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MITIGATING GLOBAL LEARNING CHALLENGES IN SECONDARY EDUCATION THROUGH THE USE OF JIGSAW INSTRUCTIONAL STRATEGY IN FOSTERING STUDENTS' INTEREST IN CHEMISTRY

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ABSTRACT

The study explored the efficacy of Jigsaw Instructional Strategy (JIS) in fostering male and female students' interest in learning Chemistry in comparison with the traditional lecture method. Two research questions and two hypotheses were formulated to guide the study. A non-equivalent and non-randomized control group quasi-experimental research design was adopted for the study. The instrument for data collection was a Chemistry Interest Scale (CIS) which was developed by the researcher. Data obtained from a sample of 91 secondary school Chemistry students were analyzed using mean and standard deviation for the research questions and analysis of covariance (ANCOVA) for the hypotheses. The results emanating therefrom showed that the mean interest score of students exposed to Chemistry instruction using JIS was significantly higher than those of their counterparts who were taught the same Chemistry topics using lecture method. It was however found that gender had no significant effect on the academic interest of male and female students in Chemistry. The implications of the findings of the study lies on the modification of chemistry learning environment in the secondary school by encouraging the adoption of learner-centered strategies such as JIS and discourage the use of teacher-centered strategies for enhancing the academic interest of students. The researcher hereby recommends that active learning strategies for enhancement of students' academic interest should be prepared and used by teachers for learning chemistry in secondary school as a means of building capacities for sustainable future and bridging global challenges in learning chemistry.

Keywords: Academic Interest, Jigsaw Instructional Strategy (JIS), Students, Chemistry.

Introduction

Chemistry which is simply the study of the composition, properties, synthesis and uses of matter (Ababio, 2018), and also one of the core subjects in senior secondary schools in Nigeria, is so multifaceted and multifarious that no area of science, technology and business enterprises escapes its application, and so, it is given priority attention because its functional role in both national and global

capacity building for sustainable futures cannot be overemphasized and this justifies the recognition of its role in our day to day activities (Okechineke, 2021).

Chemistry, precurses many science-based professions and disciplines in the university like biochemistry, medicine, engineering, nursing, agriculture, science education, and so on. It is one of the frontline science subjects in both secondary schools, colleges and higher institutions, having its branches to include but not limited to organic, inorganic, analytical, biochemistry, biophysical, physical chemistry, and so on (Okechineke, 2025). The study of chemistry has contributed immensely towards bridging global challenges and local realities, ranging from production of food, drugs, building materials, textiles and modern transportation systems; improved living conditions for mankind; acquisition of knowledge, development skills and attitudes which enrich people's lives and allow them to be scientifically capable members of society; obtaining new beneficial products that can be used in medicine, agriculture, engineering and industry and is also concerned with treating some environmental problems such as rust, air, water and soil pollution, sustainable energy and water recycling; and so on (Usang & Okoli, 2021).

The importance of Chemistry at the secondary education level cannot be downplayed, as it is both fundamental and foundational to other chemistry related disciplines and professions in higher education. This is evident in the high enrolment of students in its senior school certificate examination (SSCE) yearly in both the internal and external (WAEC, 2024). According to the National policy on Education (NPE), the major objectives of chemistry as contained in the curriculum are to prepare the students to acquire adequate useful, meaningful and relevant cognition of chemistry skills for laboratory and field operations; to develop the ability of applying the acquired knowledge to their daily live activities, which is a reflection of the desired scientific attitudes, inculcated in them through learning; as well as apply the basic rudiments of chemistry in their higher level of career and profession (Okechineke, Ezeh, Iyida & Eze, 2024)

Chemistry education plays important roles in enhancing the quality of output from teaching and research, ensuring that chemistry students acquire the desired knowledge, skills and attitudes, as well as develop their highest potentials. A successful teaching process embodies many contributing factors such as the instructional strategies adopted by the teacher, instructional materials engaged to drive home the stated objectives, among others. If a teacher adopts and utilizes the best instructional strategy, the classroom learning process optimizes the learners' achievement, interest, motivation, attitude, engagement, satisfaction, performance, understanding of learnt concept, etc. and in turn mitigates their learning challenges (Eze, Egbo & Okechineke, 2024). One of such instructional strategies that hold promises of improving these factors (achievement, interest, motivation, attitude, etc.) in learning is Jigsaw Instructional Strategy (JIS); which this study is set to examine its effect in

fostering students' interest towards mitigating global learning challenges in chemistry.

