

IMPACT OF INFORMATION AND COMMUNICATION TECHNOLOGY (ICT) ON STUDENTS' ACADEMIC PERFORMANCE IN THE DEPARTMENT OF ENVIRONMENTAL EDUCATION, UNIVERSITY OF CALABAR, NIGERIA

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ABSTRACT: The study investigated the impact of Information Communication Technology (ICT) on students' academic performance in Environmental Education in University of Calabar, Cross River State, Nigeria. Five research questions and two hypotheses were presented to direct the work. The area of study is the University of Calabar. The descriptive survey is the research design adopted in the study. The study population was made up of 520 students of the Department of Environmental Education, from where 260 undergraduate students were chosen to form the study sample. The selection of the study sample was carried out using simple random sampling procedure. The instrument utilized for collecting data in the study was a questionnaire titled Information and Communication Technology and Students' Academic Performance (ICTSAP). The instrument was validated by experts in Measurement and Evaluation. The reliability was done through the use of Cronbach Alpha and the instrument yielded an index of .956. The Statistical Package for the Social Sciences version 28 was used in carrying out all the analysis. The analysis of the data was carried out using mean and standard deviation to answer the research question and regression to test the hypotheses. The finding of the study uncovered among others that ICT is utilized by students to a high extent for academic purposes, including accessing academic materials, completing assignments, and engaging in collaborative learning. Students perceive ICT tools to be beneficial in enhancing their understanding, improving the quality of their work, and enabling efficient study practices.

Keywords: ICT, Students, Academic Performance, Undergraduate Students, Environmental Education, Nigeria.

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INTRODUCTION

In the contemporary educational landscape, the integration of Information and Communication Technology (ICT) has transformed the modalities of teaching and learning. ICT encompasses a wide array of tools and resources used to communicate, create, disseminate, store, and manage information (UNESCO, 2002). Its role in the educational sector cannot be overstated, especially in higher education institutions where digital transformation influences both academic content delivery and students' learning outcomes.

Globally, institutions of higher learning are increasingly integrating ICT to enhance the teaching-learning process. This trend is driven by the need to equip students with the 21st-century skills necessary to navigate the knowledge-based economy (Tinio, 2002). In the Nigerian context, universities are adopting ICT in various academic and administrative capacities. The University of Calabar, like many Nigerian universities, has made significant strides in incorporating ICT into its educational systems. However, the degree to which this integration has impacted students' academic performance remains a subject of inquiry, particularly within specialized disciplines such as Environmental Education.

Environmental Education is a multidisciplinary field concerned with understanding environmental issues and promoting sustainable practices. As a field that demands critical thinking, research, and analytical skills, the use of ICT can significantly enhance students' access to current data, simulation tools, environmental modeling software, and collaborative learning platforms (Adegbija & Fakomogbon, 2012). ICT tools such as digital libraries, e-learning platforms, and virtual classrooms are increasingly being used to support Environmental Education, particularly at the University of Calabar. Despite the potential benefits, challenges such as limited ICT infrastructure, poor internet connectivity, and lack of technical skills among students and lecturers persist (Jegede, 2009; Okebukola, 2007).

Understanding the impact of ICT on students' performance in this context is vital. Performance here refers not only to academic achievement as reflected in grades but also the students' ability to apply knowledge practically, solve environmental problems, and engage in critical inquiry. This study seeks to examine the extent to which ICT use influences student outcomes in the Department of Environmental Education, University of Calabar.

Statement of the Problem

The increasing integration of ICT in education raises pertinent questions about its effectiveness in enhancing student performance. In Nigeria, while the National Universities Commission (NUC) has encouraged the adoption of ICT in higher institutions, actual implementation and its impact on student learning outcomes vary widely across departments and institutions. The Department of Environmental Education at the University of Calabar has embraced ICT through the use of online resources, digital presentations, and virtual learning environments. Nevertheless, anecdotal evidence and preliminary observations suggest a mixed outcome regarding the effect of ICT usage on student performance. Some students report improved access to information and enhanced learning experiences, while others struggle with ICT literacy and infrastructural challenges.

Moreover, prior studies on ICT and academic performance in Nigeria have largely focused on general education or science-based disciplines, with limited attention given to Environmental Education. Given the unique nature of this field, which often requires modeling,

simulation, and spatial analysis tools, there is a need to specifically explore how ICT tools affect learning and performance in this context. There is a gap in knowledge concerning the specific impact of ICT on student performance in Environmental Education at the University of Calabar, and addressing this gap is crucial for policy formulation, curriculum development, and effective pedagogical practices in the department.

Aim and Objective of the Study

This study is aimed at investigating the impact of information and communication technology (ICT) on students' performance in the department of environmental education, University of Calabar, Nigeria. Specifically, the study's objectives are to:

- Investigate the extent ICT is utilized by students in the Department of Environmental Education, University of Calabar?
- Ascertain the relationship between the use of ICT and academic performance of students in the Department.
- Examine the perceived benefits of ICT usage among Environmental Education students.
- Evaluate the challenges that students face in the utilization of ICT for academic purposes.
- Appraise the significant differences in academic performance between students who frequently use ICT tools and those who do not.

Research Questions

The study seeks to address the following research questions:

- To what extent is ICT utilized by students in the Department of Environmental Education, University of Calabar?
- To what extent does the use of ICT influence academic performance of students in the Department of Environmental Education?
- What are the perceived benefits of ICT usage among environmental education students?
- To what extent is the challenges faced by students in the utilization of ICT impact their academic performance?
- To what extent is there difference between the academic performance of students who frequently use ICT tools and those who do not?

Hypotheses

To guide the investigation, the following hypotheses are formulated:

- **H₀₁:** There is no significant difference between ICT usage and students' academic performance in the Department of Environmental Education, University of Calabar.
- **H₀₂:** There is no significant difference in academic performance between students who frequently use ICT tools and those who do not.

