TECHNOLOGICAL AND PEDAGOGICAL LITERACY AND CHALLENGES OF TEACHERS IN INFORMATION COMMUNICATION TECHNOLOGY (ICT)

Aduca, Jayson B.

Completed 2023

Technological and Pedagogical Literacy and Challenges of Teachers in Information Communication Technology (ICT)

Jayson B. Aduca

Teacher III

Laya West Elementary School

Northern Tabuk District II

Schools Division Office -Tabuk City

Department of Education

jayson.aduca@deped.gov.ph

March 2023

Abstract

Information and communication technology (ICT) is fundamentally changing how we live on a global scale. We use ICT often in our jobs, classes, and personal life. This study investigated the level of ICT literacy of teachers in terms of technology operations and concepts as well as pedagogy. Participants to this study are the elementary teaching of personnel of Northern Tabuk District II which used descriptive survey method. Data were analyzed using the four-point Likert scale and mean in quantifying the level of computer literacy and the extent of occurrence of the challenges in using ICT. Moreover, Analysis of Variance (ANOVA) was used to test the significant difference between the pedagogical and technological literacy of teachers according to their profiles. The study revealed that the teachers' level of literacy on ICT technology operations and concepts; and pedagogy is "Literate" wherein they can perform the competencies with least assistance. Significant differences were noted in the ICT literacy level of teachers as to age, length of service, and number of trainings attended related to ICT. However, educational attainment of teachers does not affect their ICT literacy level. Challenges in the use of ICT are rarely observed by the teachers. This means that they experience these once or twice and can find solutions on their own. The proliferation of ICT became more relevant to this day. Teachers are not spared of this for we need to cope with the demands of the fast-changing time.

Keywords: integration, competency, computer-mediated communication (CMC), performance

Acknowledgement

The researcher wishes to extend his heartfelt gratitude to all the people who helped in the completion of this study.

To all the teachers of Northern Tabuk District II for patiently accomplishing the questionnaire for this study.

To the school heads of the different schools in Northern Tabuk District II for allowing me to collect the needed data from your teachers in your respective schools.

To my colleagues in Laya West Elementary School, especially Sir Winfred T. Singun, our school head, for the constant support and encouragement to finish and complete this study.

To the division personnel, especially Ma'am Deewaii B. Bagayao, SEPS for Research, for constantly reminding me that I can accomplish this endeavor and sharing technical assistance on the completion of this study.

To regional office personnel, especially Ma'am Crisanta B. Pantaleon, for sharing the opportunity to conduct research with financial support from the Department of Education through the Basic Education Research Fund (BERF), an opportunity being enjoyed by few.

To my friends and family for sharing your time and effort during the conduct of the study.

Above all, I thank the Almighty for providing me with the courage and strength, as well as good health and opportunity; without You, none of this would be possible.

Thank you, and may we all be blessed a thousand folds.

Introduction and Rationale

Worldwide, Information and Communication Technology (ICT) is radically transforming the way we live. ICT is pervasive in our work, study, and personal lives. Today‘s learners are growing up in a world characterized by technological change and innovation. Educators have recognized that there is a need to equip learners with the necessary skills and experiences that will enable them to become contributing members of the global community. Hence, it is generally believed that ICT can empower teachers and learners, promote change, and foster the development of 21st century skills, but the data to support these beliefs is still limited.

The development of information and communication technology (ICT) in the 21st century has created unprecedented changes in all walks of life. In the school, the rapid growth of ICT has become an integral part of day-to-day life, especially during this pandemic where face-to-face learning is still prohibited. Teachers were urged to make a quick shift in delivering education where manipulation of computers is a must—from downloading modules to printing and looking for reputable sources—and have already been accepted as tools to cope with the changes in the environment. As the facilitator of learning, a teacher essentially needs a shift in his role by utilizing ICT. Teachers should be prepared to provide technology-supported learning opportunities for their students.