Jigsaw Instructional Strategy (JIS) is a student-centered strategy that increases students' participation creating a supportive and motivating environment for learning. This strategy develops students' personal skills (reading, writing, listening, and speaking) and interpersonal skills that encourages them to communicate and collaborate with their peers. JIS is one out of many cooperative learning strategies that teaches students cooperation, responsibility, teamwork, critical thinking and social skills, which are all skills that students need to be successful in the twenty-first century (Eze, Nweze & Okechineke, 2025).

The JIS places great emphasis on cooperation and shared responsibility within groups and makes students dependent on each other to succeed. The success of each group depends on the participation of each individual in completing their task. This means the Jigsaw Instructional Strategy (JIS) effectively increases the involvement of each student in the activity. It breaks classes into groups that each assemble a piece of an assignment and synthesize their work when finished. In using JIS, one student from each group has his/her own topic and then they meet with other students from other groups who have the same topic and they work together to decide the most important parts to share back with their original or home group to help them develop the same understanding (Garcia, Abrego & Robert, 2017). This is significant to mitigating learning challenges, building capacities for sustainable future in the chemical world and by implication it develops positive interdependence, mutual support, group goals, individual accountability, face-to-face interaction, collaborative skills, social skills and interpersonal development, which makes the learning process to be interesting because when students' interests are enhanced, they become available, participate and learn more (Eze, et. al, 2025)

The review of other related literature shows that students taught with Jigsaw Instructional Strategy (JIS) and other innovative strategies had their interest enhanced more than their counterparts taught with conventional strategies such as the lecture method. This shows the effectiveness of strategies that engage the learners actively like the JIS. Specifically, using this strategy improves academic performance and self-esteem of students yielding better result when compared to lecture method; revealing that if well implemented JIS increased students' motivation, learning, reasoning, thinking skills, student achievement and active learning as it exercises the effort of working in teams for each of the students by reaching a favourable outcome in Jigsaw Classroom (Winslow, 2020). Similarly, another study revealed that students taught using Jigsaw cooperative learning strategy achieved more than their counterparts in organic chemistry (Okechineke, 2025), and this study will reveal if the interest of the students will be enhanced in chemistry using JIS.

Moreover, another study on the effects of jigsaw cooperative learning strategies on

students' interest and performance in social studies, revealed that there is significant difference in the mean performance scores of students in Social Studies taught using Jigsaw cooperative learning and conventional Strategies and there is significant difference in the students' mean interest scores in Social Studies taught using Jigsaw cooperative learning and conventional Strategies all in favour of the students taught with the Jigsaw strategy as the students wished they were taught all other subjects with Jigsaw (Michael, Yakubu & Abdullahi, 2022). The current study is therefore set to examine its effect in students' interest in chemistry.

Furthermore the positive outcome of Jigsaw learning strategy was further validated by the findings of the study conducted on science students' performance and interest in biology in selected schools in Rivers State, Nigeria, where it was revealed that in both cases, students taught with the Jigsaw strategy achieved greater improvement in their mean scores than those taught with the conventional lecture method; and also there was no gender disparity among students taught with Jigsaw as they had relatively similar scores without any significant difference (Ojekwu & Ogunleye, 2020). Similarly, the effect of jigsaw-based cooperative learning strategy on senior secondary school students' interest and achievement in physics and revealed that use of jigsaw based cooperative learning strategy was more superior in enhancing interest and achievement of physics students than lecture method; equally showing that there is no gender disparity with the students taught with jigsaw-based cooperative learning strategy as the strategy favoured both gender equally (Nduji, Nwandikor, Keziah & Elejere, 2021).

