

# Comparative Effects of Lecture Method with Advance Organizer (LMAO) and Lecture Method (LM) On Physics Students' Achievement in Delta North Senatorial District (DNSD)

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**Abstract:** *The study compared the effects of LMAO and LM on the achievement of Physics students in DNSD. This study utilized a quasi-experimental 2x2 factorial, pre- and post-test planned variation design. Six thousand seven hundred twenty-five SS II Physics students from Public Secondary Schools in DNSD served as the study's population. Stratified random sampling was utilized to sample 222 SS II students. Physics Achievement Test (PAT) was used to collect data. PAT reliability of 0.88, was established using Kuder-Richardson formula 21. A pretreatment test using PAT was conducted, followed by a posttreatment test. Data acquired were analysed utilizing mean, standard deviation, t-test, and Analysis of Covariance(ANCOVA). The results showed that: there was a significant difference between the mean achievement scores of students taught Physics using LMAO and LM, favouring LMAO. It was concluded that LMAO improves students' achievement in Physics more than LM alone. Thus, it was recommended that Physics teachers should combine the LM with advanced organizers (AO) since LM cannot be totally eliminated.*

**Keywords:** Lecture method, advance organizer, academic achievement

## Introduction

Physics is one of the science subjects taught at the Senior Secondary School level in Nigeria. Physics is a physical subject that examines matter, its mobility and behaviour in space and time, as well as associated ideas like energy and force. According to Olatunbosun, Daramola and Babarinde (2017), Physics explains how the universe behaves. They further stated that Physics instruction at the secondary level forms the bedrock and foundation of skills in science and technology. The study of physics fosters the development of the learner's clearly defined skills and values, including an inquisitive spirit, inventiveness, objectivity, the bravery to challenge, and an aesthetic sense (Federal Republic of Nigeria, 2013). In Nigeria, science education programmes are made to help students learn how to solve problems and make decisions as well as how different science fields are related to one another, such as how physics is related to health, agriculture, industry, and other facets of life.

Everyday science like physics has an impact on everything we do. Everything around us needs energy in some form or another; our cars, trains, and planes all burn gasoline; our computers need power outlets and wifi connections; and our cell phones use cellular signals to communicate. Fundamentally, as our capabilities have grown, there is a greater need for new energy sources, which might be nuclear power or alternate energy sources like fossil fuels or hybrid power (Atsuwe & Musa, 2021). We place a lot of emphasis on energy, the fundamental component of physics, when learning about and discussing the subject. Physics frequently focuses on the forces acting on matter, such as gravity, heat, light, magnetism, electricity and others.

The role of Physics towards the development and advancement of science and technology of any nation is immeasurable. Despite this importance, Nigerian students' achievement in Physics in external examinations such as the West African Senior Secondary Certificate Examination (WASSCE) has remained persistently low over the years (Amuche, Amuche, Bello & Marwan, 2014; Olatunbosun, Daramola & Babarinde, 2017; WAEC Chief Examiner's Report, 2015-2020). The barometer used to measure a country's educational quality is student achievement. Therefore, maintaining a strong performance in both internal and external exams is advisable.

For several years now, newspaper articles and study findings have documented secondary school students' dismal academic performance in Physics in public exams (Amuche, Amuche, Bello & Marwan, 2014; Olatunbosun, Daramola & Babarinde, 2017). According to Olatunbosun, Daramola, and Babarinde (2017), a number of factors, including a lack of Physics textbooks in the library, inadequate lab facilities, ineffective instructional strategies, a lack of time set aside for practical work, the use of too many technical terms or terminologies in Physics lessons, a lack of funding, and students' negative attitudes towards the subject, have all been linked to students' poor performance in Physics examinations.

From personal observation, the lecture method (LM) otherwise known as the chalk and talk method has been the predominant method of instruction of Physics in Nigeria's secondary schools. LM is a teacher centred approach characterized by listening, copying and memorizing of information (Ukpene, 2004). LM doesn't give students the chance to actively engage in the teaching and learning process. By incorporating students' past knowledge with what is being taught in class, LM does not support meaningful learning of physics ideas. Thus, students taught with LM resort to memorization and regurgitation of Physics concepts without complete understanding of such Physics concepts. This may be the cause of the consistent poor performance of students in Physics. In order to improve students' poor performance in Physics, the use of AO to supplement LM among others has been

recommended by scholars. Therefore, the researcher sought to find out if the use of LMAO enhance Physics students' academic achievement more than traditional LM.