LITERATURE REVIEW

The Extent ICT is Utilized by Students of Environmental Education in Nigeria

In the 21st century, Information and Communication Technology (ICT) has become a cornerstone of educational transformation worldwide. In Nigeria, the utilization of ICT among students—especially those in specialized disciplines like Environmental Education—has witnessed significant yet uneven progress. Environmental Education, which deals with the understanding and management of ecological systems and sustainable development, greatly benefits from ICT tools such as Geographic Information Systems (GIS), simulation software, online databases, and collaborative platforms (Adegbija & Fakomogbon, 2012).

The extent of ICT utilization among Environmental Education students in Nigeria varies across institutions, often reflecting the availability of infrastructure, students' digital literacy, and institutional support. In many Nigerian universities, including the University of Calabar, ICT has been integrated into academic programs through the provision of computer labs, internet connectivity, and e-learning platforms. However, studies show that access to and utilization of these resources remains limited by several factors (Jegade, 2009; Yusuf, 2005).

Students of Environmental Education often use ICT tools primarily for information retrieval, academic research, assignment completion, and communication with peers and lecturers. According to Oye et al. (2012), Nigerian university students commonly access online resources such as e-journals, digital libraries, and educational websites to support their studies. These tools enhance their ability to acquire up-to-date information on environmental issues and current research trends. Despite this, usage tends to be more frequent among students with personal access to ICT devices and internet connectivity.

A survey conducted by Okebukola (2007) revealed that a significant proportion of students in Nigerian universities possess basic ICT skills and use the internet for academic purposes. However, only a limited number engage with advanced applications such as GIS software, environmental modeling tools, or e-learning management systems. This suggests that while general ICT usage is increasing, its application in discipline-specific contexts remains limited. For Environmental Education, this gap is particularly concerning as students need to be equipped with digital tools relevant to environmental analysis, climate modeling, and spatial data interpretation.

Furthermore, the mode of instruction in many departments still leans heavily on traditional face-to-face lectures, with minimal integration of multimedia content or interactive ICT tools (Ajayi & Ekundayo, 2009). The low usage of platforms like Google Classroom, Moodle, and Microsoft Teams highlights an underutilization of ICT in fostering collaborative and blended learning. Environmental Education, which benefits from interactive simulations and virtual field trips, often misses out on such dynamic instructional approaches due to infrastructural and pedagogical limitations.

Another dimension of ICT utilization relates to communication. Students frequently use emails, WhatsApp, and Telegram for academic collaboration, group discussions, and information dissemination. These platforms serve as informal extensions of classroom interaction and facilitate peer learning. While beneficial, their usage is often not institutionally structured, and thus lacks integration into formal learning management systems (Tinio, 2002).

Despite these limitations, there is growing awareness among students and faculty about the value of ICT in enhancing environmental education. Government initiatives and institutional

policies have begun to emphasize digital literacy and ICT integration. The Nigerian National Policy on Education (FRN, 2013) and the National ICT Policy both stress the importance of ICT in fostering innovation, critical thinking, and academic excellence across all levels of education.

The utilization of ICT by Environmental Education students in Nigeria is expanding, particularly in the areas of information access and communication. However, there is still a need for deeper integration of ICT tools specific to the discipline, supported by improved infrastructure, targeted training, and pedagogical reforms. For students to fully harness the transformative potential of ICT, institutions must invest in tailored digital resources and foster a culture of innovation and tech-based learning.

The Use of ICT and Academic Performance of Students of Environmental Education in Nigeria

The integration of Information and Communication Technology (ICT) in education has transformed the way knowledge is delivered, accessed, and applied across various disciplines. In Nigeria, the adoption of ICT has shown significant potential in enhancing academic performance, particularly in the field of Environmental Education, which is a discipline that relies heavily on current data, technological tools, and interdisciplinary learning. The relationship between ICT usage and academic performance among Environmental Education students is becoming increasingly relevant as institutions aim to align with global best practices in teaching and learning.

ICT provides access to a vast array of information sources, including e-books, online journals, virtual laboratories, multimedia content, and academic databases, which help students conduct in-depth research and enhance their understanding of complex environmental concepts (Yusuf, 2005). For students of Environmental Education, this access supports the acquisition of critical skills in areas such as biodiversity conservation, climate change modeling, and pollution control. These are areas where up-to-date data and technological simulations are crucial for effective learning.

Numerous studies have shown that the use of ICT in academic environments positively influences student performance. According to Jegede and Owolabi (2003), students who frequently use ICT tools for academic purposes tend to perform better in tests and examinations compared to their counterparts who rely solely on traditional learning methods. This is largely because ICT promotes independent learning, immediate feedback through e-assessments, and improved academic engagement.

In the context of Environmental Education, the use of ICT fosters the development of spatial awareness and analytical skills through tools such as Geographic Information Systems (GIS), remote sensing, and environmental modeling software. These tools allow students to simulate real-world scenarios and analyze ecological data, thereby improving their problem-solving abilities and academic competence (Aduwa-Ogiegbaen & Iyamu, 2005). For instance, GIS applications are increasingly used in environmental studies to monitor land use changes, pollution levels, and urban planning, offering students hands-on experience with real-life environmental challenges.

Furthermore, ICT facilitates effective communication between students and lecturers through emails, discussion forums, and virtual learning environments. These platforms not only enhance academic collaboration but also allow for timely clarification of concepts, sharing of academic resources, and feedback on assignments (Tinio, 2002). Such interactions can

significantly boost academic performance by keeping students actively engaged in the learning process.

