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EFFECTS OF THINK-PAIR SHARE INSTRUCTIONAL STRATEGY ON SENIOR SECONDARY SCHOOL STUDENTS' ACADEMIC ACHIEVEMENTS AND INTERESTS IN CHEMISTRY IN AKWA-IBOM STATE

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ABSTRACT

The study determined the effect of the think-pair-share instructional strategy on senior secondary school students' academic achievements and interest in chemistry. The study was guided by four research questions and six hypotheses. The study used a quasi-experimental research approach, notably the pretest-post-text design. The research was carried out in the Essien-udim Local Government Area of Akwa-Ibom State. The Essien-udim Local Government has ten (10) public senior secondary schools, with a total enrollment of 1018 SS2 chemistry students. The research sample size was 66 SS2 (34 males and 32 females) chemistry students drawn from two schools out of the ten (10) government secondary schools in the study area using the purposive sampling technique. The instruments used to collect data were a 50-item chemistry achievement test with multiple-choice questions and a 10-item chemistry interest scale with Lkert's response scale. The experimental group was taught using the think-pair-share strategy, while the control group was taught using the lecture method. To answer the study questions, the mean and standard deviation were used, and ANCOVA was used to test the null hypotheses at the 0.05 level of significance. The findings show that students taught using the think-pair-share strategy performed better and had a higher interest in chemistry than those taught using the lecture method. There was no interaction effect of gender and method of instruction on students' academic achievement, as well as on academic interest of student in chemistry. Based on the findings, it was recommended, among other things, that chemistry teachers should employ the think-pair-share technique while teaching students in the classroom.

Keywords: Think-pair share**,** achievement, interest, gender, organic-chemistry.

Introduction

Science is the foundation of technological advancements, and developing nations like Nigeria are working to advance scientifically. This has led to concerns about the effectiveness of science teaching in schools. Fundamental fields like biology, chemistry, physics, and mathematics are essential for exploring the universe and improving living conditions. Scientific investigation and construction of shelters are crucial for Earth's survival (Eze, 2019). Chemistry is a science subject that studies the composition, properties, and uses of matter, as well as the principles governing changes. It is widely accepted in school curriculums and develops human thinking for accurate observation (Ojokuku, 2020). It encompasses

various branches, including organic, inorganic, physical, analytical, industrial, and nuclear chemistry. Eze (2019) emphasizes that chemistry education should be built on students' skills, knowledge, and experience through effective teaching and learning processes, resulting in their academic achievement in chemistry.

The West African Examination Council (WAEC) has reported subpar academic performance in Nigeria's senior school certificate examination (SSCE) in chemistry. From 2011-2015, the average credit level pass rate was 47.9%, while 52.1% scored below. In 2016, 61.68% passed at credit level, while 38.32% scored below credit (Muokwe and Okeke, 2021). However, Egwu and Okigbo (2021) performance improved above average in 2014-2018, with the highest percentage of 61.68% in 2016. Nigeria, a country in need of scientific knowledge in chemistry, has seen a positive shift in student achievement, with an overall raw mean score of 40 and a standard deviation of 10.00. The WAEC Chief Examiner's report in 2020 highlighted the need for more effective teaching and learning of chemistry to ensure consistent improvement and sustenance of students' achievement in external examinations. Factors affecting students' academic achievement include the learning environment, learning strategy, and students' or teachers' factors. Students may lack motivation and interest, while teachers may have poor attitudes and to achieve higher grades in chemistry, an effective teaching approach is needed (Slavin, 2020).

Effective teaching in chemistry involves fostering positive student-teacher and student-student interaction, resulting in better retention of concepts. Teachers should adopt diverse methods to engage students, arouse their interests, and engage them actively. Brooks and Brooks (2021) noted that the lecture method, which is teacher-centered, has its advantages, such as covering a large content area without much student achievement, however, this can lead to poor achievement and interest, especially in chemistry. To address this issue, Agba (2021) noted that a more reliable and effective methods of instruction to produce learner skills for a technologically and scientifically dominated society. Teachers should be flexible, dynamic, thoughtful, and adaptable to change. Innovative teaching approaches, such as think-pair-share learning, offer an attempt at this goal.

