

ASSESSMENT OF ICT KNOWLEDGE AND SKILLS OF COMPUTER TEACHERS: A GUIDE TOWARDS RE-ENGINEERING ICT PEDAGOGICAL STRATEGIES

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ABSTRACT

This study examined the ICT competencies of computer educators in government secondary schools in Agbani Education Zone, Enugu State. The research was structured around two research questions and a hypothesis. A survey methodology was employed for data collection. The study encompassed a complete sample of 39 computer teachers from 46 government secondary schools. Data collection utilized a 35-item structured Teachers' ICT Knowledge Form (TIKF) and an ICT Practical Skill Achievement Test (IPSAT) designed by the researcher. Data were analyzed using statistical methods including percentages, mean, standard deviation, and z-Test for independent samples. The analysis indicated that computer teachers' ICT competencies were insufficient, with only two out of five skills reaching a moderate level, underscoring the necessity for reforming ICT pedagogical methods, particularly at the tertiary level. The study outlined educational implications and recommended that computer teachers pursue extensive in-service training in ICT, and advocated for the government to facilitate partnerships between universities and Innovative Enterprise Institutes as per the National Policy on Education to benefit student-teachers.

Keywords: Assessment, ICT Competencies, Re-engineering Pedagogical Strategies, Computer-teachers, ICT-skills.

Introduction

Information and Communication Technology (ICT) significantly influences various facets of human existence, including education. ICT is a diverse set of technological tools and resources used to transmit, store, create, share or exchange information. These technological tools and resources include computers, the Internet (websites, blogs and emails), live broadcasting technologies (radio, television and webcasting and telephony (fixed or mobile, satellite, visio/video-conferencing, etc.) (UIS, 2009). Olukayode (2019) see ICT literacy as the requisite knowledge and skills of computer use. Khlaisang, and Koraneekij, (2019) opined that ICT skills are the most important skills for 21st century learning and which help promote other skills, including life and career skills, learning and innovation skills.

ICT basic skills according to Simplilearn, (2024) are those computer skills that are fundamentally essential for anyone who wants to use a computer. These skills include Keyboarding Skills, Using Web Browsers, Working with Microsoft Office (Microsoft Word, Excel, PowerPoint.) File Maintenance and Organization, Using the Internet for Research, Database management, Video editing and production, IT troubleshooting and support, File Management, Digital Presentation (SQL, Oracle, MySQL) etc (Lcom, 2024 & Melanie, 2022

).The significance of ICT in contemporary society is paramount. Notably, ICT demonstrates considerable versatility. It can be customized to address a wide array of challenges. On a global scale, ICT facilitates collaborative educational endeavors involving multiple instructors and external expertise integration. It enables video conferencing systems for geographically dispersed expert discussion panels. Shared networks, servers, and devices such as PCs or smartphones support distance education, remote healthcare, and connect rural areas to global markets. Consequently, ICT can surmount traditional geographical limitations. It provides universal access to information without the logistical burdens of physical transportation (Korter & Olubusoye, 2016).

In the modern era, ICT has significantly enhanced communication efficiency and effectiveness. ICT enables connections between learners, educators, and information beyond traditional classrooms. ICT permeates all sectors of life. Thus, it is imperative for individuals to familiarize themselves with this technology. To ensure widespread ICT knowledge, governments are actively promoting ICT awareness among citizens. Nations are also striving to make ICT resources accessible and affordable to their populations. For instance, the Philippine government launched the National ICT Competency Standard (NICS)-Basic to delineate essential ICT skills for all Filipinos across various sectors. Additionally, an advanced version (NICS 2002) has been developed (Anih 2012).

In June 2003, Morbid (2011) reported that the e-Schools Initiative was launched at the African Summit of the World Economic Forum in Durban, South Africa. This initiative aimed to equip all African high schools with ICT tools, including computers and various communication devices. It also sought to connect African students to the Internet. The initiative's goal is to impart ICT skills and knowledge to young Africans in primary and secondary education (Esharenana & Emperor, 2010). The Nigerian Federal Government has initiated several ICT policies since 1999 to enhance ICT awareness and national development. One key initiative is the National ICT Policy (2012), which aims to streamline ICT activities under one ministry and establish a competitive legal framework to promote international participation.

