IMPACT OF INFORMATION AND COMMUNICATION TECHNOLOGY (ICT) ON PERFORMANCE AMONG PHYSICS STUDENTS IN GIWA EDUCATION ZONE KADUNA STATE, NIGERIA

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Abstract:
This study investigated the Impact of Information and Communication Technology on performance in light energy concept among senior secondary schools' physics students in Giwa Education Zone Kaduna State, Nigeria. Two objectives, two research questions and two null hypotheses guided the study. Quasi-experimental research group Design was used. Pre-test and post-test was administered. Two groups were formed Experimental (EG) and Control (CG). The experimental group was taught light energy concept using (ICT) materials while the control group was taught the same concept using lecture method. The population of this study covered 118 SS II physics students and the sample is 199 randomly selected. The hypotheses were tested using t-test statistical analysis at 0.05% level of significance. The instrument used for data collection was physics performance test (PPT) with 0.82 reliability coefficient and it was validated by experts in Department of Physics Federal College of Education, Zaria and Department of Science .

Education Ahmadu Bello University, Zaria. Mean, standard deviation and Z-test of inferential statistics were used for data analysis at $p \leq 0.05$ level of significance. Findings revealed that hypothesis one was rejected which implied that students taught with ICT performed better than those taught using lecture method only, hypothesis two was retained showing that there was no significant difference between male and female performance in light energy concept when both were exposed to the use of ICT materials during the teaching process. Hence, it is concluded that the use of ICT materials in teaching and learning of Physics influences the cognitive, affective and psychomotor achievement of Physics students. Therefore, it is recommended that teachers should develop positive attitudes towards the use of ICT materials in teaching and learning of Physics, and stakeholders in Education should constantly organize workshop and seminars so as to keep Physics teachers in that area abreast of importance and usages of ICT materials.

Keywords: Information and Communication Technology, Physics, Senior Secondary School students, Performance and light energy concept

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Introduction

Science is the top root upon which many technological breakthroughs all over the world. Many countries including Nigeria are striving hard to develop technologically and scientifically, because the world is turning into scientific and all the proper functioning of lives depends greatly on science. Adeosun (2014) observed that science is a dynamic human activity concern with understanding the working of our world. Akanbi (2016) defined science as an integral part of human society. Its impact is felt in every sphere of human life, such that it is intricately linked with nation's development. Physics is an important science subject that has contributed in the ongoing and future development of all nations. It is offered in senior secondary schools curriculum and tertiary institution which performs vital role in seeing some national goals comes into reality.

Physics is one of the branches of science that studies matter and its motion through space and time such concept like the energy and that of momentum, and force of an object in the space field. All these are the areas where physics has been of good application in the areas of our lives. The subject is one of the most complex subjects in the school curriculum because some of its concept and idea are abstract in nature which requires deep thinking and critical analysis before deriving on any phenomenon (Akambi, 2016)

Today students lived in a global knowledge based age, and they deserved teachers whose practice embraces the best that technology can bring to learning (Arinze, 2012). The term Information Communication Technology (ICT) is defined as information and communication technology which stresses the role of unified communication and the integration of telecommunication, computers as well as necessary enterprises,

software, middleware, storage and audio-visual system which enables users to access store. Transmit and manipulate information (Arinze, 2012)

Atta (2015) defined (ICT) as the digital processing and utilization of information by the use of electronic computers; it comprises the storage, retrieved, conversion and transmission of information. (ICT) is therefore, seen as a digital processing and utilization of information by the use of the electronic devices. Margaret (2015) also defined (ICT) as an umbrella term include any communication device or application, encompassing; radio, televisions, cellular phones, computers and network hardware and software satellite systems and so on as well as various services and application associated with them such as video conferencing and distance learning, ICTs in education health care or libraries.