Think-pair-share is a cooperative learning strategy that promotes individual student participation in discussing chemistry topics with peers. According to Dange (2020), students remember 90% of what they hear, see, and practice cooperatively, enhancing their learning experience. Enyi, (2022) noted that paired-taught students show higher academic achievement, persistence through graduation, and better reasoning and critical thinking skills and that they also have a deeper understanding of learned material, more time on task, and lower anxiety and stress levels. Pairing learning leads to greater intrinsic motivation, positive peer relationships, and higher self-esteem. Research on grouping and pairing in think-paired learning focuses on achievement levels, compatibility, assertiveness, speed, and gender (Katcha and Babagana, 2018). Proper implementation of think-pair-share learning could address educational system

problems and increase students' interest in learning chemistry, potentially boosting academic achievement.

This study focuses on chemistry students' academic achievement using a Chemistry Achievement Test (CAT). Academic achievement is measured through classroom assignments, tests, and examinations like WAEC and NECO (Enyi, 2022). Improved teaching methods can lead to meaningful learning and a strong interest in the material. Interest is a selective awareness or affection that generates meaning from experiences. It plays a significant role in teaching and learning, as students' interests can lead to differences in their academic accomplishment (McGrew, 2018). Creative teaching approaches can influence students' interests, and the researcher is optimistic that think-pair sharing will have the same effect on students' interest in chemistry, regardless of gender.

Gender prejudice, a socio-cultural construct, is pervasive in Nigeria, particularly in the science classroom (Kolawole 2019). Female students often believe chemistry is a male-dominated subject, leading to low performance (Okeke, 2021). However, this is a false perception and requires a more personalized approach to science education. Research shows inconsistent evidence regarding students' academic achievement and interest in chemistry due to gender. Some studies suggest that males excel in competitive contexts, while females excel in partnered classroom settings (Kolawole, 2019). He also added that Social competence, which refers to social behaviors and capacities, is also essential for effective engagement with others. Identifying a gender-paired learning technique that significantly boosts achievement for both genders is crucial for effective chemistry instruction. Therefore, gender was included as a moderating variable in this study, given the importance of chemistry as a science subject and its contribution to society.

Nigeria's Federal Governments have invested heavily in science and technology education to improve student performance. However, chemistry secondary school performance in Essien-Udim Local Government Area has been unfavorable due to the use of traditional teaching methods like lecture and demonstration. This routine learning hinders students' ability to comprehend, recall, and apply their knowledge to real-world scenarios (Tumba, Ofodu, and Lawal, 2014). Effective instructional strategies are needed to help students understand the complex subject matter.

The academic achievement and interest in chemistry among students have consistently been low, as reported by WAEC examiners in 2014. This is due to poor understanding of chemistry topics and poor performance on chemistry questions. Mbah (2021) suggests that achievement is influenced by instructional strategies, the learning environment, and motivation. The failure rate could be attributed to poor teaching approaches, negative attitudes among students, and a lack of appropriate educational resources. This thesis investigates the effect of the think-pair-share instructional strategy on senior secondary school students' academic achievements and chemistry interests in Essien-Udim Local Government Area, Akwa-Ibom State.

Research Questions

The following research questions guided the study:

1. What are the differences in the mean achievement scores of students taught with the think-pair-share teaching strategy and those taught with the lecture method strategy in chemistry among senior secondary school?
2. What are the gender differences in the mean a0chievement score of students taught using the think-pair-share teaching strategy and those taught with the lecture method strategy in chemistry due to gender?
3. What are the differences in the mean interest scores of students taught with the think-pair-share teaching strategy and those taught with the lecture method of teaching in chemistry among senior secondary school?
4. What are the gender differences in the mean interest score of students taught using the think-pair-share teaching strategy compared to those taught with the lecture method strategy in chemistry due to gender?

Research Hypotheses

The study will be guided by the following null hypotheses and tested at a 0.05 level of significance:

1. There is no significant difference in the mean achievement scores of students taught with the think-pair-share teaching strategy and those taught with the lecture method of teaching chemistry.
2. There is no significant difference in the mean achievement score of students taught using the think-pair-share teaching strategy compared to those taught with the lecture method of teaching in chemistry due to gender.
3. There is no significant difference in the mean interest scores of students taught with the think-pair-share teaching strategy and those taught with the lecture method of teaching chemistry.
4. There is no significant difference in the mean interest score of students taught using the think-pair-share teaching strategy compared to those taught with the lecture method of teaching in chemistry due to gender.
5. There is no significant interaction effect between the think-pair-share teaching strategy, lecture method, and gender on students' achievement in chemistry.
6. There is no significant interaction effect between the think-pair-share teaching strategy, lecture method, and gender on students' interest in chemistry.

