Assessment of Competencies in Technology Operation and Concepts among Teachers in a Philippine State University

Michael B. Batan, Jasten Keneth D. Treceñe, Jessie Richie N. Delos Santos, and Ramelito R. Paler

ABSTRACT

Being prepared to use technology and knowing how that technology can support student learning have become integral skills in every teacher's professional repertoire. This study aimed to assess the level of information and communications technology competencies of teachers in higher education, particularly in the technology operations and concepts skills. The study utilized the descriptive design which involved a questionnaire adopted from the National ICT Competency Standard for Teachers. Using the sample size estimation formula for a finite population, 104 teachers in a state university in the Philippines were considered respondents of the study. Responses from the questionnaires were directly encoded and analyzed using the Microsoft Excel application using descriptive statistics such as frequency counts, percentage, and mean. Based on the results, teachers reported a basic competency in understanding and the effective use of the internet and network applications and resources. Also, teachers show a basic competency level in demonstrating knowledge and skills in information and data management. Moreover, teachers reported being proficient in demonstrating knowledge and skills in basic computer operation and other information devices, including basic troubleshooting and maintenance and the use of office and teaching productivity tools. Training can be provided to teachers on technology operations and concepts to further advance their skills and competence which can be applied in their teaching and learning process.

Keywords: ICT Competency, Technology in Education, Technology Operations and Concepts, 21st Century Teachers.

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I. INTRODUCTION

Digital technology is constantly defining society in the present world, where the digitalization of organizations is progressing from being innovative to being part of their basic activities (Treceñe, 2021). In this changing educational landscape, many students enter further and higher education without the necessary abilities to utilize digital technology to education (Gallardo-Echenique, 2015). Thus, educators should recognize that 21st-century learners should be equipped with the necessary skills and experience that will enable them to contribute to the growing global community. Classroom teachers must be prepared to present students with technology-enhanced learning possibilities. Being ready to use technology and understanding how technology may help students learn have become essential skills in any teacher's professional arsenal (UNESCO, ND). Teachers who have access to technology resources and abilities can successfully teach subject matter while integrating technological concepts and skills.

The technology operations and concepts (TOC) competence will help teachers demonstrate knowledge, skills, and understanding of concepts related to technology, such as the technology systems, resources, and services that are at a pace to 21st-century learners (Tooker, 2020). TOC provides teachers with the ongoing support and education that is necessary to continue positive technological growth in the classroom. Today, the TOC competency is vital for teachers in their teaching and learning process, as it facilitates effective learning (Thakur, 2015). It further emphasizes that it improves the students for further development and attainment of learning outcomes and maintains the context of designing classroom-based resources with the application of ICT. Thus, acquiring knowledge and competence in technology operations and concepts skills is important to teachers.

Several studies have been conducted to address the problem. According to the study of Khashkhuu (2017) some teacher educators utilized open-ended software tools for the collaborative learning experience. However, there is always room for improvement, notably in the use of sophisticated and widespread ICT technologies to enable creative teaching and learning. Marcial and de la Rama (2015) also studied the ICT competency level in institutions of higher learning

offering teacher education programs in the four provinces in Central Visayas, Philippines. The study examined 383 survey data in total. Respondents are all faculty members who teach any professional and/or specialty courses in teacher education. The degree of ICT proficiency is objectively assessed in terms of job elements outlined in UNESCO's ICT Competency Standards for Teachers. According to the findings of the survey, respondents' ICT proficiency level is at the knowledge deepening stage. As a result, teacher educators must be integrative, student-centered, and collaborative while employing the required tools. Based on the study, it is highly recommended that ICT skills enhancement training for teacher educators be regularly conducted.

The findings of research on the ICT Competencies of Tacloban City Elementary Public-School Educators found that teachers had basic ICT understanding. However, this is not sufficient to claim that instructors are already proficient in ICT, particularly in technological concepts and operational abilities. Teachers must be knowledgeable about where and when to utilize technology for teaching and other related duties (Caluza *et al*., 2017). They also suggested that educators receive training to assist them to improve their computer skills and expertise. However, it also found that many educators still require more training in the use of ICT technology in pedagogy and other school-related activities.

Despite the increased interest in researching the ICT competency of teachers, few empirical studies have been conducted on the teachers in higher education institutions. The purpose of this study is to assess the level of information and communications technology competence, particularly in the technology operations and concepts skills of teachers in higher education.

