



Effect of Role Play Method on Secondary School Students' Achievement in Chemistry.

Okpala, U. Virginia & Okigbo, E. Chinelo

Department of Science Education, Nnamdi Azikiwe University, Awka

Corresponding Author: uche4macdon@yahoo.com

Abstract

The study investigated the effect of role play on senior secondary two (SS2) students' academic achievement in chemistry in Aguata Education Zone. Two research questions guided the study and two hypotheses tested at 0.05 alpha level. The study adopted quasi-experimental design. Specifically, pretest posttest non- randomized control group design was used. Two groups (experimental and control) made up of 85 SS 2 students offering chemistry were drawn from the population of 1256. Multi-stage sampling procedure was used to select the sample. Electrolysis Achievement Test (EAT) was used for data collection. Three experts validated the instruments. The reliability Coefficient of EAT determined using Kuder Richard Formula 20 was 0.70. Students in the experimental group demonstrated electrolysis using role play while those in the control group were taught by their teacher using conventional method. Data collected were analyzed using Mean, Standard deviation and Analysis of Covariance. The findings indicated that role play method significantly improved achievement of students in chemistry more than the conventional method. Based on the findings, it was recommended among others that chemistry teachers should adopt the use of role play in teaching in order to enhance students' achievement.

Keywords: Academic Achievement, Role Play, Chemistry, Secondary School Students, and Electrochemistry

Introduction

Chemistry is one of the vital science subjects studied in the Nigerian senior secondary schools. It is needed in almost all the science courses in the University. This fact results in the perpetual global scientific and technological development. Also, the extraordinary world population growth rate continues to throw a challenge to chemistry educators and researchers to come up with most effective and suitable method of teaching chemistry. Chemistry is the study of matter reaction between substances. Despite the importance of the subject, chemistry has many topics which are abstract and difficult for students to understand. Nnoli (2017) identified electrolysis, ionic bonding, redox reaction among others as difficult topics in secondary school chemistry.

Electrolysis is the chemical decomposition of compound which takes place when an electric current is passed through either a solution or the molten form of the compound. This concept of electrolysis is very difficult to teach and students find it difficult to learn. This is because it deals with ions and bonding (Kara & Ozden, 2005). Consequently, students lack interest and this resulted in poor performance at SSCE. The method used by teachers in teaching chemistry has been blamed for poor achievement. Anyaegbunam (2012) and Nnoli (2017) indicated that many science teachers prefer the conventional method of teaching and shy away from innovative teaching methods. Ezeudu (2013) opined that conventional method is a discourse delivery method of instruction and it is one-



way flow of communication from the teacher to the students. Many innovative methods were developed to bring about improvements in teaching and learning of sciences. These methods include concept mapping, demonstration method, role play among others.

Role play refers to changing of one's behavior to assume a role either unconsciously to fill a social role or consciously to act out an adopted role. Hornby (2004) defined role play as the changing of one's behavior to fulfil a social role. The term is used to refer to: the playing of roles generally such as in a theatre or educational setting; taking a role of an existing character or person and acting it out with a partner taking someone else's role, often involving different genres of practice. Role play according to Coppola (2004) is a method which involves the players changing parts so that they can begin to empathize others point of view. In this study the role play can be performed in educational setting whereby the difficult topics in chemistry will be demonstrated through role play to enhance the academic achievement of students in chemistry.

Academic achievement is the sum total of a learner's performance in relation to a given standard over a specified period of time. Okafor (2007) opined that academic achievement explains the learners' degree of accomplishments of the desired tasks and change in behavior. Ngata (2013) conducted a study on the effect of role play on academic achievement of secondary school students in English literature in Karak district. The results revealed that role play helped the students to achieve highly in English literature. The previous study was carried out using English literature. The researcher deemed it necessary to carry out the study on role play using chemistry.

Some researchers also opined that gender is a factor in academic achievement. Gender is the social roles and behaviours that a society typically associates with males and females, Okereke and Onwukwe (2011) found out that male students achieved significantly better than female students taught chemistry using Play simulations. Ajayi and Ogbeba (2017) also found out that there is no significant difference in the mean achievement scores between male and female students taught stoichiometry using hands-on-activities. An investigation of such gender influences as intended in this research will shed further light on the issue of gender and academic achievement. The work is being carried out in Aguata Education Zone of Anambra State as no studies have been carried on effect of role play on achievement in senior secondary school chemistry. Therefore, the work is deemed relevant.

Statement of the Problem

One of the objectives of chemistry teaching at the secondary school level is to provide the students with the basic knowledge in chemical concepts and principles through efficient selection of content and sequencing. To achieve the objective, various teaching methods should be employed in teaching and learning of chemistry in secondary schools. Despite the importance of chemistry, available statistics from the West African Examination Council (WAEC, 2015-2018) recorded very poor performance at Senior School Certificate Examination (SSCE). Poor achievement of students has been traced to a number of factors which include teaching method. Many researchers have suggested learner centered method such as concept mapping, discovery, drama, role play, games among others. The question now is, will the use of Role play method



enhance secondary school students' achievement in chemistry?

