International Journal of Multidisciplinary Research and Development
Online ISSN: 2349-4182, Print ISSN: 2349-5979; Impact Factor: RJIF 5.72
Received: 24-11-2018; Accepted: 26-12-2018
www.allsubjectjournal.com
Volume 6; Issue 1; January 2019; Page No. 180-186

Effects of mastery learning strategy on students' self-esteem and academic achievement in secondary school chemistry

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Abstract
In this study, the effect of mastery learning strategy on secondary school students' self-esteem and academic achievement in chemistry was investigated. Two mixed public senior secondary schools in Obio/Akpor Local Government Area of Rivers State were purposively selected. 100 senior secondary two- SS2 students (50 from each school) who participated in the study were randomly apportioned into mastery learning strategy (MLS) group and direct instruction (DI) group. A mixed research design involving quasi experimental design and survey design was used for this study. The quasi experimental design involved the administration of a pretest and posttest to both the MLS and DI groups while the survey design was used to assess the students' level of self–esteem. While the MLS group was taught electrolysis based on mastery learning model, the DI group was taught the same topic using the conventional teaching method tagged direct instruction. Students' self-esteem assessment scale (r=0.79), Chemistry Achievement test i.e. CAT-2 (r=0.75) were used to generate data. Using t-test to test the stated hypotheses at p=0.05 significant level, results showed that mastery learning strategy increases students' self-esteem and academic achievement in secondary school chemistry. Mastery learning strategy was therefore recommended as an effective instructional strategy to be used by science teachers in the teaching of science subjects especially chemistry in our secondary schools.

Keywords: mastery learning, students' self-esteem, academic achievement, secondary school, chemistry

1. Introduction

The relevance of Science Education to a nation and her citizenry has long been established (Alebiosu and Ifamuyiwa, 2008; Okebukola, 2002; Fraser & Walberg, 1995) [15]. Chemistry is one of the three basic sciences taught at the senior secondary school (SSS) level. It is often regarded as the "QUEEN or MOTEHR OF THE SCIENCES" due to its relevance as a pre-requisite subject in the study of both pure and applied sciences courses at tertiary level of education. Anusiem (2000) described chemistry as knowledge which relates to everyday needs and is encountered in every field of science for solving human problems. Thus, apart from its requirement in the study of pure science and science-related courses, chemistry plays vital roles in solving human problems through the provision of human needs. Therefore, the relevance of chemistry in scientific and technological development of a nation and in the life of individuals cannot be underrated.

Nonetheless, the quantity and quality of science educators and technologists, doctors, pharmacists, agriculturists, engineers, chemists etc in a given nation serves as the pointer of the level of scientific and technological growth and advancement of that nation, and the availability of these manpower depend mostly on the quality of science education they received, as well as their academic attainment or achievement.

Students' academic achievement in science is one of the indices for measuring the quality of science teaching and learning. Poor students' academic achievement in chemistry has been reported (Betiku, 2002; WAEC Chief Examiner's Report, 2008; Ajewole, 2005; Ezeliora, 2004; Olatoye and Afuwape, 2004) [7, 30, 12]. Perhaps, this could be attributed to a number of factors not excluding the teacher related factors such as poor teacher preparation, incompetent teachers, and poor teaching methods (Usman & Memeh, 2007; Osuafor, 1999) that seems to be mostly implicated. Teaching methods often used in teaching science subjects especially chemistry are mostly teacher-centered. One of these strategies is direct Instruction (DI). It is regarded as the basic, conventional and mostly used teacher-centered teaching strategy that describes teaching as lecture and teacher-led demonstrations (Kinder, Kubina and Marchand-martella, 2005) [20]. Direct Instruction otherwise known as lecture or talk and chalk teaching method has been condemned for not considering learners individual differences in terms of learning rates. To Adeyemo and Babajide (2014) [2] direct Instruction does not contribute in learners achieving scientific and technological literacy nor gain of practical knowledge as it neither motivate nor promote students to actively participate in the learning process due to its teach er- centeredness. Hence this study is targeted at investigating the effects of mastery learning strategy (MLS) on chemistry students' self-esteem and academic achievement.

