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Effect Of Multiple Intelligence Teaching Strategies On Students Achievement and Retention In Chemistry.

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----------ABSTRACT----------
This quasi-experimental research work was carried out to investigate the efficacy of multiple intelligence teaching strategies (MITS) in enhancing chemistry students' achievement. This method was compared with the normal conventional teaching method. Two co-educational secondary schools were selected from urban area of Onitsha educational zone for this study. Chemistry students from one of the two schools were taught chemistry using multiple-intelligence teaching strategy (MITS) who served as the experimental group while the other students from school received instructions through conventional method and served as the control group. The sample size was eight-eight (88) SSII chemistry students who received instructions from selected topics from SS II chemistry syllabus. After the treatment, students who have been pre-tested were posted-tested and this posting testing was repeated after four weeks to monitor knowledge retention. Using teacher made achievement tests the data obtained were subjected to analysis using means, SD, and analysis of ANICOVA at 0.05 significant level. Based on the result finding, discussions, implications, suggestion and recommendation were made.

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I. INTRODUCTION

Science education has been used as a veritable instrument for social change to being about socio-economic development and empowerment all over the world. The application of science education to real life problems is the most powerful instrument for enabling society to face global challenges and innovations in education (Animalu 2000). This is why Eze (2010) maintained that science education is at the centre of empowerment of students toward self-reliant and industrial skills that are needed for survival especially in this era of global economic crisis.

It has been discovered through researches, that the science of chemistry is the pivot upon which all other sciences and technology are attached (Jantur,2005). The power of chemistry is what creates as a whole an enabling infrastructure that delivers food, medicine and materials (Ezehora 2009).This is why chemistry is often called "the central science" because it connects the other natural sciences such as astronomy, Geology, Physics and Biology. What on earth is not chemistry? Chemistry is life, chemistry rules the world and therefore referred to by Ibole (2000) as the oracle of modern science chemistry is concerned with finding out about the materials around us and turning then to our needs.

It is in realization of the powers of science education and chemistry in particular as one of bed rock of sustainable development in any nation that educators and researching are highly challenged to discover more authentic pedagogical methods that will enhance teaching and learning generally and chemistry in particular there is therefore serious search for pedagogical methods that will adequately develop students' over all potential, assess and report students' achievement more appropriately. There are many active learning strategies that could be used or have been used in the chemistry classroom that are student-centered like experimentation, demonstration, discovery, concept-mapping and soon. Apart from these, greater percentages of chemistry students still show sign of low skill acquisition, low chemistry concepts understanding. This is a clear indication that there are latent-potentials in students which these methods some times are not able to develop (Duru and Okereke, 2010).Chemistry being one of the major complex science subjects needed to be taught by more competent teachers using a more powerful strategy that will touch all students' potentials thorough engagement in holistic tasks. It is on this premise that the researchers has pinpointed multiple intelligence teaching strategy (MITS) which is in sharp contrast to the traditional approach of understanding and expressing ones

intelligence. Multiple Intelligence teaching strategy (MITS) is a new trajectory against the long lived conventional methods of teaching and judging student's intelligence based on ability to solve problems, Uhuze logic and think critically. It is an old way of lumping ones intelligence together under one label of raw intelligence (Duru and Okekeke 2010).Kagan (2008) posited that student should be taught based on their ability and ways of learning. Active and involved teaching is a step towards students' academic success. Multiple intelligence teaching strategy recognizes that each student possesses these intelligences, but they are not always developed well or effectively. This technique asks the question, in what ways are students smart, rather than, are they smart. Teachers can activate the less-pronounced intelligences in students by carefully diversifying the strategies. Child centered teaching, open- ended projects, cross-curricular activities, independent study, learning centre activities, multi model work, group projects, discovery learning are some of the techniques that embrace Gardner's theory of multiple intelligence teaching.

II. PROBLEM OF THE STUDY

In spite of efforts through research into the strategies to improve performance of students in chemistry, the teaching and learning of chemistry have continually receive criticism from the society as a result of students' poor achievement in external examinations (Chief examiners WAEC Report 2005). This weakness in students' achievement was attributed to students' weakness in comprehending some chemistry concepts, representing concepts in tables, graphs, diagrams and a manipulation of equipment and materials. There is therefore a compelling need to try a new approach in chemistry teaching that will improve the performance profile of students at all levels as well as promoting cognitive acceleration that will guarantee productivity and face global challenges. This study is programmed to determine the efficacy of Multiple Intelligence Teaching Strategy in Enhancing Students' Achievement and Knowledge Retention in Chemistry as compared with conventional approach.