Despite its advantages, the impact of ICT on academic performance is not uniform across all Nigerian tertiary institutions. Variations in infrastructure, digital literacy, access to internet services, and institutional support often limit the extent to which ICT can be fully leveraged (Ajayi, 2008). In many public universities, unreliable electricity supply, poor internet connectivity, and inadequate access to ICT devices hinder effective ICT integration in academic activities (Ololube, 2006).

Moreover, some Environmental Education students may lack the technical know-how to use advanced ICT tools beyond basic internet browsing. This digital skills gap contributes to underperformance, especially when coursework requires the use of specialized software or online platforms for research and collaboration. As such, bridging this gap through digital literacy training is essential to ensure that students can maximize the academic benefits of ICT.

Nonetheless, when properly utilized, ICT contributes to academic improvement by making learning more flexible, personalized, and resource-rich. The incorporation of multimedia presentations, video tutorials, online quizzes, and e-textbooks makes lessons more interactive and caters to different learning styles, which can enhance students' comprehension and retention of knowledge (Becta, 2004).

The use of ICT has a significant and largely positive impact on the academic performance of Environmental Education students in Nigeria. While infrastructural and technical challenges persist, the benefits of ICT in enhancing understanding, engagement, and practical application of environmental knowledge are evident. For ICT to fully realize its potential, there must be deliberate policies and investments aimed at improving access, infrastructure, and digital literacy among students and staff.

Perceived Benefits of ICT Usage among Environmental Education Students in Nigeria

In recent years, Information and Communication Technology (ICT) has emerged as a transformative force in education, providing new ways to deliver, access, and process information. For Environmental Education students in Nigeria, ICT offers critical tools for understanding complex environmental phenomena and enhancing academic engagement. The perceived benefits of ICT usage among these students span academic, professional, and cognitive domains, influencing both how they learn and what they learn.

One of the most significant perceived benefits of ICT is its ability to provide access to vast and current information resources. Students of Environmental Education rely on up-to-date information to understand global environmental trends such as climate change, biodiversity loss, deforestation, and pollution. ICT tools such as online journals, databases, e-books, and scientific repositories allow students to gain access to these materials instantly and conveniently. According to Yusuf (2005), access to ICT has helped Nigerian students stay abreast of contemporary issues and scholarly debates, thus enriching their academic experience.

ICT also promotes independent and self-paced learning, which is especially important in Environmental Education, where topics often require a multidisciplinary approach. Through digital platforms such as YouTube, Coursera, and Khan Academy, students can explore topics like ecology, environmental law, sustainable agriculture, and renewable energy on their own time. Jegede and Owolabi (2003) noted that ICT promotes learner autonomy, allow students to take ownership of their educational process and develop self-directed learning habits.

Another major benefit perceived by students is the enhanced understanding of abstract and complex environmental concepts through multimedia tools. Environmental Education frequently involves dynamic systems such as ecosystems and atmospheric cycles that can be difficult to grasp through traditional textbooks alone. With ICT, students can use videos, simulations, and interactive models to visualize processes like the carbon cycle, ocean currents, or climate systems. As Aduwa-Ogiegbaen and Iyamu (2005) argued, multimedia learning enhances comprehension by presenting information in varied formats, appealing to different learning styles.

Furthermore, ICT tools support collaborative learning and communication, which students identify as highly beneficial. Platforms such as Google Docs, WhatsApp, Zoom, and Microsoft Teams allow Environmental Education students to engage in group discussions, joint research projects, and academic networking beyond the classroom. This fosters the development of communication and teamwork skills essential for professional practice in the environmental sector. According to Tinio (2002), ICT not only bridges communication gaps between students and lecturers but also strengthens peer learning and knowledge sharing.

ICT usage is also seen as a means of developing technical competencies that are highly relevant to the environmental field. Tools such as Geographic Information Systems (GIS), statistical analysis software, and environmental modeling applications are becoming essential in environmental monitoring and research. Students recognize the long-term professional benefits of being proficient in these technologies, as they enhance employability and preparedness for the global workforce (Ololube, 2006).

Moreover, the convenience and efficiency brought about by ICT cannot be overlooked. Students perceive ICT as time-saving and cost-effective, particularly when it comes to submitting assignments, attending virtual classes, or accessing online learning materials. It reduces dependency on printed resources and offers flexibility, especially for students in remote or under-resourced areas. Becta (2004) reported that students with access to ICT tend to show improved academic performance and greater motivation, largely due to the convenience and interactivity of digital learning environments.

Despite infrastructural challenges, students generally perceive ICT as a powerful enabler of academic success and innovation. These positive perceptions are influenced by their experiences with ICT-enhanced instruction and exposure to digital tools that make learning more engaging, relevant, and practical. As more universities in Nigeria incorporate ICT into their curricula, these benefits are expected to expand and become even more impactful.

The perceived benefits of ICT usage among Environmental Education students in Nigeria are multifaceted, encompassing enhanced access to knowledge, improved understanding of complex topics, greater collaboration, and professional skill development. While challenges such as inadequate infrastructure and digital literacy persist, students largely view ICT as a valuable asset in their academic journey. Continued investment in ICT resources and training will ensure that these benefits are fully realized across Nigerian higher education institutions.

The Challenges in the Utilization of ICT for Academic Purposes in Nigeria

The integration of Information and Communication Technology (ICT) in education has revolutionized learning processes across the globe. However, in Nigeria, while efforts have been made to promote ICT in academic institutions, several challenges still hinder its effective utilization, especially for academic purposes. These challenges range from infrastructural deficits

and limited funding to poor digital literacy and policy implementation issues. Understanding these obstacles is essential for improving ICT-based education, particularly in disciplines like Environmental Education that require data-driven learning approaches.