II. METHODOLOGY

The study utilized the descriptive design which involved a questionnaire to assess the level of ICT competencies, particularly on the technology operations and concepts competence of the teachers in a public higher education institution from the school year 2019 - to 2020. One hundred four (104) out of one hundred forty-three (143) regular teachers were considered as respondents of the study which was composed of different external campuses. The sample size of the study was identified using the sample size estimation formula for finite population by Cochran (1963) (*as cited in* Singh & Masuku, 2014; Cornillez, 2019) with a 5.0 percent level of precision, 95 percent level of confidence and a proportion of 50 percent variability of data. Stratified random sampling using the proportional allocation method was used to determine the number of respondents in each group.

The researcher used a survey questionnaire as a main data-gathering tool for this study. The instrument consists of the ICT Competency assessment focused on technology operations and concepts domains. Such an instrument was adopted in the study of Caluza *et al.* (2017) that was based on the National ICT Competency Standard for Teachers. Data was collected in person and participants were given ample time to consider the items on the questionnaire, resulting in a more precise data period. The questionnaire

responses were immediately encoded and analyzed in Microsoft Excel – descriptive analysis (frequency counts, percentage, and mean).

III. RESULTS AND DISCUSSION

This area covers competencies connected to technical operations and ideas, as well as the productivity of different ICT tools such as computers and communication devices, as well as an online or offline application.

TABLE I: DEMONSTRATE KNOWLEDGE AND SKILLS IN BASIC COMPUTER OPERATION AND OTHER INFORMATION DEVICES, INCLUDING BASIC TROUBLESHOOTING AND MAINTENANCE

	Mean	Qualitative Description
Identify and describe the functions of the computer's primary components (monitor, CPU, keyboard, and mouse).	3.23	Proficient
Identify and specify the computer peripherals' functions (i.e. printer, scanner, modem, digital camera, speaker, etc.)	3.02	Proficient
Connect key components correctly, setup peripherals, and install drivers as needed.	2.54	Basic
Modify several software and hardware settings on the computer.	2.35	Basic
Learn the fundamentals of the operating system.	2.54	Basic
Computer files, directories, and folders must be organized and managed.	2.90	Proficient
Capable of storing and sharing computer files via storage devices (e.g., hard disk, diskette, CD, flash memory, etc.). Make backups of critical files.	2.98	Proficient
Knowledge of how to safeguard a computer from viruses, spyware, adware, malware, hackers, and other threats.	2.46	Basic
Capable of using online and offline assistance services for application troubleshooting, maintenance, and upgrading	2.40	Basic
Grand Mean	2.71	Proficient

The results in Table I show that most of the respondents have proficient skills in basic computer operation and other information devices, including basic troubleshooting and maintenance (grand mean of 2.71). With a mean of 3.23 and 3.02, the respondents are adept at recognizing and defining the functions of the major components of computers and their peripherals. Moreover, the result shows that the respondents are proficient when it comes to organizing and managing computer files, folders, and directories (mean= 2.90). Also, proficient in using storage devices for storing and sharing computer files with a mean of 2.98. However, the survey shows that the respondents have basic knowledge when it comes to configuring peripherals and installing drivers required (mean = 2.54), configuring settings of various hardware and software (mean = 2.35), understanding the basic function of the operating systems (mean = 2.54), protecting the computers from malware (mean = 2.46), and on the basic troubleshooting of computers with the mean of 2.40.

TABLE II: APPLY SUITABLE OFFICE AND TEACHING PRODUCTIVITY TOOLS

	Mean	Qualitative Description
Capable of entering and editing text and graphics using a word processor	3.10	Proficient
Capable of formatting text, adjusting margins, layout, and tables	3.19	Proficient
Capable of printing, saving, and retrieving text files from the word processing program	3.02	Proficient
Capable of entering data, sorting data, and formatting cells in tables using a spreadsheet	2.83	Proficient
Make computation, use formulas, and create graphs using spreadsheets	2.85	Proficient
Print and store data tables using a spreadsheet application	2.77	Proficient
Use a presentation package to add text and sequence a presentation	2.77	Proficient
Enhance slide presentations by adding sound, customizing animation, and inserting images	2.85	Proficient
Print presentation handouts and store slide presentations	3.04	Proficient
Make effective class presentations using the slides and LCD projector	2.96	Proficient
To acquire digital images and other media from websites, CDs, flash drives, etc.	2.96	Proficient
Crop, scale, color correct, and enhance digital images	2.69	Proficient
Play various media files using appropriate media players	2.83	Proficient
Stitch together video footage and soundtracks and add simple enhancements – transitions, titles, etc.	2.50	Basic
Attach and configure scanners, cameras, and cell phones to acquire digital images	2.65	Proficient
Store digital images using optical media (CD, DVD, flash disk) and online repositories	2.54	Basic
Grand mean	2.85	Proficient