In order to be prepared for the further emergence of technologies in society and to foster the development of what has been termed "21st century skills," many countries have developed visions, plans, programs, and strategies for upgrading their national curricula. Most of the teacher education institutions have redesigned their curricula for their prospective teachers to become competent users of new technologies when they become teachers (Glenn, 2002).

ICT has the ability to increase motivation and learner engagement while also assisting in the development of life-long learning skills. As a powerful educational tool, ICT can facilitate the transformation of school education. But to make this happen, it is vital to bring about changes to the mindset and culture among teachers, administrators, parents, and students;

the way in which the curriculum is designed and delivered; and how students are currently assessed. Thus, harnessing ICT continues to be an important challenge for educators.

In the context of the district, ICT coordinators were tasked with conducting sessions among teachers to upskill and reskill them in the emerging technologies in education. In the past school year alone, numerous ICT-based trainings were conducted remotely. These focus on the digitization of SLMs, the preparation of TV-based instruction, as well as the contextualization of learning materials, which are needed in the current situation of our educational system. However, it cannot be done in a single sitting. As a facilitator, I observed that most teachers hardly grasp even the simplest command on a certain application. This means that they need to be constantly supervised in terms of the technical know-how of these technologies.

In a survey conducted in 2021 by the district coordinator with the help of his school-based counterparts, 58 or 69% of the teachers belong to the age group of 40 and older, and only 50% of them have basic knowledge on computer operations. These teachers have difficulty keeping up with the demands of our current situation. They require assistance from time to time in order to meet the needs of the current system and their students. However, each school only has one ICT coordinator, who is tasked not just with their academic duties but also with administrative work such as the preparation and submission of online reports. With this, the responsibility to upskill their colleagues in the field seems to be neglected. Thus, there is an existing phenomenon in most schools in the district.

Following the overall vision of DepEd, the DepEd ICT 4E Strategic Plan envisions 21st century education for all Filipinos, anytime, anywhere. This means having an ICT-enabled education system that transforms students into dynamic lifelong learners and values-centered, productive, and responsible citizens. The DepEd ICT4E Strategic Plan gives a comprehensive history of ICT in education in the Philippines. DepEd has always been quick to recognize the potential of ICT in education. It introduced the use of radio broadcasts in education in the 1960s and educational television in the 1970s. With the support of Channel 4, the Tulong Aral Program of the 1980s was the first major initiative that

combined the use of radio and television in public basic education. Since the early 1980s, there have also been private sector initiatives in educational radio and television. Among them were children television shows such as Kulit Bulilit and Batibot and now, the DepEd TV where lessons for distance learning were designed and being broadcasted across the country.

With the government's and other companies' support for teachers in terms of upskilling, teachers are constantly provided with assistance on the use of different productivity tools, which is very relevant in the delivery of basic education.

This study assessed the pedagogical and technological aspects as well as the challenges faced by teachers in the use of information and communication technology. Providing pedagogical training for teachers, rather than simply training them to use ICT tools, is an important issue (Becta, 2004). Based on the district report on teachers' individual professional development plans, ICT is their glaring need. Five of eight teachers identified this need as a priority competency to be enhanced in the coming school years. To really prove this, a specific assessment should be conducted to determine their necessary needs in the field of ICT and its potential use in the delivery of basic education. As a result, specific competencies should be highlighted, as well as their weaknesses, strengths, and challenges.

It is understood that many studies have been conducted as to the ICT literacy of teachers, but none of these were conducted at the district level. Islami (2019) focused on age, gender and educational attainment as the factors affecting teachers' ICT literacy. Latif (2019) focused on the ICT integration as well as the challenges faced by the teacher in integrating ICT in the lesson. Payyac (2017) and Payumo (2017) focused on the ICT literacy of public secondary school teachers in Kalinga Division. These researches do not include length of service in coming up with more in-depth analysis of teachers' literacy. Needs, challenges, and strengths assessments must be more specific to come up with a more strategic and contextualized plan to suit their abilities.

