The utilization of 21st century ICT Tools in Teaching and Learning of Technology and Vocational Courses in a Nigerian Public University

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Abstract

This study investigates the use of ICT hardware and software applications in the teaching and learning of Technology and Vocational Education courses in a public university in Nigeria. Increasing trend of virtual learning facilitated by cutting-edge ICT tools and the the impact of the COVID-19 pandemic on the educational sector in Nigeria, underscore the importance of assessing their utilization in Technology and Vocational Education (TVE) to better prepare graduates for the global labor market. Descriptive survey research design was adopted for carrying out this study. Four research questions and two hypotheses guided the study. Simple random sampling was used to select 265 respondents that consist of 240 students and 25 lecturers. Data collected were analysed by SPSS Version 25 using mean and standard deviation for the research questions. The null hypotheses were tested at 0.05 level of significance using t-test statistic. The findings of the study revealed that: Hard drives are under-utilized in storing students' data, projectors are not used for presentation/delivery of lectures, computers are not used to assess students' response/performance, utilization are correspondingly low.

Keywords: ICT tools, learning, teaching, Technology and Vocational Education, 21st Century, utilization

Introduction

Globalization has created a new world order for doing business; novel Information and Communication Technologies (ICTs) have systematically changed the way we live, learn, work, and even think about work. The synergy of combining globalization with these novel technologies has had remarkable impacts on the economic, social and educational sectors and has created new opportunities, challenges as well as uncertainty (Mallikarjun Mulimani & Satishkumar Naikar, 2022). These changes have brought about momentous challenges and opportunities for change and innovation in Technology and Vocational Education.

In the past, the status of Technology and Vocational Education did not match the importance of its potential contribution to society. In the present era of academic globalization, technicians, technologists and engineers of today and tomorrow are projected to be far more creative and innovative. Nowadays, with the tremendous developments in technology, possibilities are emerging to provide Technology and Vocational Education with innovative ways to meet global demands with the help of ICT (Agbo, 2020).

The ICT revolution makes knowledge a competitive resource in this economic era. The need for recurrent education and the changing labour market conditions, call for flexible access to Technology and Vocational Education. Continuing education models that will meet workers' lifelong learning needs have to be relevant and flexible to provide just-in-time learning without distance. ICTs play a crucial role in removing distance barriers from education and in developing a lifelong learning culture in Technology and Vocational Education (Isiyaku et

al., 2018). Despite these potentials, a lot are yet to be explored regarding the usage of ICTs in Technology and Vocational Education (Banagiri, 2021).

Pedagogic application of ICT involves effective learning with the aid of computers and other information technologies that serve as learning aids, which play complementary roles in teaching and learning situations. Technologies such as ICT necessitate and facilitate learning. The use of new methods promotes learning at a distance, and on one's own and pace possible. Modelling, simulation, use of the database, guided instruction, closed-world exploration results, changes in terms of teaching strategy, instructional content, the role of the teachers and the context of the curricular are made obvious and inevitable. Furthermore, the utilization of ICT enhances motivation, helps recall previous learning, and provides new instructional stimulus for the learners. The world, due to technological innovations is rapidly changing, and demands that teachers improve and update their knowledge and skills to match global trends. To meet up with this global trend, it is necessary to ascertain where the teachers are in relation to the utilization of these ICT tools for class instruction as well as the availability of these tools.

During COVID-19, the educational sector in Nigeria came to a halt which grounded all the activities including the educational activities in schools (Adelakun, 2020). This is largely due to facility and perhaps knowledge deficit regarding e-learning. Upon resumption, academic activities were rushed in many schools in Nigeria to recover the period lost to the pandemic. In developed nations, students participated in classes virtually and so did not lose much time due to the pandemic. Additionally, it is trendy now for students to be taught virtually, and have individualized instructions, via various ICT-enabled platforms that make learning possible without needing the physical presence of the teacher. In many public universities in Nigeria, e-learning and increased ICT integration into teaching and learning are encouraged. In light of this advocacy, one wonders about the extent teachers and students are integrating ICT for teaching and learning TVE courses. Hence the need to assess the extent of utilization of cutting-edge ICT tools in the teaching and learning of Technology and Vocational Education courses. It is expected that the outcome of this study will help the school management and government to know areas of improvement to be able to raise graduates that can fit into the global labour market.