Despite these efforts, research indicates that students' ICT knowledge and skills remain inadequate. For example, The New Partnership for Africa's Development (NEPAD) found that many African students, including Nigerians, lack computer skills. with over fifty-five percent having no computer usage knowledge. Adomi (2010) highlights that African schools generally fail to provide ICT training or opportunities. This raises concerns about the effectiveness of government initiatives in improving students' ICT competency. Abdul Kalam's assertion identifies teachers as crucial societal members in fostering national integrity and intellect, suggesting teacher accountability in students' performance Iasbaba (2023). Furthermore, Umidjon (2020) notes that despite the presence of computer science teachers in Uzbekistan, their competency in effectively utilizing ICT tools remains uncertain, indicating a need to reassess the ICT skills of Nigerian educators. According to UNESCO ICT-CFT (2008), teacher quality and ongoing professional development are crucial for effective ICT education, necessitating a reengineering of pedagogical strategies.

Reengineering entails the comprehensive redesign of educational frameworks to enhance efficiency and responsiveness to changing demands. It emphasizes transformative changes in education, aligning practices with modern needs, exemplified by ICT advancements (Jaime,

2015). Similarly, reengineering ICT pedagogy involves modernizing teaching methodologies to incorporate technology, augment learning, and develop essential digital competencies. This method prioritizes active, student-centered learning and real-world ICT applications, utilizing interactive technologies to foster engaging educational experiences. Continuous curriculum updates reflecting current technological trends are critical to preparing students for contemporary workforce challenges. By implementing innovative pedagogical approaches and technology, educators can enhance the relevance and effectiveness of ICT education (Laurillard, 2013; Anderson & Dron, 2011).

Thus, this re-engineering will facilitate a profound reevaluation and redesign of pedagogical strategies, essential for elevating computer teachers' performance in delivering quality ICT knowledge and skills to students. This paper therefore, seeks to conduct a comprehensive assessment of the existing knowledge and proficiency levels possessed by educators specializing in computer science at the secondary school level, with the ultimate aim of identifying specific areas where enhancements are necessary with respect to pedagogical strategies, innovative reengineering methodologies, and the essential tools that are requisite for facilitating these critical improvements.

Statement of the Problem

The issue at hand is the low performance of students in ICT. Adomi et al (2010) corroborated this, indicating the poor quality of ICT skills and knowledge among secondary school graduates. Goshit in Adomi (2010) reinforced this claim. He noted that despite the provision of ICT facilities in Nigerian secondary schools, the acquisition of ICT knowledge remains insufficient. Umidjon (2020) concluded that secondary school teachers lack adequate ICT literacy; furthermore, as a former cyber café attendant, the researcher observed that students cannot perform basic ICT tasks after six years of secondary education. Consequently, the query arises regarding the effectiveness of governmental efforts in improving ICT skills among secondary school students. Thus, there exists a necessity to evaluate the ICT knowledge and skills of computer teachers, along with identifying areas for pedagogical improvement to validate or refute Umidjon's (2020) claims.

Purpose of the Study

Generally the main aim of the study is to assess the ICT knowledge and skills of computer teachers in secondary schools. Specifically, the study will seek to ascertain:

- i. The assumed knowledge possessed by the computer teachers in secondary schools in Agbani education zone
- ii. The Actual skill possessed by the computer teachers in secondary schools in Agbani education zone

Scope of the Study

The study was restricted to the following ICT knowledge and skills in : Word processing; Presentation packages; Keyboarding, and Electronic presentation skills. Also computer teachers in Agbani Education zone of Enugu state were used.

Research Questions

1. What is the Assumed ICT knowledge possessed by computer teachers in secondary schools in Agbani Education Zone of Enugu State?
2. What are the Actual ICT skills possessed by computer teachers in secondary schools in Agbani Education Zone of Enugu State?

Hypothesis

To further guide the study, this null hypothesis was stated and tested at 0.05 level of significance.

H₀: There is no significant difference between the Assumed and Actual ICT knowledge and skills possessed by computer teachers.

Methodology

The study adopted a Survey Research Design. The population for this study consisted of all the computer teachers in all the government owned secondary schools within Agbani Education Zone. The Government owned secondary schools in Agbani Education Zone of Enugu State are forty-Six (46) in number with a total of thirty nine (39) computer teachers within the zone. The entire population was used because the number of computer teachers was small, hence there was no sampling.

