

Game-Assisted Learning Strategy: A Strategy for Improving Upper Basic Two Students' Academic Performance and Self-Esteem in Benue State

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Abstract

This study examined Game-Assisted Learning Strategy with the aim of improving Upper Basic two students' academic performance and self-esteem in Benue State, Nigeria. Quasi-experimental design was used. Population comprised of 7,384 while the sample was 162 Upper Basic II Basic Science students in four intact classes drawn using multi-stage sampling. The Basic Science Performance Test (BSPT) and Self-Esteem in Basic Science Questionnaire (SEBSQ) used were validated by three experts. The reliability coefficient of BSAT was 0.86 using Kuder-Richardson formula-20 while that of SEBSQ was 0.83 using Cronbach's Alpha. Research questions were answered using mean and standard deviation while Analysis of Covariance (ANCOVA) was used to test the two hypotheses. Findings revealed significant differences between the mean performance scores and self-esteem ratings of Upper Basic II students taught using board game learning and conventional strategies. Teachers of Basic Science should use board games to improve the academic performance and self-esteem of students through increased engagement during learning.

Keywords: Game-Based Learning Strategy, Academic Performance, Self-Esteem, Board Game

Introduction

Basic Science is a subject taught at the Basic Education level in Nigeria. Formerly called Integrated Science, it is the first form of science a child comes across at the Upper Basic school level. Basic Science according to Kim (2014), is a core subject in the national curriculum at the Upper Basic level of education. All students in Upper Basic one to three- classes must offer and study the subject. Basic Science is considered the bedrock of all science subjects at the Senior Secondary (SS) level. The subject prepares students at the Upper Basic level for the study of core science subjects such as Biology, Chemistry Physics and Computer Science at the senior secondary school level. Oludipe (2012) emphasized that for a student to be able to study a single science subject at the senior secondary level such a student has to be well grounded in Basic Science at the Basic Education level. It is expected that those students who performed well in Basic Science will have opportunity to study science at the senior secondary level. Proper knowledge will lead to the transformation of the world through dramatic advances in medicine, engineering, electronics and aeronautics (Crosnoe, 2016). Though Basics Science has great value both to individuals and society globally, and performance is the yardstick for determining success. Ochu and Haruna (2014) noted that students have been performing poorly in the subject especially in Benue State.

Similarly, evidence from the Basic Education Certificate Examinations (BECE) in the last ten years in Basic Science show that students' performance in the subject has been very low (Benue State

Examination Board, 2021). The failure rate in Basic Science have been attributed to inadequate exposure of students to activities, poor preparation, inability of students to comprehend questions, non-use of effective method of teaching science subjects, gender insensitivity and lack of qualified science teachers (Balaraba, 2016). Wausau in Wushishi and Kubo (2011) stated that some factors that pose challenges to Basic Science students' learning which bring about poor performance in the subject are: poor learning, poor computer skills, inability to communicate effectively, low self-esteem, entrepreneurial skills and poor attitude to learning. To tame this undesirable incidence, students of Basic science must be taught with strategies capable of facilitating meaningful learning (Odoh, 2019). Researchers like Schaller (2012) and Arcagok (2021) stated that games were effective in enhancing students' performance in basic science at the Basic level of education. Thus, game-based instructional strategy is thought of as a possible solution in enhancing students' performance and self-esteem of Basic Science. Researchers abound on the use of game based learning (Ertl, Kopp, & Mandl, 2011; Looney, 2011; Gordon, 2013).

Vij (2011) defined board game learning as an instructional strategy that involves using counters or pieces moved on a pre-marked surface or board, according to a set of rules. Cheng (2018) stated that board games are typically played across a board by two or more players. The board is marked and has designated spaces. Additionally, depending on the kind of game, there may be various tokens, stones, dice, cards, miniatures or other pieces that are used in specific ways throughout the games that are provided.

