



APPRAISAL OF TECHNO-PEDAGOGICAL COMPETENCE OF PRE-SERVICE TEACHERS IN SOME SELECTED TERTIARY INSTITUTIONS IN NIGER STATE, NIGERIA

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Abstract

The integration of ICT into teaching and learning has been very low with pre-service teachers not possessing the relevant technological competencies during classroom instruction in spite of advancement in technology that continues to permeate all facets of the education. Therefore, this study was conducted to appraise the techno-pedagogical competence of pre-service teachers in some selected tertiary institutions in Niger state, Nigeria. The population of the study comprised of 13,376 pre-service teachers of tertiary institutions in Niger State Nigeria out of which a multi-stage sampling technique was used to select 351 pre-service teachers to be used for the study. A questionnaire titled “Questionnaire for Appraising Techno-pedagogical Competency of Pre-service Teachers” (QATCPT) built on a four-point Likert scale was used to collect data. The instrument was validated by experts in the field of educational technology and computer science. A single shot pilot-study was conducted and reliability figures of 0.87, 0.92, 0.86, and 0.91 were obtained using Cronbach alpha. Findings revealed that pre-service teachers possess the basic technological skills for teaching (grand mean = 3.70); pre-service teachers possess the technological skills for planning and preparing lesson plan (grand mean = 3.48); pre-service teachers possess the technological skills for instructional delivery (grand mean = 3.82); pre-service teachers possess the technological skills for evaluating learning and providing feedback (grand mean = 3.25). It was therefore recommended, among others, that emerging technologies should be integrated into educational settings to create the motivation and skills needed by pre-service, and that pre-service should be taught on the use of emerging technologies in order to improve learning outcomes.

Keywords: ICT, Techno-pedagogy, Pre-service teachers, Competence



INTRODUCTION

A pre-service teacher is the student enrolled in a teacher-preparation program in order to complete and satisfy all the requirements including course work and field experience, before being awarded a teaching license. A pre-service teacher is a student in any tertiary institution involved in learning the art of teaching and who acquires mandatory teaching practice programme experienced by practicing teaching profession under the supervision of an experienced teacher by gradually taking on more classroom management and instructional responsibilities (Hamdan, 2015). The purpose of pre-service experiences is to allow students to practice the strategies and concepts they have learned in their tertiary education courses. These pre-service teachers are exposed to all the nitty-gritty of teaching in various tertiary institutions in order to produce competent manpower in light of the fact that no nation develops beyond its educational standards. These tertiary institutions train and produce various teachers to cater for the demands of the Country by ushering into the Nigerian economy, skilful and well-trained teachers. Thus, based on the foregoing, in order to produce competent and highly-skilled teachers in the realms of the 21st Century education with the sole aim of meeting the ever-changing demands of the world, the need to include the incorporation of relevant Information and Communication Technology (ICT) to teaching becomes absolutely imperative.

The relevance of technology to human advancement cannot be overemphasized. Technology advancement in the 21st century within different industries has made society and institutions more dependent upon technologies to get information and stay connected worldwide. ICT has indeed influenced all facets of life as a diverse set of technological tools and resources used to communicate, create, disseminate, store, and manage information (Alkamel *et al.*, 2018). In the education sector, ICT adds value in teaching and learning by enhancing the effectiveness of learning or adding a new dimension to knowledge through different paradigm shift that was not previously available. ICT may also be a significant motivational factor in students' learning. In our everyday school activities today, ICT is the tool used to teach valuable knowledge and skills around computing and communications devices, software that operates them and applications so as to expose students to different approaches to learning (Venkatesh *et al.*, 2014). The integration of ICT in education permits the application of computer and technology skills to practical learning and problem-solving. However, most technology integration efforts intentionally establish innovative and creative best practices. Hence, it is not just the knowledge of the technology equipment provided with less or no training but a student-centered kind of knowledge needed to develop existing knowledge in conjunction with the integration of technology in education (Davies & West, 2014). The quest for the provision of student-centered approach to learning has led to the proliferation of different educational technologies that continue to emerge.