1.1 Objectives of the study

Precisely, the objectives of the study are

1. To compare the mean difference in students' perception of their self-esteem between the Mastery learning strategy (MLS) group and Direct instructions (DI) groups before and after treatment.
2. To ascertain the significant difference in chemistry achievement mean scores of students exposed to MLS and those exposed to DI before and after treatment.
3. To determine the significant difference in the chemistry achievement mean scores of students exposed to MLS and those exposed to DI with respect to self-esteem.

4. To compare the difference in mean academic achievement between high self-esteemed students and low self-esteemed students taught using MLS.

1.2 Null Hypotheses

1. The difference between Mastery learning strategy (MLS) and Direct instructions (DI) groups before and after treatment with respect to students' mean perception of self-esteem will not be significant.
2. There is no significant difference between the chemistry achievements mean score of chemistry students subjected to MLS and that of those subjected to DI before and after treatment.
3. There is no significant difference in the chemistry achievement mean scores of students exposed to MLS and those exposed to DI with respect to self esteem.
4. The difference in mean chemistry achievement score between high self-esteemed students and low self-esteemed students taught using MLS will not be significant.

2. Related Literature: A Review

2.1 An outline of the concept of mastery learning

The notion of mastery learning can be tracked down to early teachers like Comenius, Pestalozzi and Herbart (Bloom, 1974) [9] while its application became popular when Benjamin S. Bloom used the concept "Learning for Mastery" (Bloom, 1968) and Mastery Learning (Bloom, 1971) [9] to explain ways of providing students with instructional materials that would encourage them to learn at their own speed and receive constant corrective feedback on their level of mastery of the prescribed task.

Bloom was inspired by the work of Carrol (1963) who put forward a theoretical model of school learning that describes the degree of learning as a function of time spent or used up in learning divided by the time needed to learns. Carrol's model view students' aptitude rather than intelligence as the index for learning a given school subject, and he (Carrol) defines aptitude as the amount of time required by a student to learn (or master) the subject to a given level under optimal conditions. By Carrol's model of school learning, all students are able to achieve or learn a given set of objectives or task at a particular level if given the required amount of time, suggesting that the longer the time spent on learning a given topic, the higher the rate of learning that topic.

After series of investigations on the variation that existed in students' learning and achievement due to the mode of instruction, students' assessment and feedback information, Bloom discovered that the key to higher students' achievement is prompt feedback where the students' works were analyzed and corrected Bloom (1968). He then explained and transformed the theoretical model of Carrol to a practical and working model called "Learning for Mastery" (Bloom, 1968) later changed to "Mastery Learning" (Bloom, 1971) [9] for effective school learning. In the classroom situation, Bloom believes that the "time spent" and the "time needed" to learn are not influenced by the student's characteristics alone but also on the characteristics of instruction. To him, the time a student spent or used up in learning or accomplishing a task is a function of the students' perseverance, the opportunity to learn and the time needed to learn. As such Bloom (1976) sees the interaction between students' characteristics – students cognitive entry behaviour (i.e., pre-learning), students' affective or emotional entry behaviour (i.e., motivation); and the quality of teaching or instruction as the determinants of quality learning outcome; that also minimize the individual differences in students learning. To him clear lesson objectives, clue/scaffolding, students' participation, reinforcement and provision of regular feedback and remediation (corrective feedback information) are the essential variables for qualitative teaching or instruction needed to promote mastery learning. Accordingly, Bloom (1976:4) asserts that most students can attain a high level of learning capability if instruction is approached sensitively and systematically, if the students are given adequate assistance or helped when and where they have learning difficulties, if they are given ample time to learn and achieve mastery, and if there is a well-defined criterion of what constitute mastery. This view underlies the basic philosophy of mastery learning.