Board games have existed for a long time in several forms such as chess, checkers or Go. There are five main styles of multiplayer board games: cooperative, competitive, collaborative, and quasi-competitive and role-play. The games enable players to think, act and engage within the epistemic frame of the knowledgeable course designer (Moseley & Whitton, 2014). Board game learning is one kind of active learning which emphasizes the development of thinking skills, enhance understanding and motivate students (Qian & Clark, 2016) and allow players to link their game experiences to learning outcomes (Treher, 2011). The board games emphasize the development of thinking skills and strategies to achieve the game goal (Vij, 2011) which may enhance students' performance and self-esteem. Treher (2011) asserted that board games are an important tool to provide hands-on and heads-on skill and knowledge development for people of all ages on all subjects. Not only do well-designed board games create an engaging atmosphere, they also provide a non-threatening, playful, yet competitive environment in which to focus on content and reinforce and apply learning. Mistakes during the game are useful and point out what students need to learn. The board itself provides a visual metaphor to help students connect information. Game elements, discussions, and problem solving with fellow team members about the content are vehicles for learning. Cheng (2018) noted that educational practices such as drilling facts, connecting ideas, engaging students to synthesize ideas are the learning processes carried out by the board games. This may help improve students' academic performance and self-esteem.

Self-esteem is a psychological construct which describe confidence in one's own worth or abilities. Zeigler-Hill (2013) viewed self-esteem as more about perception rather than reality. D'Mello, Meena and Pinto (2018) described self-esteem as an evaluation one makes about oneself, based on one's self-worth. Cheema and Bhardwaj (2021) viewed self-esteem is a sense of individual's value or worth and an extent to which his worth or value is approved or appreciated. Self-esteem may also mean being competence-oriented but also evaluative appraisal of the experience of being capable of meeting academic challenges and being worthy of happiness. In this study self-esteem refers to the overall sense of confidence a student has in their worth and abilities in studying with classmates and attempting the Basic Science Performance Test. One may thus have positive or negative attitude toward themselves. With positive self-esteem, students may be more committed towards learning and generate the desired academic outcome (Maina, 2010). There are limited

studies in the literature assessing the effect of game instructional strategy on students' academic performance (Ariani, 2019; Türkoğlu, 2019; Beşalt Kul, 2021; Pawa, Laosinchai, Nokkaewand Wongkia, 2020) and self-esteem (Modaber & Far, 2017; Qureishi 2013; Mujahid & Mohammad, 2014; Beşalt & Kul, 2021). None of these studies were conducted in Basic Science in Nigeria. Most of these studies were carried out in cultural settings different from that of Africa. It will be costly to assume that such strategies will be effective in the study area because culture affect learning. These constituted the major challenges that prompted this study to find out the effect of board game learning strategy on students' academic performance and self-esteem in Benue State of Nigeria.

Research Questions

In line with the problem of the study the following questions were posed to guide the researchers.

1. What is the difference in mean academic performance scores of upper basic two students taught using board game learning strategy and those taught using conventional strategy?
2. What is the difference in mean self-esteem ratings of upper basic 2 students taught using board game learning strategy and those taught using conventional strategy?

Hypotheses

In line with the research questions the following null hypotheses were formulated and tested at 0.05 level of significance.

1. There is no significant difference between the mean performance scores of upper basic 2 students taught using board game learning strategy and those taught using conventional strategy.
2. There is no significant difference in the mean self-esteem rating of upper basic two students taught using game base learning strategy with those taught without using game base learning strategy.

Methods

The study adopted a quasi-experimental design of non-equivalent pretest and post-test control group type. The design was considered appropriate because intact classes were used. The study area was Education Zone A of Benue State, Nigeria chosen because students offering Basic Science in the area have consistently recorded unsatisfactory performance and low self-esteem. The population of the study comprises 7,384 from 12 schools that were offering Basic Science as one of their core subjects.

