



Effects of Experiential Teaching Method on Students' Academic Performance in Mathematics in Rivers State, Nigeria.

¹Charles-Ogan, G.I. (PhD.), ² Edith Chinyere Onyeka (PhD.)

¹Department of Science Education, Faculty of Education, University of Port Harcourt, P.M.B. 5323 Choba, Port Harcourt, Rivers State.

²Department of Science Education, Faculty of Education, Nnamdi Azikiwe University Awka, P.M.B. 5025 Awka, Anambra State.

ABSTRACT

The study investigated the effects of experiential teaching method on students' academic performance in Mathematics in Rivers State, Nigeria. The research design adopted for the study was quasi-experimental. Intact classes of (118) JSS1 students formed the sample of the study using a simple random sampling technique. Two research questions were answered and two null hypotheses were posited and tested at 0.05 level of significance. The research instrument used for the study was Mathematics Performance Test (MPT). The reliability of the research instrument was computed using the Kuder-Richardson formula (K-R 21) which yielded a reliability coefficient of 0.84. The instrument was administered and the data obtained were analyzed using Analysis of Covariance (ANCOVA) to test for the hypotheses while mean and standard deviation were used to answer research questions. The findings established that the students who were taught with experiential teaching method performed higher than the students taught with deductive teaching method. Empirically it was proven that there was no significant difference in students' performance to use of experiential teaching method based on gender. Based on the findings, the study among others recommended that Mathematics teachers should use experiential teaching method in teaching Mathematics to eradicate students' problem of poor performance in Mathematics.

Keywords: Experiential teaching method, Academic performance, and gender.

INTRODUCTION

The experiential teaching method is based on the principle of learning by doing as students acquire knowledge after having experienced or done somewhat innovative. Thus, the experiential teaching method focuses on students' own life experiences and comprises a high degree of involvement. According to McCrann (2016) in the experiential teaching method, learners are dynamically engaging in activities or experiences. The students acquire knowledge by doing. This means that the experiential teaching method helps learners in the acquisition of skills and construction of knowledge from the direct outcome of the experience. The learner is said to have the capability to select and partake in practices that will progress performance and retention. The experiential teaching method upraises students' cognition levels, upsurges the use of critical thinking skills, and therefore enhances students' ability to obtain, retain and retrieve knowledge hence augmenting performance.

Teaching and assessment focusing on the learning of factual knowledge as in the deductive teaching method, will not serve the needs of the learners in the future, as it does not prepare for life-long learning which prepares students for the future (Kari, Måseidvåg, Karin & Steinar 2016). Therefore, teaching and learning Mathematics should involve an experiential teaching method that goes beyond the deductive teaching method (traditional teaching method) and it helps in the transfer of information which can actively engage students, making the learning of Mathematics more interesting and appealing. In other words, the experiential teaching method is interactive and involves more than just cognitive learning. It leads to tactical, dynamic engagement of students in opportunities to learn Mathematics through doing and reflecting on those activities, which empowers them to apply their theoretical knowledge to practical knowledge. This means that the experiential teaching method, when properly designed, is highly engaging for students and leads to better long-term memory. Therefore, Koutsoukos, Fragoulis and Valkanos (2015) in a study observed that the teachers' role is to organize, guide and support the application of experiential teaching method to engage students in a more exciting and motivating learning procedure for students' personal development, critical thought and experiential learning.

Statement of the Problem

The researchers detected with shock, that students' performance in Mathematics examinations (internal and external) has continuously been poor at the junior secondary school level. It is obvious that this poor performance has increased in the senior secondary school as can be seen in table 1 below which displays the West African Examination Council (WAEC) Chief Examiner's reports for 2013-2018.

Table 1 Percentage of students with credit pass and above in WASSCE (2013 -2018)

YEAR	TOTAL NUMBER OF STUDENTS WHO SAT FOR WASSCE	NUMBER OF STUDENTS THAT OBTAINED CREDIT AND ABOVE A1 – C6	PERCENTAGE OF STUDENTS WITH CREDIT AND ABOVE A1 – C6
2013	1,543,683	555,726	36.00
2014	1,692,435	529,738	31.30
2015	1,593,442	544,638	34.18
2016	1,544,234	597,310	38.68
2017	1,559,162	923,424	39.22
2018	1,471,151	786,016	37.98

Source:- Chief Examiner's Reports West African Examination Council (WAEC) as cited by Usman & Musa (2019).