From the foregoing, it can be established that JIS is effective in enhancing students' interests in many other subjects as revealed in the researches reviewed and it is believed that when tried on chemistry students, would yield positive result especially by enhancing their interest. If the students' interest is enhanced, they will tend to devote more time to studying it and in turn mitigate the challenges of studying it. This interest will result in bridging global challenges and local realities by building capacities in chemistry for a sustainable future. Hence the justification for this study. To this end, this study centers on mitigating global learning challenges in secondary education through the use of Jigsaw Instructional Strategy in fostering students' interest in chemistry.

Statement of the Problem

Teachers need to employ the best practices and strategies in teaching so as to sustain the interest of the learners throughout the period of study. While Jigsaw Instructional Strategy (JIS) enables students to have direct engagement with the material, which fosters deep understanding; gain practice in self-teaching; gain practice in peer teaching; develops an expertise and has something important to contribute meaningfully to a group discussion, Lecture Method (LM) on the other hand, through the teacher, presents the material to them. Even though the LM seems to be more convenient for the teacher, and make them to always make use of it in teaching, it puts the teacher at the center of

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the instructional process, unlike the JIS which helps students to demonstrate increased feelings of autonomy, competence, and interested to complete their task. Chemistry needs to be properly taught using appropriate learner-friendly and interactive strategies such as JIS to captivate and sustain the learner's interest during classroom interactions irrespective of their gender. In the quest to building capacities for sustainable future in the world of chemistry by bridging global challenges and local realities, what would be the efficacy of Jigsaw Instructional Strategy (JIS) in fostering male and female students' interest in learning Chemistry when compared with the lecture method? It is on this note that this study aims at mitigating global learning challenges in secondary education through the use of Jigsaw Instructional Strategy in fostering students' interest in chemistry.

Research Questions and Hypotheses

Research Questions

These research questions were raised to guide this study:

1. What is the mean interest score of students taught chemistry using the Jigsaw Instructional Strategy (JIS) as compared with that of their counterparts taught with Lecture Method (LM)?
2. What are the mean interest scores of male and female students taught chemistry using the Jigsaw Instructional Strategy (JIS)?

Research Hypotheses

The following hypotheses were formulated to guide this study:

Ho_1: There is no significant difference between the mean interest score of students taught chemistry using the Jigsaw Instructional Strategy (JIS) and their counterparts taught with Lecture Method (LM).

Ho_2: There is no significant difference between the mean interest scores of male and female students taught chemistry using the Jigsaw Instructional Strategy (JIS).

Methodology

Quasi-experimental design, specifically the non-equivalent control group design was employed in this study while the area of this study was Ebonyi North Education zone of Ebonyi State. A sample size of ninety-one (91) SS2 chemistry students (38 boys and 53 girls) from two intact classes drawn using multi-stage sampling process involving random sampling technique to get Abakaliki LGA, purposive sampling technique to get co-educational schools as gender is a factor, random sampling to get intact classes and then random sampling to get the schools for experimental and control groups that was used for the study. One group was used for experimental (taught with JIS = 44) and one group was used as control group (taught with LM = 47). The instrument developed and validated for data collection in this study was chemistry interest scale (CIS) which was structured in four-point rating scale with the following four response options to which numerical value were assigned thus: strongly agree (SA) = 4, Agree (A) = 3 Disagree (D) = 2 and Strongly Disagree (SD) = 1; with an internal consistency reliability coefficient of 0.86 arrived at using Cronbach's alpha

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formula. All the research questions were answered using mean and standard deviation while Analysis of Covariance (ANCOVA) was used to test the hypotheses at 0.05% level of significance.

Result

The results were presented in accordance with the research questions and hypotheses that guided the study.