Adepoju (2002) defines mastery learning as an innovation which in its various form is designed towards making learners perform beautifully well on an academic task. Mastery Learning Strategy (MLS) can be regarded as a student-centered teaching strategy designed to increase students' learning and academic achievement by making the to acquire and master a predetermined learning task or unit of instruction before progressing to the next. It lay down the goal(s) to be achieve, and provides students with individualized instructions as well as different instruction time to attain the predetermined achievement goal. The strategy makes it easier for students to study a given material unit by unit until they master the material; and therefore, allows them to have the necessary prerequisite knowledge/skills as frame of reference to approach higher units of instruction.

2.2 Mastery learning and academic achievement

Results of several research conducted on MLS revealed that MLS is an important instructional approach for promoting students' academic achievement in school subjects (Iserameiya and Ibeneme, 2018; Mitee and Obaitan, 2015; Adeyemo and Babajide, 2014 [2]; Damavandi and Kashani, 2010; Wambugu and Changieywo, 2008; Adeyemi, 2007; Kazu, Kazu and Ozdemir, 2005) [19, 2, 29]. In a study on the effect of mastery learning strategy on the academic achievement of students in Edo State, Iserameiya and Ibeneme (2018) [19] used 119 (comprising 66 male and 53 female) Junior Secondary School Two students from two selected schools in Edo Central and found that students taught Basic technology through Mastery learning strategy differ significantly as they perform better in their post basic technology achievement test in contrast to those taught through the direct instruction method.

Mitee and Obaitan (2015) [24] studied how mastery learning affects secondary school students' cognitive learning outcome in quantitative aspect of secondary chemistry and stated that mastery learning is a better and an effective teaching method when compared to the conventional teaching method. Damavandi and Kashani (2010) found out from their study on mastery learning method and its effects on performance and attitude of weak students in chemistry that weak students taught using the mastery method had higher chemistry performance than those who were subjected to common learning method. Hutcheson (2015) [18] study to validate the effect of mastery learning approach on student motivation among middle level science revealed that students taught via mastery learning approach had an overall increase

in their motivation and academic achievement.

Adeyemo and Babajide (2014) [2] carried out an experimental study to determine the effect of mastery learning approach on Students' Achievement in Physics and resolved that mastery learning approach was better than traditional teaching approach as students taught through mastery learning approach perform better than those taught through traditional learning approach. In a similar study on secondary school students' physics achievement, Wambugu and Changieywo (2008) [28] reported that mastery learning approach as a teaching method leads students to higher achievement than the regular teaching method. Kazu, Kazu and Ozdmir (2005) investigated the effects of mastery learning model on the success of the students who attended "Usage of Basic Information Technologies' course and found out that the difference in achievement between the experimental group and control group was significant in favour of the experimental group; and thus they concluded that mastery learning model affected the success and achievement of the students positively in usage of Basic Information Technology Class. Also, Adeyemi (2007) [1] study on 200 level Social Studies Students; one in Osun State College of Education and the other in University of Uyo to determine the effectiveness of mastery learning approach on students' performance in Social Studies showed that students in the mastery learning approach (the experimental) group perform better than those in the conventional teaching approach (i.e., the control) group.

2.3 Self-Esteem and academic achievement

Malbi and Reasoner (2000) [21] define self-esteem as the overall evaluation of one's self in either positive or negative way. It is a person's global judgment of self competency and self worth. By this, academic self esteem can be regarded as one's total evaluation of his academic competency, abilities, skills and general school work/activities.

Self-esteem reveals one's self-evaluation based on the amount of discrepancies existing between what he/she desired and what that individual believed he/she had achieved. This comparison seems to be very special and important during adolescence because of the psychological, social, physiological, and other challenges/changes associated with adolescents. Sirin and Rogers-Sirin (2004) [27] therefore admit the development of self-esteem as one of the most important developmental process of adolescence.

