EFFECT OF MASTERY LEARNING INSTRUCTIONAL STRATEGY ON SECONDARY SCHOOL STUDENTS' ACHIEVEMENT AND RETENTION OF CHEMISTRY CONCEPTS

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Abstract
This study investigated the effect of Mastery Learning Instructional Strategy (MLIS) on secondary school students' achievement and retention of Chemistry concepts. Quasi-experimental design was used for the study.The sample used for the study was 187 (89 Males and 98 Females)students' of 2017/2018 session from two secondary schools in Jalingo educational zone in Taraba State were selected through stratified random sampling.Students in the experimental group were exposed to MLIS teaching method while the control used theLecture-demonstration method. Chemistry Achievement Test (CAT) was instrument used for data collection. The data collected were analyzed using means, standard deviations, t-test and Analysis of Covariance (ANCOVA). The result showed that students exposed to MLIS achieved significantly better than those taught usingLecture-demonstration method, hence MLIS improved students' achievement and retention of Chemistry concepts. The result also showed that there was no significant difference between the mean achievement scores of high, moderate and low ability students regarding MLIS; there was also no significant difference between the mean achievement scores of male and female students in chemistry. Based on the findings, it wasrecommended amongst others that MLIS should be encouraged in schools since it's improved students' achievement and retention; and very effective in influencing students of different abilities to achieve higher learning in chemistry; and also a gender difference does not exist.

Keywords: Mastery Learning, Instructional Strategy, Lecture-demonstration method, Academic Achievement.

Introduction

Chemistry is the catalyst for sustainable national growth and development. It is concerned with the impartment of knowledge of properties, components, transformations and interactions of matter. Chemistry which is offered at the senior secondary schools in Nigeria, forms the bedrock subject for all sciences and science-related courses in tertiary institutions both locally and internationally. Despite the importance of Chemistry, most students perceived most concepts as difficult to understand which could be as a result of poor instructional methods (Jack, 2014). The Chief Examiner's Report (WAEC, 2018) revealed that the performance of the candidates was below average and was worse than WASSCE for School Candidates, 2017.The raw mean score of 47.0 and standard deviation of 16.0 for 2017 compared to a raw mean score of 29.0 and standard deviation of 13.78 for WASSCE for School Candidates, 2018. The Chief Examiner also reported that students did not show basic understanding of simple concepts in Chemistry and also exhibited poor communication skill.The

use of innovative strategy such as Mastery Learning Instructional Strategy (MLIS) amongst others, rather than the traditional method of teaching and learning Chemistry could help to improve students' achievement and retention towards the subject.

TheLearning for mastery or mastery learning, are terms coined by Benjamin Bloom in 1968 and 1971 respectively (Bloom, 1968 & 1971).This is a school of thought that presumes all people can learn if they are provided with the appropriate learning conditions. Bloom hypothesized that a classroom with a mastery learning focus as opposed to the traditional form of instruction would reduce the achievement gaps between varying groups of students (Guskey 2007).

Mastery Learning Instructional Strategy is an instructional method, where students are allowed unlimited opportunities to demonstrate mastery of content taught or positive learning outcomes. MLIS involves breaking down the subject matter to be learned into units of learning, each with its own objectives for students to have adequate mastery of a concept or topic before moving on to the next concept or topic. Hence, the pre-requisite to a topic is mastered well before the topic is taught. The strategy allows students to study material unit after unit until they master it or have a long retentive memory of a concept learned. Mastery of each unit is shown when the student acquires the set pass mark of a diagnostic test. MLIS helps the student to acquire prerequisite skills to move to the next unit. The teacher also is required to do task analysis and state the objectives before designating the activities. MLIS can also help the teacher to know students' area of weakness and correct it thus breaks the cycle of failure or consistent poor academic performance. Results from previous research studies carried out on MLIS suggest that MLIS yields better retention and transfer of material, yields greater interest and more positive attitudes in various subjects than non-mastery learning approaches (Pankaj, 2019; Tukur, 2018; Nnorom & Uchegbu, 2017; Ishtiaq & Qaiser, 2016; Hutcheson, 2015; Lamidi, Oyelekan & Olorundare, 2015; Mitee. & Obaitan, 2015; Furo, 2014; Udo & Udofia, 2014; Wambugu & Changeiywo, 2013; Wambugu & Changeiywo, 2012; Abakpa & Iji 2011; Akinsola, 2011; Wachanga, 2011; Patrician & Johnson, 2008; Eric, 2007; Wachanga & Gamba 2004).