Responses on mean interest scores of students taught chemistry using JIS and those with lecture method

For the research question 1, data obtained with the CIS for the treatment (JIS) and control (LM) groups were used to answer the research question. Summary of result of data analysis is presented in table 1.

Table 1: summary of mean interest scores and standard deviation of students taught chemistry using JIS and those with lecture method (LM)

Method	N	Pre-test		Post-test		Gain Score
		Mean	SD	Mean	SD	
Experimental (JIS)	44	1.92	0.11	3.55	0.11	1.63
Control (LM)	47	1.84	0.11	2.52	0.10	0.68
Total/Gain Score Difference	91	1.88	0.12	3.02	0.53	0.95

Summary of result in Table 1 shows that students taught chemistry using JIS had a higher mean interest score (3.55), with SD of 0.11, than those taught using lecture method (2.52), having SD of 0.10. These results show that the experimental group taught chemistry with JIS had a higher mean interest gain score of 1.63 (i.e., 3.55 – 1.92 = 1.63) than their counterparts in the control group taught with the lecture method which is 0.68 (i.e., 2.52 – 1.84 = 0.68), with a mean interest gain score difference of 0.95 (i.e., 1.63 – 0.68 = 0.95). The standard deviation (ranging from 0.10 – 0.11) shows moderate dispersion, indicating uniformity and consistence in response and that the responses were not highly polarized. This implies that JIS enhanced the students' interest in chemistry than the conventional lecture method. Nevertheless, the inferential statistics of ANCOVA will reveal if the difference in mean interest score is significant between the experimental group and control group.

Responses on mean interest scores of male and female students taught chemistry using JIS

For the research question 2, data obtained with the test for the treatment group only was used to answer the research question.

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Table 2: summary of mean interest scores and standard deviation of male and female students taught chemistry using JIS

Gender	N	Pre-test		Post-test		Gain Score
		Mean	SD	Mean	SD	
Male	18	1.92	0.10	3.56	0.13	1.64
Female	26	1.93	0.11	3.54	0.09	1.61
Total/Gain Score Difference	44	1.92	0.11	3.55	0.11	0.03

Result on Table 2 showed that male students taught chemistry using JIS had a higher mean interest score (3.56), having SD of 0.13, than their female counterparts (3.54), having SD of 0.09. This implies that JIS enhanced the male students' interest score in chemistry than that of their female counterparts. This result shows that the male students taught chemistry with JIS had a higher mean interest gain score of 1.64 (i.e. 3.56 – 1.92 = 1.64) than their female counterparts in the same experimental group taught chemistry with JIS which is 1.61 (i.e. 3.54 – 1.93 = 1.61), with a mean interest gain score difference of 0.03 (i.e. 1.64 – 1.61 = 0.03). This implies that JIS enhanced the male students' interest in chemistry than the female. Nevertheless, the inferential statistics of ANCOVA will reveal if the difference in mean score is significant between the two genders.

Hypotheses testing

Hypothesis 1: There is no significant difference between the mean interest score of students taught chemistry using the Jigsaw Instructional Strategy (JIS) and their counterparts taught with Lecture Method (LM).

Hypothesis 2: There is no significant difference between the mean interest scores of male and female students taught chemistry using the Jigsaw Instructional Strategy (JIS).

These two hypotheses were tested using ANCOVA. Summary of the analysis for the two null hypotheses is shown in Table 3.

Table 3: ***Analysis of co-variance for students' overall chemistry interest scores by teaching strategies (JIS & LM) and by gender***

Source	Type III Sum of Squares	Df	Mean Square	F	Sig.	Decision
Corrected Model	24.245[a]	4	6.061	575.209	.000	
Intercept	2.064	1	2.064	195.917	.000	
PRE_INTRST	.012	1	.012	1.149	.287	
GENDER	**.001**	**1**	**.001**	**.048**	**.827**	**NS**
GROUP_JIS	**20.141**	**1**	**20.141**	**1911.361**	**.000**	**S**
Error	.906	86	.011			
Total	852.712	91				
Corrected Total	25.151	90				

