Relative Effectiveness of Tiered Scaffolding Instructional Strategies on Student Academic Achievement in Chemistry in Uruan Local Government Area-Akwa Ibom State

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Abstract
The study aimed at investigating the relative effectiveness of tiered and scaffolding instructional strategies on students' academic achievements in Chemistry in Uruan Local Government Area. three hypotheses were formulated for test at 0.05 level of significance. The design was quasi-experimental with pre-test and post-test. The population consisted of 4,459 Senior Secondary 1 (SS1) chemistry students. The sample was 200 SS1chemistry students in 2 coeducational public secondary schools selected by purposive sampling technique. Instruments used for the study, were the Learning Style Questionnaire (LSQ) and Achievement Test on Chemical Combination (ATOCC). Reliability indexes of LSQ and ATOCC were 0.82 and 0.78 respectively. Mean and Standard deviation were used to answer the research questions, while analysis of covariance was used to test the hypotheses. The findings of the study showed that tiered and scaffolding instructional strategies facilitated students' academic achievement in chemistry. Gender had no significant effect on students' academic achievement in both teaching strategies, and there was no significant difference in the teaching strategies, learning styles and gender on students' academic achievement in Chemistry. Based on the findings of the study, it was concluded that tiered and scaffolding instructional strategies were effective in facilitating students' academic achievement in Chemistry and recommended that chemistry teachers use it in teaching process.

Keywords: Academic, Achievement, Effectiveness, Tiered, Scaffolding

Introduction

Chemistry is a branch of pure science that is introduced into the curriculum content of secondary schools because of its educational value, and relevance to the need of the individual learner and society as a whole. Chemistry helps us understand how items around us are made. It describes various chemicals present in the environment, their reactions and effects on the environments. (Boris, 2020). Chemical combination is a fundamental concept in chemistry education (Levy *et al*, 2020). Chemical combination is the physical process responsible for the interactions between atoms and molecules which confer stability to bounded particles (Akinbola, 2015).

It is therefore necessary to engage student's creative thinking, by adopting learners-centered approach like tiered instructional and scaffolding instructional strategies.

Tiered Instructional strategy refers to using the same curriculum materials for all learners but adjusting their learning contents, the learning activity process, and/or the type of product developed by the student to include student readiness, interest or learning style (Pierce & Adams, 2015; Richard & Omdal, 2017).

On the other hand, the metaphor of scaffolding is derived from mother-child observations. It is also derived from construction where it represents a temporary structure that is used to erect a building. Scaffolding is defined as a support from experts or more knowledgeable peers, which allow students to engage in and gain skills through a given task that would otherwise be beyond the students existing capabilities. Scaffolding appears in different forms, including tools, strategies, guidelines, questions, prompts and feedback (Simons and Klein, 2017).

The effectiveness of these teaching strategies can be observed in students' academic achievement. The term Academic Achievement can be defined as what an individual has learnt from some educational experiences. According to Nwokocha & Amadike (2015), academic achievement has been described as the scholastic standing of a student at a given moment. Gender is believed to affect the way student learn in schools (Igbo *et al*, 2015). Teachers must pay attention to gender specific learning characteristics of boys and girls.

Learning styles refers to the unique ways by which learner's process and retain new information and skills. Learning styles are characterized way a learner thinks or approaches a problem (Sara, 2017). According to Akinbobola (2015). An auditory learning style depends on hearing and speaking as the main ways of learning. They also use their hearing and repeating skills to sort through information. Visual learning style utilizes graphs, charts, maps and diagrams. It also involves seeing learners think in pictures and learn best in visual images. Kinesthetic learning style require students to manipulate or touch materials to learn. A students' learning style is not focused on the material of learning but rather the process of learning.

Richards and Omdal (2017) researched on effects of tiered instruction on academic achievement in a secondary school course. The sample of the study was 222, SS2 students and the design of the study was quasi experimental in this study, students were either in a control secondary science classroom in which instruction was designed to match to high, middle, or low levels of background knowledge on astronomy and Newtonian physics. The seven control classrooms received middle – level non tiered instruction, indicating that tiered instruction and low background learners who did not received tiered instruction, indicating that tiered instruction may be especially beneficial for lower level learners. Through the implementation of this study, the researcher found that:

i. Professional support for teachers is critical to the success of tiered

ii. A strong background in the subject matter and a thorough understanding of the range of potential learning activities appropriate to the targeted levels of learners is essential; and
iii. The implementation of a change of instructional and classroom organization, pedagogy, and expectations needs to be systematically introduced over time.

