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Pedagogical Approach of E-learning: ICT as a tool to foster teaching and learning for Polytechnics in Northeast, Nigeria.

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Abstract.
One of the critical advantages of Information and Communication Technology (ICT) in the pedagogical approach of e-learning is its ability to create a proactive teaching-learning environment. This environment allows both teachers and students to learn about their respective subject areas in innovative and engaging ways. Technology-based teaching and learning methods offer various interesting avenues for exploration, incorporating educational tools and resources that cater to diverse learning styles and preferences. This research aims to investigate the Pedagogical Approach of E-learning for effective teaching and learning in Northeast Polytechnics of Nigeria. Questionnaires were used to gather information and analysed them based on available data. The finding of the research is that there is inadequate utilization of ICT resources as a pedagogy of teaching and learning in Northeast Polytechnics. Most of the challenges faced by teachers are to become digitally literate and the need for the Government or concerned authorities to integrate ICT into their curriculum.

Keywords: Information and Communication Technology (ICT), Pedagogy, E-learning, educational pedagogy.

INTRODUCTION

The pedagogical approach of e-learning and the use of Information and Communication Technology (ICT) as a tool to foster teaching and learning in Polytechnics in Nigeria have been topics of interest in current literature. Several studies have explored the potential benefits, challenges, and opportunities associated with this approach. Let's delve into some of the relevant findings.

Blended learning designs, which combine digital technology and face-to-face learning, have been identified as crucial in the digital transformation of teaching in higher education. Blended learning offers a flexible and personalized learning experience that can enhance student engagement and improve learning outcomes. It allows educators to integrate ICT tools into their teaching methodologies, enabling them to deliver content effectively and engage students in interactive and collaborative activities (Avazmatova, 2020).

Online education has also gained prominence as an alternative pathway, particularly suited to adult learners seeking higher education opportunities. The emergence of online education has opened new possibilities for Polytechnics in Nigeria to expand access to education and provide flexible learning options. E-learning platforms, coupled with ICT tools, can support remote learning, promote self-paced learning, and facilitate access to educational resources beyond the confines of a physical classroom (Paudel, 2020).

The COVID-19 pandemic further accelerated the adoption and exploration of e-learning and e-teaching approaches. A literature review on e-learning and e-teaching outcomes during the pandemic revealed valuable insights. It highlighted the challenges faced by educators and students in adapting to online learning, such as the digital divide, limited internet access, and technological barriers. However, it also underscored the potential opportunities for leveraging ICT tools to foster teaching and learning, such as the use of online collaboration platforms, multimedia resources, and interactive learning activities (Lee, 2017).

In the context of Polytechnics in Nigeria, integrating ICT as a tool for e-learning can offer several advantages. It can enhance pedagogical practices by providing multimedia resources, interactive simulations, and virtual laboratories, enabling students to acquire practical skills and knowledge. E-learning platforms can facilitate communication and collaboration among students and instructors, promoting engagement and knowledge sharing. Additionally, the flexibility of e-learning can help address challenges related to geographical constraints and time limitations, making education more accessible to a wider population (Abanikannda, 2022).

To further explore the specific applications and best practices of e-learning and ICT tools in polytechnics in Nigeria, it would be beneficial to delve into more detailed studies and reports on the topic. These

sources will provide specific insights into the implementation strategies, student outcomes, faculty development, and policy considerations relevant to the Nigerian context.

Background of the study

Information and communication technologies (ICTs) are a diverse set of technological tools and resources used for creating, storing, managing, and communicating information. For educational purposes, ICTs can be used to support teaching and learning as well as research activities including collaborative learning and inquiring. One of the main applications of the ICTs in higher education is teaching and learning based on these new technologies. However, within a shortest period, ICT have one of the basic building blocks of modern society. Many countries now regard understanding ICT and mastering the basic skills and concepts of ICT as part of the core of education, alongside reading, writing and numeracy. However, there appears to be a misconception that ICTs generally refers to 'computers and computing related activities' (Noor-Ul-Amin, 2012).

