

**PHYSICS STUDENTS' USE OF INFORMATION AND  
COMMUNICATION TECHNOLOGY (ICT) IN UNIVERSITY OF JOS,  
NIGERIA**

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**ABSTRACT**

*This study investigated the extent of physics students' use of information and communication technology in the University of Jos. The study employed the cross-sectional descriptive survey research design. The population was 227 physics students. A sample of 100 was selected using probability proportionate to size (PPS) technique. The instrument for the study was a Physics Students use of ICT Questionnaire (PSICTQ), developed by the researchers, and rated on the Likert scale. The face and construct validations of PSICTQ were ascertained by experts in the University of Jos. The PSICTQ had a reliability coefficient of 0.84, obtained using Cronbach's Coefficient Alpha method. Four research questions were raised and answered and three hypotheses were formulated and tested at 0.05 level of significance. The mean, standard deviation, Spearman Rank Order Correlation and t-test statistics were used as statistical tools to analyze data obtained. Findings*

*revealed that ICT resources were available in the University, even though e-Library, interactive whiteboard and software were limited. Further findings revealed that physics students used ICT resources. The findings also revealed that limited ICT infrastructure and unstable power supply are some challenges physics students faced with the use of ICT resources. The study established that there was a significant positive relationship between the availability of ICT resources and students use of the resources, as  $p < 0.05$ . It was also found that no significant difference existed between the challenges faced by male and female physics students in the use of ICT resources, since  $p > 0.05$ . The study concluded that physics students use ICT resources for learning courses and recommended, among others, that the federal government and stakeholders should provide adequate ICT resources such as e-Library and interactive white boards for students' use.*

**Keywords:** Physics Students, Information and Communication Technology (ICT), ICT Resources, Availability of ICT, Use of ICT

## **Introduction**

The importance of physics in a nation's economic, scientific and technological development cannot be overemphasized (American Physics Society, 2008). Thus, there is the need for the sustenance of teaching and learning of physics in our institutions of learning. However, Mankilik and Usman (2009) observed that students do not understand physics concepts and principles up to application levels. Similarly, Omosewo (2009) pointed out that traditional didactic methods which have dominated our science classrooms are responsible for students' lack of understanding of the sciences. Hence, a shift from the teacher-centered pedagogy of learning physics to a learner-centered one becomes necessary. A potent shift in pedagogical practice could involve the integration of Information and Communication Technology (ICT) as part of whole class, group, and individual student activities to support didactic classroom teaching. Gusen (2010) defined ICT as the combination of computer and telecommunication system to improve teaching, learning, research and communication in education. UNESCO (2011) provided a broader definition of ICT to mean computers, mobile phones, digital cameras, satellite navigations systems, electronic instruments and data recorders, radio, television, computer networks, satellite systems and almost anything which handles and communicates information electronically.

The use of ICT has changed our conventional ways of learning and proposes the need to rethink education in terms of a more current context (White, 2010). ICT use allows for increased individualization of learning. Adomi and Kpangban (2010) asserted that in schools where new technologies are used, students have access to tools that adjust to their attention span and provide valuable and immediate feedback

for literacy enhancement. In Nigeria, the application of ICT in the teaching and learning process has been integrated in the school system at different levels. Adeosun (2010) stated that Nigeria is a signatory to a number of pacts and treaties to the World Declarations on Education such as the Education for All and the Millennium Development Goals. ICT resources can be used to find, develop, analyze and present information, as well as to model situations and solve problems. For instance, physics students' use of ICT devices would allow for rapid fitting and calculation of slope and intercept values from manually entered data. Some ICT materials that could be provided for physics students include among others the following: laptops, palmtops, projector, projection screen, microphone, speakers, video clips from the Internet, sensors, software, memory and storage, monitors, white boards, cell phones, digital cameras, webcam, scanners, printers, copiers, and Microcomputer-Based Laboratory (MBL) tool. Physics students' knowledge of how to use ICT facilities is a critical aspect of meaningful learning of physics concepts using ICT devices. **This is so because Ugwuanyi, Chiegwu, Osuagwu and Ogbu (2017) rightly observed that the utilization of the ICT puts the student on the driving seat on the highway of learning.**