Research Method

The study used a quasi-experimental pre-test and post-test design, involving experimental and control groups. Okeke (2021) argues that random assignment of research subjects is not feasible in this design. In intact classes were used. The study design is illustrated symbolically, as follows:

Experimental	P1	X1	P2
Control	P1	X0	P2

Figure 1: Design of the study

Where:

P1 = pre-test

X1 = treatment for the experimental group (think-pair-share).

X0 = no treatment for the control group (lecture method)

P2 = post test

This study focuses on the Essien-udim local government area in Akwa-Ibom state, Nigeria. The area is Annang-speaking and comprises various clans. Essien Udim LGA is rich in raw petroleum and flammable gas, and is surrounded by Abia State, Ikot-Ekpene, Ikono, and Abak Local Government Areas. Agriculture is the primary occupation, with major food crops including cassava, maize, yam, cocoyam, water yam, melons, and vegetables. The Obo Annang market is also a significant business sector in the area.

This study focuses on 1018 SS2 chemistry students from public senior secondary schools in Essien-Udim Local Government Area, Akwa-Ibom State. The sample size is 66 SS2 students, drawn from two out of ten schools. Purposive sampling technique is used to avoid interaction between the two research groups. A toss of the coin and lucky dip sampling are used to assign schools to the experimental and control groups. The experimental class consists of 35 students, while the control group consists of 31 students.

The study used the Chemistry Achievement Test (CAT) and the Chemistry Interest Scale (CIS) for data collection. The CAT was a 50-item multiple-choice instrument and the CIS was a 10-item of Lkert's response scale instrument. Both were used for pre-test and post-test treatments. The instruments for data collection (CAT), (CIS), and lesson plans were sent to three experts at Nnamdi Azikiwe University, Awka, and a chemistry teacher with over 15 years of teaching experience for face and content validation. The instruments were tested using Kuder-Richardson 20 for CAT and Cronbach Alpha for CIS. The CAT had a reliability index of O.879, while CIS had a reliability index of 0.623.

The experimental group was taught using the TPS strategy, while the control group was taught using a lecture method. A micro-teaching session was organized to the teachers to ensure they had mastered the expected instructional technique. The experiment was conducted in three stages: familiarization with both groups, teaching for four weeks using the think-pair-share instructional strategy, and post-testing using CAT and CIS. The study used mean, standard deviation, and analysis of covariance (ANCOVA) to analyze data. ANCOVA was used to test null hypotheses at 0.05 alpha levels, eliminating non-equivalence errors and initial group differences. SPSS statistical software was used for data analysis. Null hypotheses were rejected when the p value is less than 0.05, but not if it is greater than 0.05.

Presentation of Results

The following results were obtained from the data analysis

Research question 1: What are the differences in the mean achievement scores of students taught with the think-pair-share teaching strategy and those taught with the

lecture method strategy in chemistry among senior secondary school?

Table 1: Mean achievement scores and standard deviation (SD) Scores of students taught with the think-pair-share teaching strategy and those taught with the lecture method strategy in chemistry among senior secondary school

Teaching strategy	pre-test			post-test			Mean Difference
	N	mean	SD	N	mean	SD	
Think-pair Share	35	14.24	6.45	35	24.01	5.79	9.77
Lecture	31	13.16	5.40	31	19.59	5.62	6.43

Table 1 above found that students taught with think-pair-share techniques had a post-test mean achievement score of 24.01, compared to 19.59 for those taught with the lecture method, with a mean difference of 9.77 and 6.43, respectively.

Research question two: What is the gender differences in the mean achievement score of students taught using the think-pair-share teaching strategy and those taught with the lecture method strategy in chemistry due to gender?

Table 2: Mean achievement scores and standard deviation (SD) Scores of students taught using the think-pair-share teaching strategy and those taught with the lecture method strategy in chemistry due to gender

Teaching strategy	Gender	Pre-test			Post-test			Mean Difference
		N	Mean	SD	N	Mean	SD	
Think-pair Share	Male	16	22.88	8.58	16	33.68	9.65	10.81
	Female	19	21.84	4.65	19	34.37	11.65	12.53
Lecture	Male	18	20.72	4.95	18	29.55	8.19	8.83
	Female	13	21.52	5.79	13	30.98	7.41	9.46

The table 2 above compares the achievement of male and female students in chemistry using lecture method and think-pair-share techniques. Both groups found that the think-pair-share technique had a greater mean gain. However, female students performed better in both techniques, with a main achievement difference of 12.53 for females and a mean difference of 9.46 for females.