A good number of studies have been conducted on gender issue in science achievement. Kobelin (2019) carried out a study on male and female Academic Achievement in chemical equilibrium taught using tiered instructional strategy in secondary schools of Enugu State. A sample of 400 students was drawn using a sample survey, the population being 550 physics students in Enugu East LGA. A twenty-seven-item instrument in the form of objectives was used for data collection, after being face validated by three experts each in measurement and evaluation, and Science Education in Enugu State University of Science and Technology (ESUT). The test blue print was also formulated. The reliability estimates of 0.80 was determined using test and re-test method. At 5% level of significance, the hypotheses were analyzed using Z – test. The research questions were tested using mean and standard deviations. The results revealed that there is no significant difference in Academic Achievement in boys and girls.

Zubair *et al* (2017), conducted a study Does Learning Styles Impact on Students' Academic Achievement in Private College of Malaysia? Framework developed for this study includes visual learning, verbal learning and active learning which the independent variables was while Academic Achievement was the dependent variable. This is an explanatory quantitative research engaging a sample of 200MBA students was selected from a private college in Malaysia. Descriptive and Regression Analysis were engaged to identity the impact of the independent variable on the dependent variable. The findings of the study found visual and sequential to have a significant impact on the dependent variable.

Statement of the Problem

Students' Academic Achievement is usually measured by test and examinations. However, there has been observable poor academic achievement of students in chemistry and in the concept of chemical combination. Therefore, this study seeks to answer the question; how effective would Tiered and Scaffolding Instructional Strategies enhance students' academic achievement in Chemistry in Uruan Local Government Area, Akwa Ibom State.

Students' Academic Achievement is considered as the only criteria for evaluating the quality of instruction given by teachers. This achievement is usually measured by test and examinations. There is also a general belief that the better the instructional delivery by teachers, the higher the academic achievement. This is because the strategies adopted by teachers for instructional delivery seems to influence students' assimilation of concepts and their achievement in the subject.

However, there has been observable poor academic achievement of students in chemistry and in the concept of chemical combination. This poor academic achievement may be blamed on the inability of teachers to meet the needs of individual students in the classroom. Some of the teaching strategy do not suit with the students' differences existing within the classroom, while some Chemistry teachers will finish a lesson without giving group assignment for students to think and share learning experiences together. This seems to have resulted to students' boredom in the classroom, lack of interest in chemistry class, misconception of chemical combination concept and poor academic achievement. This has become a problem to students, chemistry teachers, parents, and the entire society to the extent that it has prompted many researchers to attempt providing solutions to the problem yet the problem still persist. Therefore, this study seeks to answer the question; how effective would Tiered and Scaffolding Instructional Strategies enhance students' academic achievement in Chemistry in Uruan Local Government Area, Akwa Ibom State.

Purpose of the Study

The purpose of the study was to determine the Relative Effectiveness of Tiered Instructional Strategy and Scaffolding Instructional Strategy on Students' Academic Achievement in Chemistry in Uruan Local Government Area, Akwa Ibom State.

Specifically, this study sought to determine:

i. The difference in the academic achievement mean score of chemistry students' in the concept of chemical combination when taught with tiered instructional and scaffolding instructional strategies.
ii. The difference between the mean score of male and female student's academic achievement when taught with tiered instructional and scaffolding instructional strategies.
iii. The difference in academic achievement means score of auditory, visual and kinesthetic learners when taught with tiered and scaffolding instruction.

Research Questions

The following research questions were posed to guide the study

i. What is the difference in the academic achievement mean score of chemistry students' in the concept of chemical combination when taught with tiered instructional and scaffolding instructional strategies?
ii. What is the difference between the mean score of male and female student academic achievement when taught with tiered instructional and scaffolding instructional strategies?
iii. What is the difference in academic achievement mean score of auditory, visual and kinesthetic learners when taught with tiered instructional, and scaffolding instructional strategies?

Research Hypotheses

The following hypotheses were tested at 0.05 level of significance:

i. There is no significant difference in the academic achievement mean score of chemistry students' in the concept of chemical combination when taught with tiered instructional and scaffolding instructional strategies.
ii. There is no significant difference between the mean score of male and female student academic achievement when taught with tiered instructional and scaffolding instructional strategies.
iii. There is no significant difference in academic achievement mean score of auditory, visual and kinesthetic learners when taught with tiered instructional, and scaffolding instructional strategies.