*Despite the important place of ICT in the teaching and learning of physics, ICT use in schools could be constrained by a number of internal and external factors.* Adomi and Kpangban (2010), Josiah and Sharon (2010) identified these constraints to include *poor ICT* infrastructure, inadequate ICT facilities in schools, limited ICT skills among physics teachers, frequent electricity interruption, high cost of ICT facilities and components, inadequate physics educational software, lack of maintenance culture and lack of ICT skills and knowledge on the part of physics students. It could be deduced from literature that *the challenges to effective use of ICT in schools can be grouped into institutional factors, student-related constraints and teacher related challenges.* Philip, Oluwagbemi and Oluwaranti (2010) noted that tertiary institutions in Nigeria lack adequate infrastructure to effectively tap into the opportunities offered by the cyberspace.

The study by Maharana, Biswal and Sahu (2009) explored the use of information and communication technology by medical students. Findings revealed that respondents were of the opinion that ICT should be included in their syllabus. Zakaria, Watson and Edwards (2010) conducted a research on the use of Web 2.0 technology by Malaysian students. Result showed that students preferred finding information related to education using search engines instead of asking friends or teachers. **Ugwuanyi, Chiegwu, Osuagwu and Ogbu (2017)** examined the knowledge and utilization of ICT among radiography students in South East Nigeria. It was revealed that most of the students had good knowledge of ICT, received training and that most of their knowledge of ICT was based on Microsoft office. However, these reviewed studies on students' utilization of ICT were not specifically on physics students and not in the University of Jos; hence the need for the current study.

### **Statement of the Problem**

The use of ICT in teaching and learning has been shown to be effective in enhancing quality education. Thus, integrating ICT in the teaching and learning of physics is seen as a panacea towards improving students' understanding of physics concepts. Tertiary institutions in Nigeria, particularly universities, have made efforts towards the provision of ICT facilities required for effective teaching and learning. University of Jos, which has a reputation for being a centre of academic excellence, is not left out. However, the extent of the use of ICT facilities among students, particularly physics students, is still a thing of concern. Therefore, the problem of this study is poised by the question: What is the extent of the use of ICT facilities among undergraduate students of physics in the University of Jos, Nigeria?

### **Purpose of the Study**

The purpose of this study was to investigate physics students' use of ICT in University of Jos, Nigeria. Specifically, the study sought to:

- i. determine the extent of the availability of ICT resources for the teaching and learning of physics in University of Jos.
- ii. examine the extent to which undergraduate physics students of the University of Jos, are knowledgeable in the use of ICT resources, including software applications in learning.
- iii. determine the extent of the utilization of ICT resources for learning by undergraduate physics students of the University of Jos
- iv. find out the challenges facing undergraduate physics students' use of ICT resources for learning in the University of Jos

### **Research Questions**

The following research questions were raised to guide the study:

- i. What is the extent of the availability of ICT resources for the teaching and learning of physics in the University of Jos?
- ii. To what extent are undergraduate physics students of the University of Jos, knowledgeable in the use of ICT resources, including software applications in learning?
- iii. What is the extent of the utilization of ICT resources for learning by undergraduate physics students of the University of Jos?
- iv. What are the challenges facing the undergraduate physics students' use of ICT resources for learning in the University of Jos?

### **Hypotheses**

The following null hypotheses were formulated and tested at 0.05 level of significance:

- i. There is no significant relationship between the availability of ICT resources

- and students' use of ICT resources for learning physics in the University of Jos.
- ii. There is no significant relationship between students' knowledge and use of ICT resources for learning physics in the University of Jos.
  - iii. There is no significant difference between male and female students' challenges of using ICT resources for learning physics in the University of Jos.