The sample for this study was 162 students from four public co-educational schools in four intact classes consisting of 91 males and 71 females offering Basic Science in upper basic 2 drawn using multi-stage sampling. Two intact classes each were randomly assigned to experimental (treatment) and control groups through simple balloting. Two instruments: Basic Science Performance Test (BSPT) and Self-Esteem in Basic Science Questionnaire (SEBSQ) developed by the researcher were used for data collection. The BSPT consists of 30 multiple-choice items with four options; A, B, C and D while the SEBSQ consist of 24 items with four-point scale of Strongly Agree (SA=4), Agree (A=3), Disagree (D=2), and Strongly Disagree (SD=1). Negatively framed items are scored in reverse order. This instrument was validated by three experts all from Department of Science and Mathematics Education, Faculty of Education, Benue State University, Makurdi. Their suggestions, comments and corrections were incorporated to improve the validity of the instrument. The instruments were trial tested in two schools which were not part of the sampled schools for the study. The reliability co-efficient of BSPT was found to be 0.86 using Kuder-Richardson formular-20 while that of SEBSQ was 0.83 using Cronbach Alpha.

The total duration of the study was five weeks. Teachers teaching in the sampled schools were trained as research assistants. The training was done

in different locations. In the first week, a pre-test using BSPT and SEBSQ was administered before the teaching. Teaching commenced in the second week. In the experimental groups, teachers only acted as guide to students as they actively learn. The lesson plans for experimental groups in this study indicated instructional materials, assessment of assumed previous knowledge, introduction, presentation (teacher and students' activities), whole class discussions, evaluation, and conclusion/assignment. The teacher and students' activities included formal learning activity with educational board game. The conventional strategy with teacher dominance was used to teach the control group. The lesson plans for control group comprised assessment of assumed previous knowledge, introduction, teachers' and students' activities, summary, evaluation, conclusion and assignment. In the fifth week the posttest (containing the same questions on the BSPT pre-test but reshuffled) as well as a SEBSQ were administered. The BSPT and SEBSQ were administered by the research assistants but supervised by the researchers. The research questions were answered using mean and standard deviation while Analysis of Covariance (ANCOVA) was used to test the two null hypotheses.

Results

The results are presented in tables below.

Table 1: Mean and Standard Deviation of Performance Scores of Upper Basic 2 Students Taught Using Board Game Learning Strategy and Conventional Strategy

Instructional Strategy	N	Pre-BSPT		Post-BSPT		Mean Gain
		Mean	SD	Mean	SD	
Board game learning strategy	75	10.80	3.19	21.68	4.80	10.88
Conventional Strategy	87	11.18	2.47	15.92	2.69	4.74
Mean Gain Difference						6.14

Result in Table 1 indicates that mean gain difference was 10.88 for Board Game Learning Strategy and 4.74 for Conventional Strategy with a mean gain difference of 6.14 in favor of Board Game Learning

Strategy. This implies that Board Game Learning Strategy is superior to conventional strategy in improving performance.

Table 2: Mean and Standard Deviation of Self-Esteem Ratings of Upper Basic 2 Students Taught Using Board Game Learning Strategy and Conventional Strategy

Instructional Strategy	N	Pre- SEBSQ		Post- SEBSQ		Mean Gain
		Mean	SD	Mean	SD	
Board game learning strategy	75	2.32	0.36	2.81	0.30	0.49
Conventional Strategy	87	2.24	0.38	2.66	0.33	0.42
Mean Gain Difference						0.07

Result on Table 2 reveals the mean gain of 0.49 and 0.42 for students taught Basic Science using Board Game Learning Strategy and Conventional Strategy respectively with a mean gain difference of 0.07 in

favor of those taught using Board Game Learning Strategy. This shows that Board Game Learning Strategy is superior to conventional strategy in enhancing students' self-esteem.



Table 3: Summary of ANCOVA Result of Difference in Post-BPT Mean Scores of Board Game Learning Strategy and Conventional Strategy

Source	Type III Sum of Squares	df	Mean Square	F	Sig.
Corrected Model	1491.937 ^a	2	745.968	54.624	.000
Intercept	2221.458	1	2221.458	162.669	.000
Pre-test	155.403	1	155.403	11.380	.001
Strategy	1392.926	1	1392.926	101.999	.000
Error	2171.353	159	13.656		
Total	59627.000	162			
Corrected Total	3663.290	161			

a. R Squared = .407 (Adjusted R Squared = .400)

Table 3 reveals that $F_{(1,159)} = 101.999$; $P = 0.000 < 0.05$. Therefore, the null hypothesis was rejected. This means that there is a significant difference between the mean performance scores of upper basic 2 students taught using board game learning strategy and those taught using conventional strategy.