Methodology

The design for the study was quasi-experimental with pretest- posttest design and 2 x 3 factorial matrixes was used. The design is as symbolized below.

E_1	O_1	X_1	O_2
E_2	O_3	X_2	O_4

Where:

O_1, O_3, are Pre-test measurement for experimental group 1 and experimental group 2, respectively.

O_2, O_4 are Post-test measurement for experimental group 1 and experimental group 2, respectively.

X_1 are treatment for experimental group 1 using tiered instructional strategy.

X_2 are treatment for experimental group 2 using scaffolding instructional strategy.

This study was carried out in Uruan Local Government Area. It has nine (9) public Secondary schools with 348 teachers and numerous private secondary schools. Uruan has one outstanding post-secondary institution which is School of Nursing, Ituk Mbang. The population of the study comprised all the Senior Secondary One (SS1) students offering chemistry in coeducational public secondary schools in the study area. They are nine (9) coeducational public secondary schools in the study area, with the population of four thousand four hundred and fifty-nine (4459) SS1 chemistry students, the ratio of male to female population in the area were 151: 145, respectively.

Using Richard Kuderson 21 formula to determine the sample size, the study comprised two hundred (200) senior secondary one chemistry students in all coeducational public secondary schools selected by purposive sampling technique. The criteria for selection of schools for the study were.

i. The school must have well- equipped laboratory.
ii. The school must have a professional graduate teacher of chemistry with more than 5 years of teaching experience.

iii. The school must be presenting students for external examination for the past 10 years.

Four co-educational secondary schools met the criteria from which two were selected by random sampling technique and 2 intact class were randomly selected in each of the two schools assigned randomly to the experimental groups.

The instrument used for data collection is Learning Styles Questionnaire (LSQ) and Achievement Test on Chemical Combination (ATOCC) LSQ being an adopted instrument was deemed to have fulfilled both face and content validity by two experts from Science Education and one expert from the Department of Psychological foundations all from the Faculty of Education, University of Uyo The experts determined the clarity of the lessons as well as the suitability of the test for the level of the students and the extent of coverage based on the study objectives. For content validation of ATOCC, the experts examined the appropriateness of the content using test blue print. The reliability of LSQ was 0.82 To establish the reliability of the ATOCC, the instrument was administered on 40 SS1 Chemistry students which were not part of the population. The instrument was administered twice at an interval of 4 weeks. Pearson Products Moment Correlation formula was used to determine the reliability index at 0.78, which proved that the instrument was reliable.

Experimental Procedure

After selecting the schools, the researcher visited the school principals to request for permission to use their schools for the study. Thereafter, the subject teacher of the selected classes was requested to serves as research assistants during the study.

To ensure that the subject teachers qualified as research assistants, one week was used to brief them on the modalities of the research namely: procedure in teaching electrovalent combination in sodium and chlorine atoms and covalent combination in chlorine atoms, using validated lesson notes on ATOCC developed by the researcher as well as the administration of ATOCC. The use of the research assistants was to control the treatment effect. At the end of the briefing session the researcher assessed the research assistant on their readiness and competence for the study as each of them taught electrovalent combination in sodium and chlorine atoms and covalent combination in chlorine atoms using tiered and scaffolding instructional strategies. Assessment of their effort revealed a high level of compliance and readiness to facilitate the teaching in their classes.

After weeks, the LSQ was administered alongside ATOCC. The LSQ data was used to categorize the students into auditory, visual and kinesthetic learners while the experimental group 1 was taught using tiered instructional strategy. This involved presenting challenging task or activities and provide intervention and extension to meet individual needs and the teacher facilitate the instruction at the end of the class. Experimental group II was taught using scaffolding instructional strategy, in this instructional strategy, teacher model instructions with guidelines and teacher provide contingent support in response to student's success or failure. The teaching of both experimental groups was carried out during the normal school chemistry

periods by the research assistants using the lesson notes prepared for the study. During the period of the experiment, the researcher visited the sampled schools to ensure that the research assistants carried out the treatment and administration of ATOCC as required. After the treatment, the post test was administered to both the experimental groups. The scripts for both the pre-test and post-test were marked by the researcher and student's scores were added accordingly.

