



Impacts of Simulation-Games on Teaching and Learning Mathematics

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ABSTRACT

This study sought to determine the impact of games and simulation environment on students' achievement in attitudes to mathematics in secondary school. A total of ten thousand five hundred and thirty five (10535) students in all the twenty one (21) senior secondary schools in Ilorin-south Local Government Area of Kwara State, Nigeria constituted the population of the study. All senior secondary school students two (SS II) in six (6) randomly selected schools totaled one hundred and eighty (180) in Ilorin-south Local Government Area of Kwara State were used as the sample of the study. The finding reveals that students' poor academic achievement in mathematics is partly due to the method of teaching used. Also, the findings revealed that, the use of games and simulation environment led to improve achievement and positive attitude towards mathematics. The study concluded that teachers' use of stimulating teaching methods would go a long way in sustaining and motivating students' interest in learning mathematics. Hence, it was recommended among others that teachers should be empowered to use games and simulations in teaching mathematics in our secondary schools.

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INTRODUCTION

In recent times, there has been repletion of records pointing towards poor performance and failure of students in mathematics at secondary school level. Consequently, concerted efforts are needed to reduce this rate of failure and low interest in mathematics in public examinations. And for the efforts to succeed, approaches of teaching mathematics that will improve students' interest to the satisfaction of all the stakeholders such as students, teachers, parents, general public and government needs re-examination. As such an examination of games and simulations may be complementary to the conventional method of teaching mathematical sciences in schools, so as to arouse students' interest in the learning of mathematics. Moreover, this complementary role of games and simulation in the conventional method of teaching mathematical sciences formed one of the motivations for this study. Mathematics is a fundamental part of human thought and logic, and integral to attempts at understanding the world and ourselves. Mathematics is a necessary tool needed to be able to function effectively in the present technological age, Aremu (1998).

Generally, the benefits of Mathematics to our-day-today activities and as an agent of nation's development and wealth creation despite learning mathematics presents various challenges for many children are enormous. In addition, mathematical knowledge plays a crucial role in understanding the contents of other school subjects such as science, medicine, engineering, social science, and so on. Research findings have shown that repletion of poor performance and failure of students in mathematics at secondary school level are due to certain factors such as low interest, learning environment, students' background, non-utilization of effective instructional materials, teaching strategies etc. (Ali 1998; Olosunde and Olaleye 2010)

However, necessary efforts are needed to reduce or completely erased the rate of failure and low interest in mathematics in secondary school level. Equally, Akinsola (2002) suggested that learning environment should be prioritized in order to have suitable and more mathematics-friendly teaching in so much that students can utilize what is being learnt in a way to broaden their conceptions and become aware that mathematics is a dynamic instrument in solving real life problems. Likewise,



from the remarks of Adewumi (2001), Mathematics is a subject that is very easy to make difficult and very difficult to make easy. He then suggested that the style or approach of a teacher employed in teaching cultivates more in motivating learners to learn. Akinsola (2002) also noted that the perennial methods of teaching mathematics through listening and learning have not been successful and also resulted in making students hate mathematics. Effective learning occurs when learning strategies are effectively organized and presented so that the learner is able to see the relationship between an element and another in the learning situation.

However, the use of simulation-game is suggested to teach and learn mathematics in secondary schools so as to provide motivational environment, challenging and making learning experimental and demand active participation by students to the expectation of all the stakeholders such as parents, general public, teachers, students and government. Games are one of the oldest forms of human social interaction which serve as an integral part of all cultures. They are formalized expressions of play that allow people to go beyond immediate imagination and direct physical contact. Games were relevant as teaching tools, as cultural and social bonding events and as markers of social status. Some common features of games are uncertainty of outcomes, competition, agreed upon rules, separate place and time, element of chance, prescribed goals and personal enjoyment. Games have been employed in teaching and learning science and mathematics in several countries due to their usefulness in the education process. In the same vein, Aremu (1998) and Adelokun (1997) stated that practice with games instruction produced better test performance than the traditional style of teaching because games actually improve learning. According to Okigbo (2011) games enhance the Mathematical thinking of learners; imbibe in them the culture of cooperation, competition, organization and individualism spirit.