Educational technology uses hardware and software to facilitate learning and improve performance by creating, using, and managing appropriate technological processes and resources. It encompasses several domains, including learning theory, computer-based training, online learning, mobile technologies, m-learning (Kumar *et al.*, 2018). Consequent upon this, teachers must therefore understand their roles in technologically-oriented classrooms in order to leverage on the several advancements provided by ICT in order to enhance teaching and learning. Knowledge about the technology is essential in itself, but not as a separate entity. Today, technology competency is necessary for teachers in the teaching and learning process as it facilitates effective teaching and learning. This competence centres on the ability of teachers to integrate the use of technology in their pedagogies in what is now often referred to as techno-pedagogy (Absari *et al.*, 2020).

Techno-pedagogy is the hybrid method of teaching in which ICT resources are utilized in the classroom interaction processes. It is the art and craft of incorporating technology in effectively tailoring teaching-learning experiences (Koehler *et al.*, 2013). Techno-pedagogy can be considered as the weaving of the technologies of the craft of teaching into the learning environment itself. It requires conscious recognition of electronically mediated courses that integrate the sound principle of education to ease the transmission of information. Techno-pedagogy, according to Vanajhaa and Pachaiyappan (2017), is any electronically-mediated course that integrates sound pedagogic principles of teaching and learning with technology. In view of this, teachers are expected to have technical knowledge deployed in standard technology-based teaching from books to the blackboard and the recent advanced technologies such as the internet and digital videos. Acquiring techno-pedagogical proficiency will make teaching and learning a pleasurable and profitable exercise. Techno-pedagogical skills lessen the pressure on the teachers and enable the students to plunge deeper into the knowledge acquisition process. For effective techno-pedagogy, there are three areas of knowledge, namely: content, pedagogy, and technology. For technology to be effectively integrated into teaching, the aforementioned trio of content, knowledge and pedagogy must be mastered by teachers and this can only be done through acquiring some technological competencies. Vanajhaa and Pachaiyappan (2017) found that meaningful use of techno-pedagogy in the classroom requires the teachers to integrate technological affordances with pedagogical approaches for the specific subject matter to be taught. For teaching to be effective, teachers must be competent in the integration of technology into their pedagogy.

Techno-pedagogical competency is the ability of teachers to make use of technology effectively in education. It is described as regularly applying the competency, knowledge, and skills that promote learning (Pradeep, 2018). Accordingly, Scott



(2015) described competence as the skills and knowledge that enable a teacher to succeed. Therefore, techno-pedagogical competency is needed for teachers in their learning space, as it facilitates teaching and learning. In order to enhance teaching and facilitate learning, techno-pedagogical competency needs to be improved to equip teachers to face the students belonging to the digital era and the challenges in the modern classroom (Thakur, 2014). Furthermore, techno-pedagogical knowledge needs to be added to teacher training programs in order to produce well-skilled teachers that can integrate technology in teaching. Therefore, to maximize students' learning, teachers must have expertise in a wide-ranging array of competencies in basic technological skills, planning and preparing lesson plans, technical skills in instructional delivery, and specialized skills for evaluating learning and providing feedback

Technology skills refer to the ability to interact and complete tasks using computer-based technologies and other associated technologies. These tasks can either be digital or physical. Sometimes, these skills may be referred to as technical skills (Chu *et al.*, 2021). Techno-pedagogical skills foster the students for further development, attainment of learning outcomes and maintain the context of designing classroom-based resources through the use of ICT by the teachers and educators. Examples of these skills include connecting the projector to the system, saving and retrieving information in a computer, creating and naming a folder, typing and printing documents, capturing and editing images, which the teacher uses for planning and preparing the lesson.

