

**COMPARATIVE STUDY OF EFFECTS OF LEARNING ACTIVITY PACKAGE  
INSTRUCTIONAL STRATEGY (LAPIS) AND LECTURE METHOD ON  
STUDENTS' ACADEMIC ACHIEVEMENT IN  
SENIOR SECONDARY SCHOOL CHEMISTRY**

**BY**

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***Abstract***

*The study compared the effects of Learning Activity Package Instructional Strategy (LAPIS) and Lecture method on students' academic achievement in senior secondary school chemistry. Two (2) research questions and three (3) research hypotheses guided the study. The study employed quasi-experimental design. The sample comprised 235 SS2 Chemistry students, from secondary schools in Afikpo Education zone of Ebonyi State, Nigeria. The experimental groups were exposed to LAPIS while the control groups were exposed to Lecture method. Data was collected using Chemistry Achievement Test on Water (CATOW) which was validated by three experts and reliability indices of 0.82 and 0.94 were obtained using Kuder Richardson's (K-R 20) and Pearson's Product moment correlation respectively. The research questions were answered using mean with standard deviation while the null hypotheses were tested at 5% level of significance, using analysis of covariance (ANCOVA). The findings revealed that the LAPIS was more effective in enhancing students' achievement in chemistry than the Lecture method. Also, there was no significant difference in male and female students' achievement in chemistry. Based on the findings, the researcher recommends, among others, that chemistry teachers should teach chemistry with LAPIS to encourage active engagement and self-motivation among learners for enhanced academic achievement.*

***Key words:*** achievement, chemistry, gender, instructional strategy, learning activity package

## Introduction

Chemistry has been identified as one of the very important science subjects and its importance in scientific and technological development of any nation cannot be overemphasized. Chemistry prepares professionals such as medical doctors, pharmacists, chemistry teachers, chemical engineers, biological engineers, etc. Chemistry is also very useful for living in the society. The knowledge of chemistry enables one to directly or indirectly choose the texture and colour of clothes to wear, the food to eat (the acidic and basic properties of such food), the water to drink, the fertilizer and herbicides to apply, etc. Chemistry therefore equips the individual with necessary knowledge, skills and attitudes which enables him to interact meaningfully with the environment, and solve life problems in the society. It plays important roles in peoples' daily and national lives as well as in the industries. Many of our day-to-day activities revolve around chemistry. Chemistry is everywhere; it is life; and can be described as the oracle and crown prince of modern science (Oloyede, 2010).

It is sad to note that despite the key role chemistry plays as one of the science subjects that forms the basic foundation for many disciplines and in improving the quality of life, the performance of Nigerian secondary school students in the subject has for many years remained a matter of serious concern. It has consistently been below expectation and unimpressive (Jegede, 2010; Oloyede, 2010). Research has proven further that students' achievement in chemistry at the secondary school level in Nigeria has been abysmally poor, with little or no appreciable improvement over the years (Okonkwo, 2010; Omoregbe and Ewansiba, 2013). Efforts made through research to discover the causes of the persistent poor achievement, revealed among others, the

use of inappropriate/ineffective teaching methods as one of the major factors. Research has also shown that the secondary school chemistry teachers mainly adopt the lecture method in the teaching and learning of chemistry (Udoh, 2008). According to Aniodoh (2001) lecture is a didactic teaching approach in which the teacher supplies information while the students merely listen. He further added that Lecture is one of the oldest and most widely used methods of teaching. It is also a traditional method of teaching, which is often described as a chalk-and-talk method which has been found to be less effective in enhancing students' achievement in chemistry. Moreover, Olayiwola (2004) was of the view that the use of only lecture method in teaching chemistry without combining it with other methods might not be suitable for effective learning by the students. The argument being that telling is not learning. He opined that lecture method makes the learner a passive recipient of information, adding that there is no learner-teacher interaction during lecture. Furthermore, Abdulahi (2007) observed that most teachers emphasise theory rather than practical aspects of chemistry and most of them lack adequate knowledge of the subject matter and the required competencies to deliver the lesson. Abdulahi further stressed that the teaching of chemistry has been reduced to descriptive exercises through the use of lecture method and that the teaching and learning of chemistry do not require theoretical and lecture approaches, but approaches such as the Learning Activity Package Instructional Strategy that will enable the students to participate actively in the teaching and learning process.

