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Multimedia instruction and experiential learning strategies for chemistry students' performance in Obio-Akpor local government area, Rivers State

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Abstract
This study investigated effect of Multimedia Instruction and Experiential Learning Strategies on Chemistry students' performance in Obio-Akpor Local Government Area, Rivers State. This study adopted a quasi-experimental pre-test, post-test, non-equivalent group design. Three objectives, three research questions and three null hypotheses guided this study. The population of the study comprised of five thousand, five hundred and eighty seven (5,587) SS2 students. A sample of three schools was selected using multistage sampling technique with a sample size of one hundred and fifty four students. In each school, an intact class was used. The instruments for data collection were the Chemistry Performance Test (CPT) and Chemistry Retention Test (CRT). The instruments were validated by the researchers' supervisors, one Chemistry teacher and two experts in Measurement and Evaluation, University of Port Harcourt to ascertain the face, content and construct validity of the instrument. The reliability of the instrument was done using Kuder-Richardson -21 (KR-21) and a reliability coefficient of 0.84 was gotten for CPT. Mean, standard deviation and percentage were used to answer the research questions while Analysis of Co-variance (ANCOVA) was used to test and analyze the hypotheses at 0.05 level of significance. The result showed that there is a significant difference between students exposed to Multimedia Instruction, Experiential learning and Discussion method in their performance in Chemistry at comprehension level and application levels. The findings showed that students performed better with multimedia instruction at both comprehension and application levels. It also revealed that female students performed better than male students at comprehension level and male students performed better at application level.

Keywords: multimedia instruction, experiential learning strategy, discussion method, performance

Introduction

Due to the strong desire to achieve quality in all areas of life, man has introduced innovations in all spheres of life. Technology is one of these innovations introduced by man. The innovations in technology cause some opportunities and at the same time, challenges for educational institutions which take into consideration the adaptability of the learners. These opportunities include easy access to multimedia contents, proper utilization of e-learning resources, expansion of smart phones and tablets that can connect to the internet anytime, the role of social networks for educational development, and the accelerating interest of using technological tools in the classroom that aids learning among the students. Some of the limitations are budget limitations, lack of professional training, and poor network infrastructure. Access to smart technologies helps to develop digital literacy skills from a young age (Liubinienė & Kasperavičienė, 2018) [5].

Science is the foundation on which modern-day technological breakthrough is hinged. According to Ogunleye (2016) [8], science is a dynamic human activity concerned with understanding the workings of our world. This helps man to know more about the universe. Without the application of science, it would be difficult for a man to explore the other planets of the universe and also develop some of these innovations. Science is a necessity for every nation that wants to maintain its independence, sovereignty, self-reliance, ensure growth and have its head held high among civilized nations. This is because science and technology provide the basic tools of industrialization and economic development in the area of communication, energy, transport, information among others.

Chemistry is one of the important science subjects whose role in the development of a nation cannot be overemphasized. The study of Chemistry offers one of the opportunities to develop an understanding of the scientific method and the ability to understand the world of which man himself is a part of. This has contributed to its relative popularity among other school subjects especially the sciences.

WAEC Chief examiners' reports (2016) [12], (2018) [13] and (2019) [14] stated that the failure of students in Chemistry is as a result of their inability to answer questions in some core concepts like Gas Laws, Acid, Base and Salt and Organic Chemistry, Some as a result of inability to do calculations using the required formulae, or first principle, some as a result of poor communication, others as a result of their inability to draw the graphical illustration. Although Chemistry is very important especially to students who wish to go further in sciences in higher institutions, there is still a high rate of failure in the subject.

Several strategies are available for teaching Chemistry in senior secondary schools. The suitability of a given strategy depends on the concept in consideration. As opined by Arokoyu and Obioha (2020) [4], the teaching of Chemistry requires a conducive environment with a range of new

strategies to facilitate communication in teaching and learning and to enhance students' ability to learn which occurs when a teaching strategy takes control of students learning experience. Since understanding information is the key aspect of learning where learners will recognize what they understand and what they do not. Teaching and learning are inseparable in educational strategy and students' performance is determined by the quality of teaching and learning strategies learners have been exposed to. To ensure quality in the teaching and learning of Chemistry, the teacher has to consider some important factors such as the nature and quality of instructional materials, technological tools, etc.

Multimedia Instruction is about combining verbal material with visual materials during learning. It is the ability to integrate visualization and text material into classroom instruction. However, it must be kept simple to avoid cognitive overload. Examples of Multimedia Instruction include watching a PowerPoint presentation or watching a pre-recorded video.

