

Nigerian Inservice Teachers' Self-Assessment in Core Technology Competences and Their Professional Development Needs in ICT

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Abstract

It is no longer a question whether or not technology should be used in the classroom. The emphasis is ensuring that teachers use technology effectively to create new opportunities for students to learn and raise their achievement. The use of technology in the classroom requires teachers to be knowledgeable and competent in ICTs and to integrate them into the curriculum, align them with student learning goals, and use them to engage learners in a quest for meaningful academic development. This study was a survey designed to engage postgraduate inservice teachers from selected universities in the south-south geopolitical zone of Nigeria in self-assessment of core technology competence. There were 238 participants, including 108 male and 130 female teachers, who responded to a 61-item Likert-type questionnaire. The study was also designed to determine the professional development needs of the inservice teachers and their preferred mode of professional development. Results revealed that the majority of the inservice teachers lacked competencies in core technology areas, and they all asserted that they need extensive professional development in 17 skill areas in ICT and training in 10 competency areas. The inservice teachers preferred attendance at conferences/seminars, university courses, and mentoring as the major modes of training in ICT skills. (Keywords: professional development, inservice teachers, pedagogical practice, technology skills, telecommunications, knowledge society, technology integration)

Introduction

In educational institutions in developed and developing countries of the world, today's classroom teachers must be prepared to provide technology-supported learning opportunities for their students. Schools and classrooms in elementary, secondary, and tertiary institutions must have teachers who are equipped with information and communication technology (ICT) resources and skills, and who can effectively teach the content in subject matter while incorporating technology concepts and skills. There is hardly any doubt that traditional practices can no longer provide prospective teachers with all the required skills for teaching in the classroom. Tapscott (1999) said, "A whole generation of teachers needs to learn new tools, new approaches and skills." Roberts (1999) ascertained that the exponential increases in computing and telecommunication capacity and new, affordable, technology-based approaches for developing and delivering education and training are challenging the very essence of accepted practice. Roberts (1999), Jager and Lokman (1999), Bell (2001), UNESCO (2002A), Topper (2004), and Bowes and D'Onofrio (2006) recommended in their various studies that teachers must understand and master various modern learning technologies, as well as demonstrate their competence using extensive behaviors.

The United Nations Development Program (UNDP) Report (2000/2001) noted that developing the capacity to integrate ICT into

the national economy depends on people with practical skills, and such people are the product of massive investments in education and training. Findings of studies around the world in innovation in educational institutions show that failure of many educational innovations has been due to too little effort or too few resources available for professional development of teachers (UNESCO, 2002A). Many teachers have struggled with integration of technology into the classroom (Efaw, 2005). Sprague, Kopman, and Dorsey (1988) said that faculty members feel increasingly unprepared to integrate technology into the classroom, and Efaw (2005) reported that little has been done to prepare reluctant teachers for the networked computers found in the classrooms.

Review of Literature

The United States Department of Education (1999) reported that only 20% of the 2.5 million school teachers in the United States feel comfortable using technology in the classroom. Doherty and Orlofsky (2001) stated that educators must focus more attention on how to use existing technology effectively in the classroom. However, almost 10 years after that report, there has been a steady increase in the number of teachers who have acquired technology skills and are integrating ICT into their classroom practices. Efaw (2005) reported that the office of Social and Economic Data Analysis indicated that 50% of instructors identified themselves as educational technology novices, and 42% felt prepared to use to use technology in the classroom. Hall, Fisher Musanti, and Halquist (2006) examined 34 Preparing Tomorrow's Teachers to use Technology (PT3) grants in a teacher education faculty in the United States. They found that many of the 34 grantees had implemented substantial changes in teacher education related to technology use and integration.

In Europe, Peralta and Costa (2007) examined teachers' competence and confidence level regarding the use of ICT in Greece, Italy, Spain, and the Netherlands through a quantitative multipurpose case study. The study, which targeted primary school teachers in those countries, revealed that ICT "assumed a supplementary role in the primary teachers' practice, being used as a complement to other materials" (Peralta and Costa, 2007:79). They indicated that there are not many concrete examples of lasting and meaningful learning activities supported by ICT, except for reference to projects in Greece and Portugal. The majority of experienced teachers in those countries, according to Peralta and Costa, said that ICT had never been an object of their preservice training, whereas beginning teachers indicated they were not properly prepared for ICT even though some teachers in Portugal and Spain had some credits in new technologies. Peralta and Costa concluded in their study that not many primary schools teachers are competent in using ICT in instruction. These findings are supported by the Information Development Program (2005), which stipulated that teacher inexperience and skill deficiencies are important factors inhibiting the effectiveness of ICT use in education in the Organization for Economic

Cooperation and Development (OECD) countries. In fact, it was reported that students in most OECD countries are more sophisticated in their use of technology than teachers and that teachers who are knowledgeable in ICTs use them for administrative tasks, such as record keeping, lesson plan development, information presentation, and basic information searches on the Internet. The Information Development Program indicated that few teachers in OECD countries have broad experience using technology in their teaching. As a result of the awareness that the development of appropriate pedagogical practices is more important than technical mastery of ICTs, there have been successful ongoing professional development models and programs in OECD countries in recent years focusing on initial preparation on pedagogy, subject mastery, management skills, and use of various teaching tools, including ICTs.