AO on the other hand is information supplied before learning that the learner can use to arrange and analyze new information that comes (Enekwechi, 2016). Ausubel (1968), who favours the enhancement of presentational models of instruction, suggests using AO to create presentations. The AO model was created by Ausubel (1968), who contends that students can build their knowledge concurrently with substantive subject-matter learning. To improve the retention of new information, the model prioritises logical operation (Sirithanyarat & Laoriendee, 2019).

AO can be described as a brief set of materials delivered to the student before to the lesson to facilitate effective delivery of the lesson. AO is a framework for students' thinking, not a rehash of a previous lecture (Okoye, 2012). AOs are frameworks that let children learn new concepts and information and relate them to their existing cognitive structure in meaningful ways. They may come in the shape of short stories, questions, reading materials, demonstrations, simulation films, and real-life experiments, among other things (Enekwechi, 2016). Teachers can present lessons and instruct students on how to think about them using AOs. Similar to an excellent movie trailer, AO gives pupils a sneak peek at what's to come and piques their curiosity. Additionally, it aids students in making connections between what they already know and what they are about to learn. The potential for AOs to improve pupils' academic performance.

Academic achievement is the state of a student's learning and refers to the knowledge they have acquired and the abilities they have developed over their academic career. School authorities evaluate a student's academic achievement using teacher-made or standardised assessments. It is affected by various factors including the teaching method adopted by the (Kigo, 2017). Therefore, this study sought to compare the relative effectiveness of LMAO and conventional LM on students' achievement in Physics. Studies have also shown that some teaching method(s) adopted by the teacher interact with students' sex to influence their achievement (Shihusa & Keraro, 2009; Mogboh & Okeke, 2019). It is expected that the use of LMAO will not interact with students' sex to influence the achievement of Physics students. Given this context, this study aimed to investigate the comparative effectiveness of LMAO and conventional LM on Physics students' achievement in DNSD with the aim to isolate and recommend the most effective between LMAO and LM.

#### **Statement of the Problem**

Recent studies (Akani, 2021; Oghoghovbe, 2021) have reported a decline in Physics students' performance nationwide. A review of the WAEC Chief Examiner's reports (WAEC, 2015; 2016; 2017; 2018; 2019; 2020) confirmed the persistent poor performance of students in Physics in the WASSCE. The failure rate is very alarming and requires urgent solution. This failure rate may be attributed to students' passive involvement in the teaching and learning process as a result of the lecture method of teaching predominantly adopted by Physics teachers. This teaching method does not only render the learner's passive, but does not promote interactive classroom where learners can actively interact with learning resources. This draw back in the use of the lecture method could be ameliorated if blended with advance organizers. Exposing students to advance organizers may create engagement with facilities that may enhance conceptualization of basic concepts in Physics and boost students' motivation towards Physics. The problem of the study is; will the use of lecture method blended with advance organizer enhance Physics students' achievement and motivation more than the conventional lecture method?

#### **Purpose of the Study**

The study compared the effects of LMAO and LM on the achievement of Physics students. The research specifically found:

1. the disparity between students taught Physics utilising LMAO and LM in terms of mean achievement scores;
2. the nature of the interaction impact between treatment and sex on students' achievement in Physics.

#### **Research Questions**

1. How do the mean achievement scores of students who took physics classes utilising LMAO and LM differ?
2. How does the interplay between therapy and sex affect students' performance in physics?

#### **Hypotheses**

1. The mean achievement scores of students who learned physics via LMAO and LM do not significantly differ from one another.
2. Treatment and sex had no discernible interaction effect on students' performance in physics.

#### **Methodology**

This study utilized quasi-experimental 2x2 factorial, pre- and post-test planned variation design. 6,725 SS II Physics students from Public Secondary Schools in DNSD served as the study's population. Stratified random sampling was utilized to sample 222 SS II students. PAT created by the researcher and validated by three experts were used to collect data. The Kuder-Richardson formula 21 was used to calculate PAT reliability. This was accomplished by administering PAT 30 SSII students offering Physics outside of the study's scope and computing the reliability index. The instrument' reliability coefficient was determined to be 0.88. The actual treatment consisted of teaching the students in the lecture plus advance organizer group the following Physics concepts: simple harmonic motion, linear momentum, and mechanical energy, using LMAO, and the lecture group using a LM alone. A pretreatment test using PAT was conducted, followed by a posttreatment test. The collected data were analysed using mean, standard deviation, t-test and ANCOVA.

