials. At this point, there is little data about the penetration of gaming in library services. There is anecdotal data and guides to best practice, but there is little data about how many libraries are supporting gamings and in what ways.

Educational games and library services

Few librarians would deny that instruction is more effective for students when it includes a high level of students' participation. Students who are actively partners in learning often show higher levels of comprehension and critical thinking (Bowe, 2000). Instructional librarians can do this by using a combination of instructional methods such as lecture, demonstration, questions and answers and hands-on practice, in order to address as many learning styles and instructional preferences as possible. While this is certainly a good practice to follow, Oblinger (2003) suggested that the learning preferences of the millennial are the trend toward teamwork, experimental activities, structure and the use of technology. Whether you are developing and constructing a game yourself or collaborating with others, particularly those with technical expertise, the following tips are useful points to consider in the creation and implementation of a game:

- (i) Design the game around learning outcomes.
- (ii) Develop a library home page,
- (iii) GIL (OPACK) and
- (iv) Generate library Database and indexes

In designing a computer game, developers have to establish the objectives of the game by identifying its desired impact. This influences the game play, especially the motivational elements of the game design. They also need to consider what will make the user continue to want to play the game until the objectives are fully achieved. This lies with the fact that as librarians we continuously seek new and innovative ways of teaching students, library skills for them to enjoy success in their academic work. Library skills are about learning how to learn, as part of being an educated person. This is made possible by creating effective library induction programs that enhance the learning of library skills offered. Over the last few years, some libraries have been turning to gaming activities like Dance Revolution as a way of bringing in new demographic groups and exposing them to library services. Recently, Jenny Levine, a.k.a. The Shifted Librarian wrote in an American Library Association publication highlighting different types of video gaming activities in libraries (Levine, 2006). Other librarians have written about their experiences in gaming activities, in print and online (Neiburger, 2007; Schmidt, 2006; Gallaway et al., 2007). Gaming is rapidly growing into the next new media as sales of games have

outpaced box office sales and are predicted to grow beyond music sales in the near future (Alpert, 2007; Cheng, 2007).

Audio-visual unit of the library

Library has been recognized as the center of the educational institution, Librarian should not just find books, but also is a teacher, and should advise students on materials to further their independent study. A person could obtain more knowledge out of his or her personal drive to learn than in any classroom, and the library is the key to this learning. However, provision of audiovisual unit in the library provides a source of entertainment for members of the academic community in the following ways:

- (1) To provide an additional service for a group of active library users
- (2) To attract an underserved group of users to the library
- (3) To increase the libraries role as a community hub
- (4) To recognize the cultural significance of the gaming medium and to participate in it
- (5) To introduce users to other library services and
- (6) To create publicity for the library among others.

It is hoped that when audio visual unit of libraries is fully enhanced with multimedia equipments and internet facilities, it will increase access, improve services, and establish multi channel learning environment as a resource center where learners have ample access to instructional materials to interact with and thereby complement game taught by teacher while in class to achieve its behavioral objective.

Teachers' choice of game in teaching and learning

Teachers' choice of game in teaching primary science in Nigerian schools is very rare. It is a new innovation employed to enhance teaching and learning of difficult concepts in science at the elementary level. This method of teaching and learning incorporated in the primary school curriculum. Hence the teachers had not known its significance. Many teachers are said to be incapable of assisting students to perceive clearly a picture of the world of work in using game, because pupils have different learning styles, it is important to incorporate multiple teaching techniques into the classroom experience (Nwaboku, 2007). According to her, one of such techniques is the use of game in the classroom to reinforce the learning objectives. Many topics in verbal reasoning, quantitative, aptitude and in computer science are well suited for coverage in such a game than in primary science (Akinola, 1998). The children should be immersed in an extended series of enriched experiences

that will help to give them ample opportunity of self discovery in using Game in answering questions, filling up letters in puzzles in a science lesson, games and in toys. Teachers' choice of game depends among others, on the pupils' ages, topic to be taught, class level of the student, ability of the teacher and learners, time of lesson, size of class and, resources at his disposal. When game is used as a style, it does help understand taught lesson. Game helps children to appreciate different approaches to process. According to Akinola (1998), crossword puzzles, video, dance, letter puzzles and games have been assessed for their effectiveness, providing several insights into what makes a good game for teaching operating systems concepts in primary science and how the existing games can be improved. The nature of scientific concepts demands an innovation in imparting some learning experiences to the learners, which provide fascinating challenges. It makes the lesson actively based and helps the children to achieve the mastery of the subjects better. This is in agreement with Balogun (1992) when he viewed science game as that which enables the learner to

- (1) Develop functional knowledge and manipulative skills.
- (2) Acquire scientific appreciation and interest.
- (3) Develop problem-solving and scientific attitudes.
- (4) Engaging the individuals playing the game.
- (5) A form of socialization.
- (6) Improving quality of life of individual playing the game.