Control of the Extraneous Variables

i. The researcher trained the teachers by himself for one week. This was done to ensure that the teachers understood the application of each teaching strategies and to use the same appropriately. At the end of the training, a micro-teaching session was held for the participated teacher to ensure mastery of the training.
ii. The researcher personally prepared the notes of lessons based on the topics. He also set the ATOCC.

The ATOCC was administered as pre-test to the students before the treatment. At the end of the treatment, the ATOCC was reshuffled and administered as post-test. Mean and standard deviation were used in answering the research questions while analysis of covariance and t-test was used to test the hypotheses at 0.05 level of significance. The ANCOVA was employed to partial out the initial differences between the experimental groups. Decision was taken at 0.05 significance with the adoption of the rule that if the p-value value is less than 0.05, the null hypothesis is rejected and when the p-value is greater than 0.05 the null hypothesis is accepted.

Results

The summary of results used in answering the research questions and testing the null hypotheses formulated to guide the study, are presented and interpreted.

Research Question I: What is the difference in the academic achievement mean scores of Chemistry students in the concept of chemical combination in chemistry when taught using tiered and scaffolding instructional strategies?

Table 1: Mean ($\bar{N}$) and standard deviation of students' pre-test and post-test scores classified by treatment groups

Treatment Groups	Pre-test			Post-test		Mean Gain Score
	N	$\bar{X}$	SD	$\bar{X}$	SD	
Tiered Instructional Strategy	102	4.16	2.34	22.37	8.16	18.23
Scaffolding Instructional Strategy	98	5.31	3.34	37.34	6.97	32.03

Table 1, shows the pre-test and post-test mean scores and standard deviation of scores of students taught using tiered and scaffolding instructional strategies. The post-test and pre-test mean scores of 37.34 and 5.31 respectfully for those in scaffolding instructional strategy

yielded the best mean gain score of 32.03 while that of tiered instructional strategy post-test – pre-test mean score of 22.37 and 4.16 yield mean gain score of 18.23. The post-test standard deviation scores of 6.97 and 8.16 for students in scaffolding instructional strategy and tiered instructional strategy, respectively. Though students taught using tiered instructional strategy has the widest scattering of raw score about the group mean, those taught using scaffolding instructional strategy has the best achievement. Those strategies had post-test mean scores that are higher than pre-test mean scores of the two strategies were statistically significant was assessed by the results by testing hypothesis 1.

Research Question 2: What is the difference between the mean score of male and female chemistry student's in the concepts of chemical combination when taught with tiered and scaffolding instructional strategies?

Table 2: Mean and Standard Deviation of Students' Pre-Test and Post-Test Scores Classified by Treatment Groups and Gender

Treatment groups	Gender	Pre-test			Post-test		Mean Gain score
		N	$\bar{x}$	SD	$\bar{x}$	SD	
Tiered Instructional Strategy	Male	52	4.63	2.60	21.34	7.11	16.71
	Female	50	3.67	1.92	23.53	9.15	18.77
Scaffolding Instructional Strategy	Male	51	4.26	2.87	37.85	6.93	33.09
	Female	47	5.83	3.67	36.86	7.08	31.03

Table 2, shows the pre-test mean scores, and standard deviations scores of male and female students taught using tiered instructional strategy and scaffolding instructional strategy. The pre-test mean scores of male and female students' in the tiered instructional strategy are 4.63 and 3.67 and their standard deviation scores are 2.60 and 1.92, respectively. The post-test mean scores are 21.34 and 23.53 for male and female student respectively, while their standard deviation scores and 7.11 and 9.15 respectively. The standard deviation scores of the post-test are higher than the standard deviation scores of the pre-test. This could be attributed to the effect of the treatment. The standard deviation scores show that female students had the widest scattering about the mean. The mean gain scores for male and female students are 16.71 and 18.77, respectively. This shows that female students taught using tiered instructional strategy has superiority in achievement over their male counterparts. Generally, the post-test mean scores for both groups are higher than the pre-test mean scores. This could be attributed to the effect of the treatment.

With respect to those in the scaffolding instructional strategy, the pre-test mean scores of male and female students displayed are 4.76 and 5.83, respectively. The post-test mean scores are 37.85 and 36.86 for male and female students, respectively. While their standard

deviation scores of the post-test are higher than the standard deviation scores of the pre-test. This could be attributed to the effect of the treatment. The standard deviation scores show that female students had widest scattering of raw scores about the group mean. The mean gain scores for male and female students are 33.09 and 31.03, respectively. This shows that male students taught using scaffolding instructional strategy had superiority in achievement over their female counterparts. Generally, the post-test mean scores for both groups are higher than the pre-test mean scores. This could be attributed to the effect of the treatment. These observations show that the male student taught using scaffolding instructional strategy had the highest mean gain scores than their female counter parts in the score group.