Education that is designed for learners to acquire the knowledge, skills and competencies specific to a particular occupation/trade or class of occupations/trades is called vocational education. It can also be seen as the type of education given to an individual to prepare that individual to be gainfully employed. Vocational education is known by a variety of names, depending on the country concerned. Such names include career and technical education, technical and vocational education and training (TVET) and technical and further education (TAFE).

Technology and vocational education refer to all forms and levels of education and training which provide knowledge, skills and attitudes related to occupations in various sectors of economic and social life (United Nations Educational, Scientific and Cultural Organization, 2012). This is achieved through formal, non-formal and informal learning methods in both school-based and work-based learning contexts. To achieve its aim and purposes, TVET concerned with the acquisition of skills and knowledge for sustainable livelihood and employment through the production of skilled workforce to revitalize and sustain the economy and reduce unemployment making it a veritable tool for empowering people (Auta et al, 2023). Technology and vocational education have an important role to play in technology diffusion through the transfer of knowledge and skills. Rapid technological progress has had and continues to have significant implications for technology and vocational education.

Understanding and anticipating changes has become crucial for designing responsive technology and vocational education systems and more broadly, effective skills policies. The flexibility to adapt the supply of skills to the rapidly, and in some cases radically, changing needs in sectors such as information technology and the green economy has become a central feature of technology and vocational education systems. Globally, the skills requirements and qualifications demanded for job entry are rising (Hasanuzzaman & Nanta, 2023). This reflects a need for not just a more knowledgeable and skilled workforce, but one that can adapt quickly to new emerging technologies in a cycle of continuous learning.

New courses have been introduced to address occupational changes in the ICT job market, while many technologies and vocational education providers have shifted provision towards a blended approach, with significantly more self-directed and/or distance learning. In developed countries, new ICT approaches have been introduced to modernize technology and vocational education and to manage administration and finance, including learner records.

Information and Communication Technology is an umbrella term that includes the utilization of communication devices or applications, such as radio sets, televisions, cellular phones, computers, hardware and software satellite systems and so on. It refers to technologies that provide access to information through telecommunication. Broadly speaking, technology involves the modification of the natural world to suit a specific purpose. From the Greek word, technology means an art of artifice or crafting but more generally, it refers to the diverse collection of the processing and knowledge that people use to extend human ability and to satisfy human needs and wants. Information and Communication Technology often refers to a particular context as "I.C.T" in education health care of libraries. Information and Communication Technology is universally acknowledged as an important catalyst for social transformation and national progress. Many countries around the world have established organizations for the promotion of ICTs because it is feared that unless technology advances in developed nations, it will only serve to exacerbate the already existing economic gaps between technologies.

ICTs have necessitated a change in the ways and means of communicating and learning. Several studies have established the fact that ICTs have the potential as educational tools for both learning and teaching (Hailegebreal et al., 2022; Muhammad et al., 2020; Murithi & Yoo, 2021). They provide the basic technology for assisting language teaching and learning. Computer-based resources such as the internet, Skype, emails, mobile phones, and short messages (SMS), can be used to deliver, equip, and assess teaching and learning materials (Dash, 2022).

The need for ICT in the teaching of Technology and Vocational Courses in a university is due to the necessity to adapt to the ongoing communication technological revolution (Danmaigoro et al, 2023). This, again, will, of necessity change the attitudes, values and aspirations of Vocational teachers and learners so as to be abreast with the current global train. The tremendous progress in ICT has brought changes to teaching techniques. That is the reason Nigerian Technology and Vocational teachers should, to some extent adopt recent innovative teaching techniques in addition to the traditional techniques already in use. Technology and Vocational teachers have to update their knowledge to meet the demands of a globalized digital world (Abid, 2022). This can be done based on the teacher's worldview, readiness to be innovative and his/her perception of the usefulness of ICTs in teaching/learning. Since computers are transforming the world, teachers must master these technologies, or they are likely to be overwhelmed by it (Agbo, 2020).