### **Research Methodology**

The study employed the cross-sectional descriptive survey research design. The population of the study consisted of 227 physics students of University of Jos, which comprised of 100 physics (major) students and 127 physics (education) students. The sample for the study was 100 students (64 males and 36 females). This represents 44% of the population which, according to Awotunde and Ugodulunwa (2004), was sufficient for the study. Probability Proportionate to Size (PPS) sampling technique was employed to select physics major and physics education students for the study. Physics Students' Use of ICT Questionnaire (PSICTQ), designed by the researchers was used as instrument for data collection. The PSICTQ was made up of two sections: Section A was on students' information, and section B contained the questionnaire items. The positive items were rated on the Likert scale with Strongly Agree (SA) having a score of 5, Agree (A) having a score of 4, Undecided (UD) having a score of 3, Disagree (D) having a score of 2 and Strongly Disagree (SD) having a score of 1. The rating was reversed for negative items. The criterion mean (3.0), which is the mean of the Likert scale, was used to decide the acceptability or otherwise of a factor. Josiah and Sharon (2010) posited that a factor is accepted if the calculated mean of that item is equal to or greater than the criterion mean; and if the calculated mean of an item is less than the criterion mean, the factor is rejected. It was on that basis that the researchers took decision.

The PSICTQ was subjected to face and construct validity by two experts from the University of Jos, Nigeria: One of the experts was from the Technology Education unit in the Department of Science and Technology Education, and the other was from the Test and Measurement unit in the Department of Educational Foundations. The reliability coefficient of PSICTQ was found to be 0.84 using Cronbach's Coefficient Alpha method. Mean and standard deviation were used to answer the research questions. Hypotheses one and two were tested at 0.05 level of significance using Spearman Rank Order Correlation Coefficient while hypothesis three was tested using t-test statistics at 0.05 level of significance. All computations were done using the Statistical Package for Social Sciences (SPSS) version 25.

## Results

### Research Question One

What is the extent of the availability of ICT resources for the teaching and learning of physics in the University of Jos?

**Table 1: Mean Rating of Extent of the Availability of ICT Resources**

Factors	N	Mean	St. Dev.	Decision
Computer Laboratory	100	3.370	1.341	Accepted
Internet service	100	3.481	1.359	Accepted
e-Library	100	2.022	1.371	Rejected
Interactive whiteboard	100	2.114	1.197	Rejected
television Set	100	3.983	1.348	Accepted
Projector	100	3.852	1.417	Accepted
Software applications	100	3.233	1.384	Accepted
<b>Grand Mean</b>		3.151	1.345	

Criterion Mean = 3.0

Table 1 reveals that the ICT resources available for use by physics students in the University of Jos are computer laboratory, internet service, television set, projector and software applications. However, those that are limited include e-Library and interactive whiteboard. The grand mean of the items (3.151) suggests that ICT resources needed for effective learning by physics students are available, though not adequate. Thus, physics students depend on the ICT resources in the University of Jos to enhance their learning.

### Research Question Two

To what extent are undergraduate physics students of the University of Jos, knowledgeable in the use of ICT resources, including software applications in learning?

**Table 2: Mean Rating of Extent to which Students are Knowledgeable in the use of ICT Resources, including Software applications**

Factors	N	Mean	St. Dev.	Decision
Microsoft word processing	100	4.343	0.343	Accepted
Microsoft power point	100	3.452	1.445	Accepted
Desktop publishing	100	2.885	1.581	Rejected
Website design	100	2.811	1.577	Rejected
Computer programming	100	2.722	1.513	Rejected
Software installation	100	3.914	1.519	Accepted
Microsoft excel and other spread sheets applications	100	3.073	1.470	Accepted
<b>Grand Mean</b>		3.314	1.350	

Criterion Mean = 3.0

Table 2 shows that physics students are more knowledgeable in the use Microsoft word processing, Microsoft power point, software installations and Microsoft excel and other spread sheets applications. The table also indicates that physics students have limited knowledge of the use of desktop publishing, web designing and computer programming. The grand mean of the items (3.314) suggests that physics students in the University of Jos are knowledgeable in the use of ICT resources, although some deficiencies existed. The limited knowledge of students in the use of these resources could be linked to the inadequacy of ICT resources or the unavailability of teaching/learning materials in that area.

### **Research Question Three**

What is the extent of the utilization of ICT resources for learning by undergraduate physics students of the University of Jos?