Games are divided into two groups by Cruickshank (1980) which are non-academic games and academic games. He described non-academic games as the type that are primarily designed for fun while academic games are such primarily based upon learning. The primary focus of an academic game is to make learning more interesting for students and challenge them in these academic areas. Academic games can be employed in mathematics when teaching and learning topics such as equations, sets and so on. There are two

types of academic games which are non-simulation- games and simulation- games. He thus described non-simulation-games as the type of game in which a student solves mathematics problems in a school subject by solely making use of that subject while simulation-games is the one in which students are provided with a simulation environment in which are expected to play in.

Simulation is a situation when activities are presented as if they are real. Simulation is derived from the Latin word 'similis' which means to act. It is a representation of a real problem, event, object or situation and makes the learner an active participant in behavior modification and skills acquisition Orlich et al. (1988). Simulation techniques arouse interest, enhance skill development, provide adequate information, makes learning more practical, vivid and meaningful, helps learners determine the pros and cons implication of a given task, change attitude and improve performance of teachers and students in the classroom (Greenblat, 1988; Manguwat, 2004). It is the practice with the use of teacher made objects before trying the real object, and then involves learning experiences which do not require immediate exposure of the learners to the real object.

Buttressing the advantages of simulations, Reinhardt and Lofts garden (1979) proved simulation to be useful not only because of its ability to provide acceptable numerical results but also perhaps more relevantly because successful simulation requires a full understanding of the problems to be solved. The usefulness of simulation-games in teaching and learning cannot be undermined because using simulation and games to teach may make learning remain permanently. Likewise, Ramdel et al. (1992) claimed also that the positive answers obtained for retention over time favors the use of games and simulation. Games and simulation can greatly assist in learning mathematics especially when handling the difficult concepts that students found to be difficult to comprehend. They provide an environment whereby students can see and make application and have the ability of holding the attention of almost all the students. Simulation-games also enable the students to form mathematical data with supplied information and enable learners to know the contrast between relevant and irrelevant information. They can be designed for learners with various age pairs and for learners varied in learning abilities. Thus, games and simulation have great impact and contribute



immensely to the improvement of teaching and learning mathematics in Nigeria secondary schools.

Objective of the Study

The objective of this research is to assess the effectiveness of teaching and learning mathematics using approach of games and simulation as opposed the traditional approach of teaching and learning mathematics in Nigeria secondary schools.

Research Hypotheses

H0: There will be no significant differences in the scores of students taught using games and simulation referred to as experimental group and their colleagues using conventional teaching method referred to as the control group.

METHODOLOGY

A total of ten thousand five hundred and thirty five (10535) students in all the twenty one (21) senior secondary schools in Ilorin-south Local Government Area of Kwara State constituted the population of the study. A total number of one hundred and eighty (180) senior secondary two (SSII) students constitute both experimental and control groups in the six (6) senior secondary schools randomly selected in Ilorin-south Local Government Area of Kwara State were used as the sample of the study. The selected students were all subjected to three (3) consecutive weeks of teaching and learning by one of the instructors with the assistance of the mathematics teacher in their respective schools. A period of forty (40) minutes

daily apart from weekends was used for the consecutive weeks of teaching and learning.

The data collected from the scores of the tests administer to the students to assess the level of their pre-test scores and post-test scores and the questionnaire designed to collect the relevant data for pre-test attitude scores and post-test attitude scores needed for the study under the option of Accepted and Rejected were analyzed using mean and standard deviation scores for the experimental and control groups. The t-test statistics is used to test the hypothesis at 0.05 level Of significant using SPSS 20 Microsoft wave.

Both the control and the experimental groups were furnished with necessary and similar text materials on the topics to be treated by the instructors. The six selected senior secondary schools were categorized into A and B with three (3) schools in each of the category. Games and simulation approach were employed to teach the students in category A referred to as experimental group while conventional approach of teaching was used to teach the students in category B which is the control group. For the purpose of reliability on trial testing of the instrument was conducted using a Government Secondary School, Danialu in Ilorin with thirty (30) samples.