This is fortunately not the case, although computers and their application play a significant role in modern information management, other technologies and/or systems also comprise of the phenomenon that is commonly regarded as ICTs. Pelgrum and Law (2003) state that near the end of the 1980s, the term 'computers' was replaced by 'IT' (information technology) signifying a shift of focus from computing technology to the capacity to store and retrieve information. This was followed by the introduction of the term 'ICT' (information and communication technology) around 1992, when e-mail started to become available to the public (Pelgrum and Law, 2003). According to a United Nations report (1999) ICTs cover Internet service provision, telecommunications equipment and services, information technology equipment and services, media and broadcasting, libraries and documentation centres, commercial information providers, network-based information services, and other related information and communication activities.

UNESCO (2002) viewed information and communication technology (ICT) may be regarded as the combination of 'Informatics technology' with other related technology, specifically communication technology. The various kinds of ICT products available and having relevance to education, such as teleconferencing, email, audio conferencing, television lessons, radio broadcasts, interactive radio counselling, interactive voice response system, audiocassettes, and CD ROMs etc have been used in education for different purposes. The field of education has been affected by ICTs, which have undoubtedly affected teaching, learning, and research (Yusuf, 2005).

A great deal of research has proven the benefits to the quality of education (Al-Ansari, 2006), ICTs have the potential to innovate, accelerate, enrich, and deepen skills, to motivate and engage students, to help

relate school experience to work practices, create economic viability for tomorrow's workers, as well as strengthening teaching and helping schools change.

Kabir (2015) states, much has been said and reported about the impact of technology, especially computers, in education. Initially computers were used to teach computer programming but the development of the microprocessor in the early 1970s saw the introduction of affordable microcomputers into schools at a rapid rate. Computers and applications of technology became more pervasive in society which led to a concern about the need for computing skills in everyday life. Lee (2017) claim in that ICTs have been utilized in education ever since their inception, but they have not always been massively present. Although at that time computers have not been fully integrated in the learning of traditional subject matter, the commonly accepted rhetoric that education systems would need to prepare citizens for lifelong learning in an information society boosted interest in ICTs (Pelgrum and Law, 2003).

The 1990s was the decade of computer communications and information access, particularly with the popularity and accessibility of internet-based services such as electronic mail and the World Wide Web (WWW). At the same time the CD-ROM became the standard for distributing packaged software (replacing the floppy disk). Thus, educators became more focused on the use of the technology to improve student learning as a rationale for investment. Any discussion about the use of computer systems in schools is built upon an understanding of the link between schools, learning and computer technology. When the potential use of computers in colleges was first mooted, the predominant conception was that students would be 'taught' by computer (Noor-Ul-Amin, 2012).

Research Question

Main Question: Is it possible to adopt pedagogical Approach of E-learning for polytechnic system of Education.

Research Questions:

1. What are the impacts of ICT in Teaching and learning in Polytechnic System?
2. In What ways did ICT contribute to teaching and learning processes?
3. What are the constraints in the use of ICT tools in teaching and learning process?
4. In what ways can Polytechnics strengthen ICT infrastructure for use in teaching and learning?

Statement of Problem

The central problem of this study is that despite the critical role of ICT in sectors like banking, construction transport and communication, it has not been fully adopted in the teaching and learning processes in most developing countries like Nigeria. While there is a wide range of innovations in ICT to support effective and quality of delivery of educational services, there is considerable technology lag in the Nigeria educational institutions. Most of the institutions still use nearly obsolete systems and

consequently are unable to exploit educational potential of the emerging technologies this notion is also in agreement with Mikre (2013) and Noor-Ul-Amin (2012) and added that lack of training has contributed to this. Lee (2013) further added that Use of ICT in education at all levels is limited by poor ICT infrastructure, weak policy and regulatory framework, limited number of teachers who are ICT proficient, low telecommunication services penetration and poor-quality services, however, this notion is application to Nigeria educational system. Access to ICT facilities is presently one of the major challenges in African countries and Nigeria in particular. With changes in modern technologies learners need to be equipped with updated knowledge that will make them adapt to the changing world. Such knowledge leads to better communication and increased earnings because of e-Commerce and self-employment in the ICT sector. The study was also expected to generate knowledge on ICT Impacts on education quality, access and completion rates. It will bring to the fore the preparedness of teachers on the use of ICT right from teacher education institutions.

