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Effect Of Gender On Academic Achievement Scores Of Ssii Chemistry Students When Taught Using Self-Regulatory And Teacher Demonstration Teaching Strategies In Enugu East Local Government Area

Phina C Ezeagwu, Professor I.O Nebo
(Department Of Applied Sciences/Federal University Of Allied Health Sciences, Enugu, Nigeria)
(Department Of Science Education/Enugu State University Of Technology, Enugu, Nigeria)

Abstract:
Background*: Chemistry is an integral part of sciences and forms the bedrock for future development of every nation. Unfortunately, Nigeria has continued to witness a decline in students' performance in chemistry with gender playing a predisposing factor. Many scholars and previous researchers attributed this to poor teaching methodology. They posit that to make the teaching and learning of science, particularly chemistry to achieve its most needed results, that revolutionary, practical-oriented, less theory and*
less examination-oriented, as stipulated by WAEC (West African Examination Council) curriculum, the NSSSP, and other learning projects in Nigeria, that teaching strategies need to be reviewed. We therefore select this study to evaluate the effect of gender on academic achievement scores of senior secondary school students when taught using Self-Regulatory and Teacher Demonstration teaching strategies in Enugu East Local government area of Enugu state.
Materials and Methods: *The researcher adopted a quasi-experimental pre-test-post-test non-randomized equivalent group research design. Sample sizes of 222 senior secondary school students were selected across the coeducational schools, comprising of 93 females and 129 males. They were assigned into two groups of 117 experimental and 105 control groups. The instruments used for data collection are the Chemistry Achievement Test (CAT) and the Chemistry Education Academic Interest Scale for Adolescents (CEAISA). The experimental group was thought using Self-Regulatory teaching method while the control group was taught using Teacher Demonstration teaching strategy.*
Results*: The findings of the study indicated that gender greatly affects academic achievement scores of SSII chemistry students; it also indicated no significant difference in the teaching strategies examined.*
Conclusion: *Gender greatly affects academic achievement scores of students when taught using Self-Regulatory and Teacher Demonstration teaching strategies.*
Key Word: *Self-Regulatory teaching; Teacher Demonstration Teaching; Academic Achievement; GenderI.*

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I. Introduction

Chemistry has been seen to have the least success rate among secondary school students in Nigeria as showcased in the 2019 WAEC chief examiner's Report (2014-2018). It has also been noted that these underwhelming performances in chemistry has also continued up to the undergraduate level Adejoh (2012), Okebukola (2015), and Ajagun (2016). Many scholars and previous researches attributed this to poor teaching methodology. As a result, all instructors are expected to comprehend the pedagogy strategy that can best enhance the learning process by applying effective teaching strategies (Hightower, et al, 2011). Instructors are also to ensure that these strategies promote student progress and achievement in any subject area like chemistry (Tebabal & Kahssay, 2011). Other factors may also affect achievement and interest, such as gender, because of social expectations. This study intend to find out which pedagogy method will lead to better achievement in chemistry using Self-Regulatory and Teacher Demonstration method.

II. Material And Methods

This prospective comparative study was conducted on second year senior secondary students of schools in Enugu East Local government area of Enugu educational zone from 1st September to 30th September 2022. A total of 222 students (both male and female) of age 16-19 years were involved in this study.

Study Design: Prospective Quasi-experimental study.

Study Location: This was a study done in a coeducational secondary school located at Enugu East Local government Area in Enugu Educational zone.

Study Duration: 1st September to 30th September 2022.

Sample size: 222 students.

Sample size calculation: The sample size was estimated by purposive sampling of an intact group with gender consideration. Randomization is not possible here. The target population from which the sample was selected from was one thousand, seven hundred and forty-nine (1749), total number of SS11 students who were offering Chemistry in Enugu East LGA of Enugu state as at 2021/2022 Academic session.

Subject and selection method: The study population was drawn from eleven (11) government secondary schools in Enugu East LGA comprising of five (5) single-sex and six (6) co-educational schools. Purposefully, two co-educational schools that have two streams of intact chemistry classes were sampled. By simple balloting, the four streams of the intact classes of the two schools were assigned to experimental group and control group. The experimental group is one hundred and seventeen (117) in number while the control group is one hundred and five (105) in number.

Experimental group was taught using Self-Regulatory teaching method. This lasted for 40 minutes for each period for 4 weeks.

Control group was taught using Teacher Demonstration teaching strategy. This lasted for 40 minutes for each period for 4 weeks.

Inclusion criteria:
1. Penultimate class
2. Either sex
3. Aged 16-19
4. Chemistry student of Enugu East

Exclusion criteria:
1. Final year students
2. Non Chemistry students
3. Single sex schools

Procedure Methodology

After due diligence was concluded, the well- structured data collection instruments were administered on the students. They were Chemistry Achievement Test (CAT) and Chemistry Education Achievement Interest Scale for Adolescent (CEAISA). CAT consisted of two sections of socio-demographic characteristics; age, gender etc. The second section consisted of 40 multiple choice test-items with options of A, B, C, D that passed Blue Point/Table of Specification according to Bloom's Taxonomy of Educational objectives. Content was based on first term syllabus of SS11. CEAISA, adapted from Luo, Dang and Xu (2019), to measure interest toward a particular subject, had three dimensions of emotion, value and engagements, in a Likert response format. The CAT and CEAISA instruments were validated by experts and reliability, tested in a pilot study, gave reliability coefficient of 0.76 and 0.78 respectively.

The experimental procedure was carried out under;

Pre-testing: This was to assess their level of knowledge (entry behavior) of the chemistry content, which was administered by their regular class teacher who had earlier been trained as Research assistant. Students did not therefore know that a research was being conducted and exhibited their normal behavioral characteristics. Test was marked and scored.