Research Question 3: What are the differences in the mean interest scores of students taught with the think-pair-share teaching strategy and those taught with the lecture method of teaching in chemistry among senior secondary school?

Table 3: Mean interest scores and standard deviation (SD) Scores of students taught with the think-pair-share teaching strategy and those taught with the lecture method strategy in chemistry among senior secondary school

	Pre-test			Post-test			Mean difference
Teaching strategy	**N**	**Mean**	**SD**	**N**	**Mean**	**SD**	
Think-pair Share	35	39.09	9.45	35	61.57	14.79	22.48
Lecture	31	39.27	8.4	31	55.46	11.97	16.19

The result found that students taught using the think-pair-share method had a higher pretest and post-test interest in chemistry compared to those taught using the lecture method. The pretest mean score was 39.09, and the post-test mean score was 61.57, indicating that think-pair-share is more effective in boosting students' interest in chemistry.

Research Question 4: What is the gender differences in the mean interest score of students taught using the think-pair-share teaching strategy compared to those taught with the lecture method strategy in chemistry due to gender?

Table 4: Mean interest scores and standard deviation (SD) Scores of students taught using the think-pair-share teaching strategy and those taught with the lecture method strategy in chemistry due to gender

	Gender	pre-test			post-test			Mean difference
Teaching strategy		**N**	**mean**	**SD**	**N**	**mean**	**SD**	
Think-pair Share	Male	16	32.04	6.84	16	58.68	8.41	26.64
	Female	19	27.91	6.12	19	57.78	9.33	29.87
Lecture	Male	18	29.22	5.68	18	34.11	8.19	4.89
	Female	13	25.01	4.79	13	28.98	7.41	3.97

The table compares the interest of male and female students in chemistry, using lecture method and think-pair-share techniques. Both groups showed higher post-test mean interest in the think-pair-share technique, with female students showing better results in the think-pair techniques. However, male students showed better interest in the lecture method, with a slight difference in mean interest.

Hypothesis 1: There is no significant difference in the mean achievement scores of students taught with the think-pair-share teaching strategy and those taught with the lecture method of teaching chemistry.

Table 5: ANCOVA on the Student Mean Achievement Scores in Chemistry by Teaching Techniques

Pretest	1699.66	1	1699.66	58.81	.0	Significant
Teaching strategy	176.22	1	176.22	6.1	.015	
Error	4422.19	153	28.9			
Total	296544	156				

The result from table 5 found a significant difference in student achievement scores for organic chemistry taught using the think-pair-share technique compared to the lecture method. The experimental group achieved significantly higher scores, rejecting the null hypothesis, indicating that the think-pair-share learning strategy was effective.

Hypothesis 2: There is no significant difference in the mean achievement score of students taught using the think-pair-share teaching strategy compared to those taught with the lecture method of teaching chemistry due to gender.

Table 6: ANCOVA on the Student Mean Achievement Scores in Chemistry by Teaching Techniques Due to Gender

Sources of Variation	**SS**	**Df**	**MS**	***F***	***p-value***	**Decision**
Pretest	1616.047	1	1616.047	17.8	.0	
Teaching strategy	14364.21	1	14364.21	4.35	.04	
Gender	81.797	1	181.797	6.85	.036	Significant
Error	3105.447	184	36.97			
Total	19167.5	87				

The result from table 6 shows a significant difference in the mean achievement score of students taught chemistry using the think-pair-share technique compared to those taught using the lecture method due to gender, with a p-value of less than 0.05, rejecting the null hypothesis.

Hypothesis 3: There is no significant difference in the mean interest scores of students taught with the think-pair-share teaching strategy and those taught with the lecture method of teaching chemistry.

Table 7: ANCOVA on the students mean interest scores in chemistry by teaching technique

Sources of Variation	SS	Df	MS	*F*	*p-value*	Decision
Preest	527.18	1	527.18	17.8	.0	
Teaching strategy	128.93	1	128.93	4.35	.04	Significant
Error	2221.4	75	29.62			
Total	2877.5	77				

Table 7 reveals a significant difference in mean interest scores between students taught with the think-pair-share teaching strategy and those taught with the lecture method of teaching chemistry, rejecting the null hypothesis.

Hypothesis 4: There is no significant difference in the mean interest score of students taught using the think-pair-share teaching strategy compared to those taught with the lecture method of teaching chemistry due to gender.

