



Science Forum (Journal of Pure and Applied Sciences)



Journal Homepage: <https://atbuscienceforum.com.ng/index.php/jpas>

Impact of Information Technology on Students' Academic Performance In ICT-Related Courses

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Abstract

The rapid advancement of Information and Communications Technology (ICT) has significantly transformed educational systems worldwide, enhancing teaching and learning processes. This study investigates the impact of ICT on students' academic performance in ICT-related courses at Federal University, Dutse (FUD). A quantitative survey research design was adopted, and data were collected using a self-developed questionnaire administered to 120 students from the Faculty of Computing, comprising Computer Science, Cyber Security, Information Technology, and Software Engineering students. Findings revealed that FUD provides adequate ICT resources, including computers, projectors, smart boards, and well-equipped computer laboratories. Statistical analysis indicated a **strong positive correlation** between ICT adoption and academic performance ($r = 0.586$, $n = 120$, $p < 0.05$), demonstrating that students who actively utilize ICT tools perform better in their courses. The study concludes that effective integration of ICT in teaching and learning enhances academic outcomes. Thus, educators should prioritize ICT-based instructional strategies, such as interactive digital assignments, online discussions, and collaborative projects, to optimize student performance. Additionally, continuous investment in ICT infrastructure and faculty training is recommended to sustain and improve educational quality. This research contributes to the growing discourse on ICT's role in academic success and provides insights for policymakers and educators in fostering technology-driven learning environments.

Keywords

Evaluation,
ICT,
Students,
Academic performance,
computing

1. Introduction

The rapid growth of Information and Communication Technology (ICT) has transformed the educational landscape, offering unprecedented opportunities for teaching, learning, and research. In recent years, ICT has become an integral part of the educational system, particularly in institutions of higher learning. The integration of ICT in education has been touted as a panacea for improving student academic engagement, enhancing teaching methods, and increasing access to educational resources. ICT acts as the foundation stone of the contemporary world; thus, understanding this technology and its fundamental concepts is considered part of the core of education (UNESCO, 2002). The impact of ICT on education has been profound, with significant benefits reported in various studies. For instance, ICT has been shown to improve student engagement, motivation, and participation in the learning process (Kozma, 2003). Additionally, ICT has enabled teachers to create more interactive and immersive learning environments, which can lead to better learning outcomes (Mishra & Koehler, 2006). Educational institutions can leverage ICT to equip students with 21st century skills and knowledge, while also promoting equality, broadcasting high-quality educational programs, fostering educators' professional development, and enhancing educational management, ultimately increasing global access to quality education (Andoh, 2012).

Nigerian universities are faced with many challenges. Ogunode, Yiolokun, & Akereolu (2019) observed that many Nigerian universities lack modern laboratories to carry out research work. In the same vein, Niyi et al. (2020) revealed that many public universities do not have adequate infrastructural facilities, which include internet access, laboratories, and ICT facilities, among others, to support their students' learning. As a public university in Nigeria; Federal University Dutse is likely faced with similar challenges. Therefore, this study focuses on exploring the extent to which Federal University Dutse provides ICT facilities and their adoption, as well as examining the impact of these ICT facilities on the students' academic performance in ICT-related courses. The importance of evaluating the impact of ICT on students' academic performance cannot be overstated. With the increasing demand for ICT skills in the workforce, it is essential to ensure that students are equipped with the necessary skills and knowledge to succeed in the digital economy. Furthermore, evaluating the impact of ICT on students' academic performance can provide valuable insights into the effectiveness of ICT in enhancing teaching and learning, which can inform policy decisions and strategic planning at Nigerian universities at large.

2. Objectives of the Study

The researchers seek to meet the following research objectives:

1. To evaluate the extent to which Federal University Dutse provide ICT-resources
2. To determine the relationship between ICT-resources adoption and the performance of the FUD students

3. Research questions

The following are key questions to which present study focused to provide their answers:

1. What is the extent to which Federal University Dutse provide ICT resources?
2. Is there a significant relationship between ICT usage and students' academic performance?

4. Research Hypothesis

The following is the research hypothesis that was predictably formulated so as to give guidance for the solution of the above-mentioned problem.