His views therefore recommend that science games should be used in science teaching and learning in the primary schools. However, the teacher should know the essential features of the various games, rules, methods of organization, values received from participation, equipment and facilities (if any) needed and ways of motivating the pupils before using them. He should also ensure that the games, when used for educational purposes, are not unnecessarily prolonged to avoid the aim being defeated.

Purpose of the study

Majority of people consider games to be unimportant and have no relevance in education. It is considered to be frivolous and a kind of accidental accompaniment of work. It is customary to assume that education and work go together and play has a relatively minor role in teaching and learning. These feelings are wrong, because in all societies and culture, everyone knows different plays, even little children often involved in personally designed games. Often times, adult do not only play games of their childhood but also learn new games. Thus everyone knows about games because it is very easy to understand the analogies used, the language of game has become part of people's daily

vocabulary. Games provide fascinating challenges to the learners and add interest, activity and novelty to the lesson. In line with these, purpose of the study, science class is supposed to be full of activity. Using game to teach science will increase the student interest and participation in the class.

The main objective of this study is to investigate the effectiveness of games as technique for teaching and learning of primary science in schools and the role played by library services and specifically found out the following: Factor(s) influencing the choice of game as teaching strategy by teachers, the level of usefulness of games for instructional purposes, and to find out the problem(s) hindering the effectiveness of games as strategies for teaching/learning of primary science.

Statement of problem

The study seeks to address the problem associated with the factor(s) influencing teachers' use of game and the role played by the library for teaching and learning of primary sciences in schools vis-à-vis

- 1) Factor(s) influencing the choice of game as teaching strategy by teachers.
- 2) Level of usefulness of games for instructional purposes and delivery.
- 3) Problems hindering the effectiveness of games as teaching strategies for teaching/learning of primary science.

Research questions

To address the statement of problem enumerated earlier, the following research questions have been generated.

- 1) What factor(s) influencing the choice of game as teaching strategy in schools?
- 2) Can the level of usefulness of games lead to its use for instructional purposes in schools?
- 3) Is there any problem(s) hindering the effectiveness of games as teaching strategies in schools?

Research hypotheses

The following hypothesis has been formulated to be tested in the course of this study:

- 1) Factor influencing teachers' choice of game will not significantly affect its teaching strategy and methodology.
- 2) The usefulness of game will not have any significant effect/impact on teaching strategy, library services, and delivery technique(s).
- 3) There will be no significant effect between the

Table 1. Chi-square analysis of hypothesis 1.

Total	SA	A	SD	D	N	Df.	S ₁	X ² cal	X ² tab	Decision
Credibility of the developer	2	2	66	30	100					
Ease of use of the game	3	2	61	34	100					
Availability of the game packages	4	6	60	30	100	15	0.05	24.21	25.00	Reject
It is learner friendly	3	5	72	20	100					
Cost of the game packages	4	10	64	22	100					
Ability to meet the objectives	5	6	70	19	100					
Total	21	31	393	155	600					

$$X^2_{cal} (24.21) > X^2_{tab} (25.00).$$

Source: Survey Research Conducted November 2011.

Table 2. Chi-square analysis of hypothesis 2.

Factors	SA	A	SD	D	N	Df	S ₁	X ² cal	X ² tab	Decision
It takes shorter time to study	64	60	2	4	100					
It increases efficiency	60	34	3	3	100					
It eliminates uninteresting and repetitive concepts	57	30	3	10	100	15	0.05	50.34	25.00	Reject
It affects quality of service and instructional delivery.	70	20	3	7	100					
It contributes to the objectives for which the study is set up.	60	30	4	6	100					
It proves effective in terms of accuracy and time	71	20	4	5	100					
Total	382	164	19	35	600					

$$X^2_{cal} (50.34) > X^2_{tab} (25.00).$$

Source: Survey Research Conducted November 2011.

problems hindering the effectiveness of games packages and the choice of use as teaching strategy.

MATERIALS AND METHODS

Research design

The design adopted in the study is that of a descriptive survey aimed at teachers' use of games in teaching and learning of primary science in Lagos State.

Target population

The target population employed in this study consists of all the primary school teachers in the three local education district of Lagos State schools.

Population and sample technique

Purposeful random sampling technique was used by the researchers in selecting the primary schools in each of local education district' (LED) for better result. In all, a total of 100 respondents were sampled at the average of 20 in the selected schools.

Research instrument

For the purpose of the study, the researchers adopted the use of structured questionnaire to obtain relevant information on the topic

of the study. The subjects responded to the Roles of Libraries in the use of Games questionnaire (RLG), which was constructed by researcher and validated by senior colleagues in the area of information processing and research. Using Kuder Richardson formula 21, reliability co-efficient of 0.68 was established for the instrument, 100 questionnaires were issued out to the respondents' patrons through their respective heads. The same channel was used for retrieval of the 100 questionnaire. Hundred percent of return rate was thus recorded. Simple frequency count and chi-square test analysis were used to compute the data and the results are as shown in Table 1.