Many old European Union member states have completed the phase of teaching the use of ICT as a separate subject and have thus entered a new phase where ICT is integrated into teaching and learning across the curriculum (Gerhard, 2007). However, new member states, as well as countries such as Portugal, Italy, and Spain, are still teaching ICT as a subject in the labs, according to Gerhard. Thus, the initial focus of training in many EU countries was on "training in use and not training in integration" (European Schoolnet, 2005). Countries that have completed the phase of teaching the use of ICT include Switzerland, Norway, Belgium, Malta, and the Netherlands, among others, and they are now focusing on training in integration (European Schoolnet, 2005).

The average ratio of computers per pupil in the EU is 1 to 9, and there has been a steady increase since 2001, which resulted in Norway, Sweden, Denmark, Finland, Iceland, the Netherlands, the United Kingdom, and Luxembourg offering the highest number of computers, with figures of fewer than 5 pupils to one computer (Gerhard, 2007). Also, Gerhard indicated that 96% of EU schools have Internet access and that more and more schools are moving to broadband connection, with an EU average of 67% broadband access.

In spite of the heavy investment in ICT facilities and professional development for teachers, the overwhelming body of evidence shows that the majority of teachers have not yet embraced new pedagogical practices and many teachers do not have confidence yet in exploiting ICT to support new approaches in teaching (Silva, 2008). Silva further ascertained that most EU teachers are still in a stage of using ICT to enhance existing subject-centered pedagogical practice. European Schoolnet (2006), however, suggested that 90% of teachers in Europe use ICT to prepare their lessons but are yet to exploit the creative potential of ICT and engage students more actively in the production of knowledge.

In Africa, especially south of the Sahara, ICT use has been gaining ground in many countries. The World Bank and UNESCO have done a lot to help poor regions in many African countries integrate technology in schools. For some time now, World Links for Development (WorLD), a project of the World Bank, has been establishing computer laboratories and bringing Internet connectivity to secondary schools in Africa and helping teachers and students acquire the skills necessary to integrate technology into their classrooms (Carlson & Firpo, 2001). WorLD explored the most cost-effective and sustainable ways to connect classrooms to the Internet in countries such as Mauritania, Senegal, Uganda, and Kenya, among others. Professional development in these countries has been conducted hands-on with a small, learner-centered, constructivist approach. WorLD also applied a train-the-trainer system so that participants can pass their knowledge to their colleagues (Carlson & Firpo, 2001). However, Lorenzo (2002), Wang (2006), and Zhou (2007) warned that one-time-only workshops and hands-on training are not effective in making teachers comfortable with using technology. Rather, they suggest that follow-up programs or mentoring are necessary after initial training.

Many other African countries have given priority to ICT policy development. However, "there is a notable stratification in terms of their ability to implement" (Farrell & Isaacs, 2007). Farrell and Isaacs reported that many of the countries in North Africa have made excellent progress because of their resources and the high bandwidth they enjoy with Europe. South Africa, which has extant infrastructure and a more mature economy, is also rated high in ICT policy that is specific to the education sector. Cameroon, Ghana, Mauritania, and Botswana are moving steadily toward stable economies and are among the countries that are placing high priority on ICT applications (Farrell & Isaacs, 2007).

In terms of professional development, most African countries have invested in developing teachers' capacity to use ICT as a teaching and learning resource through inservice and preservice programs. Farrell and Isaacs reported that most teacher-training programs in Africa involved the development of basic ICT skills, sometimes as an end in itself, whereas few cases involved application of ICT skills as a learning tool for teachers. Generally, shortage of skills still limits the implementation of the ICT process in education in most African countries.

ICT Competences Required of the Teacher

Twenty-first-century teachers are required to develop the skills that will enable them to maximize the use of the computer as a teaching resource to enhance student learning and to prepare students to master high-technology society, in which lifestyles, attitudes, and skills are challenged daily (Ministerial Advisory Council on the Quality of Teaching, 1995). To achieve this, there is a need for extensive preparation, adequate time, and ongoing support for teachers to ensure they have the knowledge, skills, and confidence in teaching with ICT. The need to provide teacher-education programs and professional development facilities for practicing teachers and preservice teachers cannot be overemphasized. There is no doubt that the major challenges to be encountered in the integration of ICT in the classroom will be the pedagogical implications, the impact on the structure and content of curriculum, classroom organization and practice, and the changed role of the teacher (Ministerial Advisory Council on the Quality of Teaching, 1995).

The Australian Computer Society (2005) ascertained that ICT literacy has moved from being a fringe issue to the center stage of school reform programs and that the aim of ICT should be for all teachers and students to be not only fluent in the use of ICT but able to use it to their advantage in teacher and learning. A high level of competence in the utilization of technology has become necessary for people to function in a knowledge society or the information age. Students who graduate from school without ICT skills "will have a restricted ability to meet their fundamental future needs, such as employment, quality healthcare, and access to facilities, information, and social infrastructure" (Australian Computer Society, 2005).

UNESCO (2005) has prescribed four basic strategies for professional development that are helpful for integrating technology into education. The first strategy is that professional development needs to focus on teaching rather than on hardware and software, and second, needs to provide access to technology resources. The third strategy is that professional development activities in the use of ICT should not be a one-time activity, but rather ongoing processes. Lorenzo (2002) indicated that one-time-only workshops are not known to be effective at making teachers comfortable in using ICT. The fourth strategy is to start professional development in a small way by training a small group of teaching staff, who will in turn train other teachers.