Basic skills in computer operations have been requisite in the era of digital technologies. However, teachers are still expected to have a mastery level of skills in the operations of computers, to facilitate further stages in using computers in the teaching and learning process (Yusri, 2019). If teachers can operate a minimum of basic computer operating skills, as well as master the minimum office application programs, a teacher is considered to carry out the 4.0 industrial revolution.

Table II presents that majority of the respondents are proficient in using appropriate office and productivity tools. However, basic know-how of stitching together video material and audio, as well as making modest upgrades with the mean of 2.50, and storing digital images using optical media and online repositories (mean = 2.54) has been reported. The use of videos as teaching material shows a positive impact on students' performance (Blonder *et al.*, 2013). Blonder *et al.*, (2013) further claimed that the use of videos in teaching displayed positive perceptions from the teachers. However, teachers must upgrade from basic knowledge of video editing to a proficient one, to support their teaching and learning process. Because video provides the opportunity to stop and replay the complex activity of the classroom, its use affords a different set of practices in teacher education (Brunvand, 2010).

TABLE III: UNDERSTAND AND EFFECTIVELY USE THE INTERNET AND NETWORK APPLICATIONS AND RESOURCES

	Mean	Qualitative Description
Connect to the internet via dial-up or LAN	2.40	Basic
Configure and use Web browsers and Help applications	2.31	Basic
Send and receive emails with attachments, manage emails and use LAN and Web-based mail servers	2.67	Proficient
Effectively use synchronous and asynchronous web-based communication tools like instant messengers, voice, and teleconferencing	2.44	Basic
Connect and use shared printers, shared folders, and other devices within a network	2.54	Basic
Effectively use search engines, web directories, and bookmarks.	2.58	Basic
Download and install relevant applications including freeware, shareware, updates, patches, viewers, and support applications.	2.42	Basic
Grand Mean	2.48	Basic

The result from table III shows that the respondents are only proficient in sending and receiving emails with attachments and using LAN and Web-based mail servers with a mean of 2.67. In the present time, the internet has greatly influenced the higher education system, it has been part of the everyday lives of the majority especially teachers and students (Treceñe & Abides, 2020).

Nowadays, it is also easy for us to gather information on the internet. Therefore, teachers should be able to demonstrate the necessary knowledge and skills in information and data management. Contrary to this, the respondents showed a basic knowledge of the effective use of search engines, directories, crawlers, and agents to locate information sources (mean = 2.40), searching and collecting textual and non-textual information from online and offline sources (mean = 2.38), efficiently store and organize collected information using databases (mean = 2.38), distribute, share, publish, and print information via print or web (mean = 2.33), and appropriately recognize online and offline information sources (mean = 2.29).

TABLE IV: DEMONSTRATE KNOWLEDGE AND SKILLS IN INFORMATION AND DATA MANAGEMENT

	Mean	Qualitative Description
Effectively use search engines, directories, crawlers, and agents to locate information sources	2.40	Basic
Look for and gather textual and non-textual information from online and offline sources.	2.38	Basic
Using directories, disks, or databases, efficiently store and arrange acquired data.	2.38	Basic
Distribute, disseminate, publish, and print information through print or the internet.	2.33	Basic
Properly recognize information sources, both online and offline.	2.29	Basic
Grand Mean	2.36	Basic

IV. CONCLUSION

Teachers reported a basic competency in understanding and the effective use of the Internet and network applications and resources. Also, teachers show a basic

competence in demonstrating knowledge and skills in information and data management. Competence in technology operations and concepts is something that must be mastered by teachers in the 21st century. Training can be provided to teachers on basic hardware and software configuration, simple video editing, configuring the use of web browsers and help applications, the effective use of various teleconferencing applications, and properly acknowledging information sources, both online and offline.

CONFLICT OF INTEREST

The authors declare that they do not have any conflict of interest.

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