Based on the aforementioned problem, the purpose of this study therefore, is to determine the effect of role play method on secondary school students' achievement in chemistry. Specifically, the study sought to determine the:

1. mean achievement scores of students taught chemistry using role play method and those taught using conventional method.
2. mean achievement scores of male and female students taught chemistry with Role play method.

Based on the purpose, the following research questions and hypotheses guided the study

1. What are the mean achievement scores of students taught chemistry using role play method and those taught using conventional method?
2. What are the mean achievement scores of male and female students taught chemistry using role play method?

Hypotheses

1. There is no significant difference between the mean achievement scores of students taught chemistry using role play method and those taught using conventional method.
2. There is no significant difference between the mean achievement scores of male and female students taught chemistry with role play method.

Method

The study adopted a quasi-experimental design. Specifically, the study used non-randomized control group design.

Quasi-experimental design is a type of experimental design that does not provide for full control of the extraneous variables primarily because of lack of random assignment of subjects to groups. The design is considered appropriate because it was not possible for the researcher to randomly sample the subjects without disrupting the academic programme of the schools involved in the study. The researcher thus used intact classes for the study. Area of the study was Aguata Education Zone. Aguata Education Zone was used because from the literature review carried out and to the best of the researcher's knowledge, this kind of research has not been carried out in the Zone. The population of the study consisted of 1256 SS 2 students offering chemistry in the 49-state owned secondary schools in Aguata Education Zone. The researcher used multi-stage sampling procedure to select the sample. Purposive sampling technique was first used to select only government owned single sex secondary schools in the Zone. This is necessary because gender influence on the use of teaching method is determined by the study. Simple random sampling technique was used to draw four schools (2 boys' schools and 2 girls' schools) into the sample which comprised of 85 SS 2 students offering chemistry (42 males and 43 females). The experimental group had 42 students (24 males and 18 females) while the control group consisted of 43 students (18 males and 25 females). The assignment of the intact classes to both the role play method group and conventional method group was done randomly using a flip of coin.

Instrument for data collection was Electrolysis Achievement Test (EAT). The instrument was validated by three research experts who confirmed it to be valid. Using Kurder Richardson formula 20 (KR-20), a reliability coefficient of 0.70 was obtained.

The choice of Kuder Richardson formula 20 was influenced by the fact that it is the most suitable formula used in multiple choice items with right or wrong answer (Egbo, 2005). It is also the most appropriate in determining the internal consistency of items scored dichotomously. Before the treatment, the researcher briefed the chemistry teachers on the use of role play method. The research participants in both the experimental and control groups were given pretest by their regular chemistry teachers before commencing with the treatment. Students in the experimental group demonstrated electrolysis using role play method while those in the control group were taught electrolysis by their chemistry teacher using conventional method. The treatment lasted for four weeks after which a post-test was administered to both groups by their chemistry teachers using a rearranged copy of the pre-test instrument. To ensure that extraneous variables were controlled, the researcher was not directly involved in both the treatment and test

administrations but used their chemistry teachers. Both the pretest and post-test were marked, scored and recorded. Data Collected were analyzed using mean, standard deviation and Analysis of Covariance (ANCOVA). Mean with standard deviation was used to answer the research questions while ANCOVA was used to test the hypotheses at .05 level of significance because the groups studied differ in some important secondary variable at the beginning. ANCOVA is a statistical analysis design to remove the differences in the initial status of the two groups.

Results

The following results were presented in line with the research questions and hypotheses that guided the study

Research Question 1

What are the mean achievement scores of students taught chemistry using role play method and those taught using conventional method?

Table 1: Mean achievement scores of students taught chemistry using role play and those taught using conventional method.

Teaching method	N	Pre-test		Post test		Mean gain
		\bar{X}	SD	\bar{X}	SD	
Role play	42	24.52	6.00	75.66	11.04	51.14
Conventional	43	21.53	6.96	47.02	13.81	25.49

Table 1 showed that the group taught chemistry using role play method had higher achievement scores than their counterparts taught with the conventional method.

Research Question 2: What are the mean achievement scores of male and female students taught chemistry using Role play method?

Table 2: Mean and standard deviation of achievement mean scores of male and female students taught chemistry using role play method.

Gender	N	Pre-test		Post test		Mean gain
		\bar{X}	SD	\bar{X}	SD	
Male	24	24.56	8.40	74.16	7.22	49.60
female	18	25.66	8.05	78.55	5.31	52.89



Result in table 2 showed that female students had higher mean scores in both pretest and posttest. This is an indication that female students appear to achieve higher than male students when taught chemistry using role play method.

Hypothesis 1: There is no significant difference between the mean achievement scores of students taught chemistry using role play and those taught using conventional method.