Literature is filled with various ICT competences that teachers should acquire and possess. Turner (2005) listed 20 basic technology skills that all educators should now have. These include word-processing skills, spreadsheet skills, database skills, electronic presentation, Web navigation, e-mail management skills, file management and Windows Explorer skills,

scanner knowledge, and downloading software, among others. Martin and Dunsworth (2007) ascertained that some of the new computer literacy skills are electronic gaming, synchronous and asynchronous communication, weblogs, webpages, and multimedia text production. UNESCO (2002B) said that training and professional development will need to focus on the ability to know why, when, where, and how ICT tools will contribute to teaching objectives and how to choose among a range of ICT tools. UNESCO also emphasized training in the ability to analyze, use, and evaluate CD-ROMS, websites, video, audio, courseware, and to assist students to find, compare, and analyze information from the Internet and from other sources related to subject areas.

In a study where interns were asked to report about their own technology skills, Mulbolland (2006) reported that the interns wanted more practice and experience with a variety of software programs, creating webpages, downloading pictures and sounds from the Internet for projects, and using assistive technology devices. European Schoolnet (2005) grouped the competences in four categories of technical knowledge (ICT as a tool), the use of ICT for several purposes (e.g. pedagogical organizational, administrative) in different learning environments; information handling, and security and ethics.

The Problem

Nigerian teachers need to be part of a community of practitioner of ICT-supported teaching. There is hardly any doubt that to live, learn, and work in an increasingly complex, information-rich, and knowledge-based society, teachers and students must use technology (UNESCO, 2008). UNESCO has ascertained that within a sound educational setting, technology can enable teachers and students to become capable ICT users, information seekers, analyzers, and evaluators. They can also become problem solvers, decision makers, and informed, responsible, and contributing citizens. All these are only possible in a learning environment where teachers exhibit adequate competence in the application of technology to teaching and learning.

Evidence from research dealing with technology usage in Nigerian schools showed that the majority of Nigerian teachers are not equipped to provide technology-supported learning opportunities for their students. Studies by Kalu and Ekwueme (2007); Yusuf (2005); Ololube (2006); Olakulehin (2007); and Ureigbo, Oroke, and Ekruyota (2007) revealed a poor state of utilization of technology in schools in Nigeria due to unavailable or insufficient ICT, poor or nonexistent Internet connectivity, lack of technical support, and poor electricity supply.

Nigeria has a national policy on ICT, and the document titled Nigerian National Policy For Information Technology (No Author, n.d.) indicated that the country that aspires to participate effectively to become a key player in the emerging information age needs to have in place a highly efficient information technology system driven by a vibrant IT policy. The vision statement in the policy states as follows:

To make Nigeria an IT capable country in Africa and a key player in the information society by the year 2005, using IT as the engine for sustainable development and global competitiveness. (p. 3)

Nigeria has invested heavily in telecommunications since the commencement of the current democratic dispensation, and the country has the fastest growing telecommunication industry in Africa with over 40 million subscribers to the global system for mobile communication (GSM). The country launched a communication satellite named NIG-COMSAT-1 in May 2007. However, Nigeria cannot be said to be a key player in the information society, because with a population of about 140 million people, the country has only about 750, 000 subscribers to the Internet (Farrell & Isaacs, 2007).

The Nigerian National Policy for Information Technology seemed to have been hurriedly put together by people with peripheral knowledge of ICT. The document has no date or author(s) and has only a general vision for application of technology in education. From the general objectives, the document stated that the use of ICT for education is as follows:

- To integrate IT into the mainstream of education and training
- To empower youth with IT skills and prepare them for global competitiveness
- To establish new multifaceted IT institutions as centers of excellence to ensure Nigeria's competitiveness in international markets
- To set up advisory standards for education, working practices, and industry

One of the strategies for realizing the objectives was the restructuring of the education system at all levels to respond effectively to the challenges and imagined impact of the information age, and in particular, the allocation of a special IT development fund to education at all levels.

In the section of dealing with sectorial applications of ICT, the document did not specify the competency standards for teachers at all levels of education in the country. The policy and vision expressed in the document did not specify viable and meaningful approaches to educational reform using IT as a catalyst. There is no detailed information about changes in the school curriculum that has implications for ICT use in the classroom, as well as no clear policy on how, where, and when teachers and students will acquire skills in ICT. With such unclear policy and vision on ICT, the pertinent questions to ask are:

- How will Nigerian teachers explore the creative potential of ICT to engage students more actively in the production of knowledge?
- What are the ICT competences required of the typical inservice teachers in Nigeria?
- What are the professional development needs of inservice teachers in Nigeria?
- What mode of professional development would the inservice teachers prefer?

As Nigeria has no specific ICT competency standards for teachers and students, this paper made reference to standards prescribed by other countries and authors and UNESCO, which are already detailed in the background and literature reviewed earlier. Moreover, teachers entering the profession have a different knowledge base than the initial teacher training, and focus on ICT may vary considerably among teachers. Nigeria has no specific ICT or educational technology standards, as obtained in the United State of America and the OECD countries. It is accepted that teachers are vital players in any initiative aimed at improving teaching and learning and that ICT in schools will have no meaningful impact if teachers are not actively involved in all phases of technology integration in the classroom (Altun, 2007).