Experiential learning strategy is an engaged learning process whereby students learn by doing and by reflecting on the experience. Experiential learning activities can include but are not limited to, hands-on laboratory experiments, internships, practicums, and field exercises. The discussion method is a type of teaching method, which involves breaking the class into small groups for effective talking on a topic, a problem or issue. It is a thinking together process in which students talk freely to the teacher.

Performance is a unique term and determined by several variables depending on which field the evaluation is being done. It is increasingly judged based on effective learning outcomes. In the academic world, performance depends on the teacher's effectiveness, student's attitude and input, type and nature of the subject, curriculum and logistic factors governing economics of a sound education. Bloom's Taxonomy helps educators expand the profundity of their students' learning (Prasad, 2021) [10]. Testing with Bloom's Taxonomy is creating assessments that measure every one of the six levels of Bloom's Taxonomy which are: knowledge, comprehension, application, analysis, synthesis and evaluation. There are lots of work on the overall performance of students in Chemistry and few on the performance of students based on Bloom's taxonomy. This research work will be based on two levels of Bloom's taxonomy which are comprehension and application.

Nazmul and Syed (2019) [6] investigated on the effect of multimedia instructions on the academic performance of secondary and higher secondary school students in a developing country. The total sample size was 600, and the respondents were the secondary and higher secondary school students of Bangladesh. Data were collected through self-administered questionnaires. Finally, data analysis was performed using a two-stage structural equations modeling approach. As per the study results, communicative and interactive class atmosphere (CIC), motivational teaching method (MTM), memorizable study materials(MSM), organized class lecture (OLC) of multimedia instruction have a directly positive relationship with the academic performance of secondary and higher secondary students. The findings of the current research applies to policy makers, school administrators, researchers, as well as academicians.

Akinoso (2018) [3] investigated the effect of multimedia on students' performance in mathematics. Two schools were randomly selected from Educational District V. Intact classes were purposely assigned into experimental and control. A quasi-experimental design was adopted. Mathematics Achievement Test with a reliability coefficient of 0.81 using KR-20 was used. Data collected were analyzed using ANCOVA. No significant effect exists between the Treatment and achievement in mathematics. The mean achievement score of the experimental group was higher than that of the control. Also, a significant effect did not exist on treatment and gender, but, male have a higher achievement mean score (57.50) than female counterparts (54.13). Multimedia positively affected the academic performance of students in Mathematics.

Arokoyu and Obioha (2020) [4] investigated the effect of the experiential learning approach and Senior Secondary School one (SSS1) Chemistry students' performance in Gokana Local Government Area, Rivers State. This study was guided by two objectives, two research questions and two hypotheses. The research design for the study was quasi-experimental design. The population was 2200 SSS1 Chemistry students and a sample size of 100 students was drawn from 2 secondary schools out of the 12 secondary schools in Gokana L.G.A, using a simple random sampling technique. The instrument for the study was constructed by the researchers and named Chemistry Performance Test (CPT). The consistency of the research instrument was carried out using K-R21 and a reliability coefficient of 0.85 was obtained. Data were analyzed using mean, standard deviation and ANCOVA. The findings of this study showed that experiential learning approach increased the performance of Chemistry students more than the conventional approach; it also showed that male students performed better than their female counterparts when taught with experiential learning approach. Based on the findings of this study it was recommended among other things that an experiential learning approach should be used in teaching and learning Chemistry to improve performance.

This research work focused on performance based on two levels of Bloom's Taxonomy (comprehension and application levels). The study also investigated the relevance and possible influence of gender on students' performance in Chemistry when Multimedia Instruction and Experiential learning strategies are employed in teaching.

Statement of the problem

The Chemistry curriculum has lots of abstract topics which are important for further learning. Gas Laws is an abstract topic present in both Chemistry and Physics curricula (Woldeamanuel, Atagana & Engida, 2014) [15]. Over the years students get confused on some topics like Gas Laws, Redox reaction, Matter and others, that are taught in Chemistry and Physics because of the different explanations given to them. The difficulties met with in teaching temperature and pressure effects on gases have caused so much concern among Chemistry teachers. This is because in most cases teachers focus more on the Mathematical aspect of the topic and this becomes a problem especially for students who have phobia in Mathematics (Tilahum & Tirfu, 2016) [11]. According to WAEC chief examiners' reports (2016) [12], (2018) [13] and (2019) [14], students had weakness in answering questions about Gas Laws. What could be the cause of this poor performance and

weaknesses? Could it be as a result of the teaching strategy used by teachers? This study therefore intends to investigate the effect of Multimedia Instruction and Experiential Learning Strategy on students' performance of Chemistry in Senior Secondary Schools in Obio-Akpor Local Government Area, Rivers State.