#### **Results**

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- The mean achievement scores of students who learned physics via LMAO and LM do not significantly differ from one another.

**Table 1**

*t-test Summary Table Comparing Students Taught Physics Using LMAO and LM with Posttest Mean Achievement Scores*

Group	N	Posttest		df	t-cal	sig. (2-tailed)	Remark
		Mean	SD				
LMAO	104	66.85	14.27	220	3.121	0.002	S
LM	118	60.81	14.46				

P<0.05

Table 1 demonstrates that the computed t is 3.121 at the 0.05 level of significance, with a p-value of 0.002, which is less than 0.05. This suggests that the mean achievement posttest scores of students who were taught Physics using LMAO and LM differ significantly from each other. As a result, null hypothesis one is disproved. The mean achievement scores of students who were taught Physics using LMAO and LM varied significantly from one another, favouring LM.

- Treatment and sex had no discernible interaction effect on students' performance in physics.

**Table 2**

*ANCOVA Summary Table on Interaction Between Treatment and sex on Physics Achievement*

Source	Type III Sum of Squares	df	Mean Square	F	Sig.
Corrected Model	2281.547 <sup>a</sup>	4	570.387	2.740	.030
Intercept	57166.510	1	57166.510	274.634	.000
Pretest	1.228	1	1.228	.006	.939
Methods	2071.929	1	2071.929	9.954	.002
Sex	264.473	1	264.473	1.271	.261
Methods * Sex	4.418	1	4.418	.021	.884
Error	45169.624	217	208.155		
Total	946552.000	222			
Corrected Total	47451.171	221			

$F(1, 217) = 0.021, P(0.884) > 0.05$  in table 2 demonstrates that there is no significant interaction effect of treatment and sex on students' mean achievement scores in Physics. As a result, null hypothesis two is not disproved. As a result, treatment and sex had no discernible interaction effect on students' achievement in physics.

### Discussion of Findings

The study showed that there is a substantial difference between the mean achievement scores of students who were taught physics using LMAO and LM, favouring those who were taught using LMAO. This result is consistent with the findings of Awodun (2016), who claimed that employing AO to teach Physics has a significant impact on students' academic achievement in Senior School. Higher achievement results of pupils taught utilising LMAO group versus those taught using LM may be related to the level of involvement and participation of students during classroom instruction. In contrast to the LM, students may have been more involved and actively engaged with the learning materials when using the LMAO. This might explain why students in the LMAO groups outperformed those in the lecture method group who participated less or not at all in class instruction.

A second finding of the study was that there is no discernible connection between treatment and sex and academic achievement in physics. This suggests that regardless of gender, the teaching strategies (LMAO and LM) had the same impact on the academic performance of Physics students. This outcome supports Mogboh and Okeke's (2019) finding that there is no discernible interaction between instructional styles and sex. This could be due to the fact that the instructional methods stimulate male and female students equally. Thus, the teaching methods did not interact with the sex of the students to affect their academic achievement in Physics.

### Conclusion

LMAO improves students' achievement in Physics more than LM alone. LMAO does not interact with sex to affect students' Physics achievement.

### Recommendations

The following recommendation are given in light of the findings and conclusions of this study:

1. In order to effectively teach Physics at the Secondary School level, Physics teachers should combine the LM with AOs since the lecture method cannot be totally eliminated.
2. The government and other partners in education should provide schools with instructional materials that Physics teachers may use effectively and efficiently as AOs.

3. Teachers of Physics must always improvise educational materials that can serve as AOs.
4. Administrators of schools should provide Physics teachers with in-service training on how to effectively use AOs in classroom instruction.

#### Contribution to Knowledge

The following knowledge has been advanced as a result of this investigation.

1. The study established that LMAO is more efficient in boosting students' achievement in Physics than LM alone.
2. The study re-affirmed that the effect of LMAO on students' achievement is independent of students' sex.

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