Lesson planning is a necessary first step in implementing curriculum themes. Creating a lesson plan with clearly defined learning objectives, goals, and a metric for measuring progress towards these goals is vital to ensuring students benefit as much as possible from weekly lessons. Making an effective lesson plan takes time, dedication, and understanding students' abilities and goals. In education, every teacher strives to motivate students to retain as much as possible and apply it. Lesson planning plays a vital role in providing students with stable classroom environments that best support their learning (Alderman, 2013). A teacher needs the following technical knowledge to prepare a lesson plan, lesson notes on the computer system and acceptably arrange them, interact with supervisors using online platforms, download information sent by supervisors via E-mail, use the school internet facilities to access online materials for lesson preparation, use CorelDraw to draw and design diagrams as instructional material, operate a projector, use it to teach by connecting it to a computer and use various video clips to produce content for learning and effective instructional delivery.

Instructional delivery refers to the methods, strategies, approaches, or even techniques teachers employ to deliver their subject matter. It can also represent a pattern in which a



study is presented (Vesin and Budima, 2013). There are different methods of instructional delivery which include: Lecture, Explicit Teaching, Drill & Practice, Demonstrations, Project Method, Field Trips, Experiments, Simulations & Games, and Observations. In a technologically-oriented classroom, a teacher must possess the ability to use PowerPoint to make a recording of delivered instructions and send to the online platform for students to access at their convenience, present lessons in the classroom, and hyperlink videos to PowerPoint presentation to enhance learning. convert an instruction to various software packages, use social media platforms to deliver education, use the Internet to provide instruction asynchronously at an agreed time, manipulate instruction using diagrams, thereby putting into consideration individual differences of the students, use an image to present a lesson to the student through their Internet, use PowerPoint to show summary and conclusion within a short time, prepare user-friendly instructional packages using the online platform, for easy assessment, examination and feedback for teachers.

Educational evaluation is usually about monitoring the methods used by teachers and the rate of success with which they can assist students in learning. This type of evaluation is typically performed at a large scale for an entire school and a specific scale for individual teachers. It is also the process that a teacher uses to check the teaching and learning process; in the educational context, it is the degree of understanding and integration of knowledge to achieve the proposed competence and goals in what has been assimilated by the learners. In addition, though, it seeks to measure the effectiveness and performance of teachers (Sharma *et al.*, 2016). In most cases, technological competence varies based on gender as a result of individual difference or exposure to technology.

In the light of the foregoing discuss, despite the advancement of technology in almost all facets of education which can be used to bridge so many gaps, the gap between the teacher-centered approach (low-tech) and the student-centred (high-tech) method of imparting knowledge cannot be over-emphasized. According to Hsu (2016), the application of ICT by pre-service teachers in transferring knowledge is below expectation. Over the years, significant emphasis has been on pedagogy and content knowledge, thereby giving rise to the need for technology knowledge. This knowledge can be transferred through ICT development programs if aligned with the curriculum of the Colleges of Education and universities where pre-service teachers are trained (Cetin-Berber & Erdem, 2015) especially in a developing Country like Nigeria. Training pre-service teachers in this 21st century should be with recent technological gadgets to ensure their exposure and awareness of these devices. Pre-service teachers are expected to implement the use of technology in teaching to support the digital native students. How prepared are they? What skills do they possess? What



competencies do they have? Furthermore, many pre-service teachers cannot still think about teaching and learning as a process requiring technology in this new dispensation. Therefore, it could be due to a lack of proper knowledge of Techno-pedagogical skills. In order to ameliorate this problem, there is the need to appraise the techno-pedagogical competence of pre-service teachers in tertiary institutions in Niger State, Nigeria by determining their current levels of technology, pedagogy and content knowledge.

Aim and Objectives of the Study

The study aimed to appraise the techno-pedagogical competence of pre-service teachers in tertiary institutions in Niger State, Nigeria. Specifically, the objectives of the study were to:

1. determine basic technological skills possessed by pre-service teachers
2. examine the technological usage skills for planning and preparing lesson plans possessed by pre-service teachers.
3. determine the technological skills for instructional delivery possessed by pre-service teachers.
4. examine the technological skills for evaluating learning and providing feedback possessed by pre-service teachers.

