Lecturer' Knowledge and Self-efficacy to Employ Digital Technologies for Curriculum Instruction in Tertiary Institutions in North-east, Nigeria

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Abstract

The study assessed the lecturers' knowledge and self-efficacy to employ digital technologies for curriculum delivery in tertiary institutions in North East, Nigeria. The study employed survey research type with population of numerical strength of one hundred and fifty-three lecturers teaching basic science and technology in all universities and colleges of education in North East, Nigeria. Ninety colleges of education and university lecturers were sampled for the study. The participants responded to a 26- item structured validated by peer experts questionnaire with reliability index of 0.81 on the level of lecturers' knowledge, self-efficacy, utilization and challenges in digital technologies for curriculum instruction. Data collected were analysed with the use of frequency counts, simple percentages and mean. The lecturers consider themselves not very competent especially interms of content knowledge, TPACK-ISTE self-efficacy and frequent usage of digital technologies for teaching and learning of basic science and technology. Besides, the challenges hindering the usage of digital technologies by lecturers for instruction in teaching and learning processes were indicated. Lecturer should undergo training and retraining through seminars, workshops, among others to enhance positive change for both the teacher and student's level in the usage of technologies for teaching-learning process.

Key Words: Lecturers' knowledge, Self-efficacy, Digital Technologies Utilization, Basic Science and Technology Curriculum.

Introduction

The clamour for scientific and technological need of Nigeria necessitates for teaching of scientific skills in the child from the grassroots to university level. Hence, the design and development of integrated science for both primary and for junior secondary schools. The documents have now been re-aligned, re-structured and revised to produce basic Science and technology curriculum for junior secondary school with clearly stated objectives (NERDC, 2013). Nigerian Educational Research and Development Council (NERDC, 2013) place emphasis on activities based instructional strategies with locally-source materials and acquisition of entrepreneurship skill.

Currently, the use of digital technology globally in classroom instructions especially technologically advanced nations is growing and developing very fast with the advantage of students learning at home with convenience and moving at their own pace where learners and teachers' physical contact is been eroded may drastically alleviate sudden interruption of academic activities in schools. This is achievable because the teachers and learners are knowledgeable, skillful with good self-efficacy for the utilization of digital technologies for teaching and learning processes.

Information and Communication Technology (ICT) has undergone tremendous growth, hence modifying teaching-learning processes in the 21st century which paves way to educational policies modifications across the globe. In Nigeria, one of the efforts put in place by the federal government through the Federal Ministry of Education made educational policy titled: National Implementation Guidelines for ICT in Education (NIGICTIE, 2019). Digital technologies are being utilized to facilitate teaching and learning in diverse ways due to fast growing of ICT with its benefits. Among the benefits of ICT according to Fishman et al., (2013), it is flexible to use and offers many resources to teachers and it is cheap to acquire and use for teaching and learning online asynchronously.

However, teachers' limited skills in technology utilization in education and instruction has made teaching and learning great challenging and stressfultaskfor many science teachers (Tate, 2020). Most of the teachers were trained using conventional programmes which are deficient and inadequate for them to have appropriate knowledge and skills to integrate digital technologies in educational practices (U.S. Department of Education,2016).

Many interactive components determine successful and effective use of ICT for teaching and learning. Yeh et al. (2014) argued that thecurriculashould bestructured in such a way so that the teachers can use current technological tools and resources accurately and effectively. The teachers' knowledge of Technologies, Pedagogies, Content knowledge (TPACK) of KoehlerandMishra (2008) provides a framework of related competency variables for effective technology integration in education. They identify these teachers' technological knowledge variables to be interrelated and dynamic and provide a framework of their relationships as shown in figure 1.