Also, the scattering of the raw scores about the post-test mean was widest for the female in the tiered instructional strategy. Whether the difference between the mean scores of the two strategies by gender was statistically significant was assessed by the results in testing hypotheses 2.

Research Question 3: What is the difference in academic achievement mean score of visual, auditory and kinesthetic learners' when taught with tiered and scaffolding instructional strategies?

Table 3: Mean and standard deviation of students' pre-test scores; classified by treatment groups and learning, styles

Treatment groups		Learning styles	N	Pre-test		Post-test		Mean Gain scores
				$\bar{x}$	SD	$\bar{x}$	SD	
Tiered Strategy	Instructional	Kinesthetic learners	35	4.18	2.28	29.64	5.30	25.46
		Visual, learners	33	4.22	2.50	8.09	14.78	15.64
		Auditory, learner	34	3.89	2.03	19.36	3.99	10.89
Scaffolding Strategy	Instructional	Kinesthetic learners	33	5.31	2.97	40.17	5.70	34.86
		Visual, learners	33	5.11	3.70	5.90	7.06	29.20
		Auditory, learner	32	482	3.03	34.51	3.41	16.18

In Table 3, above, the pre-test and post-test mean scores and standard deviation scores of the visual learners, auditory and kinesthetic learners taught using tiered and scaffolding instructional strategies are 4.18, 4.22 and 3.89, respectively. The post-test mean scores are 29.64, 8.09 and 19.36 for kinesthetic, visual, and auditory learners, respectively. While the standard deviation scores are 5.30, 14.78, and 3.99. The mean gain scores are 25.46, 15.64 and 10.89, respectively. For kinesthetic, visual and auditory learners. With respect to those in the Scaffolding Instructional Strategy group, the pre-test mean scores of the kinesthetic, visual, and auditory learners displayed are 5.31, 5.11 and 4.82, respectively, and the standard deviation scores are 2.97, 3.70 and 3.03. The post-test mean scores are 40.17, 5.70 and 34.51 for

kinesthetic, visual and auditory learners respectively, while the standard deviation scores for kinesthetic learners, visual learners, and auditory learners are 5.70, 7.06 and 3.41, respectfully. These observations show that the kinesthetic learners taught using scaffolding instructional strategy had the highest mean gain scores (34.86), followed by their visual learner's counterparts in the same group (29.20). Also, the scattering of the raw scores about the post-test mean was wide for tiered instructional strategy. Whether the differences between the mean scores of the instructional strategies were statistically significant was assessed by testing hypothesis 3.

Null Hypothesis 1: There is no significant difference in the academic achievement mean score of chemistry students in the concept of chemical combination taught using tiered and scaffolding instructional strategies.

Table 4: Summary of Analysis of covariance (ANCOVA) of the student's post-test scores classified by treatment groups

Source	Type III Sum of squares	Df	Mean Square	F-cal	Sig. P	Decision at P<0.5
Corrected	11723.52	3	3907.84	140.12	0.000	S
Pre-test	27.89	1	27.89	0.005	454	Ns
Treatment	11607.28	2	5803.64	116.91	0.008	S
Error	9779.24	197	49.64			
Total	167654.00	203				
Corrected Total	21502.76	200				

R squared = 0.545 (Adjusted R squared = 0.533)

In Table 4, the calculated F-ratio for the instructional strategy at df 2, 197 is 116.91, while its corresponding calculated p-value is 0.008. This p-value is far less than 0.05 in which the decision is based; indicating that there was a significant difference in the academic achievement of students in the concepts of chemical combination in chemistry taught using tiered and scaffolding instructional strategies, in favor of scaffolding strategy. With this observation, null hypothesis I was rejected.

Null Hypothesis 2: There is no significant difference between the mean score male and female student academic achievement when taught with tiered instructional and scaffolding instructional strategies.