Many educators see self-esteem as that psychological variable that can help individuals to view themselves as active, competent skillful and capable persons to promote changes through effort investment, and higher goals setting which can cause the learning of new things possible. Thus, they have faith that a student who possesses high academic self-esteem can equally experience high academic achievement, because such a student with high self-esteem will always be encouraged to work harder, put in more effort, endure longer at task, and therefore perform highly than those with low self-esteem. Several research have shown some relationship between academic self-esteem and students' academic achievement (Feroz, 2018; Aryana, 2010; Pullmann and Allik, 2008; Marsh and O'Mara, 2008; Faithi-Ashtiani, Ejei, Khodapanahi and Jark-horani, 2007; Trautwein, Ludtke, Koller and Baumert, 2006) [14, 5, 26, 22, 28].

In one of the studies relating self-esteem with academic achievement, Feroz (2018) [14] found a significant positive correlation ($r=0.551$, $p<0.02$) amid cumulative Grade Point Averages (CGPAs) and self-esteem scores of undergraduate students. In the study, Feroz used random sampling technique to select a total sample of 600 undergraduate students (360 male and 240 female) from different departments at the University of Swat on the basis that the sample have spent at least four semesters at the university. The students responded to Rosenberg Self-esteem Scale (RSES) used to assess the intensity of their self-esteem. Scores generated from the students' response to RSES scale was correlated with the students' CGPAs from their previous semesters using the Pearson Correlation Coefficient test. From the results Feroz also discovered that high self-esteemed students had high academic outcome. In a related study, Aryana (2010) [5] observed a strong relationship between self esteem and academic success in pre-university students (both girls and boys) in Iran, while Pullmann and Allik (2008) [26] reported that academic self esteem is a strong and an accurate determinant or predictor of learning and academic performance. Their findings also showed low general self-esteem as a significant predictor of superior academic performance at school.

Faithi-Ashtiani *et al*, (2007) documented that academic achievement of students with low self-esteem is perceptibly less than the average of those with high self esteem; showing that low self-esteem affects educational function/works and decline academic achievement. Similarly, a significant relationship was found between self-esteem, academic achievement and academic performance (Hall, 2007) [17]. Hall conducted the study on students in their Junior year at Public high school in Florida, and using the individual student's previous school year scores from the Florida Comprehensive Assessment Test as a measure of students' performance, Cumulative Grade Point Average (CGPA) as a measure of academic achievement and the Piers-Harris self-concept scale to measure the level of students' self-esteem, he reported the existence of relationship among the variables. Also, Trautwin *et al*, (2006) demonstrated that reciprocal effects exist between self esteem, self concept and academic achievement. But Marsh and O'Mara (2008) [22] found out that self-esteem had a small but positive consequence on a later educational achievement.

In an early and yet well reported study by Bacham and O'Malley (1977) [6] no causal influence between self esteem and academic performance was established. Likewise, Maruyana, Rubin and Kingsbury (1981) [23] found the existence of correlation between self-esteem and academic achievement but found no causal relationship between the variables; rather they concluded that ability and social class are the determining causal factors that affect the level of both self-esteem and academic achievement. But to Skaalvik and Hagtvet (1990), high self-esteem is not a panacea for high academic achievement because they found out from their study that having high esteem did not lead one to high academic (or school) performance, rather students' performance in previous year lead to a higher self esteem in the succeeding years. Consequently, they explain that doing well in school work makes one to think of himself as good at academic work which in turn boost the person's self-esteem. Although, MLS was reported to be stressful and could diminish individual self esteem (Frick, Frick Coftman and Dey, 2011) [16], students' self- esteem is believed to be high if they (the students) perceived themselves as competent in certain areas that they believe to be important. Thus, it is believed that this study will help teachers to enhance their

students' self-esteem and learning outcome.

3. Research Method

3.1 Research Design

This study used a mixed research design involving survey design and quasi-experimental (i.e. pretest-posttest control groups) design. The survey design was used to assess the participants' level of self-esteem while the pretest-posttest control design involved the administration of the same pretest and posttest to two different groups-the experimental and control groups.