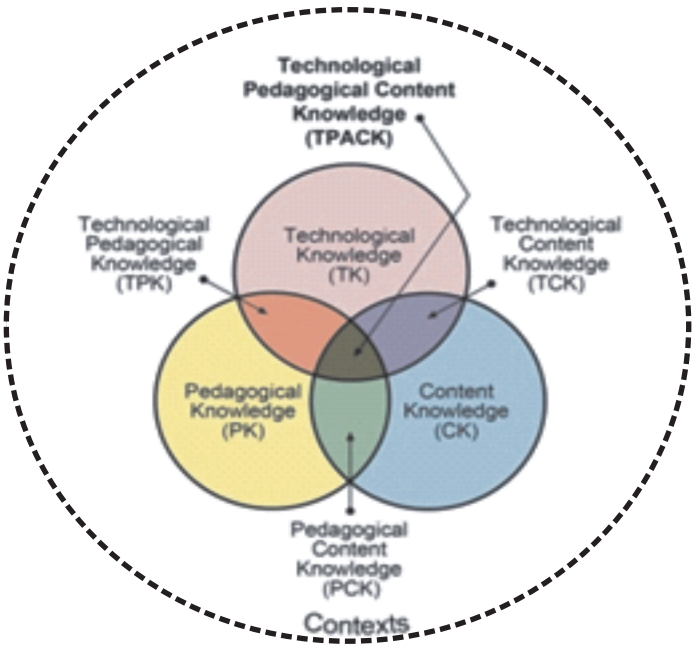


Figure1. ComponentsofTPACKStructure(KoehlerandMishra,2008)

Besides, International Society for Technology in Education (ISTE 2017) set out technology standards framework for teachers and pre-service teachers for technologies usage for learning and teaching processes at all educational levels.

`Utilization of digital technologies for curriculum instructions depend largely on the level of teacher's and learner's knowledge and competency. Aremu and Adediran (2011) observed in their study of teachers' utilization of ICT resources that teachers were not effectively making use of digital technologies for curriculum instruction in Nigerian secondary schools. Similarly, Al-Munawwarah (2014) remarked in a different study in Indonesia that school teachers were prepared for ICT usage for classroom English Language instruction, nevertheless they were not appropriately skillful. Ogundare and Jebson (2017) in their study in Ondo State observed that very good number of basic science and technology teachers were not computer literate and both the schools and teachers showed low level of utilization of ICT for curriculum delivery.

Different studies of Dawson(2008) and Stylianidou, Boohan and Ogborn (2005) found out that teachers were able to integrate technologies into teaching and learning processes because they possess needed technological and pedagogical knowledge. However, Ogundare and Maigari (2021) and Ömer and Fırat (2021) studies reported that teachers benefit from ICTtoolslessfrequentlyinmeasurementandevaluationaswellasinpresenting the course subject. Another factor that may determine the effective integration of digital technologies in teaching learning process is teachers' self-efficacy. Self-efficacy is a fundamental theory of Albert Bandura's social cognitive work which states that it is the potentialities of individual beliefs to perform a task that affect individual lives (Bandura, 1997). Self-efficacy therefore shows how strongly individuals believe to have the skills to perform well as it affects the specific task being

embarked upon .Study of Power (2018) reported that teachers had strong belief for technology pedagogy integration and ability to use technology effectively for their professional practice and in the classrooms. However, study of Fank et al. (2021) established that participating teachers exhibited moderate level of self-efficacy for employing digital technologies for teaching and learning.

Statement of the Problem

The introduction of digital technologies has created new learning opportunities in education sector globally. Educators and educational stakeholders are suggesting for ways of integrating digital technologies in classroom instructions and move away from popular conventional methods of teaching. In Nigeria, the tertiary institutions lecturers are still presenting their lectures with old and conventional traditional methods. This might be as a result of some factors hindering them from using digital technology resources for instructions in spite of government effort. The question now is are the lecturers equipped with required new technological knowledge (skills) coupled with strong self-efficacy to take up the challenge of employing digital technologies for pedagogical practices in Nigeria? It is on this premise the study focused on the assessment of lecturers' knowledge (skills) with strong self-efficacy to employ digital technologies for teaching and learning.