One of the most pressing challenges to ICT utilization in Nigeria is the lack of adequate infrastructure. Most tertiary institutions, especially public universities, suffer from inadequate ICT facilities such as computer laboratories, projectors, e-libraries, and internet connectivity. The existing infrastructure is often outdated or insufficient to support large student populations (Agbor et al., 2022). According to Ololube et al. (2013) and Agbor et al. (2023), the digital divide in Nigerian universities is significant, with many institutions lacking the basic tools required for effective ICT-based learning.

The issue is compounded by unstable electricity supply, which hampers the consistent use of computers and internet services. Regular power outages disrupt online classes, digital research, and the operation of ICT equipment, making it difficult for both students and lecturers to depend on technology for academic tasks (Ajayi, 2008).

Access to reliable internet connectivity is another major hurdle. Although some universities provide Wi-Fi services, the bandwidth is often low, limiting the speed and efficiency of internet-based academic activities. Students frequently report difficulties in accessing online journals, attending virtual classes, or downloading academic resources due to poor connectivity (Tella et al., 2007). Moreover, many students lack personal laptops, smartphones, or tablets, making it difficult for them to engage in digital learning outside campus facilities (Agbor et al., 2022). This challenge disproportionately affects students from low-income backgrounds, thereby reinforcing educational inequality (Aduwa-Ogiegbaen & Iyamu, 2005).

Digital illiteracy remains a significant barrier to ICT utilization for academic purposes. Many students and even some academic staff lack the technical skills required to effectively use ICT tools such as educational software, e-learning platforms, and research databases. This skill gap limits the ability of users to take full advantage of digital tools in their studies or teaching practices. Ololube (2006) noted that in many Nigerian universities, ICT training is either insufficient or non-existent. Where training is provided, it is often theoretical and not aligned with the practical needs of academic tasks. This disconnect results in underutilization of available resources and limits the impact of ICT on academic performance.

While Nigeria has several national policies advocating for ICT integration in education such as the National Policy on Information and Communication Technology (2001) their implementation at the institutional level has been weak. Bureaucratic delays, corruption, and lack of political will often derail ICT initiatives, resulting in inadequate funding and poor monitoring (Okebukola, 2007). Furthermore, many institutions lack a clear ICT strategy or roadmap to guide the adoption and use of digital technologies for academic purposes. The absence of institutional ICT policies leads to disjointed efforts, uncoordinated investments, and ineffective use of resources.

Resistance to change and lack of motivation among some educators also hinder ICT utilization. Some lecturers still prefer traditional teaching methods and are reluctant to adopt digital platforms for lesson delivery, assessment, or communication. This resistance slows the digital transition and affects students' exposure to innovative learning tools (Tinio, 2002).

Thus, the challenges facing ICT utilization for academic purposes in Nigeria are multifaceted and deeply rooted in infrastructural, economic, institutional, and cultural issues. Addressing these obstacles requires a coordinated effort involving increased investment in ICT infrastructure, improved internet access, comprehensive digital literacy programs, and effective

policy implementation. Only through sustained commitment can ICT fully serve as a transformative tool in Nigerian education and contribute meaningfully to student development, particularly in fields like Environmental Education.

Academic Performance of Students who Frequently Use ICT Tools and those who do not

The increasing integration of Information and Communication Technology (ICT) in education has raised essential questions about its impact on academic performance. In Nigeria, particularly among university students, the use of ICT tools ranging from internet resources and educational software to communication platforms and digital libraries has been associated with improved academic outcomes. Comparatively, students who do not utilize ICT tools often face limitations in research capabilities, academic engagement, and access to information. Understanding this disparity is vital for enhancing academic support systems, especially in knowledge-intensive fields such as Environmental Education.

According to Ololube et al. (2013) and Agbor et al. (2023), ICT usage facilitates access to a wide array of educational resources, allowing students to learn beyond classroom boundaries. Students who frequently use ICT tools can access online journals, e-books, tutorials, webinars, and simulation software, which enrich their understanding of course content (Yusuf, 2005). These students are better positioned to complete assignments efficiently, prepare for examinations, and undertake research-based projects. As Tinio (2002) noted, ICT enhances the ability to analyze, synthesize, and apply information, which are crucial components of academic success.

A study by Jegede and Owolabi (2003) revealed that Nigerian students who regularly used ICT for academic purposes had higher grade point averages (GPAs) than their peers who relied solely on traditional methods. Frequent users demonstrated better research skills, critical thinking abilities, and academic independence, all of which contributed to improved academic outcomes. The study suggested that ICT not only supports academic content acquisition but also fosters metacognitive development by encouraging students to plan, monitor, and evaluate their learning.

Conversely, students who do not regularly use ICT tools are at a disadvantage in today's digitally driven academic environment. Their access to up-to-date information is limited, and their learning is often confined to lecture notes, textbooks, and face-to-face instructions. This restricts their exposure to diverse perspectives and emerging knowledge in their field of study. Aduwa-Ogiegbaen and Iyamu (2005) emphasize that non-ICT users often struggle with information overload or insufficient materials, which affects their ability to perform optimally in assessments and academic projects.

Moreover, ICT facilitates better communication between students and lecturers through platforms such as emails, discussion forums, and learning management systems like Moodle or Google Classroom. These tools allow frequent users to receive timely feedback, submit assignments electronically, and participate in virtual discussions. Students who are not engaged with these platforms may miss out on critical academic interactions, thereby impacting their performance (Tella et al., 2007).

Beyond content access, ICT use improves academic organization. Tools like Microsoft Word, Excel, PowerPoint, and referencing software such as Zotero or Mendeley help students efficiently manage their academic tasks. Frequent users can produce well-structured reports, analyze data, and deliver professional presentations skills that contribute positively to assessment

outcomes. Non-users, in contrast, often face challenges in formatting, data management, and collaborative tasks, which may reflect poorly on their academic performance (Ololube, 2006).