To achieve the aforementioned projection, much attention is directed toward human enhancement, particularly teachers and educators who are molding the youths as “hope of the motherland.” For this reason, the researcher thought of conducting this study in order to determine the ICT competence of the teachers of Northern Tabuk District 2. The results of this study would be used as a basis to identify the needed programs for faculty development to better prepare them, especially in the effective integration of ICT in classroom teaching.

Literature Review

Factors Affecting ICT Literacy of Teachers

ICT Literacy.

The proliferation of technologies has complicated the teaching-learning process, and finding the best way to integrate technology into classroom practices is one of the challenges 21st century teachers face. Effectively integrating ICT into learning systems is much more complicated than providing computers and securing a connection to the Internet. The integration of ICT is associated with a shift from instructivist to constructivist philosophies of teaching and learning (Barker et al., 2007).

Tabios (2008) stressed that with the widespread use of the personal computer, many authorities in the field of education pointed out the need for computer literacy. It is, then, essential that everyone acquire an understanding of what computers are and how they work. In this modern world, no one can afford to be ignorant of the important role of computers in any career or business of choice. Being computer literate will give anyone a great competitive advantage. Having thorough knowledge, the right skills, and the right attitude about new technologies will certainly make educators more confident, competent, effective, and efficient.

Barker et al. (2007) examined past research studies and reports on ICT implementation in schools and found that there are two main factors that affect teachers’ use of ICT. These are manipulative and non-manipulative school and teacher factors. Research on the implementation of ICT in schools has also shown that these school and teacher

factors are interrelated. The success of the implementation of ICT is not dependent on the availability or absence of one individual factor but rather on a dynamic process involving a set of interrelated factors. Moreover, no single solution exists to address the immense challenges of ICT integration because different perspectives on integrating ICT can be chosen.

A number of studies have found that using ICT in education can increase students' motivation, deepen their understanding, promote active, collaborative, and lifelong learning, provide shared working resources and better access to information, and assist students in thinking and communicating creatively (Jonassen, 2000; Webber, 2003).

Tondeur et al. (2008) examined the relationship between teacher classroom use of computers and computer attitudes, demographics, teacher computer experience, and teaching philosophies. Data collected showed that 18 percent of the variance in their classroom use of computers was ascribed to school differences and 82 percent to teacher differences. Teacher age had little effect on classroom computer use, but males were more inclined to use computers than females. Computer experience and computer attitudes also influenced decisions to use computers professionally.

The world of computers has been described as a male domain where women are under-represented, both in IT education and the IT industry. Other researchers have suggested that women have fewer opportunities and access to computers (Gunn et al., 2003).

Likewise, the studies of Tondeur et al. (2008) and Volman & Van Eck (2001) revealed that female respondents tend to be less interested in computers, have less positive views about the value of computing, have more computer anxiety, and have less confidence in their computer abilities.

Age.

A common assumption espoused by the popular media and educators is that young people have higher competency with ICT than their elders; however, previous research provides limited information regarding the relationship between age and ICT competency.

According to Prensky (2001a), students born after roughly 1980 are “digital natives” because they have grown up with digital media and spend a great deal of time engaging with new digital devices and exploring online. Additionally, youth born after roughly 1980 are presumably used to parallel processing (simultaneously processing different incoming stimuli) and multitasking (completing different tasks simultaneously) and regard gaming as “serious” work.

On the other hand, those who were born before 1980 are, according to this line of reasoning, “digital immigrants.” Compared to young people, Prensky asserts that individuals in this latter group may reveal their immigrant status through a “digital immigrant accent” that becomes obvious in a number of ways: for example, they may print out an attachment rather than read or edit it online, or make a phone call to check if an email was received (Prensky, 2001a, p. 2).

Length of Service and Trainings Attended.