The data collection instruments included a 49-item structured Teachers' ICT Knowledge Form (TIKF) and an ICT Practical Skill Achievement Test (IPSAT), both developed by the researcher. The TIKF gathered data on teachers' knowledge levels, while the IPSAT evaluated actual skills, employing a binary response format of "can or cannot." This binary assessment is justified as skill acquisition is absolute; partial knowledge does not equate to skill competence. For example, a person with limited knowledge of email attachment cannot execute the task without complete understanding. Based on this premise, the evaluation was dichotomous. Each question was scored out of 100%, with a two-mark allocation per question; decision criteria were established for skill levels ranging from very low to very high. It is notable that a teacher must achieve a score of 65-74% to be deemed competent for delivering quality education.

Data Analysis and Results

The data collected were analyzed using percentages, mean and standard deviation to help answer the research questions while the testing of the hypothesis was calculated using z-test

Results

Research Question(s)

What are the Assumed ICT Knowledge and the Actual skills do computer teachers possess in secondary schools in Agbani Education Zone of Enugu state possess?

Response on Assumed ICT Knowledge and Actual skills that computer teachers in secondary schools in Agbani Education Zone of Enugu state possess

The data collected in respect to the research question one were presented and analyzed in table 1 to 5.

Table 1:
Teachers’ responses on the Possession of ICT Skills in Word Processors

S/No	Items	ASSUMED		ACTUAL
		Number of can	Number. of can’t	No of Teachers who can
1	I can do the following: Create a new document and Open an existing document	30 (76.90%)	9 (23.00%)	21 (53.8%)
2	Change fonts and Spell check,	32 (82.00%)	7 (17.9%)	19 (48.70%)
3	Set Style, change color and font of a document.	34 (87.10%)	3(7.6%)	15 (43.60%)
4	Insert clip art, shapes, and Insert page numbers.	32 (82.00%)	7(17.90%)	18 (46.15%)
5	Create tables and Add headers and / or footers	29 (74.30%)	10(25.64%)	30 (76.90%)
6	Change page set up and Change margins	25 (64.10%)	14(35.89%)	20 (51.30%)
7	Print a document	31(79.5)	8(20.50)	17 (43.50%)
	Mean Percentage =	77.99 ($\delta = 7.36$)		51.29 ($\delta = 14.42$)
	Decision	Moderate Level of Skill In Word processor.		

Table 1 shows that the mean percentage of computer teachers who assume/ claim they possess skill in word processing is 77.99% while the mean percentage of the computer teachers who actually possess skill in word processor is 51.29%. This shows that the computer teachers in the zone have a moderate level of skill in Word Processor (Microsoft Word and Microsoft Publisher).

Table 2. Teachers’ responses on the Possession of ICT Skills in Presentation packages:

S/N	ITEMS	ASSUMED		ACTUAL
		No of can	Number of can’t	No of Teachers who can
8	I can do the following Add animation and transitions and Include sound	32 (82.00)	7 (17.9%)	13 (33.30%)
9	Create an original master and use master slide functions	31 (79.50%)	8 (20.51%)	9 (23.00%)
10	Print handouts	22 (56.40%)	17 (43.50%)	18 (46.20%)

11	Add navigation buttons Insert hyperlinks	19 (48.70%)	20 (51.30%)	17 (43.50%)
12	Create a new slide show an edit an existing slide show	36 (92.30%)	03 (7.60%)	20 (51.30%)
	Mean percentage =	66.26 ($\delta =$ 18.13)		38.80 ($\delta = 11.44)$
Decision		Very low level of skill		

Table 2 shows that the mean percentage of computer teachers who claim they possess skill in Presentation is 66.26% while the mean percentage of the computer science teachers who actually possess skill in word processor is 38.80%. This shows that the computer teachers in the zone have a very low level of skill in Presentation (Microsoft Power point).