This study addressed the following research questions:

- Do the inservice teachers possess the desired ICT competences?
- What are the desired training needs of the inservice teachers?
- What are the inservice teachers preferred modes of training?
- Is there a difference between the male and female in their preferred mode of professional development?

Table 1: ICT Competency Level of Inservice Teachers

Skill Areas	High	Medium	Low	None
	Frequency (%)	Frequency (%)	Frequency (%)	Frequency (%)
Word Processing Skills	46 (19.33)	71 (29.83)	54 (22.69)	67(28.15)
Spreadsheet Skills	16 (6.72)	37 (15.55)	52 (21.85)	133 (55.88)
Database Skills	33 (13.87)	52 (21.85)	59 (24.79)	94 (39.50)
Electronic Presentation Skills	9 (3.78)	33 (13.87)	50 (21.01)	146 (61.34)
Web/Internet Navigation Skills	28 (11.76)	70 (29.41)	45 (18.91)	95 (39.92)
Graphic Tools Skills	10 (4.20)	34 (14.29)	57 (23.95)	137 (57.56)
Integration Skills	12 (5.04)	46 (19.33)	52 (21.85)	128 (53.78)

The Purpose of the Study

The global information society placed emphasis on highly trained individuals who are capable of using digital technology, communication tools, and/or networks to access and create information to function in a knowledge society. Most countries in the world, including Nigeria, need highly trained teachers in educational institutions. ICT competences or digital competence refers to different type of knowledge, skills, and competences that teachers need to work with ICT in educational settings (European Schoolnet). The purpose of this study, therefore, was to ascertain the ICT competency levels of the inservice teachers and to determine their professional development needs in the use of technology in the classroom. It was an important aim of this study to ascertain the mode of training required by the teachers. It was also important to determine these factors so that appropriate recommendations can be made to improve the lapses detected.

Participants and Setting

The researcher selected the participants in the study because they were inservice teachers enrolled in postgraduate programs and had master's degrees in education as of the 2006–2007 academic session in the faculties of education of the University of Benin, Ambrose Alli University, and Delta State University. The author selected these universities, located in the South-South geopolitical zone of Nigeria, because they met the following requirements:

- They have invested in ICT in an effort to implement technology across many programs.
- They have been offering postgraduate programs for inservice teachers on full-time and part-time basis for quite sometime.

The majority of the participants were teachers from secondary schools, colleges of education, and polytechnics in various states in Nigeria. The inservice teachers were postgraduate students who registered for courses mainly in science education and vocational and technical education. Participants included 108 male and 130 female teachers with varying degrees of teaching experience ranging from 1 to 20 years. The setting and sample were appropriate for this study because participants represent a cross-section of teachers found in secondary schools, colleges of education, and polytechnics in the country. The researcher trained three research assistants to administer the questionnaire in the universities selected for the study.

Description of the Instrument

During the study, participants responded to items on a questionnaire developed and validated by lecturers and researchers in the faculty of education of the University of Benin, Benin City (see Appendix, pp. 39–42). The researcher designed the questionnaire after an extensive survey of

the literature. The researcher adopted and adapted some items in the instrument from *the European Schoolnet's Assessment Schemes for Teacher ICT Competence: A Policy Analysis* (2005), Archived Information's *Teacher Technology Survey* (1998), and UNESCO'S (2008) *ICT Competency Standards for Teachers: Implementation Guidelines, version 1.0*.

The questionnaire was divided into sections A, B, C, and D. Section A of the instrument required demographic information, such as sex, place of work, state of origin, teaching experience, and teaching subjects. Section B required respondents to indicate their professional skill in ICT applications in a modified Likert-type scale from 1–4 with ratings aligning with evaluations of high, medium, low, and none (high = 4; none = 1). In Section C, participants were required to identify the quantity of training they need in 27 ICT skill areas, also on a five-item modified Likert-type scale with ratings aligned with evaluations of extensive, lots, some, minimal and none. The participants were required to indicate their preferred modes of professional development and to rate their preferred professional development modes according to whether they are high, medium, low, or none in their scale of preference in Section D of the questionnaire.

Lecturers in the field of ICT validated this instrument. Though the instrument initially had 70 items, this was scaled down to 61 on the advice of the lecturers, who screened out irrelevant items, double-barrel questions, and duplicated items. Section B had 25 items; Section C had 27 items, and Section D had 9 items, for a total of 61 items.

To test the reliability of the instrument, the research team administered the questionnaire to 30 inservice teachers who were not used for the final study. Chronbach alpha was used to test the reliability of the instrument, and this yielded a coefficient of .81, which attested to its internal consistency.

The researcher analyzed the data using descriptive statistics, such as mean, standard deviation, histogram, and t-test.

Results

The results of the study are discussed below, according to the research questions posed.

Research Question 1: Do the Inservice Teachers Possess the Desired ICT Competence?