Similarly, Prensky (2001a) revealed that ICT competence, the number of years of teaching experience, and the number of attended ICT trainings are highly significant. This means that respondents with fewer years of teaching experience assess themselves as more competent in the use of ICT in teaching. This finding is consistent with his discovery regarding the relationship between their age and level of ICT competence. That is, younger teachers are more likely to be exposed to technology-driven education. They were already trained before entering the field of education.

Moreover, teachers who attend more training as expected are more knowledgeable in the use of computers, making their work easier. The teachers who have less training are the old teachers who held the least positive attitude towards the use of computers. They are

generally frightened and stressed by changes that involve new and complex technologies, which is why they do not use computers (Payyac, 2017).

Educational Attainment.

However, he also revealed that educational attainment among teachers does not have a bearing on their ICT competence. According to Payumo (2017), computer application and operation are not highlighted in most post-graduate curricula.

In a similar study conducted by Payyac (2003), it was revealed that the youngest group of teachers is better exposed to the use of technological advancements as they themselves are products of an academic environment with computer lessons. It is expected that the young teachers are very knowledgeable about computer use because they learned their skills as individuals preparing for a career during their formative years. Thus, they are really supposed to be more knowledgeable than their older colleagues, who in their younger years did not have the benefit of its usage. Additionally, his findings revealed that teachers who hold a master's degree are better at using the computer than those with a baccalaureate degree.

Integrating ICT into teaching and learning is a complex process that may encounter a number of difficulties. These difficulties are known as "challenges" (Schoepp, 2005). A challenge is defined as "any condition that makes it difficult to make progress or to achieve an objective" (WordNet, 1997, as cited in Schoepp, 2005, p. 2). The following are some of the key challenges that have been identified in the literature regarding teachers' use of ICT tools:

Challenges of Teachers in Using ICT

Limited access to the internet.

In Sicilia's study (2005), teachers complained about how difficult it was to always have access to computers. The author gave reasons like "computers had to be booked in advance, and the teachers would forget to do so, or they could not book them for several periods in a row when they wanted to work on several projects with the students" (p. 50). In other words, a teacher would have no access to ICT materials because most of these were

shared with other teachers. According to Becta (2004), the inaccessibility of ICT resources is not always merely due to the non-availability of hardware, software, or other ICT materials within the school. It may be the result of one of a number of factors, such as poor resource organization, poor quality hardware, inappropriate software, or a lack of personal access for teachers (Becta, 2004).

School with Limited Technical Support.

In Sicilia's study (2005), technical problems were found to be a major barrier for teachers. These technical barriers included waiting for websites to open, failing to connect to the Internet, printers not printing, malfunctioning computers, and teachers having to work on old computers. "Technical barriers impeded the smooth delivery of the lesson or the natural flow of the classroom activity" (Sicilia, 2005, p. 43).

Lack of Effective Training.

Providing pedagogical training for teachers, rather than simply training them to use ICT tools, is an important issue (Becta, 2004). Cox et al. (1999a) argue that if teachers are to be convinced of the value of using ICT in their teaching, their training should focus on the pedagogical issues. The results of the research by Cox et al. (1999a) showed that after teachers had attended professional development courses in ICT, they still did not know how to use ICT in their classrooms; instead, they just knew how to run a computer and set up a printer. They explained that this is because the courses only focused on teachers acquiring basic ICT skills and did not often teach teachers how to develop the pedagogical aspects of ICT. In line with the research by Cox et al. (1999a), Balanskat et al. (2006) indicated that inappropriate teacher training is not helping teachers use ICT in their classrooms and in preparing lessons. They assert that this is because training programs do not focus on teachers' pedagogical practices in relation to ICT but on developing ICT skills.

Research Questions

This study aimed to assess the level of Information Communication Technology (ICT) literacy of teachers in Northern Tabuk District II, Division of Tabuk City, from SY 2021–2022.