3.2 Population/sample and sampling technique

The target population for this study was all the SS 2 Chemistry students in co-educational public senior secondary schools in Obio/Akpor Local Government Area, Rivers State. A sample of 100 SS2 Chemistry students participated in the study. This sample was obtained from two purposively chosen co-educational schools (i.e., 50 from each school). In each of the selected schools students were randomly apportioned into experimental and control groups.

3.3 Instruments for data collection

Three instruments were used to generate data for this study. They are Students' Self Esteem Assessment Scale (SSEAS), Chemistry Achievement Test 1 (i.e., CAT-1) and Chemistry Achievement Test 2 (i.e., CAT-2).

Students' Self Esteem Assessment Scale, (SSEAS) is a modified version of self esteem scale developed by Rosenberg (1965). It consists of 25 items. Through Cronbach alpha technique, SSEAS has a reliability index of 0.79. Items in the SSEAS were answered on a four-point Likert scale. SSEAS was validated by two experts in educational psychology. SSEAS measured the students' level of self-esteem and data obtained from it were used in categorizing students into high and low self esteem.

CAT-1 was used as a pretest (to measure the students' cognitive entry behaviour) and CAT-2 used as posttest. CAT-1 consist of 50 items multiple choice objective test on secondary school chemistry topics that the participants have already covered based on the scheme of works while CAT-2 consist of 50 items multiple choice objective test on the topic taught (i.e., Electrolysis). Items in both CAT-1 and CAT-2 were adopted from past chemistry questions of Senior Secondary School Examination (SSCE). Through test-retest on an equivalent but non-participating schools, and applying Pearson Product Moment Correlation, the reliability Coefficient of CAT-1 (r = 0.81) and CAT-2 (r = 0.75) were established.

3.4 Research Procedure

Before the commencement of the treatment, SSEAS and CAT-1 were administered to both the experimental and control groups. SSEAS measured the students' level of self-esteem and data obtained from it were used in categorizing students into high and low self-esteem while CAT-1 was used to ascertain their homogeneity. While the control group was taught the topic- electrolysis as it appears in the scheme of work using the conventional teaching method, here referred to as direct instruction (DI), the experimental group was taught the same topic using mastery learning strategy (MLS). However, in this group, the topic (Electrolysis) was divided into units and arranged in a hierarchical order of instructional objectives. Subsequently each of the units was taught based on the mastery learning model. For each unit, both criterion-referenced test and a performance criterion test were designed and applied. At the beginning of each unit the students were pretested to determine their cognitive entry behaviour (pre-knowledge). Students who lack (or do not have) the required cognitive entry behaviour were given remedial treatment (through extra instructions, extra time, peer tutoring etc) before starting to learn the unit and at the end of the unit, they were given performance test to determine if they had mastered the unit or achieved success in it. Those who had attained mastery were enriched with similar problem while those who do not were given remedial treatment and corrective feedback and tested again to be sure that they have mastered the unit before going to the next unit. This process continues throughout the units. Students' participation in the learning was encouraged through cueing/scaffolding, question and answer method. At the end of the topic, CAT-2 was administered to the two groups while SSEAS was again administered (but now) only to the experimental group to ascertain if there is any influence of MLS on self-esteem of students in this group.

4. Results/Findings

Table 1: T-test Analysis of difference in self-esteem mean scores between students in the Mastery Learning Strategy (MLS) and Direct Instruction (DI) before and after treatment

Students' Self-Esteem	Teaching Strategies	N	Mean Score ($\bar{X}$)	SD	Df	t_{-cal}	t_{crit}	Sig. (2-tailed)	Decision at P=. 05
Before Treatment	MLS	50	53.16	10.487	98	1.126	1.99	0.263	Not significant
	DI	50	56.26	16.398					
After Treatment	MLS	50	60.04	12.588	98	2.690	1.99	0.008	Significant
	DI	50	51.60	18.266					

