

A Study of Teachers' Self Efficacy and ICTs Integration in Physics Class Rooms in Kano State, Nigeria

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Abstract: *The Federal Government of Nigeria, in its National Policy on Education (Federal Republic of Nigeria, 2014), recognizes the prominent role of ICTs in the modern world. This study examined the extent to which Information Communication Technology (ICT) is integrated into various Physics Concepts in Secondary schools Curriculum as well as Teachers' Self Efficacy about ICTs Integration in Physics Class Rooms in Kano State, Nigeria. Descriptive survey design was used to collect data on Teachers' Self Efficacy and ICTs Integration (TIIQ) from 56 Physics teachers drawn from Science Colleges in Kano Metropolis. The TII Questionnaire was validated by specialists in science and Computer Education. Analysis of the results reveals that majority of the teachers (80.35%) believed that they are literate enough to incorporate ICTs in Physics class room but the extent of integration of ICTs into Senior Secondary Physics Education is minimal and to a large extent inadequate. It was recommended among others that the use of ICTs for instructional delivery should be incorporated into teacher training programs of pre-service and in-service Physics teachers.*

Keywords: Self-efficacy; ICTs; Integration

1. Introduction

Physics is a concept laden subject, notably comprising of the concepts of Electricity, Mechanics, Heat, Waves, Optics, Cryogenics, Astrophysics, and Plasma Physics, Nuclear Physics, and Solids-state physics. However, the concepts that featured predominantly in the curriculum of senior secondary schools includes: Electricity, Magnetism, Mechanics, Heat Energy, Light and Optics, Sound and Waves. The numerous applications to which these concepts are being put together to improve our environment makes it occupy a unique position among other science subjects. Physics as an academic discipline is an important subject in science and technology since it studies the essence of natural phenomena and helps people understand the increasingly technologically changing society (Bunkure, 2008). It has many applications in Medicine and Information Technology (IT) and in many other sectors of human endeavors. In Information Technology, which has made the world to be a global village through the use of satellites and computers, the application of principles of Physics has been very useful.

ICTs is an acronym which stands for Information and communication technologies and are defined by Adomi & Kpangban, (2010) as electronic technologies used for information storage and retrieval. One of the objectives of ICT in Nigeria as outlined in the National ICT Policy (FRN 2012) is to 'integrate ICT in to mainstream of education and training'. The policy thrust is geared towards facilitating the transformation of Nigeria in to a knowledge based economy, as well as empowering youths with ICT skills and preparing them for global competitiveness and promoting capacity building of ICT in the country's secondary schools.

Plethora of studies, (Nwangwu, Obi, & Ogwu, 2014 ; Kosoko-Oyedeko and Tella, 2010) reported that the use of ICT in teaching and learning is a relevant and functional way of providing education to learners in order to assist

them in acquiring the required capacity for the world of work. Findings from the literature, (Harrison, Hennessy, Wamakote, 2010) further indicates that teachers are the most important component in the integration of ICT in teaching and learning, and the success of the implementation of ICT integration depends largely upon Teachers' Competence (TC) and their perceived Self Efficacy (SE) about ICTs. These according to Agon'do, (2013) play a predominant role in how they (teachers) conceptualize and use ICTs in their teaching. Indeed this proves that unless teachers see the connection between technology and the subject content they teach, they are unlikely to develop a technology-supported pedagogy. Thus with the aid of ICT, teachers can take students beyond traditional limits, ensure their adequate participation in teaching and learning process and create vital environments to experiment and explore.

Integration is the art of combining or adding parts to make a unified whole (Drake and Burns, 2012). In some developed countries of the world, such as China and Japan, integration of technology into some school subjects in the curriculum has brought changes, development and efficiency into their system of education while non integration and poor access to Information Communication Technology (ICT) in Nigerian schools (Adenuga, Owoyele and Adenuga, 2011) and some developing countries in Africa seem to be affecting students' ICT utilization level thereby influencing achievement and competitiveness globally. Thus Nwangwu, Obi & Ogwu, (2014) posited that many developing countries, in Africa, are still low in ICT application and utilization.

1.1 Conceptual Model

The study is hinged on intra disciplinary version of Integrated Curriculum Model (ICM) which is essentially about making connections within disciplines based on skills, knowledge and attitude (Drake and Burns, 2012).

This approach focuses primarily on the various concepts in the Senior Secondary School Physics curriculum and how they are integrated in to a given theme-Information Communication Technology (ICT). These concepts include Electricity, Magnetism, Mechanics, Heat Energy, Light and Optics, Sound and Waves. Figure 1 depicts the relationship between the various Physics concepts taught and ICT as the central theme.