However, it is also essential to recognize that mere access to ICT does not automatically translate to improved performance. The effectiveness of ICT usage depends on digital literacy, the purpose of use (academic vs. social), and the ability to integrate technology into learning practices. Some students with frequent access to ICT tools may underperform if they primarily use them for entertainment or non-academic purposes. As Becta (2004) pointed out, the quality and context of ICT engagement matter more than frequency alone.

Despite this nuance, there remains a general consensus that appropriate and purposeful use of ICT correlates positively with academic success. To bridge the performance gap between ICT users and non-users, institutions must invest in digital infrastructure, offer training in digital literacy, and integrate ICT into curricula. Support systems such as computer labs, free Wi-Fi zones, and e-learning centers can ensure equitable access and encourage all students to leverage technology for academic advancement.

Students who frequently use ICT tools for academic purposes tend to perform better than those who do not, primarily due to enhanced access to resources, improved communication, and better academic organization. While access alone does not guarantee success, when ICT is purposefully integrated into learning, it significantly enhances academic performance. Bridging the digital divide is essential for ensuring that all students, regardless of background, can benefit equally from the academic advantages ICT offers.

METHODS

This study investigated the impact of Information and Communication Technology (ICT) on students' academic performance in the Department of Environmental Education at the University of Calabar, Calabar, Cross River State, Nigeria. The study employed a descriptive survey research design to assess the relationship between ICT usage and student performance. The research questions were formulated to guide the study, focusing on how ICT is used by students and its effect on their academic performance. The study was conducted at the University of Calabar, which is located in Calabar, the capital city of Cross River State, Nigeria. The university's Department of Environmental Education was the focal point for this study.

The target population for the study comprised 520 undergraduate students enrolled in the Department of Environmental Education. From this population, a sample of 260 students was selected to participate in the study. The sample size was chosen based on statistical considerations to ensure reliable and valid results. A simple random sampling technique was employed to select the study sample, ensuring every student in the population had an equal chance of being selected (see Table 1).

Table 1: Sample distribution of environmental education undergraduate students

| S/N | Level | Total | |
|-------|-------|---------------|------------------|
| | | No of student | Sampled students |
| 1 | 100 | 68 | 34 |
| 2 | 200 | 120 | 60 |
| 3 | 300 | 160 | 80 |
| 4 | 400 | 112 | 56 |
| 5 | 500 | 60 | 30 |
| Total | | 520 | 260 |

The primary instrument used for data collection was a questionnaire titled Information and Communication Technology and Students' Academic Performance (ICTSAP). The questionnaire was designed to gather data on the extent of ICT usage among students and its perceived impact on their academic performance. It consisted of both closed-ended and Likert scale questions. The questionnaire was validated by three experts in Measurement and Evaluation to ensure its content validity. To establish the reliability of the instrument, a Cronbach Alpha coefficient of .956 was obtained, indicating a high level of internal consistency.

Data collected from the questionnaire were analyzed using the Statistical Package for the Social Sciences (SPSS), version 28. Descriptive statistics, including mean and standard deviation, were used to answer the research questions. Regression analysis was employed to test the hypotheses and determine the relationship between ICT usage and students' academic performance.

RESULTS

Research Question 1: To what extent is ICT utilized by students in the Department of Environmental Education, University of Calabar?

Table 2: Mean and standard deviation of the extent ICT is utilized by students of environmental education

| s/n | Items | Mean | SD | Remark |
|-------------------|--|---------------|----------------|--------------------|
| 1 | I use the internet to search for academic materials. | 3.1480 | 1.30419 | High Extent |
| 2 | I use e-learning platforms (e.g., Moodle, Google Classroom) for coursework. | 2.9680 | 1.22186 | High Extent |
| 3 | I use presentation software (e.g., PowerPoint) for class assignments or seminars. | 3.1080 | 1.23549 | High Extent |
| 4 | I participate in online academic discussions or forums. | 3.2400 | .91748 | High Extent |
| 5 | I use digital libraries or academic databases to access journals and books. | 2.8040 | 1.21800 | High Extent |
| 6 | I use email or messaging platforms to communicate with lecturers and peers about coursework. | 3.1600 | .89083 | High Extent |
| 7 | I use ICT tools to complete assignments or projects. | 3.2920 | .95624 | High Extent |
| Grand mean | | 3.0385 | 1.10629 | High Extent |

Based on the data in Table 2, the results regarding the extent to which students of Environmental Education utilize ICT showed that the grand mean of 3.0385 indicates a high extent of ICT utilization among students. The standard deviation (SD = 1.10629) shows a moderate spread in responses, suggesting that while most students report high use, there are some variation in how frequently different ICT tools are used. The findings revealed that students in Environmental Education at the University of Calabar utilize ICT to a high extent in their academic work. They actively engage with internet resources, communication tools, and e-learning platforms. However, digital libraries and databases appear to be slightly underutilized compared to other tools, which may suggest a need for improved awareness or training in accessing academic literature.

Research Question 2: To what extent does the use of ICT influence academic performance of students in the Department of Environmental Education?