Research Questions

The following research questions guided the study:

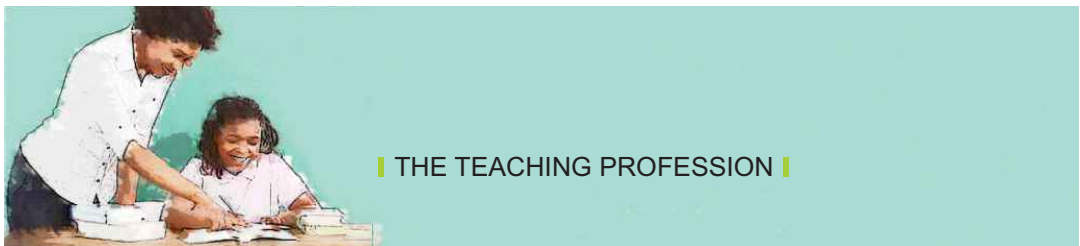
1. What are the basic technological skills possessed by pre-service teachers in Niger state, Nigeria?
2. To what extent do pre-service teachers possess technological usage skills for planning and preparing lesson plans?
3. To what extent do pre-service teachers have technological skills for instructional delivery?
4. To what extent do pre-service teachers have technological skills for evaluating learning and providing feedback?

Methodology

The research adopted a descriptive survey design. The study population comprised 13,376 students of 2019/2020 academic session in tertiary institutions offering educational courses in Niger State, Nigeria. A multi-stage sampling technique was used for the study. First, purposive sampling technique was used to select the four



institutions offering educational courses in Niger State. The names of the institutions are Federal University of Technology Minna, Ibrahim Badamasi Babangida University Lapai, Federal College of Education Kontagora, and Niger State College of Education, Minna). After that, students in Schools/Faculty of education in the selected institutions were purposively chosen because this is the only School/Faculty running education programme in all the four established institutions. After this, a purposive sampling procedure was used to select final year students in the chosen institutions because students at this level have undergone teaching practice exercises and are thus already familiar with the concept of techno-pedagogy. A simple random sampling technique was then used to select the 351 students using the Krejcie and Morgan (1970) table for determining sample size as a guide. A researcher-designed questionnaire named "Questionnaire for Appraising Techno-pedagogical Competency of Pre-service Teachers' (QATCPT)" was used for data collection. The questionnaire was divided into five sections; section A was about the respondents' demographic information. Section B consisted of items that examined pre-service teachers' basic technological skills. Section C consisted of statements on Pre-service teachers' technological skills for planning and preparing a lesson plan. Section D consisted of statements to assess Pre-service teachers' technological skills for instructional delivery. Section E consisted of statement to assess Pre-service teachers' technological skills for assessment, examination, and feedback using the 5-point Likert scale of Strongly Agree (SA) awarded 5 points, Agree (A) awarded 4 points, Undecided (U) awarded 3 points, Disagree (D) awarded 2 points, and Strongly Disagree (SD) awarded 1-point scale. The questionnaire was validated by two experts in the Department of Educational Technology, Federal University of Technology Minna, and one Computer Science specialist at College of Education Minna. A pilot test was conducted to determine the reliability of QATCPT using a total of 30 pre-service teachers and the result was computed using Cronbach Alpha where a reliability coefficient of 0.87, 0.92, 0.86, and 0.91 were obtained, thus the instrument was considered reliable. The data collected were analyzed using descriptive statistics of mean and standard deviation. A Mean score of 3.0 and above was considered as agreement to the items, while a mean score below 3.0 was considered as disagreement.





TECHNO-PEDAGOGICAL
COMPETENCE

Research Question 1: What are the basic technological skills possessed by pre-service teachers in Niger state, Nigeria?