Moreover, the search for teaching methods capable of ensuring students' understanding and appreciation of science concepts is largely influenced by the fact that conventional (Lecture) teaching

method has failed to enable students achieve the objectives of chemistry (Offor, 2011). Presently, there is a shift of emphasis from the traditional, less effective teaching strategies to innovative ones which are predominantly student-centred and activity oriented, such as the Learning Activity Package Instructional Strategy (LAPIS).

According to Cardarelli (1972) in Neboh (2012) Learning Activity Package Instructional Strategy (LAPIS) is a student-centred and activity oriented teaching strategy where the teacher acts as a facilitator of learning, guiding the students through series of activities and problems. In LAPIS, learning materials are broken into small steps that are arranged sequentially from known to unknown and in an increasing order of difficulty. LAPIS is an individualised method of teaching. Individualised instructions can be approached in many ways such as; programmed instruction, computer assisted instruction, independent study, among others. Some of these individualised methods of instruction have been investigated and found to be effective in enhancing achievement but their applications are hindered in one way or the other in Nigerian schools. For instance, Computer Assisted Instructions (CAI) has so much been advocated and has been established by research findings to be good for individualised instructions but the use in Nigerian schools has been hindered by non-availability of computer systems in most public and private schools. This is why the researcher advocates a trial of another individualised method of instruction which can be readily available and affordable. This calls for the trial of the Learning Activity Package Instructional Strategy. Moreso, since lecture is commonly used in teaching chemistry and it makes learners mere passive recipients of information, there is need to ascertain

the efficacy of LAPIS which is learner-centred and gives students the opportunity to participate in the teaching and learning process.

In considering the efficacy of Learning Activity Package Instructional Strategy, gender was considered as a variable. Meanwhile, the influence of gender on students' academic achievement has for a long time been of concern to many researchers but no consistent result has been established. Bosede (2010) asserts that students' gender influences their academic achievement in some subject areas. But, Udousoro (2003) found no significant difference in the academic achievement of male and female students in chemistry. However, Okereke and Onwukwe (2011) found that male students' academic achievement was higher than their female counterparts in chemistry. Conversely, Lawal (2009) found that female students achieved significantly higher than their male counterparts and there was significant difference in the male and female students' abilities to solve quantitative problems in chemistry. It can be deduced from the foregoing that the issue of gender in chemistry achievement has not yet been resolved. Hence the need for this present study is justified.

#### Purpose of the Study

The main purpose of this study was to determine the effectiveness of Learning Activity Package Instructional Strategy (LAPIS) in enhancing students' academic achievement in Chemistry. Specifically, this study;

1. determined the effectiveness of LAPIS and Lecture method (Control) in enhancing students' achievement in chemistry;
2. ascertained the influence of gender on students' achievement in chemistry when taught with LAPIS and Lecture method.

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number of test items.

**Method of Data Analysis:** Mean with standard deviation (X with SD) was used to analyse data derived to answer the research questions. The formulated research hypotheses were tested using Statistical Package for Social Sciences (SPSS) software to calculate the Analysis of Covariance (ANCOVA).

## Results

### Research Question 1

What are the mean achievement scores of students taught Chemistry with LAPIS and Lecture method?

**Table 1: Mean Achievement Scores of Students taught Chemistry with LAPIS and Lecture method**

Experimental group (LAPIS)      Control group (Lecture)

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Note = Standard deviation in parenthesis;

N=235

As shown in Table 1 above, the mean scores of students taught chemistry using LAPIS were 6.90 and 25.53 respectively in the pre-test and post-test, with standard deviations of 2.85 and 7.83. On the other hand, the Control group had mean scores of 6.46 and 17.55 for the pre-test and post-test respectively with standard deviations of 2.69 and 5.38.

