



STEMJAS



STEM JOURNAL OF ANAMBRA STAN

Volume 4(1);2022

ISSN:2705-1579

EDITOR-IN-CHIEF
PROF. RITA N. NNOROM



STEM Journal of Anambra State (STEMJAS), 4(1); 2022



STEM JOURNAL

OF ANAMBRA STATE

(STEMJAS), 4(1); 2022



STEM Journal of Anambra State (STEMJAS), 4(1); 2022



All right reserved

No part of this journal should be reproduced, stored in a retrieval system or transmitted in any form or by any means in whole or in part without the prior written approval of the copyright owner(s) except in the internet

ISSN: 2705-1579

Published & Printed by:

FAB ANIEH NIGERIA LIMITED

Fab Anieh House

Opposite COFI Premium Lounge

Okpuno, Awka

Tel: 08035619395

gmail: fabprezz82@gmail.com



EDITORIAL BOARD

Editor-in-Chief

Prof. Nneka R. Nnorom

Editors

Dr. Christiana U. Ezenduka

Dr. Chinwe B. Njelita

Dr. Nkiru N.C. Samuel

Mr. JohnBosco O.C. Okekeokosisi

Mr. Kingsley N.C. Ezeokeke

Consulting Editors

Prof. Emmanuel O. Akuezuilo

Prof. Uchenna Nzewi

Prof. Sunday Abonyi

Nnamdi Azikiwe University, Awka

University of Nigeria, Nsukka

Ebonyi State University, Abakaliki



Officers of Science Teachers Association of Nigeria, Anambra State Chapter

Dr. Bibiana C. Okoli	-	Chairman
Mr. JohnBosco O.C. Okekeokosisi	-	Vice Chairman
Dr. Nkiru N.C. Samuel	-	Secretary
Mr. Arinze Enekwechi	-	Assistant Secretary
Mr. Clement Okpala	-	Financial Secretary
Dr. Blessing I. Okafor	-	Treasurer
Mr. Friday Peter Usang	-	Science Fair Coordinator
Mr. Solomon C. Okoli	-	Assistant Science Fair Coordinator
Mrs. Grace N. Okpata	-	PRO I
Mrs. Ndidamaka P. Okafor	-	PRO II
Dr. Christiana U. Ezenduka	-	Immediate Past Chairman
Prof. E.O. Akuezilo	-	Member Board of Trustee
Prof. Edwin Akusoba	-	Patron



STEM Journal of Anambra State (STEMJAS), 4(1); 2022



EDITORIAL

STEM Journal of Anambra STAN (STEMJAS) is a publication of **Science Teachers Association of Nigeria, Anambra State Chapter**. STEMJAS is developed to disseminate information on Science, Technology, Engineering and Mathematics (STEM) to teachers, teacher-trainers, researchers and other interested persons. Articles that are of relevance to STEM education are published in this journal.

We are grateful to the contributors and hope that our readers will enjoy reading these contributions.

Prof. Rita N. Nnorom

Editor-in-Chief



TABLE OF CONTENTS

Technology-Enhanced Inquiry Tool in Science Education: An Inclusive Pedagogical Framework For Classroom Teaching And Learning Practice ¹Obodo Abigail Chikaodinaka , ²Nweze, Bernadine Ngozi, ³Ani Mercy Ifunanaya	1
Influence of Online Social Networking on Secondary School Students' Interest in Basic Science ¹Nwachukwu, Chisom Felicitas, ²Chikendu, Rebecca Ebonam, ³Nwankwo, Madeleine Chinyere	18
Containing the Impacts of Covid-19 Pandemic: A Step Towards Sustaining Basic Scientific and Technological Skill Acquisition in the Society ¹Kanu, Abed Chibuzo, ²Marcellinus Chibueze Anaekwe	30
Learning Style Preferences and Science Learning Motivation As Correlate of Academic Achievement Among Chemistry Students in Anambra State, Nigeria. ¹Offor, Joseph Chidiebere, ²Samuel, Nkiru N. C.	42
Learning Styles and Academic Performance of Senior Secondary Schools in Enugu State, Nigeria ¹Rebecca Ebonam Chikendu, ²Obikezie Maxwell Chukwunazo	69
Interest and Gender as Interplaying Effects of the Algebraic Board Game on Secondary School Students in Algebra in Onitsha Education Zone Of Anambra State Charles C. C. Chukwurah	82
Effects of Laboratory Practical Work and Demonstration Method on Students Achievement and Interest in Chemistry ¹Samuel, N.N.C, ²Obikezie, M.C.	91
Achievement in Algebra Due to Instructional Strategy used on Senior Secondary School Students in Onitsha Education Zone Charles C. C. Chukwurah	110
Effect of curriculum changes in teaching and learning of Biology in senior secondary school in Anambra State. ¹Aniekwu Chijioke, ²Christian, Clement C. Okpala, ³Okafor Ndidiamaka Patience	121