Knowledge is expanding day by day so teaching becoming one of the most challenging professions in our society. While learning physics, learner expect from facilitator to facilitate meaningful learning rather than just knowledge and skills. In this modern period the use of ICTs in teaching Physics provides new possibilities in teaching profession. Different research indicates (Bowker, 2014) that (ICT) can change the way of teaching and it is useful in supporting more student-centered approaches to instruction and in developing the higher order skills and promoting collaborative activities. Also UNESCO (2015) stated that the use of (ICT) promotes the quality in education. That is why, Physics teachers are provided with different professional development trainings including use of (ICT) in the Physics classroom according to the demand of time.

The concept of Performance is defined as the observable behavior of a person or animal in a particular situation usually experimental situation. (Claro, 2016). This means that performance measures the aspect of behavior that can be observe at a specific period. Singer (2017), defined performance as the types of mental test in which the subject is asked to do something rather than to say something. Performance refers as the types of test which throws light to deals with things rather than symbols. According to Jume (2019), Academic performance may be seen as the extent to which Students are achieving educational goals and objectives. Academic performance of a student can be regarded as the observable and measurable behavior of a student in a particular situation(sources). For example, the academic performance of a student in social studies includes observable and measurable behavior of a student at any point in time during a course. In physics students' academic performance consists of his scores at any particular time obtained from a teacher- made test. Therefore, we can equate academic performance with the observed behavior or expectation of achieving a specific statement of or statement of educational intention in a research. Many factors are constantly influencing the performance of student’s science subject in Senior Secondary School Certificate Examinations (SSCE). Some of these factors include the instructional materials, unprofessional teachers, the home/family

background, the syllabus and the school administrators, perception that the subject is difficult, boring subjects are important for socio economic development. It is against these reasons this study is set to examine the Impact of Information and Communication Technology (ICT) on Performance among Physics Students in Giwa Zone Kaduna State, Nigeria

Statement of the Problem

The poor performance of students in Physics subject in Senior Secondary Examination (SSCE) is an issue of concern. Many seminars and conferences have been organized in order to device ways of promoting the good performance in Physics subject by curbing problematic causative factors but not much seems to have been achieved. Therefore, there is an urgent need for a survey on factors causing the poor performance of students in Physics. In spite the importance of Physics to the scientific and technological development of our nation n, performance of student in the subject in (SSCE) was not satisfactory over the years. Inadequate of suitable teaching facilities is blamed for the poor performance, poor laboratory tools/equipments to be put in place by the government for proper learning, the learning environment also plays another setback on the learning of physics, the teacher methodology used in the classroom in teaching among other factors such as the teacher competency and the attitude of the students towards the subject.

Table 1. Physics Students' performance in WAEC from 2014-2021

Year	Candidate Registered	No Passed	No of failed	% passed	% failed
2014	8,632	859	7,779	10.0	90.0
2015	5,681	2,465	3,216	43.3	56.6
2016	12,652	5,123	7,529	40.4	59.5
2017	7,965	420	7,545	5.27	94.7
2018	22,157	5,941	16,216	26.8	73.1
2019	11,541	6,582	4,959	57.0	42.9
2020	11,577	6,412	5,165	55.3	44.6
2021	14,561	3,529	11,032	24.2	75.7

Source: Kaduna Educational Resources Department (2021)

The above table shows that, the percentage failure was high in 2014, 2015, 2016, 2017, 2018 and 2021 while there was a little improves in 2019 and 2020 only. These results indicated that there is need for urgent studies to find out new strategies in order to improve the performance of the students such as the use of Information and Communication Technology ICT

In the context, secondary schools need to improve the quality of education which is poor and one of the approaches to address this problem is to integrating ICT based teaching learning approach to get quality in education (Joshi, 2016). Therefore, there is

an urgent need for a study on factors causing the poor performance of students in Physics. In spite the importance of Physics to the scientific and technological development of our nation, performance of students in the subject is highly decreasing and not satisfactory over the years. The implementation of ICT in teaching of Physics in order to boost the performance of physics students academic has been a challenge one, this is due to Inadequate of suitable teaching ICT facilities is blamed for the poor performance, poor laboratory tools/equipments to be put in place by the government for proper learning, the learning environment also plays another setback on the learning of physics, the teacher methodology used in the classroom in teaching among other factors such as the teacher competency and the attitude of the students towards the subject.