Teaching and learning process in Nigeria Polytechnic

In a society, lecturers have very important roles. The roles they play in the education process are central to basic education, in particularly more in Third World countries. A daunting challenge facing the education system is lack of competent teachers/lecturers who are literate or proficient in the use of information technology. Information Communication Technology (ICT) proficiency is the ability to use technology tools and networks to define an information need, to access, to manage, integrate and evaluate information. The ability to access, evaluate, organise and use information from a variety of sources is known as Information literacy (Humes, 2003). As agents of change, it is important that teachers are ICT literate as this could bring about a lot of positive attitudes towards the use of computer and information technologies. Regardless of the quantity and quality of technology available in classrooms, the key to how ICTs are used is the teacher. Hence it is important that teachers are competent and have the right attitude towards technology (Kadel, 2005).

Polytechnics could have ICT hardware and software, but whether used efficiently will depend on the teachers. It will depend on the lecturers' beliefs and experiences, levels of knowledge, attitude towards ICT, educational applications, the expected outcomes, and the teaching and learning approach (Chan, 2014). High levels of knowledge, value, skill, personal dispositions, sensitivities, and capabilities will determine the ability to put those combinations into practice in appropriate way (Chan, 2014). An ICT competency describes what a teacher should know to be able to use technology in his or her professional practice, Kirschner and Woperies (2003) added that some major ICT competencies that teachers are required.

These include competency in making personal use of ICT, mastery of a range of educational paradigms that make use of ICT, making use of ICT as minds tools, using ICT as tool for teaching, mastering a range of assessment paradigms which involves use of ICT, and understanding the policy dimensions of the use of ICT for teaching and learning (Singhand Chan, 2014). To successfully impart knowledge to students, it is important that teachers are well equipped with the knowledge that they need. The central question is, do teachers have the required knowledge of ICT? There are studies which reveal that teachers do not acquire the necessary level of knowledge. Research carried out by Rosnaini and Mohd Arif (2010) find out that minority of teachers were knowledgeable in basic ICT. Added that majority of them only had average knowledge in ICT or very minimal knowledge of ICT. This scenario clearly shows that the key factor in making ICT programs successful in school is to upgrade the level of ICT knowledge among teachers (Moganashwari and Parilah, 2013).

ICT is a tool that can be used across the curriculum or in separate subjects where the emphasis is on the development of ICT-related skills, knowledge, processes, and attitudes (UNESCO, 2007). It enhances the learning outcomes of students within the limits of the existing curriculum and a potential tool to transform the teacher-based classrooms into learner-focused, rich and interactive learning environments. Teachers are the key elements in this transformation based on the acceptance of ICT learning and teaching tool in schools. Consequently, teachers' attitudes toward computer technologies are also related to lecturers' competence in using the technology.

Benefit of ICT in teaching

The use of ICT is making major differences in the learning of students and teaching approaches. Schools in the Western World invested a lot for ICT infrastructures over the last 20 years, and students use computers more often and for a much larger range of applications (Volman, 2005). Several studies reveal that students using ICT facilities mostly show higher learning gains than those who do not use. For instance, Kulik's (1994) finding across 75 studies in the United States showed the following. Students who used computer tutorials in mathematics, natural science, and social science score significantly higher on tests in these subjects. Students who used simulation software in science also scored higher. The findings also indicated that primary school students who used tutorial software in reading scored significantly higher on reading scores. Very young students who used computers to write their own stories scored significantly higher on measures of reading skill. Moreover, students who used word processors or otherwise used the computer for writing scored higher on measures of writing skill.

Furthermore, the use of ICTs in education also shifts the learning approaches. As put by Volman (2005), there is a common belief that the use of ICTs in education contributes to a more constructivist learning

and an increase in activity and greater responsibility of students. This limits the role of the teacher to supporting, advising, and coaching students rather than merely transmitting knowledge. The gradual progress in using computers changes from learning about computers, to learning computers, and finally to learning with computers (Volman, 2005).

