



**IMPACT OF MULTIMEDIA-ENRICHED LECTURE METHOD ON PERFORMANCE AMONG  
FIELD-INDEPENDENT AND FIELD-DEPENDENT SECONDARY SCHOOL PHYSICS STUDENTS  
IN GOMBE CENTRAL SENATORIAL DISTRICT, GOMBE STATE, NIGERIA.**

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**Abstract**

This study investigated the Impact of multimedia-enriched lecture method on Performance among Field-Independent and Field-Dependent Physics Students in Gombe central senatorial District, Gombe State, Nigeria. The research design was Quasi-experimental research design. The population of this study was 500 SSII Physics students. The instrument for data collection was Physics Performance Test (PPT). A validated instrument with a reliability coefficient of 0.79 was used for data collection. The data was collected using test after the administration of the treatment. The research question was answered using mean and Standard Deviation, while Null Hypothesis was tested using ANCOVA at 0.05 level of significance. Findings showed that there is a difference in performance between Field-Independent and Field-Dependent students taught Physics concepts using multimedia-enriched lecture method. Based on the findings of this study, it was recommended that multimedia-enriched lecture method be use in teaching Physics as it enhances academic performance of Secondary School Students.

**Key Words:** Multimedia-enriched Lecture Method, Field- Independent, Field –Dependent, Performance.

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## Introduction

Physics is one of the most important subjects for the development of any nation (Bello, 2016). The learning and understanding of Physics concepts and its methodologies result in the comprehension and appreciation of all other science subjects (Bello, 2016). It was based on this fact that the Federal Republic of Nigeriaplaces the subject as one of the core science subjects that each student that is offering science in secondary school must be exposed to at Senior level (Akanu, 2021). The knowledge of Physics make it easier and facilitates the understanding of other science subjects by the students (Bamoyo, 2019). Physics is a subject that has applications in many other sectors in economic development, including health, agriculture, water, energy, and information and communication technology (Bello, 2023).

Physics is one of the science subjects upon which the bulk of the present day technological breakthroughs are achieved (Bello, 2016). One of the questions is how then do we learn Physics in order that we achieve development? Various teaching methods are used in the teaching and learning of Physics in our schools but to determine which one is more effective, we have to investigate on how we came about multimedia in teaching and learning of Physics.

Ashraf (2023.) view multimedia as the exciting combination of computer hardware and software that allows one to integrate video, animation, audio graphics and text resources to develop effective presentation to an affordable desktop computer. Bello (2016) opines that multimedia is characterized by the presence of text, pictures, animation and video, some or all of which are organized into some colorant programme. However, today's multimedia is a carefully crafted combination of text, graphic, sound animation and video elements among others that allow for the benefit of the end user. Where the viewer of a multimedia project has to control 'What?' 'When?' and 'How?' the elements (learning materials) are presented, it is referred to as interactive multimedia (Bello, 2016). Multimedia can also be defined as an integration of multiple media elements (audio, video, graphic, text animation among others) into one strong and symbiotic whole that results in more benefits for the end user than any of the media element can provide individually.

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Bekele (2020), states that when you watch a movie, TV programme, and video clips among others, superficial or deep emotions are elicited such as excitements, relaxations or even boredom. These motions are triggered by the mode created by certain visual sense. Using video clips as instructional tools in nearly all subjects increase students understanding and provide them with powerful cognitive and emotional impact that can help the students in the development of a permanent learning outcome (Barr, 2018). This paper is going to look at how Field-independent and Field-dependent learners can used multimedia-enriched lecture method to effectively learn Physics concepts.

Performance is basically a function of cognitive ability. Cognitive ability the relative strategies, preferences, attitudes and interest that determined an individuals' typical modes of comprehending, perceiving, remembering and problem solving thoughts by which students approach, acquire and process information, as well as the consistent ways in which an individual memorised and retrieved memorised information (Adnan, 2018). Cognitive abilities are usually considered to be domained specific. Cognitive learning styles, however, are thought to be relatively stable ways in which a student approaches a learning task across a range of different domains (Atiku, 2022). According to Ashraf (2023), field dependence (a component of cognitive domain), is a non-verbal measure of intelligence and visualization of space around an individual. In this study, Field-Independent and Field-Dependent cognitive domains are investigated to determine their impact on academic performance among secondary school students in Gombe central senatorial district, Gombe State, Nigeria.

Field-Independent and Field-Dependent are basically two constructs use to describe how an individual learner pay attention to, recognize and structure perceptual patterns, and how recognition is processed and retained as a memory. The whole process involved individual's ability to performed perceptual analysis of a given multimedia tasks (Ashraf, 2023).