The concept of mastery learning can be attributed to the behaviour ism principles of operant conditioning. According to the operant conditioning theory, learning occurs when an association is formed between a stimulus and response. In line with the behaviour theory, mastery learning focuses on overt behaviour so that can be observed and measured (Baum, 2005). The material that will be taught to mastery in science lessons is broken down into small discrete lessons that follow a logical progression. In order to demonstrate mastery over each lesson, students must be able to overtly show evidence of understanding of the material before moving to the next lesson. In a mastery learning environment, the teacher directs a variety of group-based instructional techniques, with frequent and specific feedback by using diagnostic, formative tests, as well. The model also allows for an individual learning pace. In addition, feedback that is given during this process is helpful for the student. This model stands for the fact that every learner can learn if given the time and the right learning environment. Mastery Learning is a model where students are expected to master a learning objective or goal, before they can move on to the next goal in order to improve students' performance and retention at the end of the lesson (Anderson 2016).

There has been low performance in Chemistry in secondary school, which is due to inability of students to understand and master topics and concepts in Chemistry before proceeding to higher levels. Therefore, the use of the Mastery Learning Strategy may be very essential in overcoming this challenge. Research conducted on comparing the effects of mastery learning alone, and regular teaching methods for students' achievement in Chemistry by Mevarech (2015) showed that mastery learning was the indicator that significantly increased achievement. the study conducted by Wambugu and Changeiywo (2013) showed no significant influence of gender on students' achievement with mastery learning. Research reports on students' achievement in science on the basis of gender are inconclusive. While many researchers have provided reports that there are no longer distinguishing differences in the cognitive, affective and psychomotor skill achievements of students in respect of gender, others like Usman and Ubah, (2007), have found disparities in the achievement of male and female students. However, the literature seems to be dominated with findings indicating no significant gender disparities in students' achievement with many instructional strategies (Aluko, 2014).

Specifically, for Mastery learning instructional strategy, learners generally operate at different levels of intelligence and their ability to perform specific tasks also differs. As opined by Abu-Hamour and Al-Hmouz, (2013), all aspects of science could be said to be problem solving and students have varying ability when they are confronted with problems to solve. problem solving in science depends on students' cognitive ability level. An intelligent person is someone who can solve a whole variety of difficult questions rapidly. As a matter of fact, there is a strong relationship between the level of individual's intelligence and his mastery of a given task. In the Nigerian educational system, classrooms are generally composed of students of different scoring levels. Hence, any innovation in instructional strategy must consider the influence of students' ability levels. There is the need for good instructional strategies that go a long way in improving learning skills of students no matter their ability level.

Most empirical studies reviewed contained some gaps to be filled with the study. Some of the reviewed studies investigated the effect of a mastery learning instructional strategy on students' achievement in Chemistry and science related to experimental and control groups and so left a gap of not looking at gender, learners' ability or retention with Jalingo-Taraba State, as study area. This gap was filled by the present study.

The purpose of this study is to investigate the effect of mastery learning instructional strategy on students' achievement and retention of chemistry, considering students' gender and learners' abilities in the subject. In order to achieve this purpose, the following null hypotheses were formulated and tested at 0.05 level of significance:

$H0_1$: There is no significant difference in the achievement of students taught chemistry using mastery learning instructional strategy and lecture-demonstration method.