Table 8: ANCOVA on the **covariance of students mean interest scores in chemistry by teaching techniques due to gender**

Sources of Variation	SS	Df	MS	*F*	*p-value*	Decision
Pretest	766.41	1	766.41	15.23	.0	
Teaching strategy	396.44	1	396.44	13.41	.0	
Gender	227.2	1	227.2	5.5	0.037	Significant
Error	1952.04	184	27.97			
Total	3342.09	187				

The analysis found a significant difference in the mean interest score of students taught chemistry using the think-pair-share technique compared to those taught using the lecture method due to gender, with a p-value less than 0.05, rejecting the null hypothesis.

Hypothesis 5: There is no significant interaction effect between the think-pair-share teaching strategy, lecture method, and gender on students' achievement in chemistry.

Table 9: **ANCOVA on the** mean achievement scores in chemistry by teaching techniques and gender

Sources of Variation	SS	Df	MS	*F*	*p-value*	Decision
Pretest	919.52	1	919.52	33.24	.0	
Teaching strategy	240.93	1	240.93	8.71	.004	
Gender	242.74	1	242.74	8.777	.004	
Teaching strategy*****Gender	.95	1	.95	.03	.853	Not Significant
Error	4177.55	151	27.67			
Total	5581.69	155				

Table 9 analysis found no significant interaction between gender and teaching strategy on students' chemistry achievement, indicating that the null hypothesis was retained, indicating no significant effect of teaching strategy on chemistry achievement.

Hypothesis 6: There is no significant interaction effect between the think-pair-share teaching strategy, lecture method, and gender on students' interest in chemistry.

Table 10: ANCOVA on the mean achievement scores in chemistry by teaching techniques and gender

Sources of Variation	**SS**	**Df**	**MS**	***F***	***p-value***	**Decision**
Pretest	1312.38	1	1226.38	8.32	.0	
Teaching strategy	1219.43	1	1219.43	6.11	.0	
Gender	91.79	1	91.79	1.85	0.18	
Teaching strategy* Gender	2.03	1	2.03	0.06	1.82	Not Significant
Error	4417.81	151	27.65			
Total	7043.44	155				

Table 10 above shows no significant interaction between gender and teaching strategy on students' interest in chemistry, indicating that the null hypothesis was retained, indicating no significant effect of teaching strategy on students' interest.

Discussion of results

Findings from the study reveals that students taught chemistry using a think-pair-share learning strategy achieved higher mean gains than those taught using a lecture method. This aligns with previous research by Enyi, (2022) which found that think-pair-share strategies significantly improved students' achievement in chemistry. The think-pair-share strategy differentiates instruction by providing students with time and structure for thinking on a given topic, question, or problem. It helps students construct individual ideas and share them with others, allowing them to take ownership of their learning and negotiate meanings. This approach makes the acquired knowledge easily applicable in real life, enhancing the overall learning experience.

The findings of the study revealed a slight difference in mean achievement scores between male and female students taught chemistry using think-pair-share instructional strategy and lecture method. This aligns with Agba (2021) findings on gender and academic achievement in chemistry. However, Kolawole (2019) findings suggest that some teaching methods favor male students more, such as individual learning, while others, like think-pair-share, suggest male dominance in competitive activities. This suggests that the influence of gender on students' achievement in chemistry is still inconclusive, as females may prefer working in groups or under male counterparts. The outcome of the study revealed that the think-pair-share learning

strategy significantly increases students' interest in chemistry compared to the lecture method. This aligns with Agba (2021), which found positive interest in students taught chemistry using the think-pair-share strategy. This strategy helps students think carefully and discuss their answers with a partner before presenting to the class, which is beneficial for introverted students and boosts their interest in the subject matter.

The result of the study indicated that the think-pair-share learning strategy significantly increased female students' interest in chemistry compared to male students. This contradicts Dange (2020) findings that males dominate competitive activities, while females may prefer working in groups or under male counterparts. The high interest may be due to the interactive learning environment, which encourages active participation and sustained interest in chemistry.

The outcome of the analysis revealed no significant impact of gender and chemistry teaching techniques on students' academic achievement in chemistry. The combined effect of gender and the think-pair-share learning strategy and lecture method did not affect post-test mean scores. This aligns with Kolawole, (2019) study, which found no effect of gender on cooperative learning. The think-pair-share learning strategy is effective in enhancing both male and female students' achievement in chemistry, suggesting that when teachers use the right strategies, female students can learn as well as male counterparts.