Treatment\Intervention: This was on the chemistry content, (chemical Reaction and Chemical Equilibrium) which was part of the SS11 scheme of work for first term, was taught for four weeks by the trained class teacher who posed as the research assistant.

Post-testing: At the end of the intervention, CAT and CEAISA, were administered to both experimental and control groups to obtain post-treatment data. The numbering of the test items was reshuffled to disguise the question. This was marked and recorded.

Statistical analysis

Data generated was analyzed using statistical method. The research questions were analyzed using Statistical Mean and standard Deviation (descriptive statistics), while the null hypothesis was tested using ANCOVA (inferential Statistics) for the control of initial group difference. ANCOCA testing is at $p<0.05$ level of significant. That is, scores above 0 .05 level of significant were rejected while scores below 0.05 were accepted.

III. Result

The study revealed that gender significantly affected academic achievement score. Furthermore, the study also indicated that there was no significant difference between self-regulatory teaching strategy and teacher demonstration strategy on academic achievement scores of SSII chemistry students in Enugu East LGA, Education Zone.

Question 1

What are the mean academic achievement scores of male and female SSII chemistry students when taught (chemical reactions and chemical equilibrium) using a self-regulatory teaching strategy?

Table no 1: Summary table of the mean academic achievement scores of male and female SSII chemistry students when taught (chemical reactions and chemical equilibrium) using a self-regulatory teaching strategy.

Experimental (self-regulatory Teaching)	Mean Gain score	Std. Deviation	N
Females	31.03	5.83	64
Males	30.01	6.57	53

N=sample size

Table 1: Shows that SS II female students taught with a self-regulatory teaching strategy obtained an academic achievement mean gain score of 31.03 and standard deviation of 5.83 while the males obtained an academic achievement mean gain score of 30.01 and standard deviation of 6.57. Gender had a remarkable effect on senior secondary II chemistry students' academic achievement when taught (chemical reactions and chemical equilibrium) using a self-regulatory teaching strategy.

Research Question 2: What are the mean academic achievement scores of male and female SSII chemistry students when taught (chemical reactions and chemical equilibrium) using teacher demonstration teaching strategy?

Table2: Summary table of the mean academic achievement scores of male and female SSII chemistry students when taught (chemical reactions and chemical equilibrium) using teacher demonstration teaching strategy.

Control (Teacher Demonstration)	Mean gain score	Std. Deviation	N
Females	33.24	5.96	29
Males	30.36	6.27	76

N=sample size

From table 2, the result revealed that SS II female students taught with Teacher demonstration teaching method obtained an academic achievement mean gain score of 33.24 and standard deviation of 5.96 while the males obtained an academic achievement mean score of 30.36 and standard deviation of 6.27. Gender had remarkable Effect on senior secondary II chemistry students' academic achievement when taught (chemical reactions and chemical equilibrium) using a teacher demonstration strategy.

Hypothesis testing

Hypothesis 1

There was no significant difference between male and female SSII chemistry students in the experimental and control groups in the mean academic achievement scores when taught (chemical reactions and chemical equilibrium) using the Self-regulatory teaching strategy and Teacher demonstration teaching strategy.

Table 3: Summary of mean differences between male and female SSII chemistry students in the experimental and control groups in the mean academic achievement scores when taught (chemical reactions and chemical equilibrium) using Self-regulatory teaching strategy and Teacher demonstration teaching strategy method.

Pair wise Comparisons				
Dependent Variable: POSTRDCAT				
(I)GENDER	(J) GENDER	Mean Difference(IJ)	Std. Error	Sig.[b]
Female	Male	1.981*	.705	.005
Male	Female	-1.981*	.705	.005
Based on estimated marginal means				

The mean difference is significant at the .05 level.

b. Adjustment for multiple comparisons: Least Significant Difference (equivalent to no adjustments).

From table 3, hypothesis 1 stated that 'there was no significant difference between male and female SSII chemistry students in the experimental and control groups in the mean academic achievement scores when taught (chemical reactions and chemical equilibrium) using Self-regulatory teaching strategy and Teacher demonstration teaching strategy is hereby disconfirmed at $p<.05$ level of significance. Meaning that there is a remarkable difference between the mean scores of male and female SSII students' academic achievement in both experimental and control groups.

IV. Discussion

The study revealed that gender significantly affected academic achievement score in experimental groups. This is in line with findings of Blickenstaff, 2005; Riegle-Crumb,Moore, & Ramos-Wada, (2011) which stated that gender greatly effected academic achievement scores especially in girls as they were seen to have gradually lost their interest in learning science and science-related careers (chemistry) during their secondary school years. Several studies also suggested that teachers treat their students differently and have different expectations depending on whether they are girls or boys (Anderson 2012) and that teachers' assumptions and expectations impact their students' science achievement (Koch, 2006).To this end, gender, is the socio-cultural classification of male and female and as such, we can state that female and male students indicate different patterns of gender-science stereotypes in their academic endeavors.

Furthermore, the study also indicated that there was no significant difference between self-regulatory teaching strategy and teacher demonstration teaching strategy on academic achievement scores of SSII chemistry students in Enugu East LGA, Education Zone. This is consistent with findings of Ayimbilai and Pappoe (2021) which demonstrated and investigated the efficiency of the discussion teaching style at Navrongo High School using a quasi-experimental design. Contrary to our findings, another study by Giridharan and Raju (2016) also examined the effect of educational approaches and teacher effects on student academic performance in engineering education; he stipulated that self-regulatory teachings strategy was shown to be less effective than the demonstration strategy.

V. Conclusion

Gender greatly affects academic achievement score of SSII chemistry students while using both self-regulatory and teacher demonstration teaching strategy.

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