**ACHIEVEMENT IN ALGEBRA DUE TO INSTRUCTIONAL STRATEGY
USED ON SENIOR SECONDARY SCHOOL STUDENTS IN ONITSHA
EDUCATION ZONE**

Charles C. C. Chukwurah
cccchukwurah@gmail.com
+2348037989997

Department of Mathematics

Nwafor Orizu College of Education, Nsugbe, Anambra State, Nigeria

Abstract

The study examined the achievement in algebra due to instructional strategy used on senior secondary school students in Onitsha Education Zone. One research question was posed and two hypotheses formulated to guide the study. Quasi-experimental (Non-equivalent control group design) was used for the study. The sample used for the study was 320 (male and female) senior secondary two students purposively selected from eight schools in the zone (one intact class each). The instrument used for the study was Algebraic Expression Achievement Test (ALAT). The ALAT was used as the pretest, posttest. Two sets of lesson plans and a marking guide were also developed for the study. The instruments, lesson plans and marking guide were all validated by three experts in mathematics education and measurement and evaluation. ALAT yielded reliability coefficient of 0.76 obtained using Kuder-Richardson 20 Formula. ALAT was administered to the subjects at the beginning of the study as pretest. The experimental and control groups were taught using algebraic board game and expository method respectively, followed by posttest. Research assistants were trained for the experiment and extraneous variables were controlled. Mean and Standard deviation were used to answer the research question, while the Analysis of Covariance (ANCOVA) was adopted in testing the hypotheses at 0.05 alpha level. The findings of the study showed that students taught algebra using the algebraic board game achieved significantly higher than those taught algebra using the expository method. Moreover, there was no significant difference in the mean achievement scores of male and female students taught algebra using the algebraic board game. Based on the findings of this study, it was recommended that algebraic board game should be used by mathematics teachers in teaching algebra.

Keywords: Achievement, Algebra, Instructional strategy



Introduction

Mathematics occupies a central position in the school curriculum. It is a core subject from the primary through the junior secondary to the senior secondary school levels of the educational system. The subject is considered very important by many people, institutions and employers of labour, among others. There are many definitions of mathematics as there are authors. Mathematics is defined as a science of numbers, quantities, shapes and spaces (Chukwu, 2010). Albert (2016) defined mathematics as a physical science that is practical and activity-oriented which uses abstract symbols, axioms and facts to deal with numbers, shapes and equally solve day to day problems. Harbor-Peters (2000) defined it as a culture as well as an art. Obodo (2000) noted that it is a language that uses carefully defined terms and concise symbolic representations, which add precision to communication.

In their own contribution, Kolawole and Oluwatayo (2005) defined mathematics as a human invention, borne out of human resolve to solve human problems. Salman (2005) described it as an indispensable tool in the study of sciences, humanities and technology. Borasi (2008) asserted that it is a science that draws necessary conclusions. In summing up of these definitions, mathematics provides special skills required by an individual to solve his/ her day-to-day problem. Mathematics is also considered important in terms of its; inter-relatedness and inter- connectivity of its branches (Ashbacher, 2004) and its utility (Joseph, 2001, Adegboye, 2003, Agwagah, 2005 and Salman, 2005). The major branches of mathematics include Number & Numeration, Algebra, Number Theory, Geometry, Mensuration, Trigonometry, Statistics, Calculus and Topology. Among these branches, algebra is one of the branches that cut across different levels of our educational system, from primary to tertiary level and also across different disciplines. Algebra therefore, should be given proper attention in terms of teaching at the foundation classes. Algebra is a branch of mathematics that substitutes letters for numbers, and an algebraic equation represents a scale where what is done on one side of the scale is also done to the other side of the scale and the numbers act as constants (Chukwurah, 2021). Animasahun (2007) remarked that algebra serves as an opportunity gateway to higher studies that involve mathematics. Again, algebra develops one's thinking in specific areas like logic, patterns, problem-solving,