Section B of the questionnaire, which was used to determine the ICT competences of the teachers, had 25 items/skill areas. The researcher used frequencies, percentages, and histograms to analyze Research Question 1. To make the analysis of the items less unwieldy, the 25 items were collapsed into seven major key areas, as follows:

- Word processing skills (items 1, 2, 3, 4, 8, and 9)
- Spreadsheet skills (items 11, 14, 18)
- Database skills (items 5, 6, 7, 10, 12)

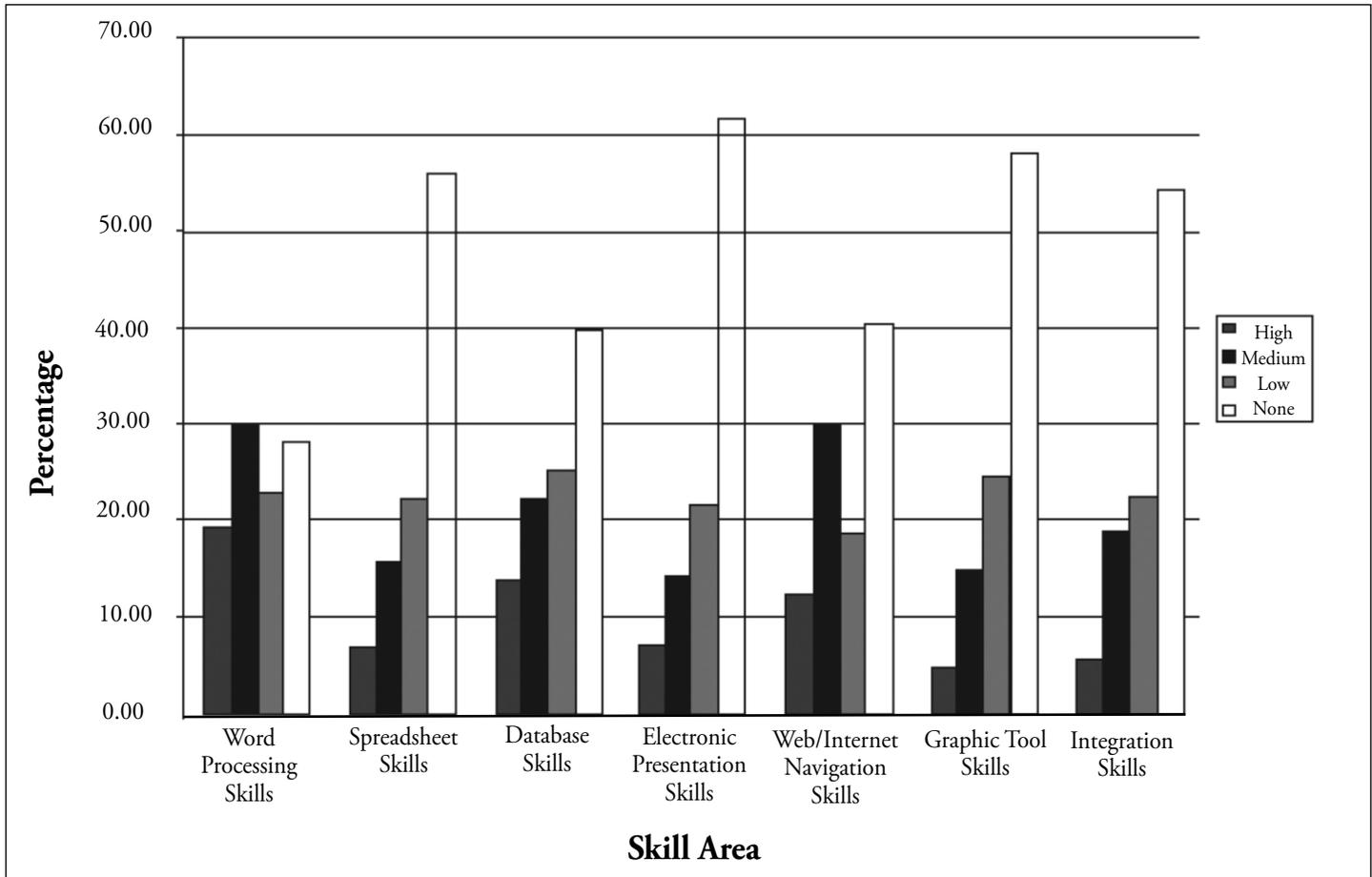


Figure 1: ICT Competency Level of Inservice Teachers (n=238)

- Electronic presentation skills (items 16, 17, and 19)
- Web/Internet navigation skills (items 20, 21, 22, 23, and 24)
- Graphic tools skills (items 13, 15)
- Integration skills (item 25)

The basis for aggregating the levels of competence in ICT skills into seven key areas was to get a clear indication of who among the inservice teachers was capable of using the word processing facilities, spreadsheet facilities, database facilities, Web/Internet facilities, graphic tools, and integration skills. The respondents answered the items listed against the seven key areas (in parentheses) in the questionnaire distributed to them, and the researcher used percentages to get averages to arrive at a single assessment for the key skill areas.

The data collected showed that the inservice teachers assessed themselves as having low skills in the seven major skills areas above. Table 1 indicates the level of skills of the inservice teachers expressed in frequencies and percentages.

The collected data show that the majority of the inservice teachers have a less than satisfactory level of ICT competency. Only 19.33% and 29.83% of the teachers, respectively, indicated that they have high- and medium-level competencies in word processing. This is less than 50% of the inservice teachers. In ability to use a spreadsheet, 6.72% of the teachers have high skill, whereas only 15.55% have medium skill in using a spreadsheet, 21.85% have low skills, and 55.88% have no skills. Regarding the use of database skills, 13.87% of the inservice teachers rated themselves as having high skill, whereas 21.85% said that they have

medium skill. This is approximately 35% of the 238 inservice teachers. The results also show that 82.35% of the teachers have low or no competency in electronic presentation skills (21.01% with low skill and 61.34% with no skill). Regarding Web/Internet navigation skills, 41.17% of the inservice teachers indicated that they have high- and medium-level skills (11.76% with high skill and 29.41% with medium skill). As for graphic tools skills, the majority of the teachers have low skill (23.95%) and no skill (57.56%). Few of the inservice teachers (5.04% and 19.33%) have high and medium skills, respectively, in integrating ICT into the curriculum. Figure 1 further illustrates these findings.