$H0_2$: There is no significanteffect of gender on the achievement of students taught Chemistry using mastery learning instructional strategy.

$H0_3$: There is no significant difference between the mean achievement scores of high, moderate and low ability students taught Chemistry using mastery learning instructional strategy.

$H0_4$: There is no significant differencein retention of students taught Chemistry using mastery learning instructional strategyand lecture-demonstration method.

Research Methodology

This study adopted a pre-test, post-test, non-equivalent control group of quasi-experimental design. This design helped to identify the effect of the independent variable on the dependent variable in which an intervention (treatment) was introduced to the experimental group and the other was treated as the control group. There was no randomization of subjects into groups, students were assigned from the intact classes. The experimental group was taught chemistry using mastery learning instructional strategy (MLIS), while the control group was taught using lecture-demonstration method (LDM). The design is represented in Figure 1.

Group	Pre-test	Treatment	Post-test	Retention test
Experimental (MLIS)	O_1	X	O_2	O_3
Control (LDM)	O_1	–	O_2	O_3

Figure 1: Design for the study
Where: O_1 is Pre-test. O_2 is Post-test and O_3 is a Retention test (Post Post-test)
X is Treatment (MLIS)

The sample consisted of 187 (89 Males and 98 Females)SS II students from two intact classes of 2017/2018 session in Jalingo educational zone in Taraba State. The studentswere selected through stratified random sampling technique since the population was divided into subgroups or strata (gender: males and females; and learner's abilities: low, moderate and high), and random samples were taken.The instrument for data collection was Chemistry Achievement Test (CAT) which was validated by three experts. The test was based on the four selected Chemistry topics in the SS II scheme of work; period table, mass and volume relationship, water, and volumetric and qualitative analysis. The items constructed to measure the six objectives in the cognitive domain of Bloom's taxonomy of educational objectives. In determining the learner' abilities, three levels were considered: Low Ability for students that scored below 50%; Moderate Ability50-69%; andHigh Ability 70%and above in the school terminal examination respectively.

The school selected for the pilot test was different, but has similar characteristics to the sampled schools used for the study. The reliability of the test items was computed using Kurder-Richardson formula 20 (K-R20) method. The choice of K-R20 was because, it is very appropriate for determining the degree of reliability of standard test. After scoring the test, a reliability coefficient of 0.87 was obtained, which was considered fit for the study.

The data for this study was collected using a 40 CAT item. The pre-test was administered to experimental and control groups in the first week of the experiment. The reason was because the result of the pre-test was used to ascertain students' entry behaviour on the topics to be taught. Six weeks were used for the study as stipulated by the schools' scheme of work for the selected topics, usedin the study. The last period of the sixth week was used for administering post-test. The

experimental group was exposed to treatment through mastery learning instructional strategy, while the control group was taught using lecture-demonstration method.

Treatment Procedure

In the experimental group, before the commencement of the treatment (mastery learning instructional strategy), a pretest was administered to the group. The teaching material is organized to follow a logical progression.The topics to be learned were broken down into units of learning, each with its own objectives for students to have adequate mastery of a concept or topic before moving on to the next concept or topic. Hence, the pre-requisite to a topic is mastered well before the topic is taught. This allows students to study material unit after unit, until they master it or have a long retentive memory of concepts learned. Mastery of each unit is shown when the student acquires the set pass mark of a diagnostic or performance test. This also helps the students to acquire prerequisite skills to move to the next unit.