Purpose of the Study

This study was aimed to examine the Lecturer' knowledge and self-efficacy to employ digital technologies for teaching and learning basic science and technology in North-east. The focus of the study was to:

i. evaluate the level of lecturers' knowledge of digital technologies based on TPACK model for basic science and technology curriculum instruction

ii. assess lecturers' level of self-efficacy (confidence) in using digital technologies based on TPACK model for teaching and learning

ii. appraise lecturers' frequency of utilizing ICT for curriculum instruction

iv. find out the challenges facing lecturers in utilizing digital technologies for instruction

Research questions

The following research questions were raised to address the problem:

i. What is the lecturers' knowledge level on digital technologies based on TPACK model for basic for basicscience and technology curriculum instruction?

ii. What is the lecturers' self-efficacy (confidence) level in digital technologies based on TPACK model for basic science and technology curriculum instruction?

iii. What is the lecturers' frequency level of utilizing ICT for teaching and learning?

iv. What are the challenges confronting lecturers in integrating digital technologies for curriculum instruction?

v. What are the challenges confronting lecturers in integrating digital technologies for curriculum instruction?

Methodology

The study adopted a descriptive survey research design. It is a quantitative typeofstudyconductedtodescribetheopinionsofindividualsinasampleselectedfroma population by means of a data collection tool. The numerical strength of the study population of this study comprised of one hundred and fifty-three integrated science (now basic science and technology) lecturers in all universities and colleges of education in North East of Nigeria. Ninety (90) integrated science lecturers were randomly selected for the study from both universities and colleges of education that offer integrated science (basic science and technology) in the North Eastern States of Nigeria that comprises Adamawa, Bauchi, Gombe, Borno, Taraba and Yobe States. Technological Pedagogical Content Knowledge Scale (TPACKS) and Technology Integration Confidence Scale (TICS)version3 based on ISTE (2017) developed by Şimsek and Yazar (2016) and Browne(2011) respectively were modified and adapted for this study. TPACK scale consists of six subscales: technological knowledge, pedagogy knowledge, content knowledge, pedagogical content knowledge, technological pedagogical knowledge and technological pedagogical content knowledge and six other items that are related to the frequency of using ICT in some processes. Other section consists of

confidence level in using technology in the classroom and possible challenges. It was a structured questionnaire based on rating scale of "Strongly Agree", Agree, Disagree and "Strongly Disagree" closed-ended questions of how articulate the respondents are. Both the face and contents validity of the instrument was ensured by peer experts in the faculty ant it was found good for the study. The reliability of the validated questionnaire by experts was ensured through the use of Cronbach alpha coefficient and was computed to be 0.81.

Approval for the collection of data was sought from Head of Departments (HOD) of the respective departments of the universities and colleges of education and explanation of the scope and aim of the study was made. The HODs then, emailed lecturers an invitation to participate in the study. Letter of invitation and participant consent along with the link to the online survey were shared with those indicating willingness to participate in the study. An online survey was administered to a random sample of 100 lecturers in the selected universities and colleges of education. Only 90 questionnaires were completed and returned via e-mail and WhatsApp platforms by the respondents. Data were analysed with the use of frequency counts, simple percentages, mean and charts.

Results

Research Question 1: What is the lecturers' knowledge level of digital technologies based on TPACK model for basicscience and technology curriculum instruction?

Table 1: Lectures' Knowledge on Digital Technologies for Curriculum Instruction

S/N	Item Statement	SA %	A %	D %	SD %	Mean	Std. d
1	I have appropriate knowledge in Technologies, Pedagogies, Content knowledge (TPACK)	5 (5.6)	3 (3.3)	23(25.6)	59 (65.6)	1.28	1.06
2	I am knowledgeable in Technological Content Knowledge (TCK)	3 (3.3)	7 (7.8)	43(47.8)	37(41.1)	1.17	.882
3	I possess good Content Knowledge (CK)	4(4.4)	7 (7.8)	31(34.4)	48(53.3)	1.79	1.128
4	Ihave Pedagogical Content Knowledge (PCK)	3 (3.3)	5 (5.6)	23(25.6)	59 (65.6)	1.63	.969
5	I possess Pedagogical Knowledge(PK)	4 (4.4)	7 (7.8)	31(34.4)	48 (53.3)	1.79	1.159
6	I do have good (TPK) knowledge	3 (3.3)	8 (8.9)	21(23.3)	58 (64.4)	1.81	1.108