Aim and Objectives of the Study

The aim of this study was to investigate the effect of Multimedia Instruction and Experiential Learning Strategy on students' performance of Chemistry in senior secondary schools in Obio-Akpor Local Government Area, Rivers State.

The objectives of the study were to:

1. ascertain the effect of instructional strategies on students' performance in Chemistry at comprehension and application levels.
2. investigate the influence of gender on students' performance in Chemistry at comprehension and application levels.
3. ascertain the joint effect of strategies and gender on students' performance in Chemistry at comprehension and application levels.

Research Questions

The study raised and answered these three questions:

1. What is the effect of instructional strategies on students' performance in Chemistry at comprehension and application levels?
2. How does gender influence students' performance in Chemistry at comprehension and application levels?
3. What is the joint effect of instructional strategies and gender on students' performance in Chemistry at comprehension and application levels?

Hypotheses

Three (3) null hypotheses were formulated and tested at 0.05 level of significance.

1. There is no significant difference between students exposed to instructional strategies in their performance in Chemistry at comprehension and application levels.
2. There is no significant difference between the performance of male and female students in Chemistry at comprehension and application levels.
3. There is no significant joint effect of instructional strategies and gender on students' performance in Chemistry at comprehension and application levels.

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Significance of the study

This study would be beneficial to Chemistry students, Chemistry Teachers, Researchers, Curriculum planners, Chemistry textbook authors, Senior Secondary School Board, the Government at all levels and the society at large. This study tends to provide a more effective way of teaching the concept of Gas Laws to improve students' performance in senior secondary schools.

This study would be of help to Chemistry teachers who will employ the use of Multimedia Instruction and Experiential Learning Strategy to identify which is better and most effective. In line with this it is hopeful that teaching and learning of Chemistry will become more interesting, effective, meaningful and less tedious on the part of the teacher.

Methodology

Research design

This study adopted a quasi-experimental pre-test, post-test, non-equivalent group design.

Population of the study

The population of the study comprised of 5,587 (female, 3,037: males, 2550) Senior Secondary Class 2 (SS2) students from the twenty one (21) coeducational public senior secondary schools in Obio-Akpor Local Government area of Rivers State.

Sample and Sampling Technique

The sample for this study consisted of one hundred and fifty four (154) SS2 students from three intact classes in three public Senior Secondary Schools in Obio-Akpor Local Government Area.

Multistage sampling technique was used in selecting the three senior secondary schools.

Stage 1: Stratified random sampling was used to group Obio-Akpor Local Government Area into sixteen (16) strata and each stratum represents the electoral wards.

Stage 2: Simple random sampling was used in selecting three co-educational schools from the stratified wards.

Stage 3: Simple random sampling was also used in selecting the schools for treatments and control from the selected three co-educational schools

Stage 4: Simple random sampling was employed in selectiing one intact class from each of the selected schools.

The three schools were assigned to treatment and control groups with a sample size of one hundred and fifty four students.

Research instrument

The instruments for data collection were the Chemistry performance test (CPT). The instrument CPT was developed by the researcher to test for performance of students in Gas Laws. These instruments were based on the topics (Boyles' Law, Charles' Law and Ideal Gas Equation). The instruments were made up of forty (40) multiple choice objective test questions with options A, B, C and D and 2.5 marks were assigned to each correct answer while wrong answer attracts zero (0) score. The maximum score for the instrument was 100 marks.

Validity of the instrument

The instrument for data collection CPT were validated by the researchers' supervisors, one Chemistry teacher and two experts in Measurement and Evaluation, University of Port Harcourt to ascertain the face, content and construct validity of the instrument. The validators inputs and corrections were reflected in the final draft of the instruments. The instrument consist of 40 multiple choice questions which covered comprehension and application according to Bloom's taxonomy.

Reliability of the instrument

The instrument CPT was trial tested. The trial testing was carried out in a Senior Secondary School in the same Local Government Area as the sampled schools. The school had same background and characteristics as the sampled schools but was not part of the study. An intact class was also used for the testing. The testing was done by administering the test instruments on forty (40) SS 2 Chemistry students.