Specifically, it sought answers to the following questions:

1. What is the level of literacy of teachers in terms of:
    a. Technology operations and concepts
        i. Standard 1. Demonstrate knowledge and skills in basic computer operation and other information devices including basic troubleshooting and maintenance
        ii. Standard 2. Use appropriate office and teaching productivity tools
        iii. Standard 3. Understand and effectively use the Internet and network applications and resources
        iv. Standard 4. Demonstrate knowledge and skills in information and data management
    b. pedagogy
2. Is there a significant difference on the level of ICT literacy of teachers and their profile in terms of:
    a. age
    b. length of service
    c. highest educational attainment
    d. number of seminars/ trainings attended related to ICT

H_o: There is no significant difference on the level of ICT literacy of teachers and their profile.

3. What is the extent of occurrence of challenges experienced by the teacher on the use of ICT?

Scope and Limitations

This study focused on the assessment of the computer literacy of elementary teachers only in Northern Tabuk District II. The study covered the assessment of the teachers' computer literacy in terms of technology operations and concepts, pedagogy, and the level of challenges they experience with the use of ICT. The respondents were the elementary teaching personnel of the district. Data was gathered through a survey questionnaire and statistically treated and interpreted using appropriate tools such as the mean, t-test, and 4-point Likert scale.

Research Methodology

Research Design

The descriptive survey research design was used since it gathered information regarding the level of literacy among teachers in terms of technology operations and concepts as well as the challenges in the use of ICT. A survey questionnaire is the main instrument used.

Population and/or Sampling

A total enumeration covering all of 85 teaching personnel of Northern Tabuk District II, from 10 schools, were the respondents of the research. They were assessed as to the different indicators of pedagogical and technological literacy as well as the challenges of using information and communication technology. The number of retrieved responses is shown below:

School	Number of Teachers	Percentage (%)
Balong Elementary School	8	9.41%
Bayabat Elementary School	6	7.06%
Burayukan Elementary School	6	7.06%
Cabaruan Elementary School	10	11.76%
Dilag Integrated School	15	17.65%
Gradual Discovery Elementary School	5	5.88%
Laya Integrated School	10	11.76%
Laya West Elementary School	8	9.41%
Pantar Elementary School	5	5.88%
San Julian Elementary School	8	9.41%
TOTAL	85	100%

Data Collection

A questionnaire was used adapting the variables from the National ICT Standards for Teachers (NICS) and the research of Payumo (2017). The first part gathered information regarding the respondents in terms of age, length of service, highest educational attainment, and number of training and seminars attended related to ICT. The second solicited responses on the level of computer literacy of the teachers in terms of technology operations and pedagogy. The last part collected information on the challenges being experienced by the teachers in the use of ICT. The data collection was done through in-person distribution, and participants were given enough time to think about the questions as stated on the questionnaire, thus producing more accurate information.

Data Analysis

A four-point Likert scale and mean was used to determine the level of computer literacy and extent of occurrence of the challenges. The mean was used to quantify the data to be gathered on the level of computer literacy of the teachers based on the different indicators plotted in the tool. Analysis of Variance (ANOVA) was used to test the significant difference between the pedagogical and technological literacy of teachers according to their profiles.

Table 1

Level of Computer Literacy

Arbitrary Value	Statistical Limits	Descriptive Equivalent	Operational Definition	Symbol
4	3.26-4.00	Much Literate	Can perform the competencies independently	ML
3	2.51-3.25	Literate	Can perform the competencies needing least assistance	L
2	1.76-2.50	Moderately Literate	Needs assistance from others from time to time	MoL
1	1.00-1.75	Less Literate	Cannot perform the competencies independently	LL

Table 2

Extent of Occurrence on Challenges Experienced by the Teachers in Using ICT

Arbitrary Value	Statistical Limits	Descriptive Equivalent	Operational Definition	Symbol
1	3.26-4.00	Always	Experienced every time you use the computer and can't find solutions	A
2	2.51-3.25	Often	Experienced from time to time and can hardly find solutions	O
3	1.76-2.50	Sometimes	Experienced but can solutions	S
4	1.00-1.75	Rarely	Experienced once or twice	R