Table 3: Teachers' responses on the Possession of ICT Skill in computer file navigation (windows Explorer)

S/N	Item	ASSUMED	ACTUAL
o	I can do following:	No of Can	No of Teachers who can
		Number of Can't	
13	Save files in a selected folder	36 (92.00%)	3 (7.70%) 32 (82.82%)
14	Create and name new folders	37 (94.890%)	2 (5.10%) 35 (89.70%)
15	Navigate between existing folders	28 (71.80%)	11 (28.20%) 18 (46.20%)
16	Copy, delete and rename files	39 (100%)	- 36 (92.30%)
17	Select and navigate between Drives and Directories	32 (82.00%)	7 (17.90%) 17 (43.60%)
18	Install software	18 (46.20%)	21 (53.80%) 5 (12.80%)
19	Recognize different file types	35 (89.70%)	4 (10.30%) 20 (51.30%)
20	Zip and unzip files	14 (35.80%)	25 (64.10%) 6 (15.40%)
	Mean percentage =	76.55 ($\delta = 76.55)$	54.27 ($\delta = 31.48)$
Decision		Moderate level of skill	

Table 3 shows that the mean percentage of computer teachers who claim they possess skill in computer file navigation is 76.55 % while the mean percentage of the computer science teachers who actually possess skill in World Wide Web is 54.27%. This shows that the

computer teachers in the zone have a moderate level of skill in computer file navigation (Window explorer).

Table 4: Teachers responses on the Possession of ICT Skill in Keyboarding

S/N	Item (Email)	ASSUMED No of Can	Number of Can't	ACTUAL No of Teachers who can
21	Type more than 20 words Per minute.	27 (69.20%)	12 (30.80%)	21 (53.85%)
22	Copy, Cut and Paste ,undo and redo, Bold, italicized, and underline	21 (53.80%)	18 (46.20%)	14 (35.80%)
23	Add subscript and super script and Change font size	15 (38.50%)	24 (61.5%)	10 (25.00%)
24	Align text left, right and centre	23 (59.00%)	16 (41.00%)	19 (48.70%)
25	Navigate to any menu and its command.	28 (71.80%)	11 (28.20%)	8 (20.50%)
26	Select program, Close a package and shut down the computer	13 (33.30%)	26 (66.7%)	13 (33.33%)
	Mean of percentage =	54.22		36.19
	Decision	$\delta = (15.76)$	Very low level	$\delta = (11.89)$

Table 4 shows that the mean percentage of computer teachers who claim they possess skill in keyboarding is 54.22 % while the mean percentage of the computer science teachers who actually possess skill in World Wide Web is 36.19%. This shows that the computer teachers in the zone have a very low level of skill in keyboarding.

Table 5: Teachers responses on the Possession of ICT Skill Spreadsheets:

S/N	Item :	Assumed No of can	Number of Can't	Actual. No of Teachers who can
27	Create a new spreadsheet (enter data)	29 (74.30%)	10 (25.60%)	21 (53.80%)
28	Enter data into an existing spreadsheet	38 (97.40%)	1 (2.60%).	25(64.10%)
29	Use AutoSUM, Average Functions	18 (46.20%)	21 (53.80%)	11 (28.20%)
30	Format and sort cells	23 (59.00%)	16 (41.00%).	14 (35.80%)
31	Insert and delete rows and columns	27 (69.20%)	12(30.80%))	13 (33.33%)
32	Create new and Modify existing charts (graphs)	17 (43.60%)	22(56.40%))	9 (23.00%)

33	I can use <i>sum if</i> and <i>count if</i> formula	16 (41.00%)	23 (59.00%).	2 (5.10%)
34	Refer to multiple worksheets	19 (48.70%)	20 (51.30%)	7 (17.90%)
35	Use conditional formatting. Import and /or export data	22 (56.40%)	17 (43.60%).	8 (20.50%)
		59.33		31.30
	Mean percentage	$\delta = (18.19)$		$\delta = (18.26)$
	Decision		Very low level of skill.	

Table 5 shows that the mean percentage of computer teachers who claim they possess skill in Spreadsheet 59.33 % while the mean percentage of the computer science teachers who actually possess skill is spreadsheet is 31.30 %. This shows that the computer teachers in the zone have a very low level of skill in Spreadsheet (Microsoft Excel).

H0: There is no significant difference between the Assumed and Actual ICT skill possessed by computer teachers in Agbani Education Zone.

Table 6: Z-test on the ICT skill Assumed and Actual ICT skill possessed by computer science teachers.

Group	No of Items	Mean	SD	Z-Cal	Z-Crit	Decision
Assumed Skill	49	25.22	7.02	7.09	1.96	Significant
Actual Skill	49	14.94	7.55			

Table 6 shows that at an alpha level of 0.05 the Z-calculated 7.09 is greater than the Z-critical that is Z 1.96. Therefore the first null hypothesis is rejected. The researcher then concludes that the mean of assumed/Claimed ICT skill is significantly greater than that of the actual ICT skill possessed by computer science teachers in Agbani Education Zone.