Table 3: Summary of ANCOVA Result of Difference in Post- Self-Esteem Mean Rating of Board Game Learning Strategy and Conventional Strategy

Source	Type III Sum of Squares	df	Mean Square	F	Sig.
Corrected Model	.965 ^a	2	.482	4.893	.009
Intercept	33.978	1	33.978	344.734	.000
Pre-test	.066	1	.066	.665	.416
Strategy	.942	1	.942	9.562	.002
Error	15.672	159	.099		
Total	1222.814	162			
Corrected Total	16.636	161			

a. R Squared = .058 (Adjusted R Squared = .046)

Result in Table 4 shows that $F(1,159) = 9.562$, $P = 0.002 < 0.05$. Therefore, the null hypothesis was rejected. The means that there is a significant difference in the mean self-esteem rating of upper basic 2 students taught using game base learning strategy with those taught without using game base learning strategy

Discussion

This study revealed that there is a significant difference between the mean performance scores of upper basic 2 students taught using board game learning strategy and those taught using conventional strategy. The reason for this finding may be because educational games create cognitive conflicts in individuals and this put the students in a state of imbalance thereby challenging the students to think, solve problem which could facilitate understanding since effective learning results from the resolution of these conflicts. From Piaget's point of view, learners use these new experiences and relate them to previous knowledge so that they can absorb new knowledge (the concept they learn in Basic Science). Research findings in this study are consistent with the findings

of Viray (2016) that significant difference exists in the academic performance of the control and board games group. Furthermore, this study aligns with that of Ariani (2019) who found that board game influenced students' degree of comparison mastery of their learning. The findings of this study also agrees with that of Türkoğlu (2019) that learners exposed to board game based cognitive training programme had a significantly positive effect on the cognitive developments compared to the control group. Similarly, this study does not disapprove the findings of Beşalt and Kul (2021) demonstrated that the students in the game group had significantly better learning performance in science related concepts (fractions) than students in the non-game group. Pawa, Laosinchai, Nokkaew and Wongkia (2020) found that the use of board game strategy significantly improved the students' understanding, although no statistically significant differences was between the two groups examined. This may be because the active-learning unit compared with the board game strategy is also an innovative instructional strategy. Furthermore, results revealed that there was significant difference in the mean self-

esteem ratings of students taught Basic science using graphic organizers strategy and conventional Strategy. This study finding agrees with that of Modaber and Far (2017) and Qureishi et al. (2013) showed that an innovative learning strategy have significant effect on students' self-esteem. The findings of this study also support that of Mujahid and Mohammad's (2014) study showed that introduction of innovative learning caused an increase in students' self-esteem. In addition, it was found that cooperative learning increases social skills and responsibility of the students. Furthermore, Beşaltı and Kul (2021) found that students in the game group had significantly better self-efficacy in science related concepts (fractions) than students in the non-game group. Board game learning enhances learners' enjoyment, concentration, generated more curiosity and students were more involved during the learning process which could be the reason for the improved self-esteem.

Conclusions

This study has shown that board game learning strategy enhanced students' academic performance and self-esteem in basic Science. Board games provide many educational and teaching benefits and have proven their value when designed appropriately for learning. Therefore, there is need to challenge the current bias in science educational settings especially in Basic Science against designing and using games to learn.

Recommendations

Based on the findings, the following recommendations are formulated:

1. Teachers of basic science should use Board games as tools to improve the academic performance and self-esteem of students through increasing their engagement during learning.
2. School administrators, textbook writer, Ministries of Education at all levels and teacher training institutions should invest in assisting teacher-trainee to understand the procedure and best ways of implementing the Board games learning strategy in the Basic Science classroom to improve students' academic performance and self-esteem.

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