The think-pair-share learning strategy, which encourages active participation and interactive learning among students, has been found to be gender-friendly and potentially enhance interest in learning chemistry, as both male and female students show equal interest in this method, observing a non-significant interaction effect.

Conclusion

The findings from the study showed that students taught chemistry using the think-pair-share learning strategy had higher mean achievement scores and interest compared to those taught using the lecture method. The study also found no significant interaction effect between the strategy, lecture method, or gender on students' achievement scores. The results suggest that think-pair-share can reduce the abstract nature of chemistry and help students develop skills like listening, questioning, and communication. Thus, the academic achievement and interest of students are highly dependent on the instructional strategy.

Recommendations

The study recommended as follows:-

1. Chemistry teachers should use the think-pair-share instructional strategy in the classroom, as it has been proven to improve academic achievement and student interest in chemistry.
2. Curriculum planners should emphasize its use to popularize its use among teachers.
3. In-service training, workshops, seminars, and symposia should be organized by the Ministry of Education and professional associations like the Curriculum Organization of Nigeria (CON) and the Science Teachers

Organization of Nigeria (STAN) for practicing teachers.

REFERENCE

Agba, M. U. (2021). *Influence of cognitive style, gender and school location on Students' problem-solving in Ecology*. Unpublished Master's Thesis University of Nigeria, Nsukka.

Brooks, M. G. and Brooks, J. G. (2021) The Constructivist Classrooms: The Courage to be a Constructivist. *Educational Leadership, 57 (3): 82-85.*

Dange, J. K. (2020). Learning and experiences: A step model. *The Online Journal of New Horizons in Education, 5(3): 101 – 108.*

Egwu E. E, and Okigbo M, K (2021). The responsive classroom discussion: The inclusion of all students mainstreaming digest. *University of Maryland, College Park, MD*. Retrieved from http://www.classroom20.com/profiles /blogs/thinkpairshare-lyman-2021-an

Enyi, G. S. (2022). Effect of standardised and improvised teaching aids on senior secondary school students' academic achievement in physics, Adamawa State, Nigeria. *International Journal of Education and Research, 9*(5), 1-10.

Eze, P. I. (2019). *Effect of Peer assessment on Students achievement and interest in French*. Unpublished M.Ed Thesis University of Nigeria, Nsukka.

Federal Ministry of Education (FME), National Policy on Education (2020), (5th ed) *NERDC*.

Katcha, M.A. and Babagana, M. (2018).Effect of iPre-test, feedback and overview strategies on students' academic achievement in ecology in Akwa-Ibom State, Nigeria. Nigeria Educational Forum. *Journal of the Institute of Education, Ahmadu Bello University, Zaria. 20 (1): 55-62.*

Kolawole, E. B. (2019). Mathematics for Everyday Living. "Implication for Secondary Schools". Mathematical Association of Nigeria (MAN) *Proceeding of September 2004 National Conferences, Sokoto.*

Mbah, F. I. (2021). Learning and Teaching Methodology. *Journal of Education and Social Research, 2 (4): 2240 – 0524.*

McGrew, K. (2018). Academic interests and attitudes: Definition and conceptual background. *Retrieved from http://www.iapsych.com/acmcewok/Academicinterestsandattitudes.html*

Muokwe, S. and Okeke, H. (2021). Improving of problem solving ability of senior high college students through application of think-pair-share based e-learning in mathematics lesson.

Ojokuku, G. O. (2020). *Understanding Chemistry for schools and colleges* (Revised Edition), Zaria: Press on chemistry resources.

Okeke, O. J. (2021). *Effect of Mind Mapping Strategy on Students Achievement, Interest and Retention in Senior Secondary Schools Chemistry*. Unpublished Thesis, submitted to the Department of Science and Education, Faculty of Education, University of Nigeria, Nsukka.



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Slavin, R. E. (2020). Cooperative learning: What makes group work work? In H. Dumont, D. Ista nce and F. Benavides (Eds.), *The Nature of Learning: Using Research to Inspire Practice* (pp. 161-178). Paris: OECD.

Tumba, L., Ofodu, G. O. and Lawal, R. A. (2014). Cooperative instructional strategies and performance level of students in reading comprehension. *International Journal of Educational Science*, 3 (2), 103-107.

West African Examinations Council (WAEC) (2014). *Chief Examiners' Report. Lagos*: WAEC.