Filled copies of the instruments for the reliability test were retrieved on the spot. The scripts were marked and recorded by researchers. Kuder-Richardson -21 (KR-21) formula was used to calculate data obtained for CPT scores. The reliability coefficient of CPT was gotten as 0.84.

Method of data collection

A pre-test was administered to both the experimental and control groups before the commencement of treatment to determine the baseline knowledge of the sample. After the pre-test, the experimental groups were taught using multimedia instruction and experiential learning strategy while the control group was taught using the discussion method. The teaching lasted for a period of four weeks. After the four weeks of training, the post-test was given to both experimental and control groups. Regular Chemistry teachers (research assistants) regulated treatment variables in their various schools.

Method of Data Analysis

Mean, standard deviation and percentage were used to answer the research questions while Analysis of Co-variance (ANCOVA) was used to test the hypotheses at 0.05 level of significance.

Results and Analysis

Research Question 1: What is the effect of instructional strategies on students' performance in Chemistry at comprehension and application levels?

Table 1: Mean scores of students' performance at comprehension and application levels classified by instructional strategies.

Comprehension Level							
Strategies		**Pretest**		**Posttest**			
	n	Mean	Std	Mean	Std	Gain	Gain%
Multimedia	39	13.59	3.47	16.95	2.01	3.36	24.72
Experiential	67	11.25	2.24	13.60	2.36	2.35	20.89
Discussion	48	10.10	2.41	11.81	2.54	1.71	16.93
Application Level							
Strategies		**Pretest**		**Posttest**			
	n	Mean	Std	Mean	Std	Gain	Gain%
Multimedia	39	7.72	2.68	11.38	2.93	3.66	47.41
Experiential	67	8.54	2.03	9.39	2.26	0.85	9.95
Discussion	48	5.71	2.50	7.65	2.54	1.94	33.98

Table 1 indicates that the students taught using multimedia instruction had the highest performance percentage gain of 24.72% at the comprehension level, followed by students taught using experiential learning with percentage gain of 20.89% while the students taught using discussion method had the percentage gain score of 16.93%.

It also indicates that the students taught using multimedia instruction had the highest performance percentage gain of 47.41% in the application level, followed by students taught using discussion method with percentage gain of 33.98% while the students taught using experiential learning had the percentage gain of 9.95%.

Summarily, at comprehension and application levels, multimedia instruction is superior to other strategies.

Research Question 2: How does gender influence students' performance in Chemistry at comprehension and application levels?

Table 2: Mean scores of students' performance at comprehension and application level classified by gender.

Comprehension Level							
Gender		**Pretest**		**Posttest**			
	n	Mean	Std	Mean	Std	Gain	Gain%
Male	87	11.67	2.97	14.09	3.16	2.42	20.74
Female	67	11.25	2.93	13.63	2.84	2.38	21.16
Application Level							
Gender		**Pretest**		**Posttest**			
	n	Mean	Std	Mean	Std	Gain	Gain%
Male	87	7.55	2.46	9.49	2.87	1.94	25.70
Female	67	7.31	2.87	9.16	2.90	1.85	25.30

Table 3 indicates that at comprehension level, male students had a mean gain percentage of 20.74%, while the female students had a mean gain percentage of 21.16%. It also indicates that at application level, male students had a mean gain percentage of 25.70%, while the female students had a mean gain percentage of 25.30%. Summarily, at comprehension level, female students performed better than their male counterparts and at application level, male students performed better than their female counterparts.

Research Question 3

What is the joint effect of instructional strategies and gender on students' performance in Chemistry at application and comprehension levels?

Table 3: Mean scores of students' performance in Chemistry by gender and instructional strategy at comprehension and application levels.

Comprehension Level								
Strategy	**Gender**		**Pretest**		**Posttest**			
		n	Mean	Std.	Mean	Std.	Mean Gain	Gain%
Multimedia	Male	27	13.37	3.54	16.78	2.10	3.41	25.50

	Female	12	14.08	3.40	17.33	1.83	3.25	23.08
Experiential	Male	39	11.36	2.16	13.67	2.68	2.31	20.33
	Female	28	11.12	2.38	13.50	1.88	2.38	21.40
Discussion	Male	21	10.05	2.42	11.43	2.48	1.38	13.73
	Female	27	10.15	2.45	12.11	2.60	1.96	19.31
Application Level								
Strategy	**Gender**		**Pretest**		**Posttest**			
		n	Mean	Std.	Mean	Std.	Mean Gain	Gain%
Multimedia	Male	27	7.85	2.85	11.56	3.07	3.71	47.26
	Female	12	7.42	2.35	11.00	2.66	3.58	48.25
Experiential	Male	39	8.26	1.77	9.13	2.02	0.87	10.53
	Female	28	8.93	2.31	9.75	2.54	0.82	9.18
Discussion	Male	21	5.86	2.33	7.52	2.32	1.66	28.33
	Female	27	5.59	2.66	7.74	2.74	2.15	38.46