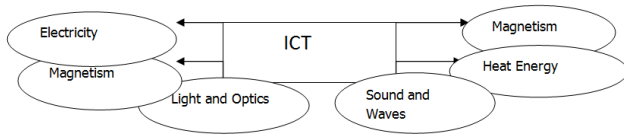


Figure 1: The relationship between the various Physics concepts taught and ICT as the central theme.

1.2 Statement of the Problem

The integration of ICTs and the extent to which they impacted on knowledge delivery in Secondary Schools in Kano state Nigeria is worthwhile issue that needs to be studied. Governments at different tiers in Nigeria have over the years committed enormous resources on the procurement of ICT laboratories, equipment and facilities. However, in spite of this effort, the attainment of objectives of ICT in these schools is observed to have suffered a setback. This is evidenced from the poor performance in ICT accessibility and utilization among students and teachers. The possible explanation for this anomaly is that the use of and integration of ICTs in the classroom has not been encouraging and teachers are not well trained in using these technologies in teaching (Ololube, 2006), notwithstanding their specifications in the National Policy (NPN, 2014). The present study is aimed at bridging this gap. Hence, it examined the degree of infusion of ICTs into various Physics concepts in the Senior Secondary School Curriculum in relation to teachers' perceived self efficacy.

1.3 Purpose of the Study.

The purpose of this study was to explore the extent of ICTs integration by teachers in Physics Classrooms and their perception of self efficacy in Secondary schools in Kano Nigeria.

1.4 Research Questions

1. In which of the Physics concepts do teacher's Integrate ICTs in secondary schools in Kano State?
2. To what extent do teachers integrate ICTs in to Physics Class rooms in secondary schools in Kano State?
3. What are Teachers' perceptions of Self Efficacy about ICTs in Physics Class Rooms in Kano state?

1.5 Significance of the Study

Physics is a subject that is a pre-requisite for almost all engineering and other technical courses. It is therefore hoped that the findings of this study would be found valuable by various bodies engaged in Scientific and

Technical and Educational policies formulation and development in the country.

The findings of the study will "hopefully" facilitate a change in attitude of Physics educators and students towards utilizing ICTs for effective teaching. It is hoped that the study will help teachers to develop ICT skills that would enhance students achievement, performance and interest in physics, so that more Scientists, Engineers, Technologists, Science and Technology teachers, that are needed for the transformation of the country's socio-economic, and technological development will be produced.

It is equally hoped that this research will be of immense benefit to both education planners and science curriculum planners to modify where necessary, the current science curriculum by Integrating ICTs in physics instruction in particular, and science oriented subjects in general. Providing for more interactive lessons in the curriculum can do this. This will serve as a source of motivation to the students.

The study is also important in view of the proper implementation of National Policy on Education (FGN, 2014) which emphasizes; "the acquisition of appropriate skills, abilities and competence both mental and physical as equipment for the individual to live in and contribute to the development of his society". The interactive skills acquired in using ICTs will help in achieving this objective.

2. Methodology

The researcher adopted a descriptive survey research design. This approach was used in order to ascertain the extent of ICTs integration by teachers in Physics class rooms. The design offers a wide range of scope and a great deal of information as well as representative sample which permits the researcher's statistical inferences and generalization to the entire population (Fraenkel & Wallen, 2005).

2.1 Population and sample of the Study

The population considered for the study was the entire Physics teachers in all the government Science secondary schools in Kano State, numbering 56 and this population formed the sample of the study.

2.2 Instrumentation

The instrument used for data collection was, Teachers ICT Integration questionnaire (TIIQ) adapted from some questionnaires used by other researchers for ICT. Thus the original questionnaire was modified to suit the present study and was face-validated by specialists in Science, Technology and Education from Bayero University, Kano Nigeria. It contained close-ended response items designed to measure the variables of level of integration and Teachers Self Efficacy about ICTs using 1-Highly Integrated (HI), 2-Slightly Integrated (SI) and 3-Not Integrated (NI).