1. There is no significant relationship between ICT-resources adoption and academic performance of the FUD students.

5. Significance of the Study

This study is important for several reasons: Firstly, it will provide insights into the effectiveness of ICT in improving students' academic excellence, and this certainly will inform policy decisions and strategic planning at Federal University Dutse. Secondly, it will add a lot to the knowledge we already have about the use of ICT in improving students'

academic excellence which will be helpful for teachers, policymakers as well as researchers. Lastly, the study will enable the researchers make recommendations to the University's policy makers especially those in academic office, on what policies and strategies can be employed to improve academic performance in institutions of higher learning by adopting ICT-resources.

6. Concept of ICT

The concept of Information and Communication Technology (ICT) encompasses the integration of information technology, telecommunications, and other software to facilitate communication and information management (Murray, 2011). ICT can be defined as a set of technological tools and resources used to process, store, and transmit information (Singh, 2013). This includes a wide range of technologies such as computers, laptops, tablets, smartphones, internet, email, social media, and other digital tools (Okoro & Ekpo, 2016). The inclusion of various examples of ICT tools and resources, such as computers, internet, email, social media, and digital tools, helps to illustrate the breadth and depth of ICT's applications. This explanation provides a solid foundation for understanding the role and significance of ICT in modern society, particularly in the context of education, communication, and information exchange.

7. ICT in Education

The concept of ICT in general, can be traced back to 19th century with the development of telegraph and the telephone. These two

inventions revolutionized the way people worked and interacted socially by making it possible for one person to communicate with another person in a different location in real or near-real time. Nevertheless, there is an element of technology during the age stone period (Pre-historic time). During this period in history, visual materials such as stones, pebbles, sticks, leaves and cowries were used to enhance effective communication and interaction. Conversely, the historical development of using ICT (information and communication technology) in education can be traced back to the 1960s (Anderson, 2008). In 1960s, computer-assisted instruction (CAI) emerged, using mainframe computers for drill-and-practice exercises. Computer-assisted instruction refers to the use of computers and technology to support teaching and learning (Dziuban *et al.*, 2020). But at that particular period of time, mainframe computers were used for CAI. It was used in several ways like;

- *Audio-Visual Systems:* mainframes controlled audio-visual equipment, presenting instructional content and quizzes.
- *Simulations-Based Systems:* mainframes ran simulations, allowing students to explore complex concepts in a controlled environment.

Some examples of CAI systems using mainframes in the 1960s include; **PLATO:** (programmed Logic for Automated Teaching

Operations): developed at the University of Illinois. PLATO used mainframes to provide CAI and other educational resources, and **SYSTEMS/360** was used at Stanford University to support educational research and CAI development.

These early CAI systems paved the way for modern educational technology, demonstrating the potential for computers to enhance teaching and learning. Keep in mind that, these early systems were limited by today's standard, but they marked an important starting point for the development of CAI and educational technology. In 1970s, microcomputers (early personal computers) emerged, allowing for individualized instruction and basic programming. This marked a significant milestone in the development of computer-assisted instruction (CAI). Microcomputers like Apple II (1977) and commodore PET (1977) enabled educators to create and implement personalized learning materials, including basic programming, simple games and simulations, interactive tutorials and Quizzes and assessment. These early computers paved the way also for the development of more advanced CAI systems, which could adapt to individual students' needs, provide real-time feedback, track students' progress and offer multimedia content (Rakes *et al.*, 2020). From here, we will understand that, the emergence of microcomputers in the 1970s was a crucial step towards making CAI more accessible, affordable, effective and

ultimately transforming the people learn and teach.

Furthermore, in 1980s, personal computers became more widely available and affordable. However, educational software became more prevalent, and CD-ROMs emerged, allowing for multimedia content. Seymour Papert, pioneer of educational computing said in this era that:

"Increasingly, the computers of the very near future will be the private property of individuals, and this will gradually return to the individual the power to determine patterns of education. Education will become more of a private act ... There will be new opportunities for imagination and originality" (Seymour, 1980).

In 1990s, internet access became widely available in the schools and online learning platforms and digital resources emerged. Moreover, multimedia and interactive content became popular, and learning management systems (LMS) started to appear. Schools have been on the frontline of the ICT revolution. The new technologies of the digital age have presented school systems. In this time, ICT has been promoted as the great hope of new education, the great liberator, the common currency of the 'knowledge age (Meredyth, 1999). A 1999 study on usage of computer in schools, *Real Time: Computers, Change and Schooling*, commissioned by the former Commonwealth Department of Education, Training and Youth Affairs, found that many

students are competent and experienced computer users who do not depend on schools to access information or develop technological skills. In surveying the basic and advanced computer abilities of primary and secondary students, the research also showed that many computer skills are picked up at home and that girls and boys have different patterns of computer use (Meredyth, 1999). Therefore, and at first glance, these figures support the prediction of Seymour Papert in 1980 century.