Table 1 shows the level of lectures' knowledge on digital technologies based on TPACK model. In item 1, only 9% of the respondents claimed that they had knowledge on digital technologies based on TPACK. This indicates that a good number of lecturers' knowledge on digital technologies for curriculum instructions is low. While items 2, 3, 4, 5 and six follow the same pattern with10%. 11%, 8%, 11% and11% respectively of the respondents claimed that they possessed knowledge on TCK, CK, PCK PK and TPK for teaching and learning.Generally, this shows that lecturers' knowledge on digital technologies for instruction is low.

Research Question 2: What is the lecturers' self-efficacy (confidence) level in digital technologies based on TPACK model for curriculum instruction?

Table 2: Lecturers' Self-Efficacy of Digital Technologies for Curriculum Instruction

S/N	Item statement	SA	%	A	%	D	%	SD	%	Mean	S. Dv
1	I have confident to use technology to support students' learning outcome	4 (4.4)		5 (5.6)		33 (36.7)		48 (53.3)		1.44	1.200
2	I do have confident in exploring and applying instructional design principles to create innovative digital environment that engage and support learning	2 (2.2)		3 (3.3)		29 (32.2)		56 (62.2)		1.22	1.106
3	I am confident to use technology to support students' needs through increased personalization and differentiation in the classroom as part of their instructional practice	3 (3.3)		4 (4.4)		37(41.1)		46(51.1)		1.26	.898
4	I have confident to teach students to think critically, be safe and responsible in digital world	5 (5.6)		7 (7.8)		36 (40.0)		42 (46.7)		1.51	1.105
5	I am confident to use digital tools to provide immediate feedback to students	2 (2.2)		5 (5.6)		41 (45.6)		42 (46.7)		1.44	1.095

Table 2 shows the level of lecturers' self-efficacy (confidence) for teaching and learning. The respondents indicated that 10%, 5%, 7.7%, 13.4% and 7.8% in items 1, 2, 3 4 and 5 had self-efficacy (confident) on digital technologies for teaching and learning of basic science and technology respectively. The implication of this is that the level of self-efficacy of lecturers in using digital technologies for instruction is very low.

Research Question 3: What is the lecturers' frequency level of utilizing ICT for teaching and learning?

Table 3: Lecturers' Utilization of Digital Technologies for Teaching and Learning