Ethical Issues

This study considered the following ethical issues before the administration of the actual survey: The researcher sought permission from the school head for the conduct of the study. Upon approval, the research proposal was prepared and submitted to the school head for notation and endorsement by higher authorities. The participants were not subjected to any way or form of harm. Full consent from the participants was obtained before answering the survey. The participants were not forced to participate or harmed in any way if they refused to answer the survey. The researcher also made sure that all the data gathered would be treated with full confidentiality and that privacy would always be observed. The researcher ensured the anonymity of individuals and organizations who participated in the survey and any type of communication about the research was done in full honesty and transparency. Lastly, sources from previous researches, magazine, sites and books are properly cited in this study.

Results and Discussion

Level of Literacy of Teachers in terms of Technology Operations and Concepts

Standard 1. Demonstrate knowledge and skills in basic computer operation and other information devices including basic troubleshooting and maintenance.

The level of literacy of teachers in technology operation and concepts standard 1 is shown in Table 3. The level of literacy of the teachers is “Much Literate” which indicates that the teachers can perform the competencies independently. The respondents are much literate on the knowledge and skills in basic computer operation and other information devices. The respondents are much literate in identifying and defining the functions of the main components (i.e. monitor, system unit, keyboard, mouse) of the computer. This implicate that the teachers are knowledgeable and can perform independently basic computer operations. Mason and McMorrow (2006) suggested that there are distinct components to computer literacy: awareness and competence. Awareness requires an individual to have knowledge of how computers affect his or her daily life or society, and competence requires an individual to demonstrate hands-on proficiency with a software application. It is, therefore, important that teachers have access to computers, the internet, hardware, and software to increase their knowledge in ICT.

However, the respondents have a level of “Moderately Literate” in the use of online and offline help facilities for troubleshooting, maintenance and update of applications. The respondents need assistance from time to time. This means that the teachers have limited knowledge and cannot independently perform the competence. Tabios (2008) stressed that, with the widespread use of computers, many authorities in the field of education pointed out the need for computer literacy. It is, then, essential that everyone acquire an understanding of what computers are and how they work. In this modern world, no one can afford to be ignorant of the important role of computers in any career or business of choice. Being computer literate will give anyone a great competitive advantage. Having thorough knowledge, the right skills, and the right attitude about new technologies will certainly make educators more confident, competent, effective, and efficient.

Table 3

Level Of Literacy on Standard 1

Standard 1	Mean	Descriptive Equivalent
1. Identify and define the functions of the main components (i.e. monitor, system unit, keyboard, mouse) of the computer	3.88	Much Literate
2. Identify and define the functions of computer peripherals (i.e. printer, scanner, modem, digital camera, speaker, etc.)	3.66	Much Literate
3. Understand the basic functions of the operating system	3.07	Literate
4. Organize and manage computer files, folders and directories	3.59	Much Literate
5. Use storage devices (i.e. hard disk, diskette, CD, flash memory, etc.) for storing and sharing computer files. Create back-ups of important files	3.73	Much Literate
6. Protect the computer from virus.	3.55	Much Literate
7. Use online and offline help facilities for troubleshooting, maintenance and update of applications	1.85	Moderately Literate
Average Weighted Mean	**3.33**	**Much Literate**

Standard 2. Use appropriate office and teaching productivity tools.

Table 4 shows that the respondents are “literate” in the use of appropriate office and teaching productivity tools. This indicates that the teachers can perform the competencies with least assistance. The respondents are much literate in using word processor to enter and edit text and images. This implicates that they can perform the competency independently. Van Braak et al. (2004) defined computer competence as being able to handle a wide range of varying computer applications for various purposes. The respondents are “literate” in making computation, using formula, and creating graphs using spreadsheets. The respondents still assistance using these applications. Research has shown that teachers require an expert in technology to show them how to integrate ICT to facilitate students‘ learning (Plair, 2008). Thus, when teachers are given time to practice with the technology, learn, share and collaborate with peers, it is likely that they will integrate the technology into their teaching (Buabeng-Andoh, C., 2012).