On the other hand, teachers' reluctance to adopt innovations need to be seen in the context of existing technology and commitments. Watson (2001) states that change or improvement can happen at schools if teachers understand themselves and understood by others. For instance, many teachers are currently not able to make informed judgements on ICTs to support their teaching goals. Clearly a variety of factors still do make using ICT in the curriculum problematic (Mikre, 2013). Because of this, the influence of ICT did not bring revolutionary changes at schools. For instance, the National ICT survey in the Netherlands shows that most primary-school students use computers less than once a week and there are still many secondary school teachers who do not use ICT at all (Mikre, 2013). Most often, they use computers for drill-and-practice and word processing.

Challenges of ICT in Teaching

ICT as a modern technology that simplifies and facilitates human activities is not only advantageous in many respects, but also has many limitations. Many people from inside and outside the education system, think of ICT as "Panacea" or the most important solution to school problems and improvements. However, many conditions can be considered as limitations of ICT use in education. The limitations can be categorized as teacher related, student related, and technology related. All of them potentially limit the benefits of ICT to education. Teachers' attitude plays an important role in the teaching-learning process that utilizes computers and internet connections. Although teachers' attitude towards use of these technologies is vital, many observations reveal that teachers do not have clarity about how far technology can be beneficial for the facilitation and enhancement of learning. Of course, some teachers may have positive attitudes to the technology, but refrain from using it in teaching due to low self-efficacy, tendency to consider themselves not qualified to teach with technology.

In this respect, Bandura (1986) describes self-efficacy as "individual's opinion of capabilities to organize and perform courses of actions to achieve particular types of performances." Moreover, as identified by Brosnan (2001), attitude, motivation, computer anxiety, and computer self-efficacy are factors affecting teachers' use of computers in their lessons. Teacher resistance and lack of enthusiasm Furthermore, many teachers may not have the required IT skills and feel uncomfortable, nor do they have trainings needed to use the technology in their teaching. Unless teachers develop some basic skills and willingness to experiment with students, ICT use in education is in a disadvantage (Brosnan, 2001). On the other hand,

the limitation of ICT use in education is related to student behaviour. Appropriate use of computer and the internet by students have significant positive effects on students' attitude and their achievement. Nonetheless, it is very common to observe limitations related to student behaviour. Students tend to misuse the technology for leisure time activities and have less time to learn and study. Yousef and Dahmani (2008) described online gaming, use of face book, chat rooms, and other communication channels as perceived drawbacks of ICT use in education, because students easily switch to these sites at the expense of their study. Internet access at home, for instance, may be a distraction because of chat rooms and online games, reducing the time spent in doing assignments and learning (Kulik, 1994).

Therefore, the impact of availability of ICT on student learning strongly depends on its specific uses. If ICT is not properly used, the disadvantage will overweight the advantage. For example, while students use the internet, it may confuse them by the multiplicity of information to choose from. As a result, the teacher spends much time to control students from websites unrelated to the learning content. Then, for caution, it is important to identify the major limitations of ICT use in education as related to student behaviour.

The other limitation of ICT use in education is technology related. The high cost of the technology and maintenance of the facilities, high cost of spare parts, virus attack of software and the computer, interruptions of internet connections, and poor supply of electric power are among the technology related limitations of ICT use in education.

The integration of ICTs in education systems may face various challenges with respect to policy, planning, infrastructure, learning content and language, capacity building and financing. ICT-enhanced education requires clearly stated objectives, mobilization of resources and political commitment of the concerned bodies. Tinio (2002) discusses issues such as analysis of current practices and arrangements, identification of potential drives and barriers, curriculum and pedagogy, infrastructure, and capacity building to be considered in the formulation of policy and planning. In addition, it is wise to specify educational goals at different education and training levels as well as the different modalities of ICT use that can facilitate in the pursuit of the goals. Policy makers then, need to know the potentials of ICTs in applying different contexts for different purposes. Other challenging points at the level of policy and planning are identification of stakeholders and harmonization of efforts across different interest groups, the piloting of the chosen ICT-based model, and specification of existing sources of financing and the development of strategies for generating financial resources to support ICT use over the long term. The infrastructure challenges that may exist are absence of appropriate buildings and rooms to house the technology, shortage of electric supply and telephone lines, and lack of the different types of ICTs. Because of this, one need to deal with infrastructure related challenges before the planning of ICTs