3. Results Analysis and Discussion

collected from the structured items of the questionnaires were analyzed using using descriptive statistics

The participants in this study were 56 Physics teachers from seven Science secondary schools in Kano. Data

Table 1: Teachers’ ICTs Self Efficacy

Teachers’ ICTs Self Efficacy	SA	A	U	D	SD
1. I don’t use ICTs for instructional purposes in Physics class rooms	35 (62.51)	13 (23.21)	-	4 (7.14)	4 (7.14)
2. I know what to do for using ICTs in instructional environments.	18 (32.14)	20 (35.71)	-	12 (21.43)	6 (10.71)
3. I can answer any question my students ask about ICTs.	8 (14.28)	8 (14.28)	-	15 (26.79)	25 (44.64)
4. I am not sure that I am computer-literate for use ICTs in my Physics classes.	29 (51.79)	16 (28.56)	9 (16.07)	1 (1.79)	1 (1.79)
5. I think that I can use ICTs in class activities more effectively day by day.	24 (42.86)	25 (44.64)	-	7 (12.50)	0 (0.00)
6. I am aware of the opportunities that ICTs offer.	26 (46.43)	22 (39.29)	-	8 (14.28)	0 (0.00)
7. I believe that tools like e-mail, forum and chat will make communication with my colleagues and students easier.	34 (60.71)	11 (17.86)	-	11 (17.86)	0 (0.00)
8. I think that ICTs supported teaching makes learning more effective.	17 (30.36)	31 (55.36)	3 (5.36)	5 (8.93)	0 (0.00)
9.I think the use of ICTs increases the interest of students toward Physics	34 (60.71)	6 (10.71)	9 (16.07)	6 (10.71)	1 (1.79)
10.I think the use of ICTs increases the quality of courses.	16 (28.56)	14 (25.00)	1 (1.79)	-	4 (7.14)
11 I can handle different learning preferences of my students having different learning styles by using ICTs	0 (0.00)	21 (37.50)	0 (0.00)	35 (62.50)	0 (0.00)

The frequency scores for the first item in table 1 indicated that about 62.51% and 23.21% of the Physics teachers strongly agreed and Agreed respectively that they don’t use ICTs for instructional purpose. This means that 85.72% of the teachers believed that they do not use ICTs

in Physics teaching. However, Majority of the teachers (80.35%) believed that they are literate enough to incorporate ICTs in Physics class rooms and 85.72% agreed that they are aware of the opportunities that ICTs offer.

Table 2: ICTs Integration in Physics Class room

Physics Topics	HI (%)	Extent of ICTs Integration SI NI TOTAL (%) (%) (100%)
Electricity	00 (00)	13 43 56 (23) (77) (100)
Magnetism	00 (00)	10 46 56 (18) (82) (100)
Mechanics	10 (18)	13 33 56 (23) (59) (100)
Heat Energy	00 00	00 56 56 (00) (100) (100)
Light And Optics	00 00	00 56 56 (00) (100) (100)
Sound And Waves	10 (18)	13 33 56 (23) (59) (100)

The table 2 reveals poor ICTs integration in nearly all the Physics topics in which Heat energy and Light and Optics ranks highest with all the 56 respondents (100 percent each) indicating non ICTs integration. It further indicates that ICTs were slightly integrated in electricity,

Magnetism and Mechanics (23%, 18% and 23% respectively) Research confirms that ICT integration and application are not well established in Nigeria because of poor information infrastructure (Adomi & Kpangban, 2010). It has also been observed that more than 40 percent

of the population of Africa is in areas not covered by telecom services. Schools located in such areas will thus experience ICT connectivity problems.

4. Summary/Conclusion

The study reveals that majority of the teachers (80.35%) believed that they are literate enough to incorporate ICTs in Physics class rooms but the extent of integration of ICTs into Senior Secondary Physics Education is minimal and to a larger extent inadequate. The anomaly might not be unconnected with Lack of/inadequate ICT facilities in schools, perhaps due to poor funding among others. This finding conforms with that of Birch & Irvine, (2009) who observed that inadequate ICTs was a challenge to integration of technologies in schools. Similarly, Okwudishu (2005) discovered that unavailability of some ICT components in schools hampered teachers' use of ICTs.

5. Recommendations

Arising from the findings of the study, the following recommendations are made.

1. All Nigerian secondary schools should be adequately equipped with relevant and appropriate ICT resources.
2. The use of ICTs for instructional delivery should be incorporated into teacher training programs of pre-service and in-service Physics teachers.
3. Effort should be intensified to ensure implementation of governments' policy to incorporate modern ICT into the teaching and learning of senior secondary Physics.
4. Physics teachers should be part of the decision-making process with respect to the implementation of ICT innovations in schools so that they may be committed to innovation with belief.
5. As a form of motivation senior secondary Physics students and teachers should be empowered to own laptop computers. This will go a long way to enhance students' readiness to integrate ICTs into Physics class room

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