Also another challenge of the ICT in improving the performance of Physics students can also be trace to the illiteracy of the knowledge of ICT used in teaching; also the availability of the manpower to make use of the ICT facilities in teaching and learning of physics is another challenge to the study. It is on this notion that the researcher therefore decided to carry out a research on the Impact of Information and communication Technology (ICT) on performance among Physics students in Giwa Zonal Education

Objectives of the study

The objectives of the study are to examine the impact of ICT on;

Performance among students taught light concept using ICT and those taught using lecture method Performance among male and female students taught light concept using ICT and those taught using lecture method.

Research Questions

The following research questions are stated for answering;

1. What is the Impact of ICT on Performance among Physics students taught light concept using ICT and those taught using lecture method?
2. What is the Impact of ICT on performance among male and female Physics students taught light concept using ICT and those taught using lecture method?

Null hypotheses

The following null hypotheses are formulated for testing at $P \leq 0.05$ levels of significance.

Ho_1: There is no significant difference between the posttest mean performance scores of Physics students taught light concept using ICT and those taught using lecture method.

Ho_2: There is no significant difference between the posttest mean performance scores of male and female Physics students taught light concept using ICT and those taught using lecture method.

Methodology

This study employed a quasi-experimental approach of the pre-test – post test type. The non-equivalent pre-test, post-test, control group and experimental design was adopted. According to (Kumar, 2015) a pre-test – post test design is the most appropriate design for measuring the factors responsible

for the poor performance of students in physics, where one group is treated and the other is not treated.

The quasi-experimental approach of the pre-test – post test design was suitable for this study because the performance of physics students taught using ICT (experimental group) was compared to the performance of physics students taught with Lecture method (control group).

In both groups a pre-test and a post- test was used to determine the performance of the groups before and after treatment. Student Performance Tests (SPT) was used to test learner's performance in Physics.

Population of the Study

The research work covers some selected senior secondary schools in Giwa Education Zone, Kaduna State. The population of this study covers 819 SS II Physics students, two public senior secondary schools participated which includes; both Government Girls Secondary School Giwa and Government Technical School.

Sample and Sampling Techniques

A sample of 199 Physics students were randomly selected from the total population of 819 SS II students within Giwa Education Zone Kaduna state, Nigeria which correspond to central class limit theory that emphasized 30 subjects are enough out of the above total population for this study (Sambo,2008). The sample consisted of 141 male and 58 female and it was divided into two groups namely the experimental (EG) and control group (CG).

Table 2 Sample for the Study

S/N	STATUS	SAMPLE
1	Experimental Group	101
2	Control Group	98
Total		199

Validation of Instrument/ Reliability of Instrument

The instrument for data collection Physics Performance Test (PPT) is reliable because it has been verified and tested with a reliability coefficient of 0.82 and was validated by experts in the Department of Physics Federal College of Education, Zaria and Department of Science Education Ahmadu Bello University, Zaria.

Data Collection Procedure

Pretest was first carried out on the students in both the groups to establish equivalence in their abilities. The students were both subjected to treatment for six weeks during which each lesson took 60 minutes. Post-test administration of Physics Performance Test (PPT) was carried out on the subjects in the groups in order to determine their level of physics achievement in that context. The response of the subjects to Physics Performance Test was scored using marking scheme each correct response was scored one point, with a maximum score of 30 marks.

Discussion of Results

Answering the Research Questions:

Research Question One: What is the Impact of ICT on Performance among Physics students taught using ICT and those taught using lecture method?