Table 3 indicates male students taught using Multimedia instruction had the highest mean gain percentage of 25.50% at comprehension level than the female students who had the highest mean gain percentage of 23.08% using Multimedia instruction at comprehension level. This means that male student taught using Multimedia media instruction performed better in female students at comprehension level than other students taught using Experiential learning and discussion method.

Table 3 also indicates that male students taught using Multimedia instruction had the lowest mean gain percentage of 47.26% at comprehension level than the female students who had the highest mean gain percentage of 48.25% using Multimedia instruction at application level. This means that female student taught using Multimedia instruction performed better at application level than the male students and than other students taught using experiential learning and discussion method.

Hypotheses

Hypothesis 1: There is no significant difference between students exposed to instructional strategies in their performance in Chemistry at comprehension and application levels.

Table 4: Summary of Analysis of covariance of students' performance at comprehension and application levels.

Comprehension Level					
Source	**Type III Sum of Squares**	**df**	**Mean Square**	**F**	**Sig.**
Corrected Model	688.054[a]	3	229.351	48.111	0.000
Intercept	796.896	1	796.896	167.165	0.000
Pretest Comprehension	110.260	1	110.260	23.129	0.000
Strategies	281.094	2	140.547	29.483	0.000
Error	715.069	150	4.767		
Total	31113.000	154			
Corrected Total	1403.123	153			
Application Level					
Source	**Type III Sum of Squares**	**df**	**Mean Square**	**F**	**Sig.**
Corrected Model	499.772[a]	3	166.591	32.652	0.000
Intercept	493.313	1	493.313	96.691	0.000
Pretest Application	198.827	1	198.827	38.971	0.000
Strategies	189.852	2	94.926	18.606	0.000
Error	765.293	150	5.102		
Total	14730.000	154			
Corrected Total	1265.065	153			

Table 4 shows that there is a significant difference between students exposed to instructional strategies in their performance in Chemistry at comprehension level $F_{2,150}$= 29.483 ($P < 0.05$). Therefore, hypothesis is rejected across the three strategies.

Table 4 also shows that there is a significant difference between students exposed to instructional strategies in their performance in Chemistry at application level $F_{2,150}$= 18.606 ($P < 0.05$). Therefore, hypothesis is rejected across the three strategies.

Hypothesis 2: There is no significant difference between the performance of male and female students in Chemistry at comprehension and application levels.

Table 5: Summary of Analysis of covariance of male and female students in Chemistry at comprehension level and application levels

Comprehension Level					
Source	**Type III Sum of Squares**	**df**	**Mean Square**	**F**	**Sig.**
Corrected Model	409.088[a]	2	204.544	31.071	0.000
Intercept	537.801	1	537.801	81.695	0.000
Pretest	400.901	1	400.901	60.899	0.000
Gender	2.128	1	2.128	0.323	0.570
Error	994.035	151	6.583		
Total	31113.000	154			
Corrected Total	1403.123	153			

Application Level					
Source	**Type III Sum of Squares**	**df**	**Mean Square**	**F**	**Sig.**
Corrected Model	311.461[a]	2	155.731	24.659	0.000
Intercept	486.200	1	486.200	76.988	0.000
Pretest_Application	307.338	1	307.338	48.666	0.000
Gender	1.541	1	1.541	0.244	0.622
Error	953.603	151	6.315		
Total	14730.000	154			
Corrected Total	1265.065	153			

Table 5 shows that there is no difference between the performance of male and female students in Chemistry at comprehension level $F_{1,151}$= 0.323 (P >0.05). Therefore, hypothesis is accepted.
Table 5 also shows that there is no difference between the performance of male and female students in Chemistry at application level $F_{1,151}$= 0.244 (P >0.05). Therefore, hypothesis is accepted.

Hypothesis 3: There is no significant joint effect of instructional strategies and gender on students' performance in Chemistry at comprehension and application levels.

Table 6: Analysis of Covariance of joint effect of instructional strategies and gender on students' performance in Chemistry at comprehension and application levels.