Research Question 2: What Are the Desired ICT Training Needs of the Inservice Teachers?

The key issue in determining the ICT competency level of the inservice teachers is the areas in which they are deficient and the skills areas where they need to strengthen. So far, it is obvious that the majority of teachers are deficient in major ICT skills, as reflected in Table 1 and Figure 1. To determine the inservice teachers' training needs, the researcher designed Section C of the questionnaire to identify key ICT areas where they need professional development. The researcher used mean and standard deviation to analyze the research question. The Likert-scale options in this section have 5 points, with a mean of 3.0. Therefore, an item with a mean of 3.0 showed that the inservice teachers need "some" training in those areas, whereas a mean above 3.0 but below 3.5 indicated that the inservice teachers require "lots" of training in the skill areas. A mean of 3.5 and above indicated that the inservice teachers required "extensive" training. Table 2 (p. 36) shows the level of professional development the inservice teachers required in ICT skills. A mean below 3.0 showed that they require "minimal" or no training in the skill areas.

Table 2: Professional Development Needs of Inservice Teachers

Item	Professional Development Needs in ICT	N	Mean	Std. Deviation
6	Integrate ICT tools into student learning activities in my subject areas	238	3.79	1.37
9	Use ICT for school management (grading, attendance, students records)	238	3.74	1.33
23	Manipulate/analyze/interpret data and perform calculations	238	3.731	1.39
26	Use presentations devices (video data projector, scan converter/monitor, document camera) for classroom	238	3.72	1.42
15	Evaluate and use computers and related ICT tools for instruction	238	3.71	1.33
24	Create models or simulations	238	3.67	1.44
7	Evaluate educational software	238	3.66	1.36
11	Create multimedia documents to support instruction	238	3.66	1.28
27	Demonstrate ethical usage of ICT materials	238	3.65	1.40
14	Use computers for grading and producing assignments for my students	238	3.63	1.38
16	Desktop publishing	238	3.60	1.47
8	Advanced input/output devices (scanner, digital camera)	238	3.59	1.50
3	Create effective computer-based presentations	238	3.59	1.33
20	Use graphics in word processing or presentations	238	3.56	1.46
18	Use spreadsheets for several instructional applications	238	3.54	1.37
4	Access information on CD-ROM	238	3.53	1.34
13	Create PowerPoint presentation	238	3.52	1.48
10	Conduct electronic research using Internet and other online resources to enhance research	238	3.49	1.32
17	Drill/practice programmes/tutorials	238	3.49	1.48
25	Use metasearch tools and subject directories (Google, Internet, public library, Yahoo) to locate materials in my subject area	238	3.49	1.48
1	Create a document on a word processor	238	3.44	1.30
22	Organize files, locate files quickly, and backup files to floppy disk or other storage devices	238	3.42	1.42
21	Set up computer and peripheral devices, load software, print and use operating system tools	238	3.41	1.40
19	Use word processor for written professional works (memos, tests, worksheets, home communication)	238	3.27	1.41
2	Operate computers and use basic software for word processing	238	3.35	1.31
5	Search Internet for resources	238	3.26	1.42
12	Access and send e-mail	238	3.22	1.37

The results of the data collected show that the inservice teachers require extensive professional development in key ICT areas. Table 2 shows that the inservice teachers need extensive professional training in 17 out of the 27 key ICT areas. Top on the list are skills in integrating ICT into student learning, school management, calculation and interpretation of data, use of presentation devices, evaluation of ICT tools for instruction, simulation of classroom events, creation of multimedia documents, use of ICT facilities for grading and producing student assignments, and desktop publishing. In the remaining 10 key ICT areas, the inservice teachers require “lots” of training to become proficient in ICT usage.

Research Question 3: What Are the Inservice Teachers’ Preferred Modes of Professional Development?

As the teachers indicated that they need extensive training in 17 out of the 27 ICT areas, there is a need to determine their preferred mode of training. The data collected show that workshops/seminars/conferences organized within the country, technology courses in university, and mentoring are the top three professional development modes the inservice teachers prefer to acquire relevant skills in the ICT areas identified in Table 2. They have means of 3.15, 3.14, and 2.91, respectively. Teacher study groups that meet regularly, seminars/workshops/conferences organized outside the country, and training in federally funded resources center are

the next three preferred mode of training required by the teachers, with means of 2.82, 2.77, and 2.77, respectively. Immersion (mean = 2.76) and teacher collaboratives or networks (mean = 2.68) were the teachers’ least preferred mode of professional development. Table 3 gives the details of the above analysis.

Research Question 4: Is There a Difference between the Male and Female Inservice Teachers in the Preferred Professional Development Mode?

To answer the question, the researcher used a *t*-test for independent samples to analyze the data collected. Table 4 shows details of the analysis.

With the male inservice teachers recording a mean of 23.463, and the female inservice teachers recording a mean of 22.646 (df = 236), a *t*-test of difference on professional development mode preference shows that there is no significant difference between the male and female inservice teachers in their preferred mode of professional development.