Discussion:

The study indicated that teachers possess moderate skills in word processing and Windows Explorer, but low proficiency in presentation software, spreadsheets, and keyboarding, failing to meet the competency benchmark. This aligns with Adomi's (2010) findings that poor ICT knowledge among educators is a significant barrier in Nigerian secondary schools. The report highlights a prevalent ignorance and misconception regarding ICT among Nigerians. These results underscore a troubling deficiency in the ICT competencies of computer educators in the Agbani Education Zone. While teachers demonstrate moderate capabilities in basic tasks, their lack of proficiency in essential ICT tools is concerning. Research by Sang et al. (2010) illustrates that teachers with limited ICT skills struggle with advanced technological integration, hindering students' 21st-century skills development. Likewise, Agyei and Voogt (2011) noted that insufficient ICT training restricts teachers to basic tools, mirroring the observed trends in Agbani.

Moreover, the lack of proficiency in presentation software, spreadsheets, and keyboarding suggests teachers are inadequately prepared for essential technological tasks necessary for effective lesson planning and delivery. Lawless and Pellegrino (2007) argue that many educators miss out on professional development opportunities to enhance digital literacy in critical areas like spreadsheets and presentations, impacting data-driven instruction. This deficiency limits the potential for engaging and dynamic teaching practices (Ertmer & Ottenbreit-Leftwich, 2010). Additionally, the disparity between perceived and actual ICT skills reveals a significant gap between self-assessment and reality. Various studies, including Tondeur et al. (2012), indicate that educators frequently overrate their ICT competencies, which hampers effective technology integration in teaching. Such overconfidence may arise from limited exposure to comprehensive ICT tools and inconsistent training experiences. For instance, despite their confidence, teachers may struggle to implement advanced technological strategies in the classroom (Koehler & Mishra, 2009). The findings suggest implications for pedagogy and student outcomes.

These findings highlight a systemic issue in education where teachers' deficient ICT skills adversely impact students' digital literacy and academic performance. Insufficient ICT proficiency restricts teachers' capacity to effectively utilize technology in educational settings, which is essential for equipping students for contemporary workforce requirements. Research by Habibu, Al Mamun, and Clement (2012) indicates that ICT integration in education is obstructed by both resource limitations and teachers' skill deficits, necessitating focused professional development initiatives. In summary, the findings reveal a critical challenge regarding the ICT competencies of computer educators in Agbani. Although there exists some basic proficiency, the inadequate skills in key areas such as presentation software, spreadsheets, and keyboarding signify a more profound issue of inadequate training and inflated self-assessment. Addressing this deficiency is imperative to ensure a thorough reassessment of the curriculum to identify areas requiring re-engineering. Consequently, this underscores the reasons for the poor performance of students instructed by these educators in ICT-related tasks. It suggests either a lack of qualified personnel to manage the practical components of computer educators' training or that existing facilities may be outdated, necessitating modernization. Moreover, this serves as concrete evidence of the pressing need for the re-engineering of ICT pedagogical strategies at the tertiary level where these computer educators are trained.

Conclusion

In light of the findings, it is concluded that these computer educators possess significantly low levels of both ICT knowledge and skills. Therefore, there is an urgent necessity to re-engineer both the curriculum and pedagogical strategies for ICT in Nigeria's tertiary institutions. The educational implications of this study suggest that due to the revealed low ICT knowledge and skills among these computer educators, their students are likely to exhibit poor quality. This indicates that the ICT awareness within the community will continue to decline unless there is immediate action taken to re-engineer the pedagogical strategies related to ICT.

Recommendations

The researcher makes the following recommendations:

- (1) Computer teachers should independently seek registration with the Innovative Enterprise Institute, as suggested by the National Policy on Education, to improve their ICT knowledge and skills.
- (2) Teachers should be granted paid study leave to pursue further education, and regular appraisals should be conducted to assess their ICT proficiency.
- (3) Universities and other higher education institutions should urgently partner with the Innovative Enterprise Institute, as recommended, to support teachers in training.
- (4) Government, education policymakers, and curriculum designers should revise the computer education curriculum to include 70% practical, internship-based training in real working environments and 30% classroom instruction, ensuring the development of highly skilled and knowledgeable professional computer teachers.

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