Comprehension Level					
Source	**Type III Sum of Squares**	**df**	**Mean Square**	**F**	**Sig.**
Corrected Model	694.056[a]	6	115.676	23.981	0.000
Intercept	790.895	1	790.895	163.964	0.000
Pretest	107.742	1	107.742	22.336	0.000
Strategies* Gender	287.096	5	57.419	11.904	0.000
Error	709.068	147	4.824		
Total	31113.000	154			
Corrected Total	1403.123	153			

Application Level					
Source	**Type III Sum of Squares**	**df**	**Mean Square**	**F**	**Sig.**
Corrected Model	503.592[a]	6	83.932	16.203	0.000
Intercept	486.117	1	486.117	93.843	0.000
Pretest	193.226	1	193.226	37.302	0.000
Strategies* Gender	193.672	5	38.734	7.478	0.000
Error	761.473	147	5.180		
Total	14730.000	154			
Corrected Total	1265.065	153			

Table 6 shows that there is a significant joint effect of instructional strategies and gender on students' performance in Chemistry at comprehension level. $F_{1,147}$= 11.904; P < 0.05. Therefore, hypothesis is rejected.
Table 6 also shows that there is a significant joint effect of instructional strategies and gender on students' performance in Chemistry at application level. $F_{1,147}$= 7.478; P < 0.05. Therefore, hypothesis is rejected.

Discussion of findings

Effect of instructional strategies on students' performance in Chemistry at comprehension and application levels

The result as indicated on table 1 revealed that Multimedia instruction is the best strategy in ensuring the Chemistry students' performance at both comprehension and application level. The result also shows that at comprehension level multimedia instruction is the best followed by experiential learning and discussion method and also at application level. This was confirmed by the corresponding hypotheses which revealed a significant difference among students exposed to instructional strategies in their performance in Chemistry at comprehension and application levels. This agrees with the view of Oghomwen, Abdullahi, Kolo and Karickson (2021) [7] who reported that students taught using Multimedia Instruction performed significantly better than students taught using the conventional method. It also supports the findings of Nazmul and Syed (2019) [6] who reported that communicative and interactive class atmosphere (CIC), motivational teaching method (MTM), memorizable study materials(MSM), organized class lecture (OLC) of multimedia instruction have a directly positive relationship with the academic performance of secondary and higher secondary students. From the findings of this study students taught using discussion method performed better at application level than students' taught using experiential learning strategy. This is inline with the findings of Yusuf, Guga and Ibrahim (2020) [16] who in their studies found that discussion approach significantly improved students' performance. Students' active participation, their interaction in groups and the teacher's role as provider of thought provoking questions might have enhanced students' achievement gains in the Chemistry over Experiential Learning.

Influence of gender on students' performance in Chemistry at comprehension and application levels?

The result obtained in Table 2 shows that the female students performed slightly better than their male counterparts at comprehension level, it also showed that male students performed better than female students at application level. This is also inline with Table 5 that showed that there is no difference between the performance

of male and female students in Chemistry at both comprehension and application levels with $F_{1,151}$= 0.323 (P >0.05) and $F_{1,151}$= 0.244 (P >0.05). Therefore, hypothesis was accepted. This supports the finding of Ado, Essien and Job (2018) [1] who reported that gender did not influence students' achievement when taught using multimedia. Oluwatosin and Josiah (2017) [9] in their research also reported there is no significant difference in the mean achievement scores between male and female students taught stoichiometry using hands-on activities. On a contratry, Akinbadewa (2020) [2] reported a significant main effect of treatment on students' achievement in Biology.

Joint effect of instructional strategies and gender on students' performance in Chemistry at comprehension levels and application levels.

Table 3 indicates that male student taught using multimedia media instruction performed better in comprehension level than the female students followed by male students taught using experiential learning and discussion method. Table 6 that female student taught using Multimedia media instruction performed better in application level than the male students than other students taught using Experiential learning and discussion method. Table 6 further shows that there is a significant joint effect of instructional strategies and gender on students' performance in Chemistry at comprehension and application levels with $F_{1,147}$= 11.904; P < 0.05 and $F_{1,147}$= 7.478; P < 0.05 respectively. Therefore, hypothesis was rejected. The finding of this study is at variance with Oluwatosin and Josiah (2017) [9] who reported that no significant interaction effect between methods and gender on the mean achievement scores of students in stoichiometry.

Conclusion

The findings of this study showed that students' can perform better in Chemistry when multimedia instructional strategy is used as method of instructional strategy. It also showed that students' can perform well at comprehension level and not perform well at application level. Therefore the different levels of Bloom's taxonomy should be considered during instruction.

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