Table 3: ANCOVA test of the significant difference between mean achievement scores of students taught chemistry using role play method and those taught using conventional method.

Source	Type III Sum of squares	Df	Mean square	F	Sig.
Corrected Model	17532.912	2	8766.456	55.650	.000
Intercept	20311.818	1	20311.818	128.940	.000
Group	15960.685	1	15960.685	101.319	.000
Pre-EAT	100.869	1	100.869	.640	.426
Error	12917.441	82	157.530		
Total	348568.000	85			
Corrected Total	30450.353	84			

The result in table 3 showed significant main effect with respect to the group taught electrolysis using role play method and those taught chemistry using conventional method, $F(1,82) = 101.319$, $P = 0.000 < 0.05$. Since the p-value of .000 was less than .05 level of significance, the null hypothesis was rejected. Therefore, there was a significant

difference in the mean achievement scores of students taught chemistry using role play method and those taught using conventional method. This is in favour of role play method.

Hypothesis 2: There is no significant difference between mean achievement scores of male and female students taught chemistry using role play method.

Table 4: ANCOVA test of significant difference between mean achievement scores of male and female student taught chemistry using role play method.

Source	Type III Sum of squares	Df	Mean square	F	Sig.
Corrected Model	217.487 ^a	2	108.734	.923	.406
Intercept	11423.821	1	11423.821	96/972	.000
Pre-EAT	19.360	1	19.360	.164	.687
Gender	177.022	1	177.022	1.503	.228
Error	4594.418	39	117		
Total	247708.000	42			
Corrected Total	4811.905	41			

a. R squared = .045 (Adjusted R Squared = -.004)



The result in Table 4 showed significant main effect with respect to male and female students' achievement, taught Electrolysis using role play, $F(1,42) = 1.503$, $p = .228 > .05$. Since the p-value of .228 is greater than .05 level of significance, the null hypothesis was not rejected. Thus, there is no significant difference in the mean achievement score of male and female students taught chemistry using role play method.

Discussion of Findings

Findings showed that the mean gain achievement scores of students taught chemistry using Role play method were higher than the mean gain scores of students in the conventional group. This indicated that role play method had a positive effect on students' achievement in chemistry. Role play method arouses and sustains interest in senior secondary school students of chemistry. Sustained interest will ultimately lead to enhanced achievement in chemistry. The findings were in line with what Sowan (2013) stated that Role play is a method which enhances students performances and that students taught science using role play had a higher academic achievement. Stanford and Roark (2011) opined that role playing can be used in a more focused way to help students understand some of the school subjects. It was also discovered that the difference in achievement of the two groups was significant in favour of role play method group. The significant difference is attributed to the treatment. This implies that role play method enhances students' academic achievement in chemistry than conventional method. The findings are in line with the findings of Abraham (2012) and Ngata (2013) who in their separate studies found out that the students taught using Role play achieved higher than those taught using conventional method. Baran (2013) also in his study on

role play found out that role play enhances he academic performance of students.

The findings revealed that female students taught electrolysis using role play method had a higher achievement mean gain than the male students taught using the same method. This is an indication that female students appear to achieve higher than their male counterparts. However, it showed that the difference in achievement was not significant when the result was subjected to further statistical analysis. This implies that gender does not influence the mean achievement scores of students taught chemistry using role play. Thus, there is no significant difference in the mean achievement scores of male and female students taught chemistry using role play method. The findings were in line with the work of Okafor (2017), who found out that a significant difference does not exist in the mean achievement scores of male and female students. Ajayi and Ogbeba (2017) in their studies, also found out that there is no significant difference in the mean achievement scores between male and female students taught stoichiometry using hands-on-activities. Shambi (2017) found out that there was no statistically significant difference in the students science achievement based on gender while Akam and Okoli (2018) in their research work found out that there was no significant gender differences in the achievement of students in chemistry.

Conclusion

The study revealed that role play method improved students' achievement in chemistry. It is therefore concluded that Role play enhances more understanding and comprehension of chemistry concepts which leads to higher academic achievement. It is



therefore necessary that Role play be adopted in teaching and learning of chemistry in secondary schools.

Recommendations

The following were recommended

1. Chemistry teachers should always adopt role play method of teaching that will help increase the academic achievement of students.
2. Some of the chemistry teachers may not be familiar with the use of Role play method, Ministries of Education should organize workshops, seminars on how to use role play method.
3. Government and relevant professional associations such as Science Teachers Association (STAN) should sponsor further research to find ways of making the use of role play method easily practicable by teachers.
4. The curriculum developers should develop appropriate curriculum that will make provision for the teachers to adopt instructional modes (Role play) that will enable students to learn effectively.
5. Examination bodies like WAEC, NECO and NABTEB should be able to develop appropriate assessment instruments that will enable them to assess students' performance or abilities using role play method of teaching.

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