2.1.PURPOSE OF THE STUDY

1. To compare the strengths of multiple intelligence teaching strategy and conventional approach in enhancing students achievement in chemistry.
2. To compare the strengths of the above two methods of approaches in enhancing knowledge retention ability of students in chemistry concepts.

2.2.HYPOTHESES

The following hypotheses were stated to guide the study.

1. There will be no significant difference in the means scores of students taught chemistry using multiple intelligence teaching strategy and those taught using conventional approach.
2. There will be significant difference in the mean scores on knowledge retention ability of students taught chemistry using the above two method. (MITS and CM).

III. METHODOLOGY

Design - The design for this study was a pre-test-post-test quasi experimental and control group design. The groups were exposed to different treatment conditions.

3.1.POPULATION/SAMPLE

The population was all SS II chemistry students. Out of about 18 government owed secondary schools in Onitsha North Local Government Area of Anambra State, only two schools were purposively selected for the study. The selected schools were all mixed type (boys and girls). The schools were random assigned to treatment conditions. The schools which receives instruction using Multiple Intelligence Teaching Strategy (MITS) served as Experimental group, while the other school that receives instructions through conventional method (CM) served as the control group.

Table I - Distribution of subjects by treatment group

	MITS	CM
School Mixed typed	Experimental group (E) 47 40	Control group (C) 41 42

3.2.INSTRUMENTATION

The teacher- made tests from selected topics in SS II chemistry Syllabus were made and used as the main instrument for this study. The tests were I, II, and III. Test I was a 40 item multiple choice test of four options, two essay questions and two practical exercises that will involve (a) Setting up of equipment (b) manipulation of equipment (c) Observation of process (d) Measurements to obtain data (e) plotting of graphs and calculations. The test I was used as for a pretest to ensure equivalency of the groups. Test II was a rearranged version of test I which serves as an immediate post-test to measure achievement. Test III was a further rearranged version of test I after four weeks which was used to monitor knowledge retention ability (retention test). These tests were made to cover the three domains of bloom's objectives.

IV. VALIDATION OF INSTRUMENT

The researcher made sure that the tests was content validated by expected colleagues in the field. After a pilot study, the test scores obtained were used to characterize the instrument using split –half, odd-even plot reliability technique and person's product moment correlation formula. Its reliability coefficient was fixed at 0.84.

4.1.PROCEDURE PRE-TEST SESSION

Before the commencement of the main treatment, pre-test was administered to both experiment and control group to ascertain the group equivalency.

4.2.TREATMENT SESSION

The experimental group students received instructions utilizing their multiple intelligence. This is done by engaging students in groups in activities such as use of concept maps to classify, categories and connect abstract relationship between concepts eg concept of electrolytes and non-electrolytes; separation of components of mixtures; determination of solubility of salts; preparation of gases eg CI_2 and NH_3; drawing of periodic chart as project. While the control group students are taught the same topics through teacher centre or teacher-directed lessons, on the over head, notes on the board, practice problems from the text book and teacher-demonstrated experiments. The whole exercise lasted for total of eight weeks of two lessons a week to give a sum of sixteen lessons on the whole. Finally, all the groups were given the post- test to measure achievements. After four weeks, test III was administered to both groups to measure knowledge retention. The teachings of the two groups were done by the two researchers who presented themselves as subordinate teachers to the selected schools. These are to ensure non-jeopardization of the results

4.3. DATA ANALYSIS

The scores obtained from post-tests were processed using ANCOVA as the main statistical tool at 0.05 level of significant.

4.4 .RESULTS PRESENTATION

Hypothesis I The will be no significant difference in the means score of students taught chemistry using multiple intelligence teaching strategy and those taught using conventional approach.