Table 1: Mean and Standard Deviation of Pre-service Teachers' Response on Basic Technological Skills Possessed in Teaching

S/N	Statement	N	\bar{X}	SD	Decision
1	I can connect a projector to the system	351	3.99	0.97	Agree
2	Save and retrieve information on computer	351	3.91	0.84	Agree
3	Can create and name folders for a different purpose	351	4.18	0.76	Agree
4	Interact with the system in the absence of a mouse	351	3.96	0.81	Agree
5	Type and produce document with computers	351	3.98	0.80	Agree
6	Draw and edit image with computer	351	2.79	1.04	Disagree
7	Play multimedia application with a computer	351	3.72	0.89	Agree
8	Print with a computer	351	4.21	0.90	Agree
9	Develop and run a programme package with a computer	351	2.48	0.73	Disagree
10	Capture image with a computer webcam.	351	3.78	0.85	Agree
	Grand Mean		3.70		Agree

Decision mean = 3.0



Table 1 shows the Mean and Standard Deviation Response of Pre-service Teachers' Response on Basic Technological Skills Possessed in Teaching. The table revealed that the grand mean score of 3.70 which is more than the decision mean score of 3.0. It implied that pre-service teachers in tertiary institutions in Niger State possessed the basic technological skills for teaching.

Research Question 2: Do pre-service teachers have technological usage skills for planning and preparing lesson plans?

Table 2: Mean Response of Pre-service Teachers' Technological Skills for Planning and Preparing a Lesson Plan

S/N	Statement	N	\bar{X}	SD	Decision
1	I possess the ability to browse the internet or web for information on new ideas for lesson preparation	351	3.75	0.55	Agree
2	I can prepare lessons on the computer and acceptably arrange them	351	3.24	0.71	Agree
3	I can interact with my supervisor using an online platform	351	3.22	0.67	Agree
4	I can download information sent to me by my supervisor via e-mail	351	3.23	0.64	Agree
5	I can use the school internet facilities to access online materials for lesson preparation	351	3.36	0.61	Agree
6	I can use CorelDraw to draw and design diagrams as instructional materials.	351	3.41	0.60	Agree
7	I can operate a projector and use it to teach by connecting it to a computer	351	3.70	0.99	Agree
8	I can use a projector to teach within a given time	351	3.98	1.02	Agree
9	I can use various video clips to produce content for learning	351	3.86	1.03	Agree
10	I can use CorelDraw to manipulate diagrams and explain the lesson	351	3.03	0.89	Agree
Grand Mean			3.48		Agree

Decision Mean = 3.0



Table 2 shows the Mean and Standard Deviation of pre-service teachers' technology skills for planning and preparing a lesson plan. The grand mean score of responses to the ten items is 3.48, which is more than the decision mean score of 3.0. Thus, it implied that pre-service teachers in Niger State possess the needed technological skills for planning and preparing a lesson plan.

Research Question 3: Do pre-service teachers have technology skills for instructional delivery?

Table 3: Mean Response of Pre-service Teachers Technological Skills for Instructional Delivery

SN	Statement	N	\bar{x}	S.D	Decision
1	I can use PowerPoint to present lessons in the classroom	351	4.23	0.80	Agree
2	I can hyperlink videos to my PowerPoint presentation to enhance learning	351	4.20	0.92	Agree
3	I can convert Instruction to various software packages	351	4.02	1.07	Agree
4	I can use social media platforms to deliver instructions	351	4.08	1.03	Agree
5	I can record delivered instructions and send an online platform for students to access at their convenience	351	3.94	1.10	Agree
6	I can use the net to deliver instruction asynchronously at an agreed time.	351	3.79	1.04	Agree
7	I can manipulate instruction using diagrams, thereby putting into consideration the individual differences of the students.	351	3.02	0.89	Agree
8	I can use an image to present a lesson to the student through the net	351	3.16	0.90	Agree
9	I can use power point to present a summary and conclusion within a short time	351	3.84	1.10	Agree
10	I can prepare user-friendly instructional packages using an online platform	351	3.89	0.85	Agree
Grand Mean			3.82		Agree

Decision Mean = 3.0

Table 3 shows the Mean and Standard Deviation of pre-service teachers' technological skills for instructional delivery. The table revealed the grand mean score of responses to the ten items was 3.82, which is more significant than the decision mean score of 3.0. Thus, it implied that pre-service teachers in Niger state possessed the needed technological skills for instructional delivery.