Table 3: Post-test Means and Standard Deviations Scores of Physics between Experimental and Control Groups

Group	N	Mean	MD:	SD:
Exp.	101	32.45	104	0.25
Cont.	98	31.41		0.26

Key: N: Number of Subjects, SD: Standard Deviation, MD: Difference

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Table 3 presents the posttest mean performance scores of Experimental and Control Groups. From the result, the posttests score of experimental group is 32.5 while that of Control group is 31.41. A mean difference of 1.04 is recorded against Control group.

Research Question Two: What is the impact of ICT on performance among male and female Physics students taught using ICT and those taught using lecture method?

Table 4: Post-test Means and Standard Deviations of Performance Scores of Male and Female in Experimental Group

Group	N	Mean	SD	Mean Difference
Male	25	32.24	3.03	0.61
Female	14	31.63	2.54	

Key: N: Number of Subjects, SD: Standard Deviation, MD: Difference,

Table 4 presents the posttest mean performance scores of male and female in experimental group. From the result, the post-test's score of male in experimental group is 32.24 while that of female is 31.63. A mean difference of 0.61 was recorded against female.

Testing the null hypotheses

The null hypotheses are re-stated and tested using inferential statistics as follows;

Null hypothesis one: There is no significant difference between the posttest mean performance scores of Physics students taught using ICT and that taught using lecture method

Table 5: Independent Sample Z-test for Physics Performance between Experimental and Control Group

Group	N	Mean	SD	DF	Z-Cal	p-value	Remark
Expt.	60	7.25	2.78	310	2.90	0.004	Sig.
Cont.	50	8.30	3.09				

* Significant

The above table showed the Z-test of mean Performance of Experimental and Control groups high Mathematical knowledge in Physics scores. The observed p-value is 0.004 with df as 310 while the significant p-value is 0.05. The observed p-value is less than the level significant p-value 0.05. Therefore, the null hypothesis was rejected. This implies that there is significant difference in Performance in Physics between Students taught using ICT and those taught using lecture methods only

Null hypothesis two: There is no significant difference between the posttest mean performance scores of male and female Physics students taught using ICT and those taught using lecture methods

Table 6: Mann Whitney U-Test of Male and Female students taught using ICT in Experimental Group

Group	N	Mean Rank	U-Cal	p-value	Remark
Male	35	145.25	0.43	0.65	Not Sig.
Female	25	149.68			

* Not Significant

Table 6: Mann Whitney U-test was used to analyze the scores of male and female Students. The mean rank of those taught using ICT is greater than those taught using lecture method only and the U-calculated value is 0.43 while the p-value is 0.65. Since, the observed p-value is greater than the significant value 0.05, the null hypothesis is retained

This findings corresponds with previous findings of Salisu (2015), who worked on Impact of Animated-Media Strategy on Academic Achievement, Retention and Interest among Secondary School Geography Students in Weather Concept; Katsina State, Nigeria. He observed` that both male and female perform almost the same and such functions as the extension of the range of experience available to learners, supplementing and complementing the teachers verbal explanations thereby making learning experience richer and providing the teacher with interest into a wide variety of learning activities. The result also contradicts findings by Bello (2016), which indicates that, there is much difference between the performance of male and female students taught using instructional material in favor of female students.

Conclusion

The findings provided the researcher with a broader concept of the Impact of Information and Communication Technology in teaching and learning of

Physics in Senior Secondary Schools. The use of ICT in teaching and learning of Physics influences the cognitive affective and psychomotor achievement of Physics students. It helps the Physics students in recalling and Recognition of information and principles of physics, develop intellectual abilities of the physics. It helps to make teaching and learning of Physics fun by providing the students of Physics firsthand experience. The use of ICT in teaching and learning of Physics influences the classroom performance of the Physics and promote gender friendly

Recommendations

Based on the findings and conclusions made above, the following recommendations were made;

1. There is need for the development of positive attitudes by Physics teachers towards the use of ICT this will encourage the development of their proficiency.
2. Regular supply of ICT should be embarked by the government at all levels.
3. Seminars and workshop should be organized time to time for Physics teachers in Secondary Schools so as to keep them abreast of modern instructional materials.

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