In 2000s, E-learning platforms and LMS became more sophisticated. However, online collaboration tools and social media emerged. On the other hand, mobile devices and laptops became increasingly used in education, and virtual classrooms as well as online courses became more popular from 1990-2000 (Brabazon, 2002). Choy and Gao (2009) conducted a mixed study to examine the intentions of pre-service teachers before and after a technology preparation course. Their intentions were then compared with their actions related to technology integration during their teaching. The findings showed that the teachers' intentions became significantly more positive regarding the use of ICT. This indicates how the ICT use became more sophisticated at this era. However, in 2010s, cloud computing and storage expanded. Moreover, gamification flipped classrooms and blended learning gained popularity. In addendum to this, MOOCs (Massive open online courses) emerged, and mobile learning (M-learning)

and tablets devices became widespread. In 2020 to date, artificial intelligence (AI) and machine learning (ML) started to be explored in education. AI is a broad field that encompasses a range of disciplines, including computer science, mathematics, engineering and cognitive science. The goal of AI is to create intelligent machines that can perform tasks that typically require human intelligence such as learning, reasoning, problem solving and language understanding (Russell & Norving, 2020). In this time also, augmented reality (VR/AR) began to be used in educational settings. However, online and hybrid learning models became more prevalent due to the COVID-19 pandemic (Jaakkola, et al., 2020).

From the above review of existing literature, it becomes apparent that ICT integration is mediational and entails an evolving process, not a final product. However, to achieve successful integration of ICT, it requires an effort from three sides: teachers, students, and school administrators. However, these timelines of ICT integrations are not rigidly linear and may overlap or occur concurrently.

8. Related Literature Review

A substantial number of rigorous studies have been meticulously conducted and thoroughly analysed to investigate the significant impact of Information and Communication Technology (ICT) on students' academic performance, focusing on assessing the effectiveness of ICT integration in various educational settings across different countries, with

consideration for diverse educational backgrounds, socio-economic statuses, cultural contexts, and learning environments. These comprehensive studies have employed a range of research methodologies, including experimental designs, surveys, interviews, and observational studies, to collect and analyse data on the relationship between ICT use and academic achievement. Furthermore, the studies have examined the impact of ICT on various aspects of academic performance, such as student engagement, motivation, attendance, and grades, as well as the development of essential skills, including critical thinking, problem-solving, collaboration, and communication. Some of these studies are;

Hussain et al. (2017) conducted a research investigating the effects of information and communication technology on the students' academic achievement and retention in chemistry. Fifty students of 9th grade were selected randomly from Kohsar Public School and College Latamber Karak. The students were grouped into equivalent groups based on pretest score. In order to collect data, pretest posttest equivalent groups design was used. Mean, standard deviation and independent samples t-test were applied through SPSS for data analysis. Based on statistical analysis, it came to light that information and communication technology positively affects students' academic achievement and retention and ICT was found more compelling, effective and valuable in teaching of chemistry when

contrasted with conventional techniques of teaching. Abdul'aziz *et al.* (2021) conducted a research aimed to study the impact of online learning on the academic performance of Embry-Riddle Aeronautical University (ERAU) students, as compared to an in-person medium. The research was conducted over a period of 2 years for 3 modules that are common for students across all courses. Data utilized in the study will be obtained through a survey, as well as academic performance data sourced from ERAU. The analysis was conducted using T-test and Regression techniques to identify statistically significant impacts of student performance in online versus in-person classes. The results obtained estimated general trend of student performance in various other universities which conduct a mix of in-class and online learning in this COVID-19 era.

Bibi *et al.* (2023) conducted a research investigating the impact of ICT on academic achievement and innovation in Pakistani higher education institutions. A quantitative method was used to collect data that could be used to figure out how the independent variables of the study affected the dependent variable. The group was made up of 600 research students. The survey results showed that research students could use ICT better for their studies and projects. The more research students and universities use ICT, the more productive and efficient they become. Even though research students had more access to digital resources, their

output stayed the same. However, Ronald *et al.* (2023) conducted a research assessing the effect of Information and Communication Technology (ICT) usage on Second Cycle Schools (SCSs) student academic performance and its associated challenges in a developing country. This study employed a mix method approach to assess the effect of ICT usage on SCSs student academic performance and its associated challenges in Ghana. A total of one hundred and seventy-two (172) respondents were chosen for this study. Questionnaire and interview guide was used as data collection tool in the study. The study found that the majority of students use mobile phones, computers, the internet/modem, social media, digital cameras, or printers outside the school. The findings again indicated that, ICT usage has improved students' academic performance.