ICT creates an analytical mind of teachers and students that helps them study and offer solutions to problems emanating from all related fields that employ it as a learning tool (Voogt et al, 2011). It develops new ways of solving problems scientifically. It makes information storage and retrieval easy. It creates gainful employment, hence a viable source of livelihood. It makes comprehension of other subjects easy. Virtually all fields of learning are amenable to ICT such as the application of a projector for teaching in the classroom. It is used for proper documentation of official activities and administration. It creates an avenue for the exchange of ideas and inventions among information technology scholars locally and internationally.

Conceptual Framework

This study is greatly supported by the community of Inquiry (CoI) theory The Community of Inquiry (CoI) theory was developed in 2000 by D. Randy Garrison, Terry Anderson, and Walter Archer (Garrison et al, 2000; Swan, 2009). An educational community of inquiry is a group of individuals who collaboratively engage in purposeful critical discourse and reflection to construct personal meaning and confirm mutual understanding. The theory suggests that an educational experience should be embedded in a community of inquiry composed of both students and teachers, with three essential elements: (1) social presence, (2) cognitive presence and (3) teaching presence. These elements and their relationship with educational experience are illustrated in Figure 1.

Figure 1

Conceptual model of Community of Inquiry Theory
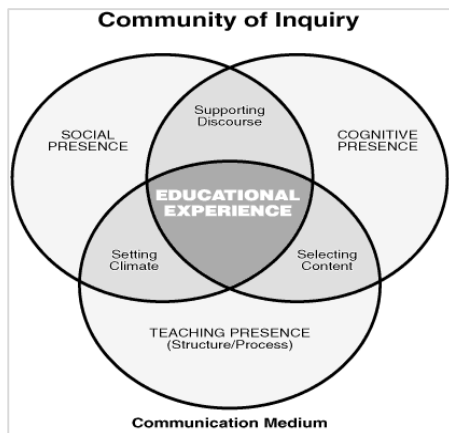
Social presence

Within the community of inquiry model, social presence was initially defined as the ability of learners to project themselves (i.e., their personal characteristics) socially and emotionally, thereby representing themselves as "real" people, in a community of inquiry. Establishing relationships and a sense of belonging is important. However, the role of social presence in a purposeful learning community is to support critical inquiry and the achievement of educational outcomes. Social presence does not mean supporting engagement for purely social purposes, it means creating a climate that supports and encourages probing questions, scepticism, expressing and contributing to ideas. As Rogers and Lea (2005) indicate when individuals identify with the group and the purpose, the group is more productive (as opposed to simply creating interpersonal bonds). To reinforce this, Jahng et al, (2010) found that increased social communication reduced cognitive presence. Therefore, in order to emphasize the mediating role of social presence in collaboration and critical discourse, the definition of social presence has been revised as the ability of participants to identify with the group or course of study, communicate purposefully in a trusting environment, and develop personal and affective relationships progressively by way of projecting their individual personalities (Garrison, 2009). The new definition suggests that social presence should be developed naturally and progressively through the purposeful and collaborative inquiry process (Garrison, 2011).

Cognitive Presence

The second element in the framework is cognitive presence. Cognitive presence is defined as the extent to which learners are able to construct and confirm meaning through sustained reflection and discourse in a critical community of inquiry (Garrison et al, 2000). The concept of cognitive presence is grounded in the critical thinking literature and derived specifically from Dewey's (1933) reflective thinking model. According to Dewey, reflective or critical thinking deepens the meaning of our experiences and is therefore a core educational aim. Critical thinking both authenticates existing knowledge and generates new knowledge suggesting an intimate connection with education. Critical thinking is integral to inquiry and viewed as an inclusive process of higher-order reflection and discourse. In order to create cognitive presence and higher-order learning outcomes consistent with the intended goals and expectations of the educational experience, there is a need for a moderator (i.e., teaching presence) who can assess the nature of the discourse continuously and proactively shape it following the critical thinking cycle. Students should be encouraged to relate the ideas and concepts to societal contexts, which increases the likelihood of moving the discourse to the integration and resolution phases. Moreover, a metacognitive understanding of critical thinking and practical inquiry greatly supports the development of cognitive presence. That is, when students understand the inquiry process and what is required at each phase, they can exhibit the skills to ensure progression through the phases to resolution.