Therefore, the gap in this study is how to provide empirical evidence on the efficacy of the use of experiential teaching method in solving the problem of poor academic performance in Mathematics in Rivers State, Nigeria.

Aim and Objectives of the Study:

The study investigated the effects of experiential teaching method on students' academic performance in Mathematics in Rivers State, Nigeria. Specifically, the study:

1. find out if there is any difference in the mean performance scores of junior secondary school students taught with experiential teaching method and those taught using deductive teaching method.
2. determined whether any difference exist in the mean performance scores of the male and the female students taught with experiential teaching method.

Research Questions

The following research questions guided this study.

1. What is the difference in the mean performance scores of students taught with experiential teaching method and those taught using deductive teaching method?
2. What is the difference in the mean performance scores of the male and the female students taught with experiential teaching method?

Hypotheses:

The following null hypotheses were formulated and tested at 0.05 level of significance.

1. There is no significant difference in the mean performance scores of students taught with experiential teaching method and those taught using deductive teaching method.
2. There is no significant difference in the mean performance scores of the male and the female students taught with experiential teaching method.

Methodology

Research design

The study adopted quasi-experimental research, structured as a pretest-posttest non-randomized design. The pretest-posttest control group design was used to investigate how the use of experiential teaching method in teaching Mathematics affected students' academic performance in Mathematics in Oyigbo Local Government Area of Rivers State.

Area of the study

The study was carried out in Oyigbo Local Government Area in Rivers State.

Population of the study

The population of this study consisted of all the Junior Secondary School one students in the seven mixed government junior secondary schools in Oyigbo Local Government Area of Rivers State. As at the time of the study (2018/2019 academic session), there were three thousand four hundred and fifty-one (3451) students made up of one thousand seven hundred and seventy-seven females (1777) and one thousand six hundred and seventy-four males (1,674), (Source, Zonal Post-primary School Board, Oyigbo Education Zone).

Sample and sampling technique

Intact classes comprising a total of 118 JSS1 students formed the sample of the study. Simple random sampling technique was used to select two junior secondary schools one in Oyigbo Local Government Area of Rivers State, in which one school was used as the experimental group and the other school as the control group. Simple random sampling technique was also used to select one arm of JSS1 classes in each school, experimental group consisted of (66) students made up of (32) females and (34) males. The control group was made of fifty-two (52) students made up of thirty-one (31) females and twenty-one (21) males.

Instrument for data collection

The researchers developed an instrument titled "Mathematics Performance Test (MPT) which was used to collect data. MPT was made up of twenty-five multiple choice test items with options A to D. The instrument was used for pre-test and post-test. The items of the instrument were re-shuffled before the administration of the posttest to reduce the memory effect. The students were required to answer all the questions. The content of the test items was derived from the topics that were taught. The instrument contained 2 sections. Section A elicited information on the students' personal data. Section B contained 25 multiple-choice test items which measured students' academic performance.

Validation of the instrument

To establish whether the test items in (MPT) addressed the topic of the research, the instrument was presented to one research expert in the department of Curriculum Studies and Educational Technology, one research expert in measurement and evaluation at the University of Port Harcourt and one experienced mathematics teacher to vet the content and errors in grammar, spellings, disregard vagueness and establish appropriate coverage of the instrument. The inputs were corrected at the final construction of the instrument.

Reliability of the instrument

The reliability of MPT was established by carrying out a trial testing on a sample of 20 students who were not part of the sample for this study. The students were administered MPT once without any form of teaching with regard to the study. The answer scripts were retrieved, marked and graded in percentage. Reliability was computed using the Kuder-Richardson formula (K-R 21) which yielded a reliability coefficient of 0.84. This reliability index showed that MPT was reliable for the conduct of the investigation.