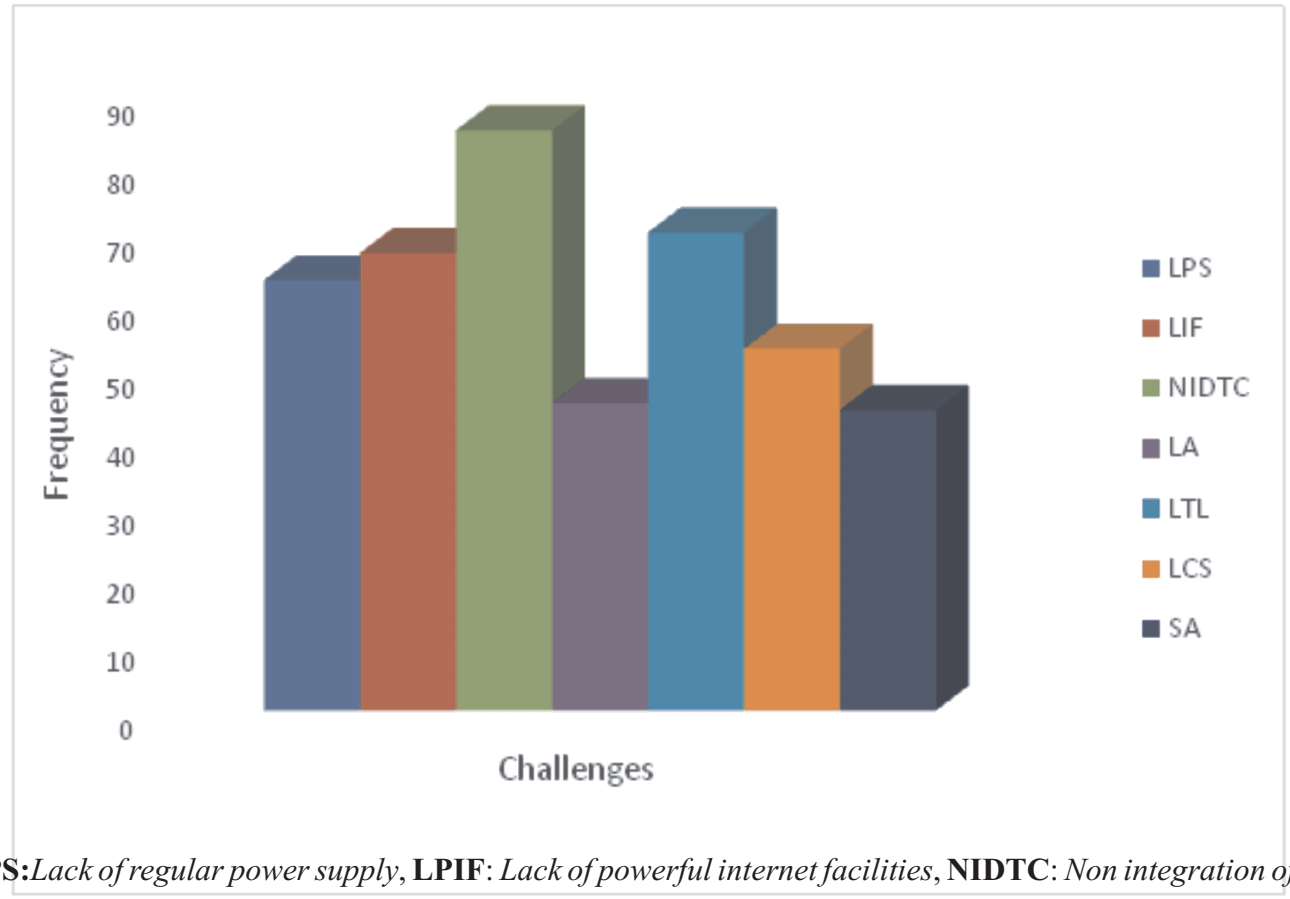
S/N	Item Statement	SA %	A %	D %	SD %	Mean	Std. d
1	Preparinglecturenotes	11(12.2)	33 (36.7)	27(30)	19(21.1)	2.18	1.006
2	Presentingthesubjectin thecourse	9 (10)	13(14.4)	29(32.2)	39(43.3)	1.70	.882
3	Measurementandevaluation	17(18.9)	15 (16.7)	19(21.1)	39(43.3)	1.60	1.128
4	Doingstudy	21(23.3)	26 (28.9)	37(41.1)	6 (6.7)	1.51	.969
5	Communication(E-mail, etc.)	16(17.8)	14(15.6)	22(24.4)	38(23.0)	2.50	1.159
6	Socialmedia(Facebook,Twitter,etc.)	6 (6.7)	11(12.2)	31(34.4)	42 (467)	1.7	1.23

Table 3 shows the lecturers' frequency of digital technologies utilization for curriculum instruction. Only items 1 and 4,52.2% and 49. 9%, respectively of the respondents claimed that they frequently use digital technologies for preparing notes and for study respectively. This implies that the lecturers' level of frequently using digital technologies

for curriculum instruction is moderate. In items 2, 3, 5 and 6, 24.4%, 35.6%, 33.4% and 18.9% of the respondents indicated that they frequently used ICT resources in teaching and learning. This shows that the level of lecturers frequent using digital technologies for teaching is low.