In order to demonstrate mastery over each lesson, students must be able to overtly show evidence of understanding of the material before moving to the next lessonin contrast to "conventional instruction". In the mastery learning environment for this study, the teacher directs a variety of group-based instructional techniques, with frequent and specific feedback by using diagnostic, formative tests, as well. This also allows for an individual learning pace. In addition, feedback is given during the mastery learning process which is very helpful to the students. The principles of mastery learning involve the learner given adequate time, right learning environment. It also involves students' mastery of a learning objective or goal, before they can move on to the next goal was adhered to strictly in order to improve students' performance and retention at the end of the lesson. The teacher also did task analysis and stated the objectives before designating the activities. This helped the teacher to know students' area of weakness and effect necessary corrections and ensured that 70% of the learners understood the topics taught before proceeding to the next topic, thereby breaking the cycle of failure or consistent poor performance among different ability learners. At the end of the treatment a post-test was also administered to the group. Three weeks later, after the experimental implementation process (close to the end-of-term examinations), the achievement test was implemented again as a retention test (post post-test) to determine students' retention ability among the experimental group.

In the control group, a pretest was administered to the students. They were taught using the lecture-demonstration method that is teacher-activity centred, where the teacher teaches the lesson to the passive students through lecturing and demonstrations. The lesson was taught without the teacher adequately considering students' prior knowledge and checked whether students have mastery of the lesson taught or not. During the instruction, students listens to their teacher, takes notes, studies their textbooks and completed their worksheets. The students were not given the opportunity to develop their thinking, reasoning, communication, problem-solving and mastery skills, though were given assignments at the end of end lesson. The post-test was also administered to them at the end of the exercise. Three weeks later the achievement test was implemented again as a retention test to the control group.

The data collected from the pretest and posttest from the two groups were analyzed using descriptive(means and standard deviations) and inferential

statistics (Analysis of Covariance-ANCOVA and t-test). Hypotheses one to three (Ho_1-Ho_3) was tested using Analysis of Covariance (ANCOVA) while Ho_4 was tested with t-testat 0.05 level of significance. The pretest was the covariate which was used to control for variations in the students' prior knowledge of the subject matter.

Results

Table 1: **Mean and Standard Deviation of students' Post-tests scores in both experimental and control Groups**

		Pre-test		Post-test		
Group	**N**	**Mean**	**SD**	**Mean**	**SD**	**Mean gain**
Experimental (MLIS)	92	33.67	19.70	57.67	19.70	24.0
Control (LDM)	95	32.54	17.11	38.91	17.11	6.37
Mean Difference		1.13		18.76		

Table 1 shows the mean scores of students taught chemistry using mastery learning instructional strategy is 57.67 with a standard deviation of 19.70 while the mean scores of students taught chemistry using lecture-demonstration method (LDM) is 38.91 with a standard deviation of 17.11. The difference between the posttest mean scores between MLIS and LDM is 18.76 while mean gain scores was 24.0 and 6.36 respectively, but was tested with Ho_1 on Table 2.

Testing Ho_1:

Ho_1: There is no significant difference in the achievement of students taught chemistry using mastery learning instructional strategy and lecture-demonstration method.The result of Ho_1tested, is presented in Table 2.

Table 2: Summary of one-way Analysis of Covariance of experimental and control groups

Source of variation	**Sum of squares**	**DF**	**Mean square**	**F.**	**Sig.**
Corrected model	53557.31	2	26778.65	191.31	0.000
Intercept	16672.33	1	16672.33	119.11	0.000
Pre-test	37093.29	1	37093.29	265.00	0.175
Method	9387.08	1	9387.08	67.06	0.000*
Error	25755.08	184	139.97		
Total	512660.00	187			
Corrected total	79312.39	186			

*P < 0.05 is significant

The result of the analysis in Table 2 shows that there is a significant effect of the treatment (Mastery learning instructional strategy) on the mean achievement scores of students. Since the computed P-value (0.000) with DF (1, 184) is less than 0.05 level of significance. Therefore, the null hypothesis was rejected (*P < 0.05). This implies that there is a significant effect of the treatment on students' achievement in chemistry when taught using mastery learning instructional strategy and lecture-demonstration method. Therefore, $Ho_1$was not retained.