Table 5: Summary of Analysis of Covariance (ANCOVA) of male and female student's post-test scores classified by treatment groups and gender with pre-test scores as covariate

Source	Type III Sum of Square	Df	Mean Square	F	Sig,	Decision at P<0.05 alpha
Pre-test	36.99	1	36.99	0.006	0.389	
Treatment	11613.93	2	5806.97	8065.24	0.00	S
Gender	0.72	1	0.72	0.01	0.904	Ns
Error	9628.71	194	49.63			
Total	167654.00	198				
Corrected total	21502.26	200				

a. R squared = 0.552 (Adjusted R squared = 0.538)

In Table 5, the calculated F-ratio for the instructional strategies at df 2, 194 is 8065.24 while its corresponding p-value is 0.000 alpha. This p-value is less than 0.05 in which the decision is based; indicating that there was a significance difference between the academic achievement of students in the concepts of chemical combination taught using tiered instructional strategy and scaffolding instructional strategy. However, the F-cal value for the effect of gender at df 1, 194 was 0.01. This p-value is greater than 0.05 alpha levels in which the decision is based, indicating that the influence of gender on the students' academic achievement as not statistically significant with this observation, null hypothesis 2 was upheld.

Null Hypothesis 3: There is no significant difference in the academic achievement mean scores of kinesthetic learners, visual learners, and auditor learners when taught with tiered and scaffolding instructional strategies.

Table 6: Summary of Analysis of Covariance (ANCOVA) of students' post-test scores classified by teaching strategies and learning styles with pre-test scores as covariate

Source	Type III sum of square	Df	Mean square	F-cal	Sig.	Decision at P<.05 a4hs
Pre-test	4.06	1	4.06	0.001	0.73	Ns
Teaching strategy	7570.90	2	3785.43	2.31	0.56	S
Learning styles	3281.08	2	1640.54	49.49	0.63	S
Error	6365.24	192	33.15			
Total	167654.00	197				
Corrected total	21502.76	200				

R-squared = 704 (Adjusted R Squared = 692)

In Table 6, the calculated F-ratio for the instructional strategies at df 2, 192 is 2.31 while its corresponding calculated p-value is 0.56. This p-value is more than 0.05 level of significant which the decision is based, indicating that there was a significant difference between the academic achievements of students in the concepts of chemical combination taught given the instructional strategies. Table 6 also shows that the F-cal value for the main effect of learning styles at df 2, 192 was 49.49 while its p-value is 0.63. This p-value is more than 0.05 level of significant which the decision is based, indicating that there was no significant difference in the academic achievement means score of kinesthetic, visual and auditory learners when taught using tiered and scaffolding instructional strategies. With this observation, null hypothesis 3 was upheld.

Discussion of Findings:

In this section, the findings from the results in Tables 1 to 6 are discussed in the order of the research questions/hypotheses.

Tiered Instructional Strategy and Scaffolding Instructional Strategy and Student's Academic Achievement in chemical Combination

The findings with regard to the effect of tiered and Scaffolding Instructional Strategies on students' academic achievement in the concept of chemical combination showed that there was a significant difference in the academic achievement of students. Student taught using tiered and scaffolding instructional strategies significantly performed better. This is in line with Omonyi and Eze (2018), which states that scaffolding instructional strategy is effective.

Tiered Instructional Strategy, Scaffolding Instructional Strategy and Gender and Students' Academic Achievement in the Concept of Chemical Combination

On the effect of gender on students' academic achievements, it was observed that its effect was not statistically significant given the instructional strategies used. This indicates that the instructional strategies used do not discriminate by gender. This implies that when appropriate teaching strategies are used to teach chemical combination both male and female students will compete favourably in the same way. The non-significant difference in gender observed in this study agrees with Udousoro (2017), which stated that gender has no effect on students' academic achievement.

Tiered Instructional, Scaffolding Instructional Strategies and Visual, Auditory and Kinesthetic Learners and Students Academic Achievement

As regards to students learning styles given the instructional strategies used, the findings indicated that students' learning styles was statistically significant. This observation agrees with the findings of Khan *et* al, (2019).

Conclusion

Based on the findings of the study, tiered and scaffolding instructional strategies are effective in facilitating students' academic achievement in chemical combination in chemistry. Also gender and learning styles had no significant difference on students' academic achievement in chemical combination in chemistry, when these teaching strategies are used for teaching; students with kinesthetic learning styles achieved significantly better than those in visual and auditory learning styles.

Recommendations

Based on the findings and the conclusions reached, the following combinations are made;

i. Chemistry teachers should make effective use of scaffolding instructional strategy in teaching chemical combination in chemistry.
ii. Curriculum planners should ensure the incorporation of scaffolding instructional strategy in the teaching and learning of chemistry concepts involving chemical combination.

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