PRESENTATION OF RESULTS

The result of the analysis and the discussion of the findings carried out between the control group and the study group were given below.

Table 1: ANOVA Result for the pre-tests Achievement Scores

Source of Variation	DF	Sum of Square	Mean Square	F-Ratio	F-Table
Between Group	1	8.153105	8.153105	0.58	3.84
Within Group	178	2021.724405	13.94292693		
Total	179	2021.87751			

The result in Table 1 shows no significant difference between the experimental and the control groups using analysis of variance for the

pre-test achievement scores. And this indicated that the subjects has equivalent entry behavior in both of the groups

Table 2: ANOVA Result for the post-tests Achievement Scores

Source of	DF	Sum of Square	Mean Square	F-Ratio	F-Table
Between Group	1	47.4384	4743.8438	0.58	232.63



Source of	DF	Sum of Square	Mean Square	F-Ratio	F-Table
Within Group	178	2956.9861	20.3920		
Total	179	7700.8299			

The result in Table 2 shows that there was a significant difference on students' performance within the period of the research using analysis of

variance for the post-tests achievement scores between the two groups. Thus, null hypothesis is rejected.

Table 3: T-Test on post achievement scores between the two groups

Source of Variation	N	X	SD	T-Calculate	T-Critical
Games and Simulation group	90	18.80	5.46	2.31*	1.96
Control Group	90	15.61	3.89		

The result in Table 3 also confirms the better performance of experimental group over the control group using T-Test on post achievement

scores between the two groups as indicated in Table 2.

Table 4: ANOVA Result for the Attitude test scores

Source of Variation	DF	Sum of Square	Mean Square	F-Ratio	F-Table
Between Group	90	32.5075	5.46	2.31*	1.96
Within Group	90	4917.48	3.89		
Total	179	7700.8299			

The result in Table 4 shows that there is no significant difference with the attitude test

scores of the students in the experimental and control groups using analysis of variance.

Table 5: ANOVA Result for the post-tests Attitude Scores

Source of Variation	DF	Sum of Square	Mean Square	F-Ratio	F-Table
Between Group	90	276.6125	276.6125	7.9836	3.92
Within Group	90	5023.8875	34.6475		
Total	179	5300.5			

The result in Table V shows that there was a significant difference on students' performance within the period of the research using analysis of variance for the post-tests attitude scores between the two groups. The H₀ is rejected since F-Ratio is greater than F-Table.

experimental group, while conventional method was used for the students in the control group. The results presented in Table 1 and Table 4 showed that there were no significance differences in the achievement and attitude pre-test scores between the two groups towards learning of mathematics. The results in Table II and Table 4 revealed better performance in achievement and attitude of the students in the experimental group compared to the students in

DISCUSSION ON RESULTS

Simulation-games approach was employed to teach the students in the



control group judging by the application of analysis of variance for the post-test achievement and attitude scores within the period of the study. Results in Table III further confirmed the better approach of teaching employed in the experimental group over the control group using T-test on post achievement scores. So, the H_0 is rejected since F-Ratio is greater than the F-table. Therefore, this research work revealed that the hardship faced by both teachers and students in the teaching and learning of mathematics would in no time be bygone if appropriate and relevant activities based strategies are applied. This establishment is in consonance/resonate with the views of Amoo (2002), Uhumuavbi and Umoru (2005), Imoko and Agwagah (2006).

CONCLUSION

The outcomes of this research work have shown that the approach of simulation-games technique does boost the students' attitude and achievement in Mathematics greatly. This work revealed that appropriate teaching aids/teaching technique is a major contributory factor to students' interest in learning mathematics. The findings in this study also revealed that mathematics teachers should always direct their students towards positive attainable goals to reduce low interest, rate of failures and difficulties in mathematics in public examinations and making teaching and learning of mathematics in secondary schools vivid, practical, meaningful and applicable to our-day-today activities through the application of simulation-games approach and other activities based approaches. Teaching and research materials on activities based approaches should be made available for both teachers and students consultation and teachers who had training on activities based approaches most especially simulation-games approach should be allowed to train and re-train their colleagues in the school.

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