Table 2 Presentation of means scores and standard deviation of both experimental and control groups on pre-test, and knowledge retention test. N = 88

Types of Test	Experiment (e) Male & Female	Control C Male & Female
Mean pre-test score	7.81	8.14
S.D	1.27	2.07
Mean post-test score	54.39	42.04
S.D	2.19	3.01
Mean post-test score of knowledge retention test	49.81	31.74
S.D	3.17	3.28

Table 2 above indicates that experimental group performed better than the control group as shown by the values of means and standard deviations but one cannot say whether these differences observed is significant or not

Table 3 A summary of Analysis of covariance, examining the effect of methods on achievement using pre-test scores as a Co-varnate
ANCOVA Summary of Post-test Scores of (E & C).

	Between	Within	Total
Sum of squares Y	2.13.38 243.17	2004.69 211930	2362.47
Sum of squares X	53.11 23.34	1079.47 = 1703.19	1726.53
Sum of Products	14.28 12.19	894.60 = 909.54	921.73
Degree of Freedom	2 -1 =1 K – 1 = 1	82-2 =80 N- K = 86	81 87
Adjusted sum of squares Y	22.10	296.59	
Degree of freedom adjusted Sum of squares varance estimate	1 24.10	82 – 3 N – K – 1 = 79 5.02	1 + 79 =80 86

$F = \frac{24.10}{5.02}$
F Calculated = 4.81
F Critical = 3. 07
Key Y = post-test scores
X = pretest scores
K = No of groups involved
N = No of subject involved.
Table 3 above showed that, the experimental group performed significantly better then the control group size the observed F value is greater than the table value. Teaching chemistry using MITS makes for better achievement.
Hypothesis II:- There will be significant difference in the mean scores on knowledge retention ability of students taught chemistry using the above two method. (MITS and CM)

Table 4 Summary of Analysis of covariance of the post test of (E & C) on knowledge retention

	Between	Within	Total
Sum of squares Y	109 .10	398.91	508.01
Sum of squares X	16 . 17	209.31	225.48
Sum of products	- 11. 10	209.90	220.00
Degree of freedom	K – 1 = 1	N – K = 86	87
Adjusted sum of squares Y	18. 88	284 .10	
Degree of freedom for adjusted sum of squares	1	N- K – 1 = 85	86
Variance estimates	18 .80	4 .03	

$F = \frac{18.88}{4.03} = 4.72$

F Calculated 4 . 72

F Critical 3. 07

From the table above one may conclude that MITS makes for knowledge retention in students since
F calculated > F critical

V. DISCUSSION

The results show that the experimental group performed significantly better than the control group as indicated by the values of the F – critical and calculated. The results also indicated that the multiple Intelligence teaching strategy has more power in aiding students retained the knowledge they have gained. This enhance performance of the experimental group was as a result of the completely engagement of students in a holistic tests in class from the beginning to the end of the lesson. Hence, Okebukola 2002) maintained that human beings have multiple intelligence which can be natured and strengthened to enhance performance. This means that the use of lecture or conventional method does not allow teachers of science to place equal attention on individuals. This was well with Gardners' idea that children develop and learn differently and maintained that the strategies employed in teaching should reflect the changing view point otherwise many children who have gifts in other intelligences that do not receive much reinforcement in the class will end up being labeled learning disabled. Gardner who developed theory about multiple intelligence strategy based on multiple skills and abilities presumed positive correlation between the use of multiple – intelligence strategies and the increase in academic achievement. His idea was in consonance with the research studies carried by Armstrong (1994), Santrock (2004), Campbell and Dickson (1998) who reported progress in using multiple – intelligences to develop students' potentials and judge their intelligences.

VI. CONCLUSION

It was noted that MITS is a good and powerful method of developing students' potentials and judging students' intelligence using variety of ways. If properly used to teach students, it could enhance Students achievements. Implication of the finding as stems from Gardner's theory of Multiple Intelligence include:-Many kinds of abilities exist in the learners. Teachers have the challenge to enrich their learners lives by identifying, developing and celeb rating the diverse attributes of each learner. Teachers have the challenge to enhance future intellectual capabilities of the learners no matter what a child's present capabilities area.

VII. RECOMMENDATIONS

Based on the findings and implications. Teachers should be trained through workshops, seminars and conference on how to integrate and use MITS in teaching science especially chemistry in order to enable students learn in a variety of ways. Policy makers and curriculum designers should incorporate the use of MITS in producing curriculum materials. Students should be encouraged by parents at home and teachers in School to embrace MITS learning in order to develop their potentials.

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