Table 3: Mean and Standard Deviation of Students' Post-Test Scores by Gender

Gender	Group	N	Mean	SD
Male	Experimental(MLIS)	47	48.50	20.90
Female		45	48.12	21.06
	Mean Difference		0.38	
Male	Control (LDM)	42	48.02	20.40
Female		53	47.78	20.50
	Mean Difference		0.24	

In the experimental group in Table 3, the male students hadmean scores of 48.50 and the female students had mean scores of 48.12 with mean difference of 0.38 while for the control groupthe male students hadmean scores of 48.02 and the female students had mean scores of 47.78 with mean difference of 0.24. Based on the result from Table 3, it shows that the mean achievement score of male and female students is slightly higher than the mean achievement score of female students when taught chemistry using mastery learning instructional strategy. The difference between the mean scores of male and female students for experimentalgroup taught with mastery learning instructional strategy is 0.38 alone which is quite negligible, but was tested with Ho_2 on Table 4.

Testing Ho_2:

Ho_2 There is no significant effect of treatment on gender when taught chemistry using mastery learning instructional strategy.The result of Ho_2 tested, is presented in Table 4.

Table 4: Analysis of Covariance of Differences between Male and Female Students

Source of Variation	**Sum of Squares**	**DF**	**Mean square**	**F**	**Sig.**
Corrected model	44317.40	2	22158.700	116.508	0.000
Intercept	13195.42	1	13195.416	69.380	0.000
Pre-test	44312.17	1	44312.165	232.989	0.195
Gender	147.17	1	147.1690.7	740.380	0.815**
Error	34994.99	184	190.190		
Total	512660.00	187			
Corrected total	79312.39	186			

**P > 0.05 is not significant

The result of the analysis in Table 4,P > 0.05 shows that there is no significant effect of gender on mean achievement scores of students taught chemistry using mastery learning instructional strategy. Since the computed P-value (0.815) with DF (1, 184) is greater than 0.05 level of significance, therefore, the null hypothesis, $Ho_2$was rejected.

Table 5: Mean and Standard Deviation of Students' Post-Test Scores by Ability Levels

Ability Levels	**Group**	**N**	**Mean**	**Mean Difference**	**SD**
High	Experimental(MLIS)	13	35.14	14.82	11.13
	Control (CLM)	16	20.32		9.12
Moderate	Experimental(MLIS)	49	34.65	19.32	12.55
	Control (CLM)	43	15.33		9.19
Low	Experimental(MLIS)	30	34.07	20.04	10.25
	Control (CLM)	36	14.05		8.40

*P < 0.05 is significant

In the experimental group inTable 5, the high, moderate and low ability students had mean scores of 35.14, 34.65 and 34.07 respectively while in the control group the high, moderate and low ability students had mean scores of 20.32, 15.33 and 14.05 respectively with mean differences of 14.82, 19.32 and 20.04 respectively.The results showed a significantdifference of learner's abilities on the achievement of students taught Chemistry using the mastery learning instructional strategy and lecture-demonstration method.However, the difference between high, moderate and low ability students had mean scores of 35.14, 34.65 and 34.07 of only the experimental group taught Chemistry with mastery learning instructional strategy alone was very negligible. But, to investigate whetherthere is a significant difference onlearners' abilities when taught chemistry using mastery learning instructional strategy alone, it was tested with Ho_3on Table 6.

Testing Ho_3:

HO_3: There is no significant difference between the mean achievement scores of high, moderate and low ability students taught Chemistry using mastery learning instructional strategy.

The result of Ho_3 tested, is presented in Table 6.