deductive and inductive reasoning and critical thinking. People of all ages love to play games. In the classroom, games are inherently fun and motivating and engage students in active participation. Udeh (2019) defined play as a pleasurable activity which is carried out to help children carry out real life situations. Albert (2016) stated that play is a spontaneous activity where children are free to participate in an atmosphere of mutual interaction. In primary and secondary schools, play way method is used in various school subjects. Examples of such are games, simulation, dramatization and modelling. According to Ogbu (2006), games and mathematics are related because each has rules that govern them and both involve experiences, drill and practical applications.

For better academic achievement in algebra, there is need to use certain mathematical games in teaching algebra. When games are incorporated in teaching mathematics, significant achievement is likely to be achieved. Achievement is the act of performance and accomplishment. Nneji and Ezeamenyi (2014) defined achievement as the process of bringing about something through effort, skill or courage. Egbulefu, Amaele and Osaat (2015) remarked that academic achievement suggests an achievement that relates to education and scholarship. Academic achievement is the extent to which a student, teacher or institution has attained their short or long term educational goals. It is commonly measured through examinations or continuous assessment.

Evidence from past and present research in mathematics education has long established that academic achievement of all categories of students have been a point of concern to many mathematics educators (Ashby, Sadera & Mcluary, 2011). This state of affairs in a country like Nigeria which is urgently attaining to improve its science and technology in search of stable economy and self-sufficiency should be a major concern, hence it can be said that this ugly trend of high failure rate in mathematics is a national catastrophe. Better results in algebra are achievable if innovative and practical instructional strategies are employed.

Current studies on how students learn science and mathematics revealed new ideas and instructional approaches for the teaching of algebra. These studies indicate that one of the ways of seeking solutions to the problem of algebra is by comparing methods so as to identify the ones that are suitable for solving different problems in algebra. Based on this, it is argued that the teaching of algebra can adopt certain board games rather than the conventional approach.



Research Question

What are the mean achievement scores and standard deviations of students taught algebra using algebraic board game strategy (experimental group) and those taught using conventional approach (control group) as measured by Algebraic Expression Achievement Test (ALAT)?

Hypotheses

Two null hypotheses were tested at 0.05 level of significance.

1. There is no significant difference between the mean achievement scores of students in the experimental and control groups as measured by ALAT.
2. There is no significant difference between the mean achievement scores of students in the experimental group due to gender as measured by ALAT.

Method

Quasi-experimental (Non-equivalent control group design) was used for the study. The sample used for the study was 320 male and female senior secondary two students purposively selected from one intact class each of the eight schools in the zone. The instrument used for the study was Algebraic Expression Achievement Test (ALAT). The ALAT was used as the pretest, posttest and the retention test, while the ALIS was used the pretest and posttest. Two sets of lesson plans and a marking guide were also developed for the study. The instruments, lesson plans and marking guide were all validated by three experts in mathematics education and measurement and evaluation. ALAT yielded reliability coefficient of 0.76 obtained using Kuder-Richardson 20 Formula. ALAT was administered to the subjects at the beginning of the study as pretest. The experimental and control groups were taught using algebraic board game and expository method respectively, followed by posttest. Research assistants were trained for the experiment and extraneous variables were controlled. Mean and Standard deviation were used to answer the research question, while the Analysis of Covariance (ANCOVA) was adopted in testing the hypotheses at 0.05 alpha level.



Results

The data collected were presented in the Tables.

Research Question 1: What are the mean achievement scores and standard deviations of students taught algebra using algebraic board game strategy (experimental group) and those taught using expository method (control group) as measured by Algebraic Expression Achievement Test (ALAT)?

Table 1: Mean Achievement and Standard Deviation Scores of Students taught algebra using algebraic board game (experimental group) and those taught using expository method (control group)

Method	N	Pretest		Posttest	
		Mean	SD	Mean	SD
Experimental	161	8.40	5.21	38.41	5.21
Control	159	5.06	10.11	15.66	10.01

Table 1 shows the pretest mean achievement and standard deviation scores of the experimental group were 8.40 and 5.21 respectively and their posttest scores were 38.41 and 5.21 respectively. For control group, the pretest mean achievement and standard deviation scores were 5.06 and 10.11 respectively, while the posttest were 15.66 and 10.01 for mean achievement and standard deviation scores respectively. The table shows that the experimental group scored higher than the control groups in both pretest and posttest. The standard deviations of the experimental group are smaller than those of the control group. There was not much difference between the two groups in the pretest but there was an appreciable difference in the posttest.