In a Field-Independent domain of learning, an individual tend to break up a given field organizational structure and locate a nominated field structural parts that appealed to learning a given task, while in Field-Dependent domain, an individual's pattern of recognition is dominated by organization of

perceptual field. In the field independent mode of perception, the individual is more likely to see the parts of the field as distinct from the organized pattern. (Bamoyo, 2019) argued that the individual who performed in an FI tests, tends to analyse a given field such that some hidden features of a given materials are recognized, but FD perceptions, tend to follow the presented visual field structure all along. This study used multimedia-enriched lecture method to teach students some Physics concepts, and assessed its impact on Field-Independent (FI) students and Field-Dependent (FD) students on academic performance in Physics among SSII secondary school students in Gombe Central Senatorial District, Gombe State, Nigeria.

It was observed by Bekele (2020), that Field-Independent (FI) students when compared to Field-Dependent (FD) students, the FI students are more capable of structuring a perceptual field in a given task or are more likely to recognized a missing field or a gap to be filled than the FD students. The FI also are more autonomous in nearly all aspects of learning than the FD.

### **Statement of the Problem**

According to Baola, (2019) that physics as a science subject in secondary schools in Nigeria faces severe problems in relation to its instructional strategies and curriculum content delivery by the physics teachers. It was unfortunately observed that physics has been neglected by the learners and its content delivery by its teachers has been too slow (Bamoyo, 2019). Similarly, the teaching and learning of physics in our secondary schools was bedeviled with multi-dimensional problems which impede successful implementation of the curriculum (Ashraf, 2023,). At the centre of the problem are the teachers who are ill-equipped for the task of teaching, and are usually not having the necessary teacher training to implement the curriculum in the classes they are assigned to teach. As such students failed their examinations and become not serious with physics as a subject. According to WAEC Chief Examiner's report of 2022, more than 60% of students who sat for physics examination recorded a failure. This poor performances as are observed to be either due to lack of effective teaching methodologies, inadequately trained teachers, absence of required teaching facilities as well as negligence of physics teachers to make effective use of the available multimedia/other teaching

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facilities in teaching and learning situations. This paper seeks to investigate the teaching and the quality learning of Physics concepts by two categories of students: Field-Independent and Field-Dependent secondary school students and to see how teaching and the quality of learning could be enhanced in Physics using multimedia-enriched lecture method, thereby improving performance in our secondary schools in both internal and the external examinations.

### **Objectives of the Study**

The objective of the research work is to determine the impact of multimedia- enriched lecture method on Academic Performance among Field-Independent and Field-Dependent SSII Physics Students in Gombe Central Senatorial District, Gombe State, Nigeria.

### **Research Question**

What is the difference in the mean scores of Field-Independent and Field-Dependent students when taught Physics using multimedia-enriched lecture method?

### **Research Design**

The research design is pre-test, posttest, Quasi Experimental research design, with no control group as the research is a comparison in performance between FI and FD in Physics. Two groups of students were used for the experiment. At the end of the treatment, a post test ( $O_2$ ) was administered to both the two groups to evaluate the academic performance of the two groups and report the findings of the experiment.

### **Population/Sample of the Study**

The population/sample of this study consisted of 500 SS II Physics students from ten (10) public Secondary Schools in Gombe Central Senatorial District, Gombe State, Nigeria. SSII students were because they have a good introduction to Physics syllabus at SSI level.

### **Instrumentation**

The instrument that was used for data collection is a self-developed Physics Performance Test (PPT), developed by the researcher. The test items consisted of fifty (50) multiple choice objectives questions structured based on the concepts taught. The instrument was validated by senior academic staff from the Department of Science Education, federal university of Kashere, Gombe State, Nigeria.

The instrument was pilot tested by administering the test items to secondary school that is not part of the experimental group, and data obtained from the pilot study was used to calculate the reliability coefficient of PPT. In doing so, Pearson Product Moment Correlation Coefficient (PPMCC) statistic was used and a reliability coefficient of 0.79 was obtained.

### **Data Collection Procedure**

The data was collected after treatment to the two groups for six weeks (6) using Physics Performance Test (PPT), and was analysed using mean and standard deviation to answer the research question and analysis of covariance to test the hypothesis at 0.05 level of significance.

To answer this research question, the test scores of both the FD and the FI were subjected to descriptive statistics and the result is shown in table 1 below:

**Table 1: Mean scores and Standard Deviation of FI and FD students Exposed to Multimedia-enriched Lecture Method.**

Group	N	Mean	SD	MD
Field Independent FI	250	30.83	3.05	7.10
Field Independent FD250	23.73	1.97		

KEY: SD: Standard Deviation, MD: Mean Difference, N: Number of Subjects

Table 1 above showed the post-test mean scores of Field- Independent and Field-Dependent students. From the table, the post-tests mean scores of Field-Independent students is 30.83 while the posttest mean scores of the Field-Dependent students is 23.73, with a mean difference of 7.10.this clearly showed that the Field Independent students performed better than the Field Dependent students.