Jamal *et al.* (2024) also conducted a research investigating the impact of ICT on the academic performance of students at the university level. Descriptive research design of quantitative survey approach was employed. 500 samples of the students were taken through simple random sampling. The self-structured quantitative questionnaire was used as a research tool. The findings reflected that, majority of the students used ICT devices and improved their academic performance. In the same vein, Prudence *et al.* (2024) conducted a research titled "ICT in Education and Student Performance: A Case Study of Secondary

Schools in Kampala". The study aimed at conducting an in-depth investigation into the relationship between the integration of information and communication technologies in education and students' academic performance within the context of secondary schools located in Kampala. Through the mixed administration of surveys and interviews gathering both quantitative and qualitative perceptions, the research deployed a cross-sectional examination of the views of final-year secondary students as well as their instructors across a stratified representation of high, midrange and low-performing schools categorized as either publicly or privately administered educational facilities. Regression analyses found ICT integration significantly improved student performance.

The present study differs from previous ones in several significant ways, highlighting its unique contributions to the existing body of knowledge. Specifically, it focuses on the impact of ICT on student performance in ICT-related courses, whereas previous studies had a broader focus on academic achievement and retention in various subjects, such as chemistry, mathematics, and languages. This narrower focus allows for a more in-depth examination of the relationship between ICT and student performance in a specific context. Additionally, the previous studies used a range of methodologies, including pre-test and post-test designs, experiments, and mixed-methods approaches while the present

study uses survey type of quantitative approach. This difference in methodology allows for a comparison of the effectiveness of different research designs in investigating the impact of ICT on students' performance. The study also used descriptive and inferential statistics, including Pearson correlation, whereas previous studies employed various statistical techniques, such as t-tests, regression analysis, and ANOVA. This variation in statistical analysis enables a more comprehensive understanding of the relationship between ICT and student performance. Furthermore, the study focus on a specific education setting (Federal University Dutse) in Nigeria, whereas previous studies were conducted on various schools and universities in different countries, including Pakistan, Ghana, and Uganda.

9. Materials and Method

9.1 Study design, population and Sample

The research design is the blue print of any empirical study (Sekaran & Bougie, 2013). The design of this study is purely quantitative approach, as it involves using numbers and numerical data as well as applying a statistical tool for data analysis. Therefore, a survey type of descriptive research was adopted. This is a type in which a group of people or items is studied by collecting and analysing data from only a few individuals or things. These personalities considered to be a descriptive

representative of the entire target population (Akuezuilo, 1993). The Population of this research encompassed the entire level four (4) students of the faculty of computing federal University Dutse, which includes students from Computer Science, Cyber Security, Information Technology and Software Engineering. Based on this population, one hundred and twenty (120) students were randomly selected as a sample for the study using Krejcie and Morgan table 1970. The students were considered the true representative population as they cut across different departments within the Faculty.

9.2 Data collection

When collecting the data, a questionnaire was developed by the researcher and used as instrument for data collection. It is a set of questions relating to the research objectives of the study to which the respondents (students) are required to answer by ticking in one of the preferable options that will best represent their responses. The questionnaire required demographic characteristics, availability of ICT facilities in the university, adoption of such ICT facilities and academic status (CGPA) of the respondents in the sample.

9.3 Validity and Reliability of the instruments

After developing the instrument, it was presented to the experts in the field of educational technology for face, content and constructs validity to ensure that the instruments measures what was claimed to measure. The reliability of the instrument

was determined by using pilot study to a small number of the target population, in order to assess the feasibility, time, cost, adverse events and effect size (statistical variability). The value of Cronbach's alpha is 0.756 based on the study. Therefore, the value was exceeded the minimum value of 0.6 as recommended by Nunally (1978). In nutshell, any irrelevant items were removed, and ambiguous questions were discarded.

9.4 Method of data Analysis

Mills (2007) revealed that data analysis is carry out when investigators want to summarize and represent data that have been collected in a dependable, accurate, reliable, correct, and right way. A simple percentage of descriptive analysis was used to answer the first research objective. However, a Pearson correlation coefficient was used to analyse the collected data of second research objective through a Statistical Package for Social Sciences (SPSS).