Furthermore, the mean achievement gain score of 18.63 was recorded for the LAPIS group, while 11.09 was for the Control group. The LAPIS group differed from the Control group in

the mean achievement gain scores by 7.54, indicating that students taught with LAPIS achieved higher than those taught with Lecture method. However, the standard deviations of the groups in the post-test are 7.83 and 5.38 for the LAPIS and Lecture groups respectively, indicating that the students' individual scores were more clustered around the mean in the Lecture group than in the LAPIS group which had extreme scores.

### Research Question 2

To what extent do gender influence students' mean achievement scores when taught chemistry with LAPIS and Lecture method?

**Table 2: Mean Achievement Scores of Male and Female Students taught Chemistry with LAPIS and Lecture method**

Experimental group (LAPIS)      Control group (Lecture)

From table 2 above, it can be observed that in the LAPIS, the male students' mean achievement scores in the pre-test and post-test were 6.55 and 25.69 respectively, with standard deviations of 2.54 and 8.00. On the other hand, the female students' achievement scores in the pre-test and post-test were 7.23 and 25.69 respectively with standard deviations of 3.10 and 7.67. From the results, the male students' gain score was 18.81 while that of the female students was 18.46, showing that the male students achieved slightly higher than their female counterparts. However, the standard deviation of the male students in the post-test was 8.00 while it was 7.67 for the female students, indicating that there were generally extreme scores in the male and female students' individual scores, with the male students having more extreme scores than their female counterparts.

Also, in the Control group, the male students' mean scores in the pre-test and

post-test were 6.33 and 17.58 with standard deviations of 2.89 and 3.72 respectively. On the other hand, the female students' mean scores in the pre-test and post-test were 6.57 and 17.88 respectively with standard deviations of 2.51 and 5.17. From the results, the male students' mean achievement gain score was 11.25 while that of the female students was 11.31. This showed that the female students' achievement gain score was slightly higher than that of their male counterparts. However, the standard deviation of the male students in the post-test was 3.72 while it was 5.17 for the female students, showing that the individual scores of the female students were clustered around the mean while that of their male counterparts were at extremes from the mean.

### Testing of Hypotheses

**Table 3: Analysis of Covariance (ANCOVA) Summary of Effect of Teaching Methods and Gender on Students' Achievement in Chemistry.**

Source of Variation	Type III Sum of Squares	Df	Mean Square	F-cal	Sig.	Decision
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**H<sub>01</sub>.** There is no significant difference in the mean achievement scores of students taught chemistry with LAPIS and Lecture method.

In table 3 above, the calculated F-value for the effect of teaching methods on students' achievement in chemistry is 3.815 significant at 0.023 level of significance, which is less than 0.05 level set for the study. The null hypothesis is therefore rejected. This means that a significant difference exists in the mean achievement scores of Chemistry students taught with LAPIS and those taught with Lecture method.

**H<sub>02</sub>.** There is no significant difference in the mean achievement scores of male and female students in chemistry.

From the same table 4, the calculated F-value for the main influence of gender on students' achievement in chemistry is 1.228 significant at 0.272 level of significance, which is greater than 0.05 level set for the study. The researcher therefore fails to reject the null hypothesis. This means that there is no significant difference in the mean achievement scores

of male and female students in chemistry. Thus, the efficacy of the teaching methods in enhancing students' achievement in chemistry according to this finding is not influenced by gender.

**H<sub>03</sub>.** There is no significant interaction effect of method and gender on students' achievement in chemistry.

In table 4 shown above, the calculated F-value for the interaction effect of method and gender on students' achievement in chemistry is 1.796 significant at 0.182 level of significance, which is greater than 0.05 set for the study. Therefore, the researcher fails to reject the null hypothesis. Hence, the two-way interaction of method and gender does not have significant effect on students' achievement in chemistry. Meanwhile, the main effect of method is significant but the interaction effect with gender is not significant, it then means that the methods do not depend on students' gender to be effective. This means that they enhanced both male and female students' academic achievement.