Teaching Presence

Teaching presence is crucial for realizing intended learning outcomes. It is the key element in integrating social and cognitive presence during the inquiry process. Simply put, teaching presence is what the participants (usually the instructor) do to create a purposeful and productive community of inquiry. Teaching presence is formally defined "as the design, facilitation and direction of cognitive and social processes for the purpose of realizing personally meaningful and educationally worthwhile learning outcomes (Garrison et al, 2000; Ngubane-Mokiwa & Khoza, 2021). The main responsibilities of teaching presence are identifying relevant societal knowledge, designing experiences that facilitate reflection and discourse, and diagnosing and assessing learning outcomes. The function of teaching presence is organized into three categories: design and organization, facilitating discourse, and direct instruction.

This study is underpinned, to a great extent, by CoI theory in that it provides a framework for the utilization of ICT tools in teaching and learning processes. To have a perfect blend of the elements of CoI theory, ICT integration which involves utilization in teaching and learning is required. Furthermore, this study is necessitated by the increased advocacy for increased ICT integration into teaching and learning processes as well as e-learning. The results of this study are expected to reveal the level of utilization of ICT tools in higher education institutions for teaching and learning TVE courses. The elements of the CoI theory identified will only work when the hardware and software are provided and utilized adequately. That is to have a fulfilling educational experience, there should be adequate utilization of ICT tools.

Research objectives

The objective of this study is to examine the extent of utilization of 21st century ICT tools in the teaching and learning of Technology and Vocational Education courses. Specifically, the study sought to determine:
1. the hardware used by students in the learning process of Technology and Vocational Education courses
2. the software applications used by students in the learning process of Technology and Vocational Education courses
3. the hardware used by lecturers in the teaching process of Technology and Vocational Education courses
4. the software applications used by lecturers in the teaching process of Technology and Vocational Education courses

Research Questions

The study sought to answer the following research questions:
1. What are the hardware used by students in the learning process of Technology and Vocational Education courses?
2. What are the software applications used by students in the learning process of Technology and Vocational Education courses?
3. What are the hardware used by lecturers in the teaching process of Technology and Vocational Education courses?
4. What are the software applications used by lecturers in the teaching process of Technology and Vocational Education courses?

Research Hypotheses

The following null hypotheses were tested at 0.05 alpha level of significance:
1. There is no significant difference between the students and lecturers regarding the use of hardware in the teaching and learning process of TVE courses.
2. There is no significant difference between the students and lecturers regarding the use of software applications in the teaching and learning of TVE courses.

Methodology

Research design

The research design adopted for this study was a descriptive survey because the researcher collected information on the extent of ICT tools utilization in teaching and learning Technology and Vocational Education courses (Kumar, 2011; Creswell & Creswell, 2022). The sample of the study comprised 241 students and 25 lecturers of Technology and Vocational education students. Data were collected with a structured questionnaire which has three sections (sections A, B and C). Section A sought demographic information of respondents, Section B sought information on the utilization of hardware technologies for teaching and learning and Section C sought information on utilization of software technologies for teaching and learning. The instrument was validated by three experts. The reliability was determined by administering the questionnaire on 15 computer science education students and 5 computer science education lecturers. Cronbach Alpha statistic was calculated using SPSS 25 and a reliability coefficient of .83 was obtained. The questionnaire was administered by the researcher using Google Form. The instrument was put in Google Form and sent personally to the lecturers and the students. The research questions were answered using mean statistics while the standard deviation showed the spread or togetherness of the responses (Field, 2018). Null hypotheses were tested using t-test statistics at a .05 level of significance.