Table 4

Level Of Literacy on Standard 2

Standard 2	Mean	Descriptive Equivalent
1. Use a word processor to enter and edit text and images	3.54	Much Literate
2. Format text, control margins, layout and tables	3.38	Much Literate
3. Print, store and retrieve text documents from a word processor	3.22	Literate
4. Use a calculation spreadsheet to enter data, sort data and format cells into tables	2.40	Moderately Literate
5. Make computation, use formula and create graphs using spreadsheets	2.19	Moderately Literate
6. Print and store data tables using a spreadsheet application	2.47	Moderately Literate
7. Use a presentation package to add text and sequence a presentation	2.86	Literate
9. Enhance slide presentations by adding sound, customizing animation and inserting images	3.00	Literate
10. Print presentation handouts and store slide presentations	2.93	Literate
11. Make effective class presentations using the slides and LCD projector	2.93	Literate
12. To acquire digital images and other media from web sites, CD, flash drives, etc.	2.95	Literate
13. Crop, scale, color correct and enhance digital images	2.86	Literate
14. Play various media files using appropriate media players	2.93	Literate
15. Stitch together video footages and sound tracks and add simple enhancements - transitions, titles, etc.	2.48	Moderately Literate
16. Attach scanners, cameras, cell phones to acquire digital images	2.67	Literate
17. Store digital images using optical media (CD, DVD, flash disk) and online repositories	2.85	Literate
Average Weighted Mean	**2.85**	**Literate**

Standard 3. Understand and effectively use the Internet and network applications and resources.

The level of literacy of teachers in technology operations and concepts standard 3 is shown in Table 5. The level of literacy of teachers is “literate” which indicates that they can perform the competencies needing least assistance. The teachers are “Much Literate” in connecting their computer devices to the internet. This implies that the teachers can perform the competency independently. Access to the internet is not limited to the use of a personal computer; nowadays, there has been an increase in mobile users in the Philippines, from 6,454,359 million in 2000 to 120,255,00 million in 2015 (ICT Data and Statistics, International Telecommunication Union).

On the other hand, the respondents are literate in downloading and installing relevant applications, including freeware, shareware, updates, patches, viewers, and support applications. This means that teachers can perform the competencies with least assistance. This may be attributed to the fact that respondents do not frequently use these features when they use computers because they are unaware of their benefits. According to Teo (2008), using computers more frequently and developing a variety of computer-related skills and techniques increases one‘s knowledge of the computer as a whole. Another could be the respondents' lack of technical support and/or training. The lack of available technical support is also likely to lead to teachers avoiding ICT for fear of a fault occurring that cannot be rectified and lessons being unsuccessful as a result (Becta, 2004; see Cuban, 1999; Preston et al., 2000).

Table 5

Level Of Literacy on Standard 3

Standard 3	Mean	Descriptive Equivalent
1. Connect to the internet	3.20	Literate
2. Send and receive emails with attachments, manage emails	2.85	Literate
3. Effectively use synchronous and asynchronous web-based communication tools like instant messengers, voice and teleconferencing	2.80	Literate
4. Effectively use search engines, web directories and bookmarks	2.84	Literate
5. Download and install relevant applications including freeware, shareware, updates, patches, viewers and support applications	1.89	Moderately Literate
Average Weighted Mean	**2.72**	**Literate**

Standard 4. Demonstrate knowledge and skills in information and data management.

The level of literacy of teachers under standard 4 focusing on the demonstration of knowledge and skills in information and data management is shown in Table 6. The level of literacy of teachers is “Literate” which indicates that the teachers can perform the competencies with least assistance. Perceived by the respondents, they are “Literate” in

searching and collecting textual and non-textual information from online and offline resources. This implies that they can work on this competency with minimal assisatnce.