**Table 3: Mean Rating of Extent of Students' Utilization of ICT Resources for Learning**

<b>Factors</b>	<b>N</b>	<b>Mean</b>	<b>St. Dev.</b>	<b>Decision</b>
I use ICT devices like Laptop to source information/literature	100	4.152	1.273	Accepted
I use ICT facilities for presentation	100	4.067	1.284	Accepted
I use ICT facilities for teleconferencing	100	2.434	1.403	Rejected
the use of ICT devices accelerates learning of difficult topics in physics	100	4.112	1.325	Accepted
I use ICT facilities for preparing my term papers and assignment	100	4.245	1.199	Accepted
I use the internet to browse and download articles and journals	100	3.144	1.189	Accepted
I feel library materials like books are more useful for learning than ICT resources	100	2.674	1.401	Rejected
<b>Grand Mean</b>		<b>3.547</b>	<b>1.296</b>	

Criterion Mean = 3.0

Table 3 reveals that students use ICT devices like Laptop to source information, prepare term papers and assignment and that the use of ICT devices accelerates learning of difficult topics in physics. It also revealed that students use ICT facilities for presentation and that they use the internet to browse and download articles and journals. The students are also of the opinion that ICT resources are more useful in learning than library materials like books. The items' grand mean (3.547) suggests that physics students in the University utilized ICT resources in learning physics concepts. However, it was also revealed that the use of ICT resources for teleconferencing by the students was limited.

### Research Question Four

What are the challenges facing the undergraduate physics students' use of ICT resources for learning in the University of Jos?

**Table 4: Mean Rating of Extent of Students' Challenges in using ICT Resources for Learning**

Factors	N	Mean	St. Dev.	Decision
Limited ICT infrastructure like personal computers and desktops	100	4.293	1.328	Accepted
Unreliable power supply	100	3.571	0.987	Accepted
Insufficient ICT staff	100	4.354	1.329	Accepted
Poor internet services	100	4.390	1.324	Accepted
limited time for using ICT facilities	100	3.132	1.491	Accepted
Absence of ICT accessories like, modem, printers and flash	100	2.475	1.425	Rejected
Limited e-Library facilities	100	3.714	1.473	Accepted
<b>Grand Mean</b>		3.704	1.337	

Criterion Mean = 3.0

Table 4 shows that the challenges faced by physics students in using ICT resources in learning include insufficient ICT staff, poor internet, limited ICT infrastructure like personal computers and desktops, limited e-library facilities, unreliable power supply and limited time for using ICT facilities. However, the absence of ICT accessories like modem, printers and flash were not major challenges to students' use of ICT. On the whole, a grand mean of 3.704 shows that those items listed in the table are the challenges physics students face in the use of ICT resources for learning in the University of Jos.

### Hypothesis One

There is no significant relationship between the availability of ICT resources and students' use of ICT resources for learning physics in the University of Jos.

**Table 5: Results of Spearman Rank Correlation of the Relationship Between Availability and Use of ICT Resources by Physics Students**

Variable	$\bar{X}$	SD	N	$r^s$ -cal.	p	Decision
Availability of ICT	3.151	1.345	100	.411	.001	H <sub>0</sub> Sig.
Use of ICT Resources	3.547	1.296				

$p < .05$

Table 5 reveals that  $r^s(100=.411, p=.001)$ , which implies that  $p < 0.05$ . Therefore, the null hypothesis was rejected and conclusion was drawn that there is a significant positive relationship between the availability of ICT resources and physics students' use of ICT resources in the University of Jos. Hence, H<sub>0</sub> was statistically significant at 0.05 level.



**Hypothesis Two**

There is no significant relationship between students' knowledge and the use of ICT resources for learning physics in the University of Jos.

**Table 6: Results of Spearman Rank Correlation of the Relationship Between Students' Knowledge and Use of ICT Resources for Learning**

Variable	$\bar{X}$	SD	N	r <sup>s</sup> -cal	p	Decision
Knowledge of ICT	3.314	1.350	100	.453	.000	H <sub>0</sub> Sig.
Use of ICT Resources	3.547	1.296				

$p < .05$

Table 6 established that  $r^s(100=.453, p=.000)$ , signifying that  $p < 0.05$ . Thus, the null hypothesis was rejected and the study concluded that there was a significant positive relationship between the students' knowledge of ICT and the use of ICT resources for learning physics by the students of the University of Jos.