Results

The extent students utilize hardware technologies in the learning of TVE courses

Table 1

Mean and Standard Deviation of Students' Responses on Hardware Technologies Utilization in TVE Courses

Hardware Technology	M	SD	Remark
Computer/Laptop	4.08	1.05	Utilized
Visual classroom	2.18	1.30	Under utilized
Flash drive	2.33	1.17	Under utilized
Cell phone	4.45	.87	Utilized
Computer laboratory	3.63	1.11	Utilized
Printer	2.14	1.24	Under utilized
Photocopier	2.11	1.24	Under utilized
Internet facilities e.g., Wi-Fi	3.14	1.26	Utilized
Online/Virtual libraries	1.99	1.26	Under utilized
Projectors	1.72	1.17	Under utilized

Note. N = 240

The result presented in Table 1 shows that computers/laptops and cell phones, computer laboratory and internet facilities with mean of 4.08, 4.45, 3.63 and 3.14 respectively are utilized in the learning of TVE courses while visual classroom, flash drive, printer, photocopier, online/virtual libraries and projectors with mean of 2.18, 2.33, 2.14, 2.11, 1.99 and 1.72 respectively are under-utilized in the learning of TVE courses. It also revealed the respondents' opinions on the hardware technologies used in the learning of TVE courses.

The extent students utilize software technologies in the learning of TVE courses

Table 2

Mean and Standard Deviation of Students' Responses on Software Technologies Utilization in TVE Courses

Software technology	*M*	*SD*	Remark
Typing with Microsoft Word	3.36	1.26	Utilized
Design with Corel Draw/Photoshop	1.65	1.12	Under-utilized
Spreadsheet (Excel)	2.37	1.23	Under-utilized
System software (Chrome, Google, etc.)	2.94	1.32	Under-utilized
Chat rooms (WhatsApp, Telegram, Facebook, etc.)	3.99	.94	Utilized
Online tutorials	1.78	1.17	Under-utilized
PowerPoint presentation for lectures	1.64	1.20	Under-utilized

Note. N = 240

The result presented in Table 2 shows that typing with Microsoft Word and chat rooms with a mean of 3.36 and 3.99 respectively are utilized in the learning of TVE courses, while designing with CorelDraw, Spreadsheet, System software, online tutorials and PowerPoint presentation with a mean of 1.65, 2.37, 2.94, 1.78 and 1.64 respectively are under-utilized in the learning of TVE courses. It also revealed the respondents' opinions on the software technologies used in the learning of TVE courses.

The extent lecturers utilize hardware technologies in the learning of TVE courses

Table 3

Mean and Standard Deviation of Lecturers' Responses on Hardware Technologies Utilization in TVE Courses

Hardware technology	*M*	*SD*	Remark
Computer/Laptops	4.12	1.24	Utilized
Visual classroom	2.40	1.29	Under-utilized
Flash drive	3.40	1.47	Utilized
Cell phone	4.56	.65	Utilized
Computer laboratory	3.04	1.24	Utilized
Printer	3.44	1.36	Utilized
Photocopier	3.36	1.44	Utilized
Internet facilities e.g., Wi-Fi	4.08	.91	Utilized
Online/Virtual libraries	3.04	1.24	Utilized
Projectors	2.68	1.25	Under-utilized

Note. N = 25

Result presented in Table 3 shows that computers/laptops, flash drive, cell phone, computer laboratory, printer, photocopier, internet facilities and online/virtual libraries with mean of 4.12, 3.40, 4.56, 3.04, 3.44, 3.36, 4.08 and 3.04 respectively are utilized in teaching TVE courses, while visual classroom and projectors with mean of 2.40 and 2.68 are under-utilized in teaching TVE courses. It also revealed the respondents' opinions on the hardware technologies used in the teaching of TVE courses.