Research Question 4: Do pre-service teachers have technological skills for evaluating learning and providing feedback?

Table 4: Mean Response of pre-service teachers' technological skills for evaluating learning and providing feedback

S/N	Statement	N	\bar{x}	S.D	Decision
1	I can compute students' result using excel package	351	2.43	0.61	Disagree
2	I can track students' online progress or activities.	351	3.23	0.68	Agree
3	I can assess student's results through the internet.	351	3.25	0.73	Agree
4	I can interact with students using an online platform	351	3.66	0.95	Agree
5	I can create an online group where I can send Assignments to students.	351	3.81	1.01	Agree
6	I can get feedback from students' using online platforms	351	3.93	0.79	Agree
7	I can conduct online examinations	351	2.32	0.65	Disagree
8	I can assess student's performance at their own pace and time through the net	351	3.19	0.77	Agree
9	I can evaluate a large group of students without difficulty using an online platform	351	3.15	0.70	Agree
10	I can align interval of assessment base on the lesson content	351	3.49	1.05	Agree
Grand Mean			3.25		Agree

Decision Mean = 3.0

Table 4 shows the Mean and Standard Deviation of pre-service teachers' technological skills for evaluating learning and providing feedback. The grand mean score of responses to the ten items is 3.25, which was more than the decision mean score of 3.0. It implied that pre-service teachers in Niger State possessed the needed technological skills for evaluating learning and providing feedback.

Discussion

The result of research question one revealed that pre-service teachers in tertiary institutions in Niger State possess the basic technological skills for teaching in their respective fields. This result is evidently seen when the grand mean of the responses was higher than the decision mean. The grand mean therefore falls under agree. It therefore means that pre-service teachers possess the basic technological skills for teaching. However, two of the items in the responses returned a very weak mean where the respondents disagreed. The respondents disagreed with the responses that have to do with them drawing and editing an image on their computers as well as developing and running education software on the computer. This is not unconnected to the unviability of computers and inadequate skills to properly run them.



The result of research question two shows that pre-service teachers in Niger State possess the needed technological skills for planning and preparing a lesson plan. This means pre-service teachers can use technology in planning and preparing lesson plans for effective instructional delivery. The grand mean responses revealed that all the respondents agreed with the statement.

The result of research question three revealed that that pre-service teachers in Niger state possess the needed technological skills needed for effective instructional delivery. The grand mean revealed that all the respondents agreed that they can use technology for various instructional delivery.

The result of research question four revealed that pre-service teachers in Niger State possessed the needed technological skills for evaluating learning and providing feedback. The grand mean of all the responses revealed an agreement showing that pre-service teachers can use technology for lesson evaluation and providing feedback. However, two of the responses revealed a weak mean where the respondents disagreed about having the skills to calculate results on excel as well as conduct examinations online. This is not unconnected to lack of ICT facilities and paucity of skills in those areas.

CONCLUSION

Based on the findings of this study, it can be revealed that pre-service teachers possess the necessary techno-pedagogical skills needed for effective teaching and instructional delivery, evaluation of learning outcomes and providing feedback as well as planning and preparing lessons plans using technology. The results also revealed that both male and female pre-service teachers equally possess the techno-pedagogical skills needed for effective instructional delivery, evaluation of learning outcomes and providing feedback as well as planning lessons and preparing lesson plan. Thus, the use of techno-pedagogical skills when well-tailored would undoubtedly improve the teaching and learning process.

Recommendations

BASED ON THE FINDINGS OF THIS STUDY, THE FOLLOWING RECOMMENDATIONS ARE HEREBY MADE:

1. Integration of emerging technologies into educational settings to create the motivation and skills needed by pre-service teachers should be included



explicitly in teacher education curricula.

2. Pre-service should be taught on the use of emerging technologies in other to improve the learning outcomes of the learners.
3. Management of tertiary institutions should provide continuous training, workshops, and seminars in emerging technologies for pre-service teachers in tertiary institutions. It will further develop their techno-pedagogical skills for instructional delivery and learning outcomes.



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