integration to education systems. Another great challenge is the financing. ICTs in education programs require large capital investment and developing countries need to predict the benefit of ICT use to balance the cost relative to the existing alternatives. Potential sources of money and resources for ICT use programs suggested are grants, public subsidies, fund-raising events, in kind support from volunteers, community support, revenues earned from core business, and revenues earned from ancillary activities (Tinio, 2002). Overcoming the mentioned challenges may help education systems benefit the most from this technology.

Research Location

This research "*Pedagogical Approach of E-learning: ICT as a tool to foster teaching and learning for Polytechnics in Northeast, Nigeria*". The research work focuses on some selected higher institutions in the Geopolitical zone with emphasis of polytechnic sector as case study. The study was conducted on the following institutions, as shown on the table below.

S/N	STATES	POLYTECHNICS
1	Adamawa	1. Federal Polytechnic, Mubi 2. Adamawa State Polytechnic, yola
2	Bauchi	1. Federal Polytechnic, Bauchi. 2. Abubakar Tatari Ali Polytechnic, Bauchi
3.	Borno	1. Ramat Polytechnic, Maduguri
4.	Gombe	1. Federal Polytechnic, Kaltungo 2. Gombe State Polytechnic, Bajoga
5.	Taraba	1. Federal Polytechnic, Balli 2. Taraba State Polytechnic, Suntai
6.	Yobe	1. Federal Polytechnic, Damaturu 2. Mai Idris Alooma Polytechnic, Geidam

Sample and Sampling Procedure

Since the population of the study is large, simple random sampling techniques is used in which every item in the population has an equal right of been selected in the population. Therefore, six Hundred (600) staffs and students were selected for the analysis. The exception of The Federal Polytechnic, Damaturu which has 60 questionnaires (40 for students and 20 for Academic staffs), all others are 50 questionnaires (30 for students and 20 for Academic staffs).

Data Collection Instrument

The instrument for the research work was a structure questionnaire, the questionnaire consists of two section (2) "A" and "B" section "A" deals with the personal data of the respondents, while section "B" consists of questionnaire items. The five (5) point response option are used for the collection of responses to the questionnaire items are as follow: - Strongly Agreed (AS), Agreed (A), Neutral (N), Disagreed (D), and Strongly Disagreed (SD).

The Validity of the Instrument

The researcher presented the subject of the study, its aims and objectives, and made any required adjustments, which were implemented by the researcher and reflected in a final copy of the instrument. This validated the instrument in terms of both its content and its appearance. **Method of Data Collection**

The researcher used the questionnaire in collection of data, 600 questionnaires were distributed and 550 were retrieved.

Method of Data Analysis

After arriving at the teaching staff index (i.e. the mean value of the teachers) and students' academic achievements with the use of simple mean and percentage, the various indices will be correlated with the help of spearman product moment correlated coefficient approaches. To calculate the various indices for the schools, we first add up all the respondents' scores on each question for that school and then divide those totals by the total number of respondents (mean). The researcher made use of a frequency distribution table as a scoring method, and the analysis entailed the application of values assigned to the Likert scale rating on a scale of five points:

SA=5, A=4, N=3, D=2, SD=1.

The cut of point is obtained using the following formular.

$$X = \sum \frac{fx}{n}$$

$$x = \frac{5+4+3+2+1}{5} = \frac{15}{5} = 3$$

The cut-off point is therefore set at 2.5. The score will now be determined by multiplying each variable by the value that has been allotted to each of the four points, and then adding all of those values together to get the summation of frequency (EFX), which will then be divided by the number of the sample size (N) to get the mean score. Therefore, the cut-off point is what determines whether such a variable is accepted.