Data analysis

Data from the questionnaire were used to test the formulated hypotheses.

RESULTS AND DISCUSSION

The results of data analysis are presented in Tables 1, 2 and 3, and discussions of findings are also proffered.

Test of hypothesis

Hypothesis 1

Factors influencing teachers' choice of game will not significantly affect its teaching strategy. The focus of this

Table 3. Chi-square analysis of hypothesis 3.

Factor	SA	A	SD	D	N	Df	S ₁	X ² cal	X ² tab	Decision
High cost of game package	70	1	1	1	100					
Where it exists, there is no adequate personnel service	75	23	1	1	100					
My library does not subscribe to gaming	80	17	1	2	100	15	0.05	164.7	25.00	Reject
My library does not have audio visual unit to support gaming	40	20	30	10	100					
Library lacks support from the school management.	70	26	1	1	100					
Inadequate training facilities	70	26	1	1	100					
Total	407	140	35	18	600					

$$X^2_{cal} (164) > X^2_{tab} (25.00)$$

Source: Survey Research Conducted November 2011.

hypothesis is to find out which of the factors listed below influence an individual (teacher) towards the use of games for teaching learning.

Based on the analysis presented earlier, it was discovered on Table 1 that at 15 degree of freedom and 15% level of significance, that is X² calculated (29.21) was greater than X² table value (25.00) that is X²cal (24.21) > X²tab (25.00). Therefore, the null hypothesis which states that "inadequacy of factors that influence teachers' choice of game will not have any significant effect on teaching and learning of primary science in schools" is hereby rejected.

The reasons for this could have ranged from factors highlighted on table on, that is, credibility of developer, ease of use, availability, user friendliness, cost of purchase or production and ability of the game to meet the objectives of the study. This is in line with the view of Hays (2005) which states that the onus of the use of instructional packages such as game rests on the government to support in the design production and training through adequate funding, human and material resources for the schools.

Hypothesis 2

The usefulness of game will not have any significant effect/impact between teaching strategy, for library services, and delivery techniques.

Analyzing hypothesis 2 as contained in Table 2, it was discovered that at 15 degree of freedom and 5% of significance, X²cal (50.34) was greater than X²tab (25.00). Therefore, the null hypothesis was rejected. This, in effect, revealed that usefulness of game has a significant effect on teaching and learning of primary science in schools, the reason for this could have been that it increases efficiency, elimination of uninteresting and repetitive concept, quality of instructional delivery, contribution to the objectives of the study and its effectiveness in term of accuracy, time and level of usefulness among others. This is also in line with the

view expressed by Nwaboku (2007), Akinola (1998) and Aleyideino (2000) that education presented in the spirit of play will be understood and mastered easily as it provide fascinating challenges to the learners and add interest, activity and novelty to the lesson. This, in effect, helps the children to achieve the mastery of the subject better.

Hypothesis 3

There will be no significant effect arising from the problems hindering the effectiveness of games packages and their choice of use as teaching strategy.

Findings from Table 3 revealed a rejection in the analysed data. It also showed that there is a significant effect on problem hindering effectiveness of game and the teachers' choice of game as teaching strategy in schools. This is evident as the X²cal (164.07) was greater than X²tab value (25.00). The reasons for the rejection of the hypothesis could have ranged from inadequate library personnel to reader services in schools, inadequate training facilities, poor attitude of staff and learners to training, high cost of game package, to lack of support from the management of schools. This may be as a result that game has not been incorporated into primary school curriculum. Hence, teachers had not known its significance. Many teachers are said to be incapable of assisting students to perceive clearly a picture of the world of work by using game because pupils have different learning styles coupled with the aforementioned inadequacy levels.

Conclusion and Recommendation

Going by the data presented and discussions made on the analysed data, it can be concluded that factors influencing the use of games as teaching strategies to improve primary science indicated significant difference between the variables tested for the study as they were all rejected based on data analysis.

Based on the findings of this study, when teachers adopt the use of games as teaching technique, he/she must first write the behavioral objectives to be achieved, plan the design phase and procedure before the teaching. Library being the nerve centre of any academic institution is charged with the responsibilities of making information and recreational materials available in print, non print and multimedia formats. Libraries should be equipped or build where there is none, so that learners can have access and interact at high level with library resources to enhance their knowledge. With this, teacher will be able to think well ahead of the lesson to be presented and plan, design a simple if possible look for credible vendor or direct learners to library and hence implement by combining Game as strategy with normal teaching procedure, in effect primary science learning will be further enhanced.

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