**Hypothesis Three**

There is no significant difference between male and female students' challenges of using ICT resources for learning physics in the University of Jos.

**Table 7: Results of t -test statistics for the Difference Between Challenges facing Male and Female Physics Students' Use of ICT Resources**

Gender	N	$\bar{X}$	SD	df.	t-cal.	p	Decision
Male	64	4.370	1.313	98	2.673	.132	H <sub>0</sub> Not Sig.
Female	36	3.861	1.524				

$p > .05$

Table 7 indicates that  $t(98=2.673, p=.132)$ , which also means that  $p > 0.05$ . Hence, the study failed to reject the null hypothesis and the conclusion drawn therefore was that there was no significant difference between the challenges facing male and female physics students in the use of ICT resources in the University of Jos. In other words, both groups of students faced the same challenges; hence students' gender does not posed threats in the utilization of ICT resources.

**Discussion**

The findings on the extent of the availability of ICT resources in the University revealed that ICT resources are available for use by physics students, even though e-Library resources, interactive whiteboard and software applications needed for learning by physics students were limited. This result is not in agreement with that of Hamilton-Ekeke and Mbachu (2015) who revealed that basic ICT

facilities like computers are unavailable for students' use. The findings on the extent to which physics students are knowledgeable in the use of ICT resources revealed that the students are more knowledgeable in the use of Microsoft word processing, Microsoft power point, software installations and in the use of Microsoft excel and other spread sheets application. This is in conformity with the findings of **Ugwuanyi, Chiegwu, Osuagwu and Ogbu (2017)** who examined students' knowledge and utilization of ICT, and found that most of their knowledge of ICT was based on Microsoft office. The results of hypothesis tested established that there was a significant positive relationship between students' knowledge of ICT applications and the use of ICT resources by physics students of the University of Jos.

The findings on physics students' utilization of ICT resources revealed that the students use ICT devices like Laptop to source information, prepare term papers and assignment. It was also revealed that they use ICT facilities for presentation and that they use the internet to browse and download articles and journals. However, it was revealed that students' use of ICT resources for teleconferencing was limited. This finding is in line with that of Ahmed (2009) who reported that almost all the respondents in the study used computers for their research works. The findings from the hypothesis tested revealed that there is a significant positive relationship between the availability of ICT resources and physics students use of ICT resources in the University of Jos.

The results of analysis for challenges facing physics students use of ICT resources revealed such major challenges as insufficient ICT staff, poor internet, limited ICT infrastructure like personal computer desktops, limited e-library resources, unreliable power supply and limited time. This result corroborates that of Osuchukwu, Obuezie and Ogwuche (2017) who identified challenges of using ICT to include staff, epileptic power supply and irregular internet connectivity among others. The findings of the hypothesis on challenges of using ICT by gender established that there was no significant difference between the challenges facing male and female physics students in the use of ICT resources in the University of Jos. This finding is in contrast to the result of previous study by Mahmood and Bokhari (2012) who reported an ICT use gap in favour of females.

## **Conclusion**

The aim of this study was to assess the extent of the use of ICT resources by physics students in the University of Jos. The findings from results of analysis revealed that ICT resources available are computer laboratory and internet services, projectors, while e-library facilities and interactive whiteboard were limited. It was found that students are knowledgeable in Microsoft word processing, Microsoft power point and spread sheet as software application provided by ICT resources. Furthermore, the study revealed that physics students use ICT resources for sourcing information and literature, presentation, and for preparing term papers and assignment. However, the study identified limited infrastructure, unreliable power

supply and insufficient ICT staff as major constraints faced by the students. There were no gender gaps in the challenges of using ICT by the students. The study concluded, therefore, that undergraduate physics students use ICT resources in the University of Jos.

### **Recommendations**

The following recommendations were proffered towards improving students' use of ICT resources for the teaching and learning of physics:

- i. The federal government and stakeholders should ensure that modern and functional ICT resources, such as e-library and interactive white board, are made available for students' use.
- ii. Students should be taught the application of ICT resources in desktop publishing, computer programming and web designing that can improve the learning of physics
- iii. The university authority should employ more ICT resources supporting staff, while the available ones should attend refresher training programmes in ICT.

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