Data presented in table 1 showed that before treatment, the mean self-esteem score ($\bar{X}$ =53.16) of students in the MLS group is less than that ($\bar{X}$ =56.26) of the students in the DI group, and a t-test analysis of the mean difference revealed a non-significant difference since t_{-cal} (1.126) at $p > 0.05$ is less than $t_{critical}$ (1.99) at $p = 0.05$. Table 1 also show that after treatment, the mean self-esteem score ($\overline{X}$ =60.04) of Students in the MLS group is greater than the mean self-esteem score ($\overline{X}$ =51.60) of students in the DI group. A t-test analysis of this mean difference revealed a significant difference since t_{-cal} (2.690) at $p < 0.05$ is greater than t critical (1.99) at $p = 0.05$. Thus, after treatment HO_1 was rejected, indicating a significant increase in self-esteem in favour of students in the MLS group.

Table 2: A t-test Analysis of difference in mean chemistry achievement score between students taught using Mastery Learning Strategy (MLS) and those taught using Direct Instruction (DI) before and after treatment.

Students' Self-esteem	Teaching Strategies	N	Mean Score ($\overline{X}$)	SD	Df	t_{cal}	t_{crit}	Sig. (2-tailed)	Decision at P =0.05
Before Treatment	MLS	50	43.40	7.82	98	0.28	1.99	0.421	Not significant
	DI	50	42.96	8.10					
After Treatment	MLS	50	61.22	9.89	98	6.77	1.99	0.003	Significant
	DI	50	48.64	8.66					

A glance at table 2 shows that before treatment, chemistry mean achievement scores of students in the MLS group and DI group do not differ significantly because t_{cal} (0.28) at $p>0.05$ is lesser than $t_{critical}$ (1.99) at p=0.05 and df = 98. However, after treatment there was a significant difference in the mean scores between the two groups since t_{cal} (6.77) at $p<0.05$ is greater than $t_{critical}$ (1.99) at p=0.05 and df of 98. Hence HO_2 is rejected with respect to post test. This indicates that after receiving treatments, students in the MLS group achieve significantly higher in chemistry than those in the DI group.

Table 3: t-test Analysis of difference in the post test mean scores between students taught using Mastery Learning Strategy (MLS) and those taught using Direct Instruction (DI) with respect to their level of self-esteem.

Teaching Strategies	Students' Self Esteem	N	Mean Score ($\overline{X}$)	SD	Df	t_{cal}	t_{critl}	Sig. (2-tailed)	Decision at P= 0.05
MLS	High	21	59.10	10.05	43	3.88	2.02	0.007	Significant
DI	High	24	48.50	7.96					
MLS	Low	29	56.97	8.70	53	4.65	2.01	0.001	Significant
DI	Low	26	45.80	9.06					

Table 3 shows that high self-esteemed students taught using MLS had higher mean score ($\overline{X}$ =59.10) in the post test than their colleagues taught using DI ($\overline{X}$ =48.50). A t-test analysis of difference in the mean scores revealed a significant difference to the benefit of those taught using MLS since t_{cal} (3.88) at $p<0.05$ is greater than $t_{critical}$ (2.02) at p=.05. Thus, HO_3 is rejected. The table also showed a significant difference in mean scores in favour of low self- esteemed students taught using MLS because t_{cal} (4.65) $p<0.05$ is greater than $t_{critical}$ (2.01) at p=0.05.

Table 4: A t-test Analysis of differences in the post test mean scores between high and low self esteemed students taught using Mastery Learning Strategy (MLS).

Students' Self Esteem	N	Mean Score ($\overline{X}$)	SD	Df	t_{cal}	t_{crit}	Sig.(2-tailed)	Decision at P=0.05
High	21	59.10	10.05	48	0.78	2.01	0.19	Not Significant
Low	29	56.97	8.70					

Table 4 revealed a non-significant difference in the mean scores between high self-esteemed and low self-esteemed students exposed to instructions through MLS since t_{cal} (0.78) at $p>0.05$ is less than $t_{crit.}$ (2.01) at p=.05. Hence HO_4 which predicted no significant difference was retained. This means that, despite the high mean score of high self-esteemed students they do not achieve higher than their low self-esteemed counterparts.