Table 6: Analysis of Covariance of Difference between the Mean Responses of Students on Mastery Learning Instructional Strategy in CAT According to Learners Ability Level

Source of Variation	Sum of Squares	DF	Mean square	F	Sig.
Corrected model	44702.99	3	14900.99	778.790	0.000
Intercept	11903.82	1	11903.82	162.942	0.000
Pre-test	43728.08	1	43728.075	231.216	0.127
Ability	532.76	2	26638.114	090.247	0.0247*
Error	34609.39	183	189.2		
Total	512660.00	187			
Corrected total	79312.39	186			

**P > 0.05 is not significant

The result of the analysis in Table 6 shows that there is no significant difference in the mean achievement scores of different learners' ability groups taught chemistry using mastery learning instructional strategy alone since the computed P-value (0.247) with DF (2, 183) is greater than 0.05 level of significance. Therefore, the null hypothesis was not rejected (** P > 0.05).This shows that there was great improvement in the mean posttest test scores for high, moderate and low ability groups when taughtchemistry using mastery learning instructional strategy.Therefore, the null hypothesis (HO_3) was rejected (P >0.05).

Testing Ho_4:

HO_4: There is no significant differencein retention of students taught Chemistry using mastery learning instructional strategyand lecture-demonstration method.

The result of Ho_4 tested, is presented in Table 7.To verify the difference between the two means in the post-test was statistically significant, anindependent t-test was used as shown in Table 7.

Table 7: Independent t-test results regarding retention test scores of experimental and control groups

Group	N	Mean	SD	DF	T	P	Decision
Experimental (MLIS)	92	41.45	4.16	185	20.45	.000*	Rejected
Control (LDM)	95	15.29	4.22				
Mean difference		26.16					

**significant at $p \leq .05$*

It can be seen in Table 7 that there is a significant difference between the retention test scores of experimental and control group in favour of the experimental group (t(185) = 20.45, p=.000 *p<.05). The results showed that the experimental group which had engaged in mastery learning instructional strategyproduced a higher overall improvement in scores on the Chemistry delayed retention test scores used to determine students' retention. As seen in this result,mastery learning instructional strategy (MLIS)which was implemented in experimental group, provided more retentive learning than the lecture-demonstration method (LDM).

The findings from the study are therefore summarized below according to the arrangement of the formulated and tested hypotheses before discussion:

i. There is a significant difference in the mean achievement scores of students taught chemistry using mastery learning instructional strategy than the conventional lecture method, in favour of mastery learning instructional strategy.
ii. There is no significant difference between the mean achievement scores of male and female students taught chemistry mastery learning instructional strategy alone.
iii. There is no significant difference between the mean achievement scores of high, moderate and low ability students taught with mastery learning instructional strategy.
iv. There is a significant difference in retention of students taught Chemistry using mastery learning instructional strategy and lecture-demonstration method.

Discussion of findings

The findings from the study are hereby discussed below:

From Tables 2, the result showed that there is a significant difference in the mean achievement scores of students taught chemistry using mastery learning instructional strategy than the conventional lecture method, in favour of the mastery learning instructional strategy. This result is consistent with the findings of previous researchers (Pankaj, 2019; Tukur, (2018); Nnorom & Uchegbu, 2017; Ishtiaq & Qaiser, 2016; Hutcheson, 2015; Lamidi, Oyelekan & Olorundare, 2015; Mitee & Obaitan, 2015; Furo, 2014; Udo & Udofia,2014; Wambugu & Changeiywo, 2013; Wambugu & Changeiywo, 2012; Abakpa & Iji 2011; Akinsola, 2011; Wachanga, 2011; Patrician & Johnson, 2008; Eric, 2007; Wachanga & Gamba 2004); who found out that mastery learning method if effectively employed would improve students' achievement better in a given task. This implies that mastery learning instructional strategy enhances higher scores in Chemistry achievement test than conventional lecture method (lecture method) which is deficient in meeting the learners' need since it more teacher-activity centered.

From Tables 4, the result showed that there is no significant difference between the mean achievement scores of male and female students in the

experimental group taught chemistry using mastery learning instructional strategy. The result of this study agrees with the findings of previous researchers (Lamidi, Oyelekan & Olorundare, 2015; Furo, 2014; Bada & Ibrahim, 2012) who reported that gender differences does not exist or insignificant among students in secondary schools taught chemistry using Mastery learning instructional strategy.