DATA ANALYSES AND PRESENTATION

The questionnaires were distributed for the respondents and retrieved back for analysis. A total number of 600 respondents have filled the questions and out of this 600, the questionnaire was sorted, some questions were not answered or left blank. A total number of 50 were identified and removed from the results due to not completing one question among the questions given. A total number of 550 are

identified to be valid and the analysis will be conducted using them. In this case data relating to each research question is presented and thereafter analysed and interpreted.

Demography

The completed survey consists of demography data which include age and gender were collected. Out of 550 responders, 19- 20 ages are 50, 21- 30 are 180, and 31 – 65 are 220 are Academic staffs and the remaining 330 are students among the case study polytechnics within the Northeast region of Nigeria respectively. Out of the respondent 430 are males and 120 are females.

DATA PRESENTATION AND DISCUSSION OF FINDINGS

Table 1 Personal Data

Survey	Reaction	Frequency	Percentage
Gender	Male	430	78.18%
	Female	120	21.82%
Sub- Total		550	100%
Age	18- 25	150	27.27%
	26- 35	250	45.45%
	36- 45	90	16.36%
	46 - above	60	10.91%
Sub- Total		550	100%
Marital Status	Married	295	53.64%
	Single	255	46.36%
Sub- Total		550	100%

Analysis/ Interpretation of Table 1

Above shows the records of the questionnaire that, 78.18% are males and 21.82% are female that answer the questionnaire respectively. In terms of age, 27.27% of the respondents are between 18-25 of age, 45.45% are between the age of 26-35, 36-45 scale has a percentage of respond of 16.36% and 46- above are reported to have about 10.91 %. Consequently, results from the sample showed that 53.64% are married and 46.36% are single, this cis as a result the sample comprised of staff and students.

QUESTION 1: **What are the impacts of ICT in Teaching and learning in Polytechnic System**?

Discussion: Teaching and learning has become and effective tool with the uses of ICT in higher institutions as the world is gradually changing to digital world. Nevertheless, the integration of ICT in teaching and learning has great impact. This is as a result from the feedback indicates overall results have an average mean of (M=4.04), this implies the students and lecturer are willing to imbibe the use of ICT in their pedagogy of teaching and learning in respective schools. S/NO 1 has the only less mean of

(M=3.82), this indicates students and staffs can continue with their traditional learning and teaching process. The result of this item shows the impact of integrating ICT in educations pedagogy is at an average level, however, the SD shows less concentration of the results from the mean, which implies the majority selected.

"Neutral". The neutral indicate student can be addicted to some certain aspect as Table 6. This result has shown also more cybersecurity campaign is needed to enlighten the students on the basic knowledge of cybersecurity

S/NO	ITEMS	N	MEAN	SD
1.	Did the integration of ICT in teaching and learning enhance student engagement and participation in the polytechnic system?	550	3.82	1.261
2.	Do the integration of ICT in teaching and learning has effects on students' acquisition of knowledge, skills, and attitudes in the polytechnic system?	550	3.98	1.183
3.	Does the use of ICT in teaching and learning promote equality, inclusion, and social integration in the polytechnic system?	550	3.84	1.179
4.	Are their impacts of ICT integration on teachers' professional practices and instructional approaches in the polytechnic system?	555	4.04	1.180

QUESTION 2: In What ways did ICT contribute to teaching and learning processes?

Discussion: The role of IT in educational system cannot be over emphasis. ICT has contributed to the success of educational system. The overall results indicated that there is an adequate knowledge on the use of ICT in teaching and learning process as the mean values are (M=4.21) as the least and (4.34) as the higher mean, as the question shows most of the students will be engage in facilitated Resource-based learning in teaching and learning processes. The rest of the questions indicates an average knowledge of

the item; however, the SD shows not all the students, and the lecturers are neutral. This result shows there is a need to facilitated Resource-based learning in teaching and learning processes.