5. Discussions, Conclusion and Recommendations

5.1 Discussions

This study made four predictions. One of the predictions as stated in null hypothesis one (HO_1) was tested and findings revealed that prior to treatment the mean self-esteem score of students in the MLS group was not significantly different from that of the students in the DI group. However after treatment a significant difference in mean self-esteem scores of students was observed between the two groups in favour of the group exposed to MLS (see table 1). This finding indicates the effectiveness of MLS over DI in enhancing students' self-esteem, and thus lends support to other studies (Goreyshi, Kargar, Noohi and Ajilchi, 2013) that reported the effectiveness of instructional strategies in raising students' self-esteem. In another assumption stated as HO_2, it was tested and found that a statistically significant difference exist after treatment in favour of MLS (see tables 2) indicating that students in the MLS (i.e., experimental) group achieved significantly better in the CAT-2 than those in the DI (i.e. control) group thus supports the positions of Iserameiya and Ibeneme (2018) [19] and Adeyemo and Babajide (2014) [2] who respectively found MLS more than the conventional teaching strategy to be effective in teaching and enhancing students' achievement in Basic technology and physics. It also supports the early findings of Wambugu and Changieywo (2008) [28] and Adeyemi (2007) [1].

Again, the assumption stated as HO_3, we found a significant difference in academic achievement between high self-esteemed students in the MLS group and those in the DI group. A similar result was observed between the two groups for those with low self-esteem. In each of these, the significant difference was in favour of those who received instructions following the MLS (see tables 3). Nevertheless, the comparison of the mean scores of both high and low self-esteemed students exposed to MLS as stated in HO_4 revealed no significant difference irrespective of the high mean achievement score of high self-esteemed students over those with low self-esteem (see table 4). This discovery revealed an improvement in the chemistry achievement of low self-esteemed students exposed to MLS which is in consonant with the position of Goreyshi, Kargar, Noohi and Ajilchi (2013) that students' self-esteem and academic achievement among others can be enhanced through effective instructional strategies.

The effectiveness of MLS over DI in improving students' self-esteem probably made the students to gain the self-confidence and encouragement to participate well in the

learning of chemistry, and consequently improve in their academic achievement with respect to CAT-2, contrary to Frick, Frick, Coftman and Dey (2011) [16] that reported MLS to be stressful and could diminish individual self esteem. This is so, because when people evaluate and rate themselves positively and like what they see, they usually tend to have high self-esteem. Following the student's self reported self-esteem after treatment, students (especially the academically weak ones and the low self-esteemed ones) who received the chemistry instruction through MLS had increased positive perception of themselves, improved self-esteem and academic competency in relation to the learning of chemistry.

5.2 Implications of the study

This study validates the positive effects of Mastery learning strategy on self-esteem and academic achievement of students, and for that reason it has vital educational implications. One of which is that chemistry teachers will appreciate the fact that students can develop positive self-esteem as well as increase their academic achievement in chemistry, and that one of the possible ways of achieving this is through the use of Mastery learning strategy in the teaching of chemistry topics. In addition, secondary school students will be motivated and propelled to develop positive interest and self-confidence, and engage actively in the learning of secondary school chemistry (a preconditioned science subject for the learning of pure and applied science courses at the tertiary level of education) if mastery learning strategy is used in teaching them.

5.3 Conclusion and Recommendation

In all these findings, Mastery Learning Strategy was revealed to be a potent and effective instructional strategy that can offer students the opportunities to enhance their self-confidence and readiness to participate in the learning of chemistry and achieve academic success in it, thus, confirming the report of Demavadi and Shekari, (2010) [11]. This is because, in MLS all students are provided with suitable opportunities, enough time etc to engage in learning, self-assessment of previous knowledge and mastering of all the educational goals.

Mastery Learning Strategy, having the status of an effective instructional strategy was therefore, recommended to be used by science teachers in the teaching of science subjects most especially chemistry.

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