Method of data collection

The instrument was used to generate data at two different times during the study, namely the pretest and the posttest. Participants of the experimental groups and the control group were given a pretest before treatment and a posttest after treatment respectively. The results of the test formed part of the data of this study.

Experimental procedure

The researchers employed the intact classes' Mathematics teachers as assistant researchers to deliver the lessons. These teachers were trained for two days by the researcher on the modality of instruction. The students in the two different groups were first given a pretest of (MPT) without any form of prior teaching. After the pretest, the research assistants taught their respective groups the assigned lesson plans. The students in the experimental groups were taught with the experiential teaching method, while the control group was taught with the deductive method. A posttest of (MPT) was given to the two groups after the teaching which lasted for four consecutive weeks. The posttest was administered to the same students but this time, the test items were reshuffled starting with an even number of items from the bottom. The scripts for both the pretest and posttest were collated, marked and graded in percentage.

Method of data analysis

The research questions were answered using mean and standard deviation, while Analysis of Covariance (ANCOVA) was used for the testing of the hypotheses. This was used to take care of the initial differences in the groups and to control selection bias. $P \leq 0.05$ level of significance was set for rejecting or accepting the null hypotheses

Presentation of Results

Research Question 1: What is the difference in the mean performance scores of students taught with experiential teaching method and those taught using deductive teaching method?

Table 2: Descriptive statistics on mean performance scores of students based on the use of experiential teaching method and Deductive method.

Methods		Pretest	Post_test	Mean Gain	Mean Gain%
EM	Mean	23.61	69.30	45.70	65.94
	N	66	66		
	SD	7.05	11.81		
DM	Mean	26.10	33.15	7.06	21.29
	N	52	52		
	SD	9.23	9.28		

Key: EM= Experiential teaching method and DM= Deductive Method

Table 2, shows that students taught with the experiential teaching method had a mean gain of 45.70 while those taught using the deductive method had a mean gain of 7.06 when the pretest and posttest were compared. The percentage mean gain also indicated (65.94) for the students taught with the experiential teaching method while students taught with the deductive method had a percentage mean gain of (21.29). This indicated a difference in favour of the experimental group.

Research Question 2: What is the difference in the mean performance scores of the male and the female students taught with experiential teaching method?

Table 3: Mean and standard deviation on how the performance mean score of students taught with experiential teaching method differ by gender

Group	Gender	N	Pretest		Posttest		Performance Gain	
			Mean	SD	Mean	SD	Mean	SD
EM	Male	34	23.53	7.50	68.94	12.14	45.41	15.56
	Female	32	23.69	6.66	69.69	11.62	46.00	13.37

Table 3, showed the mean and standard deviation on how the performance mean score of students taught with experiential teaching method differ by gender. The table showed that the male students taught with the experiential teaching method had a performance mean gain of 45.41, SD=15.56 while the female students taught with the experiential teaching method had a performance mean score of 46.00, SD=13.37. It is evident from table 3, that the female students taught with the experiential teaching method outperformed their male counterparts in the same group.

Hypothesis HO₁: There is no significant difference in the mean performance scores of students taught with experiential teaching method and those taught using deductive teaching method.

Table 4: Summary of ANCOVA of performance of Mathematics students based on the use of experiential teaching method and Deductive teaching method.

Tests of Between-Subjects Effects

Dependent Variable: Post_test

Source	Type III Sum of Squares	Df	Mean Square	F	Sig.	Decision
Corrected Model	38023.99 ^a	2	19011.99	162.71	.00	P < 0.05
Intercept	27817.20	1	27817.20	238.06	.00	P < 0.05
Pret_est	17.10	1	17.10	0.15	.70	P
Methods	37367.21	1	37367.21	319.79	.00	P < 0.05
Error	13437.61	115	116.85			
Total	387604.00	118				
Corrected Total	51461.59	117				

*Significant at P < 0.05

Table 4, revealed that using pre-test scores as a covariate, $F_{1,115} = 319.79$ at (115) degree of freedom and a probability level of 0.05 with $p = 0.00$, $P < 0.05$. Since the p-value is less than 0.05, the null hypothesis is rejected and the alternative hypothesis is retained. This indicated a significant difference in favour of the experimental group.