### Null Hypothesis

**H<sub>0</sub>:** There is no significant difference in the mean scores of Field-Independent and Field-Dependent students taught Physics using multimedia-enriched lecture method. To test this research hypothesis, the posttest performance scores of the Field-Independent students and the posttest performance scores of the Field-Dependent were subjected to the analysis of covariance ANCOVA. The result of the ANCOVA is shown in table 2 below:

**Table 2: Analysis of Covariance of Post test scores of Field-Independent Students and Field-Dependent students**

Source	Type III Sum of Squares	df	Mean Square	F	Sig.
Correct Model	2976.719	5	595.344	83.523	0.000
Intercept	12023.456	1	12023.456	1.687E3	0.000
PRETEST	1.124	1	1.124	.158	0.692
GROUPS	2862.535	2	1431.268	213.052	0.000
SEX	0.754	1	0.754	0.106	0.745
GROUP*SEX	0.000	0			
Error	1667.931	494	13.128		
Total	187136.00	498			
Corrected Total	4644.650	499			

\* significant at  $p \leq 0.05$  level

From Table 2, the calculated  $F(1, 494) = 213.052$  at  $p \leq 0.05$ , shows that there is a significant difference in performance between Field-Independent students and Field-Dependent. Therefore, the null hypothesis one is rejected.

This means the Field-Independent students taught physics concepts using multimedia-enriched lecture method significantly performed higher than the Field-Dependent students who were taught the same physics concepts using the same method of teaching.

## Discussion

One of the findings of this research work is that there is a significant difference in academic performance between Field-Independent and Field-Dependent students taught Physics concepts using multimedia-enriched lecture method. This showed that the performance of the Field-Independent students was enhanced when they are taught using multimedia-enriched lecture method more than their counter part. The mean Academic Performance of Field-Independent students taught Physics concept using multimedia-enriched lecture method is practically more than the mean performance of the Field-Dependent students taught the same Physics concepts using the method of teaching. This finding agreement with the findings of Adnan (2018) who observed that there is a significant differences in academic performance of students between rural and urban secondary schools in terms of perception and generally in terms of cognitive abilities, availability of working tools and the availability of laboratories and Laboratory Facilities. The finding is also in agreement with the findings of some other researchers like; (Abapa, 2022), who found that using internet system to teach students, gives the students the opportunities to access a wide range of information and knowledge about the environment, socio-cultural, socio-economic and some other aspects of live in all nations of the world. Other studies that share similar views include that of Bamoyo (2019) who contended that computer has dominated human activities in the last two decades and that learning has been made easier by the use of the computer, the use which is been complimented with other electronic devices. Also Adam (2023) observed that Computers do have an editing applications that control and improved the quality of students work and enhances students' academic achievement through

visualisation of learned concepts and thereby improving students writing capabilities, language and communication skills.

Equally, the finding in this study is supported by some previous studies such as that of Audu (2017), Abapa (2022), Atiku (2022), Adam (2023) and Bello (2023), who in their separate studies found that innovative teaching strategies with integrated resource materials enhance students' performance irrespective of gender. Also Barr (2018) further supported the result of this finding in his study "Relationship between Students' Perceptions and their Academic Performance in Physics using Graphic-Aided-Instructions mode of teaching which revealed that Senior Secondary students differ significantly in their Performance when exposed to innovative strategies. Furthermore, Ahmad (2017) revealed that the use of innovative teaching strategies in concepts learning proved to be effective in enhancing academic performance of students.

## **Conclusions**

Based on the findings of this study, it was concluded that the use of multimedia-enriched lecture method has proved to be more effective in the teaching and learning of physics concepts in secondary schools.

## **Recommendations**

Based on the findings of this research work, it was recommended that:

1. Governments in Nigeria at all levels should collaborate with professional bodies like STAN, NUT, NPTAN and other stake holders in Education and Non-governmental Organisations, to train teachers on the use of multimedia-enriched lecture method in teaching Physics concepts through seminars and workshops.
2. Because of its potentialities in enhancing academic performance, teachers of Physics across the nation should be supported and encouraged to use the strategy as alternative strategy so that the teaching and learning of Physics in our secondary schools could be enhanced.

3. The use of multimedia-enriched lecture method have a positive effect on student when this strategy is employed in the teaching and learning of physics, students creativity will be boosted.

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