The extent lecturers utilize software technologies in the learning of TVE courses

Table 4

Mean and Standard Deviation of Lecturers' Responses on Software Technologies Utilization in TVE Courses

Software Technology	*M*	*SD*	Remark
Typing with Microsoft Word	4.52	.71	Utilized
Design with CorelDraw/Photoshop	2.12	1.13	Under-utilized
Spreadsheet (Excel)	3.36	1.32	Utilized
System Software (Chrome, Google, etc.)	4.28	.94	Utilized
Chat rooms (WhatsApp, Telegram, Facebook, etc.)	4.24	.88	Utilized
Online Tutorials	3.12	1.20	Utilized
PowerPoint presentation for lectures	3.04	1.34	Utilized

Note. N = 25

Based on the result presented in Table 4, typing with Microsoft Word, Spreadsheet, systems software, chat rooms, online tutorials and PowerPoint presentation are utilized in teaching TVE courses, while design with CorelDraw/Photoshop is under-utilized in teaching TVE courses. It also revealed the respondents' opinions on the software technologies used in the teaching of TVE courses.

Test of statistical significance of hypotheses

Test of statistically significant difference between lecturers and students' responses on extent of utilization of hardware technologies in learning TVE courses

Table 5

Results of t-test on Lecturers and Students' Responses on Hardware Technologies Utilization in TVE

Variable	*N*	*M*	*SD*	*t*	*df*	*p*	Remark
Students	241	2.78	.75	-4.19	263	.334	Not significant
Lecturers	24	3.46	.86	-3.74			

Results presented in Table 5 reveals that the mean responses of the students (*M* = 2.78, *SD* = .75) do not differ significantly from the mean responses of the lecturers (*M* = 3.46, *SD* = .86) on the extent of utilization of 21st-century hardware technologies in teaching and learning TVE courses. This means that the null hypothesis is upheld at $p \leq .05$ level of significance, [*t* (241) = -4.19, *t* (24) = -3.74, *p* = .334]. This implies that the lecturers and students do not differ in their responses on the extent of utilization of 21st-century hardware technologies for teaching and learning.

Test of statistically significant difference between lecturers and students' responses on extent of utilization of software technologies in teaching and learning TVE courses

Table 6

Results of t-test on Lecturers and Students' Responses on software Technologies Utilization in TVE

Variables	*N*	*M*	*SD*	*t*	*df*	*p*	Remarks
Students	241	2.54	.85	-5.74	263	.422	Not significant
Lecturers	24	3.56	.69	-6.82			

Based on the results presented in Table 6, the mean responses of the students (*M* = 2.54, *SD* = 0.85) do not differ significantly from the mean responses of the lecturers (*M* = 3.56, *SD* = 0.69) on extent of utilization of 21st

century hardware technologies in teaching and learning TVE courses. This means that the null hypothesis is upheld at $p \leq .05$ level of significance [$t(241) = -5.74$, $t(24) = -6.82$, $p = .422$]. This implies that the lecturers and students do not differ in their responses on extent of utilization of 21st century hardware technologies for teaching and learning.

Findings and Discussion

The findings of this study revealed that most of the hardware technologies e.g., computers/laptops and cell phones, computer laboratories and internet facilities are utilized in the learning of TVE courses while visual classrooms, flash drives, printers, photocopiers, online/virtual libraries and projectors are under-utilized in the learning of TVE courses. On the part of the teachers, the study revealed that most of the hardware technologies e.g. computers/laptops, flash drives, cell phones, computer laboratories, printers, photocopiers, internet facilities and online/virtual libraries are utilized in teaching TVE courses, while visual classroom and projectors are under-utilized in teaching TVE courses.

Furthermore, the findings of the study show that most of the software technologies e.g. typing with Microsoft Word and chat rooms are utilized in the learning of TVE courses, while design with CorelDraw, Spreadsheet, System software, online tutorials and PowerPoint presentations are under-utilized in the learning of TVE courses. Similarly, it was revealed that most of the software technologies e.g. typing with Microsoft Word, Spreadsheets, systems software, chat rooms, online tutorials and PowerPoint presentations are utilized in teaching TVE courses, while design with CorelDraw/Photoshop is under-utilized in teaching TVE courses. Gender was also found not to be a factor in the responses of the respondents on the extent of utilization of ICT for teaching and learning. All the hypotheses stated to test whether the responses of the lecturers and students on both 21st-century hardware and software technologies differed turned out to be statistically insignificant.