10. Results

The first research objective was addressed through descriptive statistic of frequency and simple percentage, while the second objective was treated through Pearson correlation coefficient (r).

10.1 Demographic Characteristics of the Participants

Results presented below included demographic characteristics of the respondents, frequency counts and

percentage. Variable used included age, gender, and department.

Table 10.1.1: Distribution of the Respondents by Gender

Gender	Frequency	Percentage (%)
Male	72	60%
Female	48	40%
Total	120	100%

The table above contains the distribution of the respondents by gender. It revealed that 72 respondents (60%) were male, while 48 respondents (40%) were female.

Table 10.1.2: Distribution of the Respondents by Age

Age	Frequency	Percentage (%)
16 - 20	41	34.1%
21 - 25	44	36.6%
26 - 30	20	16.6%
31 and above	15	12.5%
Total	120	100%

Table 10.1.2 above entails the distribution of the respondents by age. The table revealed that 34.1% of the respondents were between the ages of 16 and 20, 36.6% were between the age of 21 and 25, 16.6% were between the ages of 26 and 30, and only 12.5% of the respondents were 31 or above. The result corroborated with the fact that targeted population were undergraduates and are mostly under 25 years of age.

Table 10.1.3: Distribution of the Respondents by Department

Department	Frequency	Percentage (%)
Computer Science	40	33.3%
Software Engineering	28	23.3%
Cyber security	25	20.8%
Information Technology	27	22.5%
Total	120	100%

The table above is the distribution of the respondents by department. From the table, it can be deduced the majority of respondents are students of Computer Science (33.3%). 28 respondents (23.3%) are from Software Engineering, 20.8% of the total respondents were from the department of Cyber security, while 27 respondents (22.5%) were from Information Technology department.

10.2 First research objective: What is the extent to which Federal University Dutse provide ICT resources?

This hypothesis is tested using count and frequency. Questions related to the extent to which Federal University Dutse provide ICT resources. The table below contains the respondents' opinion in this regard.

Table 10.2.1: Distribution of the Respondents' by opinion on the extent of ICT resources

ICT Resources	Opinion	Frequency	Percent
Computer/PC	Available	93	77.5%
	Not Sure	10	8.3%
	Not available	17	14.1%
Total		120	100
Internet services	Available	60	50.%
	Not Sure	40	33.3%
	Not available	20	16.6%
Total		120	100
Computer Laboratory	Available	115	95.8%
	Not Sure	4	3.3%
	Not available	1	0.8%
Total		120	100
Projector	Available	65	54.1%
	Not Sure	35	29.1%
	Not available	20	16.6%
Total		120	100
Smart board	Available	75	62.5%
	Not Sure	25	20.8%
	Not available	20	16.6%
Total		120	100
Video conferencing	Available	12	10%
	Not Sure	70	58.3%
	Not available	38	31.6%
Total		120	100
The available ICT-resources are used in the course of instruction	Agreed	97	80.8%
	Not sure	10	8.3
	Disagree	13	10.8
Total		120	100

As seen in the table above, majority of respondents (77.5%) testified to the provision of the computers by the University management. 5 respondents (8.3%) were not sure of the availability of computers, while 17 respondents (14.1%) said that computers were not available. This result indicates the University system provides computers for use as part of their contributions to Information Communication Technology resources. The table also further revealed that Internet services is provided to the students of the University as majority of the respondents (60, 50%) consented. 20 respondents (16.6%) indicated its unavailability, and only 40 respondents (33.3%) were not sure. However, the table also revealed that the majority of respondents agreed to the availability of computer laboratory at the Faculty. 95.8% of the respondents agreed that computer laboratory is available, 0.8% said it was not available, while only 3.3% of the respondents were not sure. The result showed the computer laboratory is provided to the students for their use.

Moreover, the table above showed that projector was provided as part of ICT resources in the school. This was consented

by the majority of the respondents (65, 54.1%), 29.1% of the total respondents were not sure and 16.6% said it was not available. Furthermore, the majority of the respondents (62.5%) agreed to the availability of smart board, 16.6% of the respondents said it was not available, while 20.8% of the respondents were not sure. Moreover, the survey indicated that, there is no video conferencing facilities in the faculty as majority of the respondents (70, 58.3%) were not sure. 31.6% of the respondents indicated that, it is not available. While only 10% agreed of the availability of video conferencing facilities in the university. Lastly, the finding revealed that, ICT resources are used in the course of instruction, as 97 of the respondents constituting 80.8% agreed with the statement, 10 of the respondents constituting 8.3 are not sure, and 13 of the respondents constituting 10.3 disagreed with the statement.