From Tables 6, the result also showed that there is no significant difference between the mean achievement scores of high, moderate and low ability students taught with mastery learning instructional strategy.Therefore, the null hypothesis was not rejected, which meant that there isno significant difference in the mean achievement scores of different ability groups (high, moderate and low) taught Chemistry using mastery learning instructional strategy alone. This result shows that mastery learning instructional strategy used alone influences high, moderate and low ability students achieve higher in Chemistry. This is because the students at high, moderate and low ability levels improved their scores which shows nosignificant difference between high, moderate and low learners'mean achievement scores. The result of the study agreed with the reports of previous researchers (Abu-Hamour & Al-Hmouz2013; Rubon & Reis, 2006; and Siegle, Reis & McCoach, 2005) who found that there is a significant difference in the strategy used on different learners'abilities, since their findings showed either students from high ability group performing better than those with low or vice-versa. But the result of the study agreed with Ayilas' (2003) and (2007 study who found out that there is no significant difference of learners' ability on students' academic achievement, due to theeffective teaching method (MLIS)which narrowed the gap between high, moderate and low ability students.This is because MLIS used in this study helped the teacher to determine students' areas of weakness and effect necessary corrections before progressing, since a topic must be understood by 70% of the learners before proceeding to the next topic, thereby breaking the circle of failure among different ability learners. MLIS also helped to reduce the achievement gaps between varying groups of students

The findings related to the mean retention scores of students in the experimental and control groups on their retentionin Chemistry lesson were shown in Table 7. The results showed that the experimental group which had engaged in mastery learning instructional strategy produced a higher overall improvement in scores on the Chemistry delayed retention test scores used to determine students' retention or more retentive learning than the control group that usedlecture-demonstration method.This result is consistent with that of Ishtiaq and Qaiser,(2016) whose results also revealed that Mastery learning has a positive effect on students' retention. The findings of this study imply thatmastery learning instructional strategyhad much more positive effect on students' learning and retention compared to lecture-demonstration method.This is because the students were helped to master each learning unit (topic) before proceeding to a more advanced learning task in contrast to conventional instruction (lecture-demonstration method).

Conclusion

Based on the findings of this study, it can be concluded that mastery learning instructional strategy is an effective method of teaching chemistry in senior secondary schools in Taraba State. This is because students taught using mastery learning instructional strategy had a better achievement and retention than their

counterparts taught with thelecture-demonstration method.

More also mastery learning instructional strategy was a teaching strategy that benefits both male and female students in the learning of chemistry, which means that gender did not have any significant influence on students. In other word, gender difference does not exist when mastery learning instructional strategy was used to teach chemistry in senior secondary schools in Taraba State.

More also, mastery learning instructional strategy also helped to bridge the gaps among students with high, moderate and low abilities. This implies that MLIS assisted low and moderate ability students to improve in their achievement since they had higher scores close to high ability students. This means that mastery learning instructional strategy is effective in influencing students of different abilities to achieve higher learning in chemistry.

Recommendations

Based on the conclusions drawn from the findings of this study, the following recommendations were made:

1. Mastery learning instructional strategy should be adopted and practice by teachers amongst other innovative strategies in secondary schools since it has been found effective and capable of improving students' achievement and retention in Chemistry concepts.
2. Chemistry teachers should also adopt mastery learning in their classroom lessons since the strategy help to close the gap between high, moderate and low ability learners.
3. Teachers should be trained on how to use mastery learning instructional strategy as a means of promoting effective chemistry teaching through organized workshops and seminars by government.
4. Educational planners should design curricularactivities that involve mastery. This will not only help to close the gap between high, moderate and low ability learners in chemistry and other subjects but also enhance mastery in the acquisition of life skills and other cognitive, affective and psychomotor learning outcomes.

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