Table 3: Mean and standard deviation of the use of ICT and academic performance of students of environmental education

| s/n | Items | Mean | SD | Remark |
|-------------------|--|---------------|----------------|--------------------|
| 8 | ICT helps me to better understand complex course topics. | 3.1960 | 1.04015 | High Extent |
| 9 | Using ICT has improved the quality of my academic assignments. | 3.3480 | .97091 | High Extent |
| 10 | ICT tools enable me to study more efficiently. | 2.8800 | 1.28694 | High Extent |
| 11 | ICT usage has a direct impact on my academic performance. | 3.2320 | 1.08762 | High Extent |
| 12 | I achieve higher grades when I integrate ICT into my learning. | 2.6680 | 1.31327 | High Extent |
| Grand mean | | 3.0648 | 1.13977 | High Extent |

The information in Table 3, which explores the influence of ICT use and academic performance among Environmental Education students' revealed that the grand mean is 3.0648, which falls within the "High Extent" range. This suggests that students perceive ICT use have a significant positive impact on their academic performance. The standard deviation (1.13977) indicates some variability in responses, meaning that while most students agree on the benefits of ICT, a few may have differing experiences. The data suggests that students strongly believe ICT enhances their academic performance, particularly by helping them understand complex topics, improving assignment quality, and supporting efficient study. However, while the perceived impact on grades is positive, it is slightly less pronounced, indicating that ICT alone may not be sufficient without other supportive academic practices.

Research Question 3: What are the perceived benefits of ICT usage among environmental education students?

Table 4: Mean and standard deviation of perceived benefits of ICT usage among environmental education students

| s/n | Items | Mean | SD | Remark |
|-------------------|---|---------------|----------------|--------------------|
| 13 | ICT increases access to up-to-date academic resources. | 3.2440 | 1.07568 | High Extent |
| 14 | ICT promotes independent learning and research. | 3.0240 | 1.13339 | High Extent |
| 15 | ICT enhances my creativity in solving environmental problems. | 3.0160 | 1.15111 | High Extent |
| 16 | ICT supports effective collaboration with other students. | 2.7240 | 1.26738 | High Extent |
| 17 | ICT makes learning more engaging and interactive. | 2.9440 | 1.22428 | High Extent |
| Grand mean | | 2.9904 | 1.17036 | High Extent |

Data in Table 4, examined the perceived benefits of ICT usage among Environmental Education students and the result depicts that the grand mean of 2.9904 indicates that students perceive the benefits of ICT to a high extent. The grand standard deviation of 1.17036 showed moderate variability, which suggests that most students agree to a high extent on the benefits in the use of ICT, though there are some differing views. All individual items are rated as "High Extent," confirming that students generally see ICT as valuable to their academic experience. Overall, Environmental Education students perceive ICT as highly beneficial, particularly in providing access to current academic resources and fostering independence and creativity. While the benefits of engagement and collaboration are also acknowledged, they are slightly less emphasized, pointing to potential areas for improvement in how ICT is leveraged for peer interaction and group learning.

Research Question 4: To what extent is the challenges faced by students in the utilization of ICT impact their academic performance?

Table 5: Mean and standard deviation of the challenges in the utilization of ICT for academic purposes

| s/n | Items | Mean | SD | Remark |
|-------------------|--|---------------|----------------|--------------------|
| 18 | Poor internet connectivity limits my ICT usage. | 3.0880 | 1.16864 | High Extent |
| 19 | Inadequate access to ICT facilities on campus is a problem. | 3.4360 | 1.10398 | High Extent |
| 20 | I lack sufficient ICT skills for academic tasks. | 3.0440 | 1.17285 | High Extent |
| 21 | ICT tools and platforms are difficult to navigate. | 3.1400 | 1.20591 | High Extent |
| 22 | High cost of internet data or computer accessories limits usage. | 3.0640 | 1.06227 | High Extent |
| Grand mean | | 3.1544 | 1.14273 | High Extent |

Table 5 presents data on the challenges faced by Environmental Education students in utilizing ICT for academic purposes and the results revealed that the grand mean of 3.1544 indicates that students experience challenges related to ICT usage to a high extent. A standard deviation of 1.14273 suggests a moderate level of agreement to a high extent among students, with some variation on how severely these challenges are felt. Each individual challenge listed is perceived to occur to a high extent, highlighting the prevalence and significance of these issues. Thus, students in Environmental Education at the University of Calabar face multiple challenges in using ICT for academic purposes, with infrastructure limitations, internet issues, skill gaps, and financial barriers all reported to a high extent. These challenges may significantly limit the effective integration of ICT into their academic routines, despite its recognized benefits.

Research Question 5: To what extent is there difference between the academic performance of students who frequently use ICT tools and those who do not?

Table 6: Mean and standard deviation of academic performance of students who frequently use ICT tools and those who do not

| s/n | Items | Mean | SD | Remark |
|-------------------|--|---------------|----------------|--------------------|
| 23 | I perform better academically when I frequently use ICT tools. | 2.6360 | 1.25131 | High Extent |
| 24 | Students who rarely use ICT struggle more academically. | 2.7720 | 1.15818 | High Extent |
| 25 | My use of ICT tools correlates with improvements in my GPA. | 3.1080 | 1.10145 | High Extent |
| 26 | There is a noticeable difference in performance between students who use ICT frequently and those who don't. | 3.4280 | .85776 | High Extent |
| 27 | ICT usage helps me stay academically competitive with my peers. | 3.3920 | .98500 | High Extent |
| Grand mean | | 3.0672 | 1.07074 | High Extent |

Table 6 examined the academic performance of students who frequently use ICT tools compared to those who do not and the results revealed that the grand mean of 3.0672 indicates that students believe, to a high extent, that frequent ICT usage positively influences academic performance. The standard deviation of 1.07074 suggests a moderate level of agreement, with most students perceiving ICT usage as beneficial, though experiences vary slightly. As a result, students widely perceive that frequent use of ICT tools enhances academic performance. They associate ICT usage with improved GPA, better competitiveness, and a clear advantage over those who use

ICT less frequently. This highlights the crucial role of ICT in modern academic success and suggests that efforts to bridge ICT access and skill gaps could help close performance disparities.

Test of Hypotheses

H₀₁: There is no significant difference between ICT usage and students' academic performance in the Department of Environmental Education, University of Calabar.