The results of this study are in agreement with the study conducted by Okolocha and Nwadiani (2015) who reported that educational institutions of higher learning lack computers and allied ICT facilities for efficient teaching and learning in Nigeria. The utilization of ICT facilities in institutions of learning would bring about quality standards of education to the graduates (Muhammad et al., 2020). It assists the graduates to widen their horizons, to be up to date on current issues and innovations going on in the global village. This is buttressed by Lomos et al. (2023), that ICT is not yet a common feature of the classroom environment despite the claim that all teacher educators are now ICT literate. In fact, all the respondents agreed that ICT facilities contribute immensely to improve students' performance, creating new knowledge through the lectures delivered by their lecturers. These findings are also similar to those made by Abba et al, (2023) which revealed that ICT has the potentials that can improve academic staff performance in Nigerian Universities in today's world of knowledge economy. However, they indicated that ICT access and usage, availability have been underutilized by academic staff in the Universities. This is largely due to environmental factors in the Nigerian Universities. The findings of Okolocha and Nwadiani (2015) on the utilization of ICT resources in teaching among Business Educators in tertiary institutions in southeast of Nigeria also revealed that the few ICT resources are rarely utilized in teaching.

ICT facilities are capital intensive especially when it involves procurement for a large number of teachers and students. Addressing students' (and teachers') need to access technology supporting their learning, meeting teacher technology requirements, and offering digital resources within the budget could be a daunting job (Muhammad et al., 2020). However, when teachers are digitally literate and qualified to use ICT, their knowledge will contribute to higher-order thinking skills, provide students with innovative and individualized opportunities to communicate their understandings, and leave students better prepared to cope with ongoing technological change in society and the workplace (Rosaline & Wesley, 2017). The implication of this is that the teachers and students must make good use of the available ICT resources while more funding is strongly needed to procure the facilities that are insufficient so that the students will have requisite exposure to be able to compete favorably in the highly competitive labor market upon graduation.

Conclusions and recommendations

This study assessed the extent of utilization of ICT in teaching and learning of Technology and Vocational Education in a public university in Nigeria. Findings revealed that most of the hardware technologies e.g., computers/laptops and cell phones, computer laboratory and internet facilities are utilized in the learning of TVE

courses while visual classrooms, flash drives, printers, photocopiers, online/virtual libraries and projectors are under-utilized in the learning of TVE courses by the students. On the part of the teachers, most of the hardware technologies e.g. computers/laptops, flash drives, cell phones, computer laboratories, printers, photocopiers, internet facilities and online/virtual libraries are utilized in teaching TVE courses, while visual classroom and projectors are under-utilized in teaching TVE courses.

The effective utilization of ICT technologies requires the equipping of students and teachers with ICT skills and facilities needed to effectively function in the knowledge-based economy. Hence, the utilization of ICT in the preparation and presentation of lectures, instructional delivery, individualized learning, as well as collaboration and evaluation of learning will significantly be of great benefit.

Based on the findings of this study, some recommendations are made. For instance, both lecturers and students should be provided with opportunity for the utilization of Information and communication technology (ICT) for teaching and learning. Students should be involved in using ICT in learning activities such as doing assignments and searching the internet for learning resources because it's believed that ICT can enhance teacher and student interaction and also tends to increase students learning motivations. Similarly, the number of lectures on the use of information and communication resources should be increased in teachers' training programs to increase knowledge and skills for teachers to use for teaching.

Conflict of interest
The authors declare no conflict of interest

Author contribution
Conceptualization: Nnaemeka Agbo, Ngozi Onyemachi; **Methodology:** Nnaemeka Agbo, Ngozi Onyemachi. **Software:** Nnaemeka Agbo; **Validation:** Nnaemeka Agbo, Ngozi Onyemachi**. Formal analysis:** Nnaemeka Agbo. **Investigation:** Nnaemeka Agbo, Ngozi Onyemachi, Ogunmola Abiodun **Writing- Original Draft:** Nnaemeka Agbo, Ngozi Onyemachi; **Editorial:** Nnaemeka Agbo, Ogunmola Abiodun

Data availability statement
Data availability will be based on request

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