Hypothesis 1: There is no significant difference between the mean achievement scores of students in the experimental and control groups as measured by ALAT.

Hypothesis 2: There is no significant difference between the mean achievement scores of students in the experimental group due to gender as measured by ALAT.



Table 2: Two –way ANCOVA Results on Achievement due to Method and Gender.

Source	Type III sum of squares	Df	Mean square	F	Sig	Dec
Corrected Model	8.507	3	2.836	8.698	.000	
Intercept	2900.851	1	2900.851	8,898.316	.000	
Method	7.032	1	7.032	21.570	.000	S
Gender	0.524	1	0.524	1.658	1.918	NS
Method * Gender	0.324	1	0.324	1.025	32.81	NS
Error	129.794	316	0.326			
Total	4213.000	320				
Corrected Total	141.481	319				

Table 2 shows that for method, the F-calculated value of 21.570 is significant at 0.000 the significant level which is less than 0.05 level set for this study, hence, the null hypothesis was rejected. Therefore, there is a significant difference between the mean achievement scores of students in the experimental and control groups as measured by ALAT in favour of experimental group.

For gender, the F-calculated value of 0.524 is significant at 1.918 probability value which is higher than 0.05 level set for this study. Hence, the null hypothesis was accepted. This means that there is no significant difference between the mean achievement scores of male and female students in ALAT.

Discussion

The results in Table 1 showed that the experimental group taught using algebraic board game achieved significantly higher than their control counterparts taught by expository method. The results for hypothesis 1 in Table 2 indicated that method is significant showing that there is a significant difference between the mean achievement scores of



students in the experimental and control groups as measured by ALAT. The implication of the results in Table 1 and hypothesis 1 of Table 2 is that it is important to use algebraic board game to teach algebra in such a way that students should comprehend better. The above results agreed with the result of Nnakwo (2019) who found out that the experimental group with quadratic equation box achieved better than their counterparts taught with expository method. The results of the study also are in support of Adaramola and Alamina (2007) who found out the use of mathematical games was more effective than the use of traditional lecture method in teaching mathematics. The result as well is in conformity with Abonyi, Maduagwuna and Ugama (2014) who found out that mathematical game approach is superior to the conventional method in facilitating achievement in mathematics. On the other hand, the result disagrees with the findings of Okigbo and Agu (2010) who found out that analogy was more effective in facilitating students' achievement in mathematics than game.

This result may have been due to the use of an innovative learning strategy (Algebraic board game) which involved students' meaningful participation. Invariably in this study, students in the control group may have continued with their rote memorization pattern of learning algebra which they were already used to. They may not have also seen any change in their teacher's style of teaching at present compared with what they have been previously used to. Hence it appeared to them that their lesson was "business as usual". This was opposed to the interesting experiences gained by students in the experimental group who were very anxious to learn considering their level of participation in asking and answering questions, together with deep interest in carrying out class assignment. This implies that the algebraic board game is effective in enhancing students' achievement in algebra.

Conclusion

The following conclusions are made based on the result of the analysis of data in this study; the use of the algebraic board game strategy significantly improved students' achievement in algebra than the use of the conventional approach. Gender difference in students' achievement in algebra was not significant.



Recommendations

From the finding of the study, the following recommendations are made:

1. The Federal/State Ministry of Education should ensure that the use of Algebraic Board Game for teaching secondary school algebra should be adopted by all secondary schools.
2. The Federal/State Ministry of Education should ensure that the Nigerian teacher education curriculum emphasized on the use of mathematics games in microteaching and teaching practice exercises to avail mathematics teachers more practical knowledge during their training.
3. The Federal/State Ministry of Education should ensure that Periodic practical oriented workshops and seminars are organized for mathematics teachers on the use of games for the teaching of mathematics.