Table 7: Regression analysis of difference between ICT usage and students' academic performance in the Department of Environmental Education

| | Model | Sum of Squares | Df. | Mean Square | F | Sig. |
|---|------------|----------------|-----|-------------|--------|-------------------|
| 1 | Regression | 19.580 | 7 | 2.797 | 17.323 | .000 ^b |
| | Residual | 39.076 | 252 | .161 | | |
| | Total | 58.656 | 259 | | | |

The regression analysis (Table 7) conducted to examine the relationship between ICT usage and students' academic performance in the Department of Environmental Education reveals a statistically significant result. The model produced an F-value of 17.323 with a significance level (p-value) of .000, indicating that ICT usage significantly predicts students' academic performance. Specifically, the regression sum of squares (19.580) represents the proportion of variance in academic performance explained by the seven ICT-related predictors included in the model, while the residual sum of squares (39.076) accounts for the unexplained variance. The total variation in students' academic performance was 58.656. These findings confirm that a substantial portion of students' academic success can be attributed to their engagement with ICT tools and platforms. Thus, the results provide strong empirical support for the conclusion that increased and effective use of ICT contributes positively to academic achievement among students in Environmental Education.

H₀₂: There is no significant difference in academic performance between students who frequently use ICT tools and those who do not.

Table 8: Regression analysis of academic performance between students who frequently use ICT tools and those who do not

| | Model | Sum of Squares | Df | Mean Square | F | Sig. |
|---|------------|----------------|-----|-------------|--------|-------------------|
| 1 | Regression | 30.830 | 5 | 5.695 | 46.048 | .000 ^b |
| | Residual | 31.570 | 254 | .124 | | |
| | Total | 61.400 | 259 | | | |

Table 8 presents a regression analysis examining the difference in academic performance between students who frequently use ICT tools and those who do not. The model shows a statistically significant result, with an F-value of 46.048 and a significance level (p-value) of .000, indicating that the frequency of ICT usage is a strong predictor of academic performance. The regression sum of squares (30.830) represents the proportion of the total variance in academic performance explained by differences in ICT usage among students. In contrast, the residual sum of squares (31.570) accounts for the unexplained variance. The total variance

(61.400) includes both explained and unexplained components. The mean square for the regression is 5.695, while the mean square for the residual is .124, showing a substantial difference between the model's predictive power and random error. These results imply that students who frequently use ICT tools perform significantly better academically than those who do not, which confirms the positive impact of consistent ICT engagement on academic outcomes.

DISCUSSION

The Extent ICT is Utilized by Students of Environmental Education in Nigeria

The results on the extent to which students of Environmental Education utilize ICT showed that the grand mean of 3.0385 indicates a high extent of ICT utilization among students, and the findings from the regression analysis confirm that a substantial portion of students' academic success can be attributed to their engagement with ICT tools and platforms.

This findings are in line with those of Adegbija and Fakomogbon (2012), Jegede (2009), Yusuf (2005), Okebukola (2007), Ajayi and Ekundayo (2009) and Oye et al. (2012). They all agree to a high extent that Students greatly benefits from ICT tools such as Geographic Information Systems (GIS), simulation software, online databases, and collaborative platforms. The extent of ICT utilization among Environmental Education students in Nigeria varies across institutions, often reflecting the availability of infrastructure, students' digital literacy, and institutional support. In many Nigerian universities, including the University of Calabar, ICT has been integrated into academic programs through the provision of computer labs, internet connectivity, and e-learning platforms.

Students of Environmental Education often use ICT tools primarily for information retrieval, academic research, assignment completion, and communication with peers and lecturers. Nigerian university students commonly access online resources such as e-journals, digital libraries, and educational websites to support their studies. These tools enhance their ability to acquire up-to-date information on environmental issues and current research trends. Despite this, usage tends to be more frequent among students with personal access to ICT devices and internet connectivity. Their survey revealed that a significant proportion of students in Nigerian universities possess basic ICT skills and use the internet for academic purposes. Thus, the utilization of ICT by Environmental Education students in Nigeria is expanding, particularly in the areas of information access and communication.

The Use of ICT and Academic Performance of Students of Environmental Education in Nigeria

The influence of ICT use and academic performance among Environmental Education students' revealed that the grand mean is 3.0648, which falls within the "High Extent" range. This study is in line with that of Yusuf (2005), Jegede and Owolabi (2003), Tinio (2002), Ololube (2006) and (Becta, 2004), when the noted that ICT provides access to a vast array of information sources, including e-books, online journals, virtual laboratories, multimedia content, and academic databases, which help students conduct in-depth research and enhance their understanding of complex environmental concepts. For students of Environmental Education, this access supports the acquisition of critical skills in areas such as biodiversity conservation, climate change

modeling, and pollution control. These are areas where up-to-date data and technological simulations are crucial for effective learning.

Their studies have shown that the use of ICT in academic environments positively influences student performance. Students who frequently use ICT tools for academic purposes tend to perform better in tests and examinations compared to their counterparts who rely solely on traditional learning methods. This is largely because ICT promotes independent learning, immediate feedback through e-assessments, and improved academic engagement. ICT facilitates effective communication between students and lecturers through emails, discussion forums, and virtual learning environments. These platforms do not only enhance academic collaboration but also allow for timely clarification of concepts, sharing of academic resources, and feedback on assignments. Such interactions can significantly boost academic performance by keeping students actively engaged in the learning process. The incorporation of multimedia presentations, video tutorials, online quizzes, and e-textbooks makes lessons more interactive and caters to different learning styles, which can enhance students' comprehension and retention of knowledge.

Perceived Benefits of ICT Usage among Environmental Education Students in Nigeria

The perceived benefits of ICT usage among Environmental Education students and the result depicts that the grand mean of 2.9904 indicates that students perceive the benefits of ICT to a high extent. This finding is in line with Jegede and Owolabi (2003), Tinio (2002) and Aduwa-Ogiegbaen and Iyamu (2005). They observed that the perceived benefits of ICT usage among these students span academic, professional, and cognitive domains, influencing both how they learn and what they learn.