Discussion

The major aim of this study was to ascertain through self-assessment of Nigerian inservice teachers their technological skills and competencies and to determine their professional development needs in key areas of ICT. Examination of the data collected showed that slightly less than

Table 3: Mean and Standard Deviation of the Preferred Modes of Professional Development

S/N	Professional Development Mode	Mean	Std. Deviation
1.	Courses in university in instructional technology.	3.14	.939
2.	Workshops/conferences/seminars organized within the country.	3.15	9.15
3.	Immersion or internship activities in which teachers spend time working in a lab or industry	2.76	.925
4.	Mentoring, coaching, lead teaching, or observation in classroom	2.90	.954
5.	Teacher study groups that meet regularly in face-to-face meetings to further knowledge in ICT	2.82	.960
6.	Seminars/workshops/conferences organized outside the country	2.77	1.098
7.	Teacher collaboratives or networks at national and international levels	2.68	1.005
8.	Federally funded resource center that provides professional development in ICT	2.77	1.018

Note: N = 238

Table 4: T-test of Difference between Male and Female Teachers on Professional Development Mode

Sex	N	Mean	Std. Deviation	df	t	Sig. (2-tailed)
Male	108	23.463	4.754	236	1.017	.310
Female	130	22.646	7.127			

half of the respondents (49.16%) have high and medium skills in word processing and 41.17% have high and medium skills in Web browsing and navigation. This study also found that the inservice teachers have low or no skill at all in key areas such using spreadsheets, databases, electronic presentations, graphic tools, and integration. It's little wonder that the majority of the inservice teachers indicated that they need extensive professional development in 17 out of the 27 technological skills listed in the questionnaires.

The findings in this study corroborated those of Kalu and Ekweme (2007), Ololube (2006), Baskin and Williams (2006), and Olakulehin (2007). The findings of the inservice teachers's desire to engage in extensive professional development in key technological skills corroborated the findings of Mulbolland (2006), who reported that teachers wanted to acquire more skills and experience with a variety of software programmes.

There is no doubt that the skill and experience of the teacher are key determinants in the effectiveness of technology integration into the curriculum. Baskin and Williams (2006) ascertained that accepted wisdom is that once teachers assemble ICT skills, they begin to find ways to integrate technology into their curriculum and demonstrate its use to others. Few people will argue that the human factor is perceived as the most critical in developing the ICT culture in any educational setting. Teaching staff represents the greatest challenge to school renewal and continuing ICT integration.

The study also reveals that the Nigerian inservice teachers preferred workshops/conferences/seminars organized within the country, courses in the university, and mentoring as major modes for acquisition of skills in ICT. There is hardly any doubt that these modes of training provide a strong base for teachers' continuing learning and growth. Regular attendance at conferences/seminars, mentoring, and courses taken from time to time in the university provide more ongoing professional development activities than one-time-only workshops (Lorenzo,2002; Wang, 2006; and Zhou, 2007). These activities provide improved teacher skills in the classroom, which in turn help facilitate improved student performance.

The inservice teachers leave no doubt that they are willing and ready to acquire ICT skills. It stands to reason that inservice teachers who are more open to change through continuing education will be willing to try new ideas in the classroom as well as for their personal improvement. When willing teachers receive the opportunity to learn new technology skills and techniques, they certainly will avail themselves of the opportunity, with a resulting increase in their competence.

The survey responses reveal that the male and female teachers did not differ in their preferred modes of professional development. The reason for this result may not be far-fetched. The majority of the inservice teachers are employed in secondary schools, colleges of education, and polytechnics. One of the major requirements of teachers is the continual upgrade of their knowledge and skills through attendance at seminars, conferences, and courses in the university. These also constitute part of the overall criteria for teachers' promotion in many educational institutions in Nigeria.

Conclusion and Recommendations

This research's findings seem to indicate that inservice teachers in Nigeria are not competent in many skill areas in ICT. This is all the more reason the teachers indicated that they need "extensive" or "lots" of professional development in the ICT skill areas. Though teachers may need to have some knowledge in using a software programme, it may not be necessary for them to have a high level of computer self-efficacy to implement the technology into their classroom practice. A key element in designing professional development program for teachers is to make learning technology relevant for teachers, and the key areas are skills for using the Internet, finding relevant Web sites, and finding materials appropriate for grade levels of students and knowledge to incorporate materials into teaching and learning. However, it is an added advantage if teachers are proficient in word processing, graphic tools, electronic presentation, classroom management skills, and spreadsheets, as this will make the inservice teachers more versatile in the use of ICT in the classroom. Professional development should be an ongoing effort to learn about technologies. The focus of professional training in ICT should be on how to apply and integrate appropriate technologies into the curriculum. As the inservice teachers are willing and open to change, a critical variable as predictor to technology integration, the following recommendations are made based on the general understanding that it is not considered imperative for all of the teachers to become experts in all aspects of technology:

- All inservice teachers should have minimum proficiency in the use of a variety of software, including basic word processing, database, and spreadsheet functions.
- They should have basic understanding of the functions of the various components of the computer.

- They should acquire the ability to use the Internet and e-mail for research purposes and to search for relevant materials for their lessons.
- The inservice teachers need pedagogical skills, such as classroom management skills, creating student-centered learning environments, and developing innovative ways of using technology to enhance teaching and learning.
- Governmental and nongovernmental agencies and individuals involved in the education sector should ensure that equity of access to computer technology is maintained in educational institutions.