H0₂: There is no significant difference in the mean performance scores of the male and the female students taught with experiential teaching method.

Table 5: Summary of ANCOVA on the difference between the performance mean scores of students taught geometry with Geoboard based on gender

Dependent Variable: PostTest						
Source	Type III Sum of Squares	Df	Mean Square	F	p-value	
Corrected Model	129.63 ^b	2	64.82	.46	.64	
Intercept	29096.78	1	29096.78	205.27	.00	

PreTest	120.45	1	120.45	.85	.36
Gender	9.95	1	9.95	.07	.79
Error	8930.31	63	141.75		
Total	326052.00	66			
Corrected Total	9059.94	65			

a. Group = EM

b. R Squared = .014 (Adjusted R Squared = -.017)

Table 5, showed that no significant difference exists between the performance mean score of students taught geometry with experiential teaching method based on gender ($F_{1, 63}=.07, p>.05$). The null hypothesis two, H_{02} was retained at 0.05 level of significance since the p-value is greater than 0.05.

DISCUSSION

The results of this present study revealed that the students taught with experiential teaching method had higher mean performance scores in the post-test than the students taught with deductive teaching method. This significant difference is attributed to the treatment in the experimental group. This revealed that the application of the experiential teaching method has positively influenced students' performance in Mathematics. This finding supports the study of Rukhsana, Naemullah, and Rehman (2022) who in their study on the effect of experiential learning on students' academic achievement at the elementary level in the subject of general science, revealed that the experiential learning method was more effective than the traditional methods of teaching in the teaching of science in primary school. This is in agreement with the work of (Fitri, 2017) who, observed in his study that students using experiential learning-based teaching material in Mathematics in their schools had higher cognitive ability than the students that do not use experiential learning-based teaching material in mathematics in their school. The result of this study was also consistent with the work of Syed, Abiodullah and Yousuf (2014) whose research result concluded that the students taught using experiential learning methods in Pakistan have proved more successful to develop critically and creatively than those taught with traditional pedagogies. Likewise, a study conducted by Buzdar, Mohsin, Akber, & Mohammad, (2017) determined that the academic achievement of students taught using the experiential learning method has a favourable and significant relationship with their intrinsic and extrinsic motivation than those taught with the traditional teaching method.

The result of this present study also, in table 3 revealed that the male students taught with the experiential teaching method had a performance mean score of 45.41, $SD=15.56$ while the female students had a performance mean score of 46.00, $SD=13.37$. It is evident that the female students taught with the experiential teaching method outperformed their male counterparts in the same group. When the result was subjected to statistical test, the result in table 5 showed that no significant difference exists between the performance mean score of the male and the female students taught with experiential teaching method ($F_{1, 63}=.070, p>.05$). This result of the statistical test led to the non-rejection of H_{02} at 0.05 level of significance. Thus, H_{02} was retained. This finding is in agreement with the finding of Nweke, Abonyi, Omebe, Adibe - Njoku (2014) whose summary of their research result on the effects of experiential teaching method on pupils' achievement in basic science and technology revealed, uniformity in male and female pupil's achievement in basic Science and technology progression, this implies that the method is not gendered biased. This finding is also, in agreement with the findings of Sani and Salahudeen (2016) that there is no significant difference between males and females in the experimental group. This is because the experiential teaching method is a gender-inclusive teaching method. On contrary, the research finding of Sibiyi (2018) and Hoke (2008) showed that the female students in the experimental group had higher performance than their male counterparts in the same group. While the finding of Ishola (2014) and Enefu (2019) is not in agreement with the present result because it showed that the male students in the experimental group who were taught with the experiential teaching method outperformed their female counterparts in the same group.

Conclusion

Based on the findings of this study, it was empirically concluded that the use of the experiential teaching method enhanced the performance of students in Mathematics more than the deductive method.