Research Question 4: What are the challenges confronting lecturers in integrating digital technologies for curriculum instruction?

Figure 2: Challenges Confronting Lecturers in Integrating Digital Technologies for Curriculum Instructions



KEY: LPS: *Lack of regular power supply*, **LPIF**: *Lack of powerful internet facilities*, **NIDTC**: *Non integration of digital technologies in the curriculum*, **LA**: *Lecturers' attitude*, **LTT**: *Lack of training for lecturers,* **LCS:** *Lack of computers for students*, **SA**: *Students' attitude.*

Fig 2indicates challenges confronting lecturers in using digital technologies for curriculum instructions. The challenges ranked thus: non-integration of digital technologies in the curriculum (85), Lack of training for lecturers (70), Lack of powerful internet facilities (67), Lack of power supply (63) and lack of computers for students (53). The least challenges were lecturers' (45) and students' attitude (44 respectively).

Discussion of Findings

The result indicated that lecturers' knowledge level of using ICT resources for teaching and learning was low. This implies that the lecturers were not knowledgeable and competent enough to integrate digital technologies for curriculum instructions for 21st century teaching skills. The findings of the study support the study of Ömer and Fırat (2021) that teachersbenefitedfrom ICTtoolslessfrequentlyinmeasurementandevaluationaswellasinpresenting the course subject. However, the findings negate the study of Dawson(2008) that teachers were able to integrate technologies into teaching and learning processes because they possess needed technological and pedagogical knowledge

The finding also revealed that lecturers' self-efficacy' level of integrating digital resources for teaching and learning was low. The result was in line with the finding of Fank et al. (2021) that practicing teachers had a low level of

self-efficacy (confidence)for curriculum implementation and instruction. Nevertheless, the result negates the finding of Power (2018) that teachers had strong belief for technology pedagogy integration and ability to use technology effectively for their professional practice and in the classrooms.

Moreover, study revealed that lecturers' frequency of digital technologies utilization for curriculum instruction was generally below average. This indicates that lecturers were not confident enough to integrate digital technologies for curriculum instructions to meet up of opportunities inherent in digital technologies integration in education. The result corroborates the findings of Ogundare and Maigari (2021) which confirmed that teachers were not utilizing ICT resources for curriculum instruction as a result of their in-competencies.

The finding shows the numerous challenges confronting lecturers for the utilization of ICT recources teaching and learning. Hence, the findings support the findings of Tate (2020) who reported that challenges confronting teachers'competence in the use of ICT resources for teaching and learning were numerous.

Educational implications

Lecturers still marry and cling to the use of traditional lecture methods of teaching students. Therefore, lecturersneedtocontinue building uptheirtechnological skillsthrough regular training and re-training programmes so as to be effective and relevant in 21st century.Lecturers professional training sessions need to focus and address current challenges in diverse ways confronting the usage of modern technologies for teaching and learning.

Conclusion

The study established the facts that lecturers' knowledge level and confident of integrating digital technologies in education and professional practice in the classrooms was not encouraging coupled with numerous challenges confronting lecturers for effective utilization of digital technologies for teaching and learning of basic science and technology.

Recommendation.

i. Development programmes through conferences, workshops, seminar, among others should be organized for lecturers to enhance the usage of digital technologies for teaching-learning process.

ii. There is urgent need to embrace sophisticated digital media for teaching and learning in ordertodevelop student's critical thinking, problem-solving, communication, collaboration, positivecreativity,and self-direction knowledge and skills

iii. Factors that pose challenges to lecturers for effective utilization of digital technologies for curriculum instruction such as regular power supply, powerful internet facilities among others, should be supplied by the government andschool management.

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