Teachers should be provided with the necessary incentives to acquire knowledge and skills in ICT. Such incentives include sponsorship of teachers to conferences, workshops, seminars, and even higher degree programmes in university. Scholarships should also be granted to teacher to acquire technology skills, as professional development is a catalyst that allows change in pedagogical practices.

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Appendix

FACULTY OF EDUCATION UNIVERSITY OF BENIN BENIN CITY, NIGERIA

SURVEY OF ICT COMPETENCIES AND PROFESSIONAL DEVELOPMENT NEEDS OF TEACHERS

This questionnaire is designed to assess your competence in using information and communication technology (ICT) tools and to determine your professional development needs/requirements. It is also designed to determine your preferred mode of professional development in areas where you are deficient. It is not a test, but information provided by you will be treated with utmost confidentiality. Thank you for sparing time to fill out this questionnaire.

SECTION A

Sex: Male Female

Place of Work: _____

State of Origin: _____

Teaching Experience: _____

Teaching Subject (e.g. Computer, Business etc): _____

Have you received any professional development (training) in the use of computers in the past three years? Yes No

I have access to computer at home: Yes No

I have access to computer at work: Yes No

SECTION B

What level of professional skill do you have in the following ICT areas?

Please, tick(√) in the appropriate column.

Professional Skills	Level of Skill			
	High	Medium	Low	None
1. Create a document on a word processor.				
2. I can use word processor tools such as font, spell check, grammar check to edit my work.				
3. I can plan, create, and edit documents created with a word processor.				
4. I can correctly use the four types of tab settings, margin settings, and page alignments.				
5. Print selected information from database.				
6. Create a database.				
7. Search database for specific information.				
8. Copy and delete files.				
9. I can move, copy, and organize files in folder.				
10. I can assess information in CD-ROM.				
11. Using computer to maintain students' records.				
12. I can perform basic software application such as creating, modifying, printing, and saving files.				
13. Using computers to create visual displays of data/information (e.g. graphs, charts, drawings).				
14. I can enter data in spreadsheets and create data displays to explain information.				
15. Using scanner to import graphics, photos, and /or text.				
16. Carrying out PowerPoint presentation.				
17. Using multimedia presentation.				
18. Using computers for student profiling and reporting lesson preparation and class.				
19. Using interactive presentation.				
20. Accessing and sending e-mail.				
21. Conducting an efficient search of Internet resources using directories such as Yahoo and Google.				
22. I can complete task using technological collaboration such as sharing information through online communication.				
23. Using Internet and other online resources to obtain materials for my research.				
24. Upload/download files from the Internet.				
25. I can integrate acquired technology skills, and use of the word processor, database, and spreadsheets into my subject area curriculum.				

SECTION C

Identify the quantity of training you feel you need in each of the following areas.

Training/Professional Development Needs in ICT		Extensive	Lots	Some	Minimal	None
1.	Create a document on a word processor					
2.	Operate computers and use basic software for word processing					
3.	Create effective computer-based presentations					
4.	Access information on CD-ROM					
5.	Search the Internet for resources					
6.	Integrate ICT tools into student learning activities in my teaching subject					
7.	Evaluate educational software					
8.	Advanced input/output devices-scanner, digital camera					
9.	ICT for school management grading, attendance, student records.					
10.	Electronic research using Internet and other online recourses to enhance my research					
11.	Create multimedia documents to support instruction					
12.	Accessing and sending e-mail					
13.	PowerPoint presentation					
14.	Using computers for grading and producing assignments for my students					
15.	Evaluate and use computers and related ICT tools for instruction					
16.	Desktop publishing					
17.	Drill/practice programs/tutorials					
18.	Use of spreadsheet for several instructional applications					
19.	Use of word processor for my written professional works (memos, tests, worksheets, and home communication)					
20.	Use of graphics in my word processing or presentations					
21.	Set up my computer and peripheral devices, load software, print and use operating system tools					
22.	To organize my files, locate files quickly, and back up my files to floppy disk or other storage devices					
23.	To manipulate/analyze/interpret data and perform calculations					
24.	To create models or simulations					
25.	To use metasearch tools and subject directories (Google, Internet, public library, Yahoo) to locate materials in my subject area					
26.	Use presentation devices (video data projector, scan converter/monitor, document camera) for classroom presentation					
27.	To demonstrate ethical usage of ICT materials (e.g., software)					

SECTION D

What is (are) your preferred mode(s) of professional development? Rate them as to whether they are high, medium, or low in your scale of preference.

Preferred Professional Development Mode		Scale of Preference			
		High	Medium	Low	None
1.	Courses in university in instructional technology				
2.	Workshops/conferences/seminars provided by professional organizations within the country				
3.	Immersion or internship activities in which a teacher spends a concentrated period of time working in a lab or industrial setting with professionals in my subject area				
4.	Receiving mentoring, coaching, lead teaching, or observation in the classroom				
5.	Teacher study groups that meet regularly in face-to-face meetings to further my knowledge in my discipline and ICT				
6.	Seminars/workshops/conferences provided by professional organizations outside the country				
7.	Teacher collaborative or networks connecting teachers regionally, statewide, nationally, or internationally				
8.	Federal funded resource center which provides professionals development materials and is staffed by professional in ICT				

9. Specify other forms of organized professional development related to ICT you would prefer.

I. _____

II. _____

III. _____

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