References

- Abonyi, O., Maduagwuna, N. & Ugama, J. O. (2014). Effect of mathematical game on students' achievement in quadratic expression. *International Journal of Scientific and Engineering Research*. 5(6), 678-684.
- Adaramola, O. & Alamina, J. (2007). Effect of mathematical games on Nigerian students' performance in mathematics in secondary schools in Port Harcourt Metropolis. *European Journal of Scientific Research*, 20(2), 255-263.
- Adegboye, A.O (2003). The use of mathematics in solving *mathematics* problems. *ABACUS. The Journal of the Mathematics Association of Nigeria* 28 (1), 67-77
- Agwagah, U.N.V (2005). Teaching mathematics for critical thinking, essential skill for effective living. *ABACUS*, 30 (1), 38-45
- Albert, L. N. (2016). Effect of triangle solver game on students' achievement and retention in trigonometry in secondary schools. An unpublished MSc (Ed) Dissertation. Dept of Science & Computer Education, Enugu State University of Science and Technology, Enugu.
- Albert, L. N. (2016). Application of computer game in teaching and learning of mathematics in secondary schools. *International Journal of Studies in Education*, X(1), 38-48.
- Animasahun, A. (2007). The effect of simulation games environment on students' achievement and attitude to mathematics in secondary schools. *Turkish Online Journal of Education Technology*. 6(3), 113-119.
- Ashbacher. C. (2004). "Importance of mathematics: A lecture by Timothy. Retrieved (11-3-2020) from <http://google.com/search?.hl>
- Ashby, T; Sadera, W. A. & Mcluary, S. W. (2011). Comparing Students Success between Developmental Mathematics Courses offered online, Blended and Face-to-Face. *Journal of Interactive Online Learning*.10(3) 2011. www.ncair.org/jol.
- Borasi, R, (2008). *Rethinking the nature of mathematics as humanistic discipline: Retrieved (16-4-2008) from <http://www.rochester.edu/rasiate/c/clb-math.htm>*



- Chukwu, J. A. (2010). Effect of delayed formalization approach on students' achievement in quadratic equation. Unpublished M.Sc Dissertation, Enugu State University of Science and Technology, Enugu.
- Chukwurah, C. C. (2021). Effect of algebra board game on senior secondary school students' achievement, interest and retention in algebra in Anambra State. Dept of Mathematics & Computer Education, Enugu State University of Science & Technology.
- Egbulefu, C.A., Amaele, S. & Osaat, S.D. (2015). Effect of cooperative learning strategy on students' learning and achievement in mathematics. *International Journal of Educational Learning and Development*, 3(4), 67-75.
- Harbor-Peters, V. F. A. (2000). Andragogical Inquiry. A pedagogical Model for teaching mathematics within the next millenium. *ABACUS: The Journal of Mathematics Association of Nigeria*. 25(1), 64- 72
- Joseph, W.D. (2001). *The World Book Encyclopedia Chicago; World Book*. Inc. scotte fetzer company
- Kolawole, E.B and Oluwatayo, J.A (2005). Mathematics for Everyday living. Implications for Nigerian Secondary Schools. *ABACUS* .30 (1), 51-57
- Nnakwo, F. O. (2019). Effect of quadratic equation box on secondary school students' academic achievement, interest and retention in algebra in Enugu State. Unpublished M.Sc.(Ed.) Dissertation. Dept of Mathematics and Computer Education, ESUT, Enugu.
- Nneji, S. O. & Ezeamenyi, M. N. (2014). Application of Polya George's problem solving technique in teaching of secondary schools in Ebonyi State. *Journal of Science and Computer Education*, 2(2), 169-188.
- Obodo, G.C. (2000). "Mathematics a language for computers in the new millennium. Implication for Nigeria". *Proceeding of Annual conference of Mathematical Association of Nigeria*.
- Ogbu, S. (2006). Effect of simulation games on students' achievement and interest in mathematics. An unpublished MSc(Ed) Dissertation, Dept of Science Education, ESUT Enugu.
- Okigbo, E. C. & Agu, N. N. (2010). The effects of mathematical game and instructional analogy as advance organizers on students' achievement in secondary school



mathematics. *African Journal of Educational Studies in Mathematics and Sciences*, 8. DOI: 10.4314/ajesms.v8i1.69096

Salman, M F. (2005). Teachers identification of the difficulty levels of topics in the primary school mathematics Curriculum in Kwara State. *ABACUS* 30 (1) 20-29.

Udeh, I. J. (2019). Effect of algebra board game on secondary school students' interest and achievement in algebra. Dept of Science Education, Ebonyi State University, Abakiliki.