S/NO	ITEMS	N	MEAN	SD
1.	Does ICT enhance the effectiveness of teaching and facilitate effective learning?	550	4.21	1.097
2.	Does ICT promote student centrality in the teaching and learning processes?	550	4.25	1.095
3.	Does ICT enable modelling and simulation of real-life situations in the teaching and learning processes?	550	4.24	1.092
4.	Are there advantages of resource-based learning facilitated by ICT in the teaching and learning processes?	550	4.34	1.086

QUESTION 3: What are the constraints in the use of ICT tools in teaching and learning process?

Discussion: Several constraints had hindered the processes of teaching and learning in polytechnic system with the use of ICT. The overall results indicated that there is insufficient knowledge on the utilization of ICT tools such as Skills, Competence of using ICT tool are also factors which has a mean value are (M=3.98) as the least and (M=4.27) as the higher mean, as the question shows many challenges faced by teachers in becoming digitally literate and integrating ICT into the curriculum. The rest of the questions indicates an average knowledge of the item; however, the SD stands to be neutral. This result shows there is a need to facilitated Resource-based learning in teaching and learning processes.

S/NO	ITEMS	N	MEAN	SD
1.	Are there any challenges faced by teachers in becoming digitally literate and integrating ICT	550	4.27	1.068

	into the curriculum?			
2.	Are there any barriers in your schools that hinder the use of ICT tools for communication, creation, dissemination, storage, and information management?	550	4.25	1.097
3.	Are their sufficient requirements, competencies, and skills needed for teachers to effectively utilize ICT as pedagogical tools?	550	3.98	1.234
4.	Are there any limitations in using ICT tools for specific educational purposes, such as vocational education or lifelong learning?	550	4.03	1.196

QUESTION 4: In what ways can Polytechnics strengthen ICT infrastructure for use in teaching and learning?

Discussion: The result from the feedback indicates overall results have an average mean of (M=4), this implies that ICT infrastructures are used in learning and teaching processes in Polytechnics. S/NO 1 has the less mean value of (M=3.9), this indicates that schools have ICT tools and technologies to support teaching and learning but are not sufficient. The result of this item shows strengthen ICT infrastructure for use in teaching and learning, however, the SD shows less concentration of the results from the mean, which implies the majority selected.

S/NO	ITEMS	N	MEAN	SD
1.	Do your school have ICT tools and technologies currently available to support teaching and learning?	550	3.9	1.151
2.	Do your Polytechnics assess the needs and requirements of schools and students regarding ICT infrastructure for teaching and learning purposes?	550	4.15	1.096

3.	Can Polytechnics adopt some strategies that can enhance the accessibility and availability of ICT infrastructure for teaching and learning purposes?	550	4.20	1.062
4.	Can Polytechnics ensure the scalability and sustainability of their ICT infrastructure for future needs?	550	4.05	1.101

Conclusion

In summary, the pedagogical approach of e-learning in polytechnics relies on ICT as a tool to foster teaching and learning. By embracing ICT, polytechnics can create proactive teaching-learning environments, engage students in interactive and immersive learning experiences, and facilitate the acquisition and application of knowledge across various subject areas. The use of ICT in education opens new possibilities for effective and innovative learning practices in polytechnics. The pedagogical approach of e-learning refers to the strategies and methods employed in the use of information and communication technology (ICT) to enhance teaching and learning experiences in educational settings. Specifically, for polytechnics, which are institutions offering technical and vocational education, ICT can play a crucial role in fostering effective teaching and learning practices. ICT can impact student learning in polytechnics when teachers are digitally literate and understand how to integrate technology into the curriculum. By leveraging a diverse set of ICT tools, polytechnics can facilitate communication, creation, dissemination, storage, and management of information. This enables teachers and students to access and share knowledge, collaborate on projects, and engage in interactive and immersive learning experiences. ICT serves as a tool for students in the learning process, enabling them to discover topics, solve problems, and apply ICT to provide solutions. The accessibility of knowledge acquisition is enhanced using ICT, allowing students to understand concepts more effectively and engage in practical applications of ICT in various learning areas [3]. For polytechnics, e-learning supported by ICT can provide opportunities for hands-on, experiential learning, simulations, virtual laboratories, and real-world industry collaborations. This combination of theoretical knowledge and practical application can better prepare students for the demands of their future careers in technical and vocational fields.

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