For hypothesis 1, the ANCOVA table shows that the significant value of 0.000 is less than 0.05. The decision rule is to reject the null hypothesis when the sig. value is less than alpha value of 0.05. Since the sig. value is less than 0.05, the null hypothesis is rejected. The study concludes that there is a significant difference between the mean interest scores of students taught chemistry using JIS and that of those taught chemistry using lecture method in favour of JIS group. For hypothesis 2, the ANCOVA table shows that the significant value of 0.827 is greater than 0.05. The decision rule is not to reject the null hypothesis when the sig. value is greater than alpha value of 0.05. Since the sig. value is greater than 0.05, the null hypothesis is not rejected. The study concludes that there is no significant difference between the mean interest scores of male and female students taught chemistry using JIS. This implies that JIS enhanced the interest of male and female students equally in chemistry.

Discussion

Students taught chemistry using Jigsaw Instructional Strategy (JIS) had higher mean interest scores than those taught using the Lecture Method (LM) and the difference in their mean interest scores were statistically significant. JIS was superior to the lecture method in enhancing the interest of the learners in chemistry. This result has shown that JIS generally enhances the interest of students studying chemistry. This finding authenticates the results of past research studies which reveals that JIS enhances students' interest in learning when properly implemented (Okechineke, 2025; Michael, et. al, 2022; Ojekwu & Ogunleye, 2020; Nduji, et. al, 2021; Winslow, 2020). This could have been a result of the positive interdependence, mutual support, group goals, individual accountability, face-to-face interaction, social skills, interpersonal development and collaborative skills developed by the students while learning with JIS revealing the effectiveness of JIS in mitigating learning challenges by facilitating the interest of the students.

Secondly, there was no statistically significant difference in the mean interest scores of male and female students in chemistry when taught with the Jigsaw Instructional Strategy (JIS). The finding of this study revealed that male students taught chemistry using JIS had equal interest score with their female counterparts. The finding is in line with earlier research studies that revealed that there was no significant difference between the female and male students' academic interest in chemistry (Michael, et. al, 2022; Ojekwu & Ogunleye, 2020; Nduji, et. al, 2021). This implies that the benefits of JIS in chemistry are equally accessible and effective for both genders. This could be attributed to the fact that JIS encourages collaboration and cooperation among learners and reduces competitiveness thereby benefiting both male and female students alike as they contribute towards their successful completion of any task as a team without undue attention to their gender.

Conclusion

In JIS lesson, all learners had equal chances of learning and constructing their knowledge. There was more interactive exchange of information than just giving formation. JIS

creates opportunities for a deeper sense of responsibility for student during the learning process. The activities allowed the students to learn concepts more than contents and provided the opportunities for students to express free opinions with others by thinking, pairing and sharing their thoughts. Therefore, the students who learned through JIS continuously encourage the active participatory process in constructing their knowledge. Furthermore, the finding of this study also revealed that male students taught chemistry using JIS had equal interest score with their female counterparts. This implies that the benefits of JIS in chemistry are equally accessible and effective for both genders. This result is important because it highlights the equality of educational opportunities provided by JIS, eliminating any gender-based disparities in enhancing students' interest in chemistry. This reveals the consistency of the positive effect of JIS, having positive impact on enhancing interest consistently for both male and female students and reinforcing the notion that JIS is an effective teaching strategy that can be successfully implemented to enhance and sustain interest regardless of students' gender. As the educational landscape continues to evolve towards building capacities for sustainable future, incorporating JIS could be a strategic approach for bridging global challenges and local realities and also a beneficial move for mitigating learning challenges in secondary schools, fostering improved interest in chemistry.

Recommendations

This study recommends that chemistry teachers should utilize JIS which is effective in enhancing students' interest in chemistry more than the lecture method. Also, curriculum developers should develop a chemistry curriculum that will take into considerations strategies like the JIS in teaching in secondary schools. More so further research should be conducted to determine the effect of JIS using various location.

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