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### Discussion of Findings

Results of data analysis have shown that the Learning Activity Package Instructional Strategy is more effective in enhancing students' achievement than the Lecture method. This is based on the fact that the students taught with LAPIS achieved higher than their counterparts who were taught with the Lecture method. This finding is in line with the findings of previous researchers; Abu (2000) and Neboh (2012) who found that the Learning Activity Package (LAP) was more effective than the Lecture method in fostering students' achievement. The relative effectiveness of LAPIS over the Lecture method in enhancing students' achievement could be attributed to the fact that, LAPIS is a student-centred and activity-oriented method of teaching, which enables more active participation of students in teaching/learning process than the lecture method where students are often passive recipients of the facts from their teacher. Moreover, the activities in the LAPIS were carried out by the students themselves at their own pace during the school period, which is different from the lecture method where the teacher did most of the work for the students to see and copy. Given these prevailing circumstances under which the LAPIS and Lecture methods were employed in the classrooms, it is not surprising that the students taught with LAPIS achieved higher than their counterparts who were taught with Lecture



provided an empirical evidence to support the efficacy of the Learning Activity Package Instructional Strategy (LAPIS) in facilitating students' achievement in chemistry. The researcher therefore advocates the need for the Chemistry teachers to imbibe the use of student-centred and activity-oriented teaching methods such as LAPIS while de-emphasising the use of lecture method in Chemistry teaching and learning. This is because effective teaching arising from the use of Learning Activity Package Instructional Strategy certainly allows the students to understand the Chemistry concepts better, resulting to high achievement in the subject.

#### Recommendations

Based on the findings of this study, the researcher hereby recommend as follows;

- (1) Chemistry teachers should utilise the Learning Activity Package Instructional Strategy in their lesson delivery to encourage active engagement and self-motivation among learners.
- (2) The LAPIS should be included in the Chemistry curriculum of teacher training tertiary institutions, in order to popularize its use among the teacher trainees so as to bring about more effective students' achievement in Chemistry in the secondary schools.
- (3) Chemistry teachers should be encouraged to attend regular workshops and seminars on innovative methods of teaching such as the LAPIS, so as to enable them to master their effective use in lesson delivery. Such seminars and workshops should be organized by government and relevant professional bodies such as the Science Teachers' Association of Nigeria (STAN) to educate and sensitize the teachers on the effectiveness of the

teaching strategy in enhancing students' achievement.

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in Chemistry.

The results further revealed that the mean achievement score of male students in the LAPIS group was slightly higher than that of their female counterparts and also the mean achievement scores of female students was slightly higher than that of the male students in Lecture method. But, this study further revealed that, there is no significant difference in the mean achievement scores of male and female students in Chemistry. This shows that the efficacy of the teaching methods in enhancing students' achievement in chemistry according to this finding is not influenced by gender. This finding is in agreement with findings of similar research conducted by Salta & Tzougraki (2004) and Oludipe (2012) who in their separate studies found that there is no significant difference in the mean achievement scores of male and female students in Chemistry. But disagree with Lawal (2009) and Okereke & Onwukwe (2011) who found significant difference in the mean achievement scores of male and female students in Chemistry. In other words, the finding of this study has clearly shown that gender has no significant influence in the academic achievement of male and female students in chemistry.

### **Conclusion**

Research has shown that students' achievement in chemistry has been fluctuating, despite efforts being made to improve the intellectual skill and growth of students in science. The major cause of the poor performances is attributed to among others, the use of inappropriate/less effective teaching method by the chemistry teachers. However, this study lends empirical support to the fact that students' achievement in chemistry could be greatly improved if they are exposed to Learning Activity Package Instructional Strategy (LAPIS) among other innovative, student-

centred and activity-oriented teaching strategies. These innovative teaching strategies facilitate students' achievement in chemistry more than the lecture method. When the teachers utilises the LAPIS method of instruction, gender does not influence students' academic achievement in chemistry. This is because this study found no significant interaction effect of gender and method on students' achievement in chemistry.

Furthermore, this study has provided an empirical evidence to support the efficacy of the Learning Activity Package Instructional Strategy (LAPIS) in facilitating students' achievement in chemistry. The researcher therefore advocates the need for the Chemistry teachers to imbibe the use of student-centred and activity-oriented teaching methods such as LAPIS while de-emphasising the use of lecture method in Chemistry teaching and learning. This is because effective teaching arising from the use of Learning Activity Package Instructional Strategy certainly allows the students to understand the Chemistry concepts better, resulting to high achievement in the subject.

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