They further noted that one of the most significant perceived benefits of ICT is its ability to provide access to vast and current information resources. Students of Environmental Education rely on up-to-date information to understand global environmental trends such as climate change, biodiversity loss, deforestation, and pollution. ICT tools such as online journals, databases, e-books, and scientific repositories allow students to gain access to these materials instantly and conveniently. ICT also promotes independent and self-paced learning, which is especially important in Environmental Education, where topics often require a multidisciplinary approach, fosters learner autonomy, allowing students to take ownership of their educational process and develop self-directed learning habits. With ICT, students are able to use videos, simulations, and interactive models to visualize processes like the carbon cycle, ocean currents, or climate systems.

Furthermore, ICT tools support collaborative learning and communication, which students identify as highly beneficial. Platforms such as Google Docs, WhatsApp, Zoom, and Microsoft Teams allow Environmental Education students to engage in group discussions, joint research projects, and academic networking beyond the classroom. This fosters the development of communication and teamwork skills essential for professional practice in the environmental sector.

The Challenges in the Utilization of ICT for Academic Purposes in Nigeria

The challenges faced by Environmental Education students in utilizing ICT for academic purposes and the results revealed that the grand mean of 3.1544 indicates that students

experience challenges related to ICT usage to a high extent. This finding is in line with that of Tella, et al. (2007), Ajayi (2008), Ololube et al. (2013), and Agbor et al. (2023), who found that the most pressing challenges to ICT utilization in Nigeria is the lack of adequate infrastructure. Most tertiary institutions, especially public universities, suffer from inadequate ICT facilities such as computer laboratories, projectors, e-libraries, and internet connectivity. The existing infrastructure is often outdated or insufficient to support large student populations. The digital divide in Nigerian universities is significant, with many institutions lacking the basic tools required for effective ICT-based learning.

The issue is compounded by unstable electricity supply, which hampers the consistent use of computers and internet services. Regular power outages disrupt online classes, digital research, and the operation of ICT equipment, making it difficult for both students and lecturers to depend on technology for academic tasks.

Access to reliable internet connectivity is another major hurdle. Although some universities provide Wi-Fi services, the bandwidth is often low, limiting the speed and efficiency of internet-based academic activities. Students frequently report difficulties in accessing online journals, attending virtual classes, or downloading academic resources due to poor connectivity. Moreover, many students lack personal laptops, smartphones, or tablets, making it difficult for them to engage in digital learning outside campus facilities.

Academic Performance of Students who Frequently Use ICT Tools and those who do not

The results of the academic performance of students who frequently use ICT tools compared to those who do not revealed that the grand mean of 3.0672 indicates that students believe to a high extent that frequent ICT usage positively influences academic performance, and that students who frequently use ICT tools perform significantly better academically than those who do not, which confirms the positive impact of consistent ICT engagement on academic outcomes.

These results are in line with that of Jegede and Owolabi (2003), Ololube (2006), Tella et al. (2007), Ololube et al. (2013), and Agbor et al. (2023) noted in their studies that Nigerian students who regularly used ICT for academic purposes had higher grade point averages (GPAs) than their peers who relied solely on traditional methods. Frequent users demonstrated better research skills, critical thinking abilities, and academic independence, all of which contributed to improved academic outcomes. The study suggested that ICT not only supports academic content acquisition but also fosters metacognitive development by encouraging students to plan, monitor, and evaluate their learning. Students who do not regularly use ICT tools are at a disadvantage in today's digitally driven academic environment. The non-ICT users often struggle with information overload or insufficient materials, which affects their ability to perform optimally in assessments and academic projects.

ICT facilitates better communication between students and lecturers through platforms such as emails, discussion forums, and learning management systems like Moodle or Google Classroom. These tools allow frequent users to receive timely feedback, submit assignments electronically, and participate in virtual discussions. Students who are not engaged with these platforms may miss out on critical academic interactions, thereby impacting their performance.

Beyond content access, ICT use improves academic organization. Tools like Microsoft Word, Excel, PowerPoint, and referencing software such as Zotero or Mendeley help students efficiently manage their academic tasks. Frequent users are able to produce well-structured reports, analyze data, and deliver professional presentations skills that contribute positively to

assessment outcomes. Non-users, in contrast, often face challenges in formatting, data management, and collaborative tasks, which may reflect poorly on their academic performance.

CONCLUSION

This study investigated the impact of Information and Communication Technology (ICT) on students' academic performance in the Department of Environmental Education, University of Calabar, Nigeria. The findings revealed that ICT is utilized by students to a high extent for academic purposes, including accessing academic materials, completing assignments, and engaging in collaborative learning. Students perceive ICT tools as beneficial for enhancing their understanding, improving the quality of their work, and enabling efficient study practices. Regression analyses further confirmed a statistically significant relationship between ICT usage and academic performance, indicating that students who frequently use ICT tools perform better than those who do not. However, the study also identified key challenges limiting ICT usage, such as poor internet connectivity, inadequate ICT infrastructure on campus, limited technical skills, and high costs associated with data and digital devices. Despite these obstacles, students overwhelmingly acknowledge the value of ICT in boosting their academic success.

Recommendations

Based on these findings, the following recommendations are made:

- The University should invest in upgrading ICT infrastructure and internet connectivity across campus to facilitate seamless access to digital resources.
- Workshops and training programs should be organized regularly to improve students' ICT competence.
- Subsidized internet access or data support should be provided to reduce the financial burden on students.
- Lecturers should integrate ICT tools more consistently into teaching and assessments to further encourage digital engagement.

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