10.3 Research hypothesis testing and Second Research objective: There is no significant relationship between ICT adoption and student's academic performance in ICT related courses in FUD.

Table 10.3.1 Descriptive Statistic of the Variables

	Mean	std. Deviation	N
ICT Adoption	3.1586	.42731	120
Students' academic Performance	3.2955	.46797	120

Table 10.3.1 indicates the mean and standard deviation of the variables as well as the total number of the sample particularly selected for the study. The mean of ICT Adoption is 3.1586 while for students' academic performance is 3.2955 which indicates the arithmetic average of the items under each variable. However, the standard deviation measures the variability of each variable which is .42731 for ICT adoption and .46797 for students' academic performance.

Table 10.3.2 Pearson correlation for the variables

Variables	<i>r</i>	<i>p</i>	<i>n</i>
ICT Adoption	.586**	.000	120
Students' academic performance	.586**	.000	120

** . Correlation is significant at the 0.01 level (2-tailed).

Table 10.3.2, revealed that "there was a highly positive correlation between ICT adoption and students' academic performance in ICT-related courses, $r = 0.586$, $n = 120$, $p = 0.000$. $P < .05$ ". However, the $P = 0.000$ which is extremely less than .05 indicates a statistically significant correlations between the two variables which is the answer to the second research objective. This means increases in ICT adoption do significantly relate to increases in students' academic performance in ICT-related courses. Therefore, the analysis accepted to reject the research null hypothesis.

11. Discussion

The findings of this study reveal that the Faculty of Computer Science, Federal University Dutse, has made significant provisions for ICT resources, including

computers, computer laboratories, projectors, and smart boards, to a large extent. This is consistent with the university's goal of providing students with a world-class education that prepares them for the challenges of the digital age.

However, the study found a highly positive correlation between ICT adoption and students' academic performance in ICT-related courses. This suggests that the mere availability of ICT resources does not necessarily translate to improved academic performance. Rather, it is the effective adoption and utilization of these resources that leads to better academic outcomes. The study's findings are supported by previous research, which has also reported positive relationships between ICT use and academic achievement (Bibi et al 2023, Ronald et al 2023, Jamal et al 2024, and Prudence et al 2024) However, this study contributes to the existing body of knowledge by providing insights into the specific context of ICT adoption in a Nigerian university.

12. Conclusion

In conclusion, the result of this study revealed that, there is provision of ICT resources such as computers, computer laboratory, projectors, smart board among others to a large extent in the Faculty of Computer Science, Federal University Dutse. However, the study revealed a highly positive correlation between ICT adoption and students' academic performance in ICT-related courses. Therefore, the analysis accepted to reject the research null hypothesis. The rejection of the null hypothesis suggests that there is a statistically significant relationship between ICT adoption and improved academic

performance, implying that ICT has a positive impact on students' academic outcomes. This conclusion has far-reaching implications for educational policy, practice, and research, highlighting the need for continued investment in ICT infrastructure and teacher training to harness the full potential of ICT in promoting academic excellence.

13. Recommendations for practice and further studies

From the findings of the study, the following recommendations for practice and further investigations were suggested;

1. The University management should show more interest in the use of ICT tools to guarantee effective learning process of the students.
2. Educators should prioritize the development of effective strategies for integrating ICT resources into their teaching practices. This may involve providing students with opportunities to use ICT tools to complete assignments, participate in online discussions, and engage in collaborative projects.
3. Educators should recognize the importance of ongoing teacher training and professional development in ensuring that they are equipped to harness the full potential of ICT in promoting academic excellence. This may involve providing teachers with opportunities

to participate in workshops, conferences, and online courses that focus on ICT integration and pedagogy.

4. Policymakers should prioritize the development of policies that support the effective integration of ICT resources into teaching and learning practices. This may involve providing funding for ICT infrastructure, teacher training, and professional development.
5. Government, organizations as well as individuals should join hands to facilitate the provision of the required ICT materials, to enable effective implementation of the ICT usages.
6. Future research should investigate the impact of ICT on non-ICT related courses to determine whether the findings of this study can be generalized to other disciplines.
7. Another research should be conducted to investigate the impact of ICT on student engagement and motivation to determine whether ICT can be used to improve student outcomes in these areas.

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