Empirically it was also, proven that there was no significant difference in students' performance with respect to the use of experiential teaching method based on gender.

Recommendations

Based on the findings and conclusions from the study, the following recommendations were made by the researchers:

1. Mathematics teachers should use experiential teaching method in teaching Mathematics since it improves performance. Mathematics curriculum designers should recommend the use of experiential teaching method in teaching and learning of Mathematics.
2. Mathematics teachers should also give attention to and encourage both gender during classroom interactive sessions such that both male and female students can perform better in the study of Mathematics.
3. Seminars, workshops and symposia should be organized by the Ministries of Education and professional bodies such as the Mathematical Association of Nigeria (MAN), Science Teachers Association (STAN), Curriculum Organization of Nigeria (CON) and National Mathematical Centre (NMC) on how to integrate experiential teaching method in the teaching of Mathematics.

References

- Buzdar, M., Mohsin, M. N., Akber, R., Mohammad, N., (2017). Students' academic performance and its relationship with their intrinsic and extrinsic motivation. *Journal of educational research*, 20(1)
- Enefu, J. (2019). Effect of the use of geoboard on junior secondary school student's academic achievement in plane. *Readings in African Science and Mathematics Education.*, 21, 7381.
- Fitri, R. Y. (2017). The effect of problem-based learning model (PBL) and adversity quotient (AQ) on problem-solving ability. *American Journal of Educational Research*, 5(2), 179–183.
- Hoke, D. M. (2008) Effects on student performance of using hands-on activities to teach seventh grade students measurement concepts <https://www.semantic scholar.org/paper/Effects-On-Student-Performance-Of-Using-Hands-on-To-Hoke>
- Ishola, G.S. (2014). Geoboard and students' achievement and retention in Mathematics in Rio Grande. *Journal of Educational Assessment and Research Method*, 2, (5),23-30.
- Journal of the Mathematical Association of Nigeria (Mathematics Education Series)* 44 (1)
- Kari, S., Måseidvåg, G. S., Karin S.A. & Steinar, E. K. (2016) Educating for the future: A conceptual framework of responsive pedagogy. *Journal of Cogent Education*3(1)
- Koutsoukos, M., Fragoulis, I. & Valkanos, E. (2015) Connection of environmental education with application of experiential teaching methods: A case study from Greece. *International Education Studies* 8(4)
- McCran, J.T. (2016) Learning by doing: The Case for experiential education Retrieved 5/1/2020 from <http://blogs.edweek.org/teachers/prove-it-math-and-education-policy/2016/02/learning-by-doing-case-for-experiential-education.html>
- Nweke, C. O., Abonyi, O. S., Omebe, C. A., Adibe - Njoku, M. I. (2014) Effects of Experiential Teaching Method on Pupils' Achievement in Basic Science and Technology International Journal of Scientific & Engineering Research, 5 (5), 2229-5518
- Rukhsana, B., Naeemullah, M., Sajid Rehman, S. (2022) Effect of experiential learning on students' academic achievement at elementary level in the subject of general science 8 (1) 138 - 150. *Multicultural Education*
- Sani, S. & Salahudeen, B. (2016) Effects of Geoboard and Geographical globe on senior secondary school students' performance in Mathematics in Kaduna State, *Journal of Science, Technology & Education (JOSTE)*.4(1).
- Sibiya (2018). Effect of geoboard on the understanding of geometry theorems among senior secondary school students. *International Journal of Curricula Change and Innovation*, 1, 12-19.
- Syed, S. A., Abiodullah, M., & Yousaf, A. (2014). Assessing emotional intelligence and interpersonal skills of university students as predictors of employability. Paper presented at 21st Century Academic Forum Conference, 243-255. http://www.21caf.org/uploads/1/3/5/2/13527682/syed-hrdconference_proceedings.pdf
- Usman, M. A. & Musa, D.C. (2019). Concept mapping instructional strategies and senior secondary school students' performance and interest in Algebra in Bauchi State.
- West African Examination Council. (2013-2018). Chief Examiner's Reports West African Examination Council. Lagos.