Also, teachers are “Literate” in terms of acknowledging properly the different offline and online resources. This means that the teachers need least assistance when performing the competency. Gathering sources for research is now relatively easy because of the Internet. However, the increasing use of the Internet by students is creating a serious problem (McCabe, D., 2005). Through his study, McCabe, D. (2005) found out that high school students who participated in focus groups said that teachers were not as Internet-savvy as their students and were unlikely to detect Internet plagiarism. As defined by Oxford Dictionaries, "plagiarism" is the practice of taking someone else‘s work or ideas and passing them off as one‘s own. Noting the lowest mean of 2.65, this literature supports why teachers should know the proper way of doing citations for both online and offline sources to be able to guide their students on the proper way of gathering information.

Table 6

Level Of Literacy on Standard 4

Standard 4	Mean	Descriptive Equivalent
1. Search and collect textual and non-textual information from online and offline sources	3.22	Literate
2. Efficiently store and organize collected information using directories, drives, or databases	3.05	Literate
3. Distribute, share, publish and print information via print or web	2.75	Literate
4. Properly acknowledge information sources – online and offline	2.65	Literate
Average Weighted Mean	**3.22**	**Literate**

Overall Level of Literacy of Teachers in Technology Operations and Concepts

The level of literacy of teachers in technology operations and concepts is shown on Table 7. The level of literacy of teachers is “Literate” which indicates that the teachers can perform the competencies with least assistance. This implies that teachers need minimal assistance in performing the competencies in terms operations and concepts. The proliferation of technologies has complicated the teaching-learning process, and finding the

best way to integrate technology into classroom practices is one of the challenges 21st century teachers face. Effectively integrating ICT into learning systems is much more complicated than providing computers and securing a connection to the Internet. The integration of ICT is associated with a shift from instructivist to constructivist philosophies of teaching and learning (Barker et al., 2007).

Table 7

Level of Literacy of Teachers in Terms of Technology Operations and Concepts

Standards	Mean	Descriptive Equivalent
1. Demonstrate knowledge and skills in basic computer operation and other information devices including basic troubleshooting and maintenance	3.33	Much Literate
2. Use appropriate office and teaching productivity tools	2.85	Literate
3. Understand and effectively use the Internet and network applications and resources	2.72	Literate
4. Demonstrate knowledge and skills in information and data management	3.22	Literate
OVERALL Weighted Mean	**3.04**	**Literate**

Level of Literacy of Teachers in Terms of Pedagogy

The level of literacy of teachers in terms of pedagogy is shown in Table 8. The level of literacy of teachers is “Literate” which indicated that the teachers can perform the competencies with least assistance. The teachers are “Much Literate” on the use electronic means of administering quizzes and examinations. This implies that the teachers can perform the competency independently. Rubrics can be used for grading a large variety of assignments and tasks: research papers, book critiques, discussion participation, laboratory reports, portfolios, group work, oral presentations, and more. The use of rubrics is also supported by the Department Education under DO 73, s. 2012 wherein rubrics are given for the assessment and rating of learning outcomes for the different levels of assessment. As earlier stated, COVID-19 reiterated the need to innovate ways of delivering lessons as well as assessing learning. In the locale of this study, teachers were trained to design assessment tools distributed during the distance learning and were electronically treated. This leads to the achievement of the respondents high literacy on the use of electronic means of administering quizzes and examinations. This coincides with the finding of

Jonassen's (2000) study that the use of ICT in education can increase students' motivation, deepen their understanding, promote active, collaborative, and lifelong learning, offer shared working resources and better access to information, and help them to think and communicate creatively (Jonassen, 2000; Webber, 2003). Thus, teachers should have all the necessary resources, such as ICT infrastructures, equipment, and materials, to better serve our clients in this vastly changing world.

On the other hand, teachers are "Literate" on the of use emails, group sites, blogs, etc. for disseminating information directly to students, colleagues and parents. This means that the teachers can perform the competency needing least assistance. Social media is a communication mechanism that allows users to communicate with thousands, and perhaps billions, of individuals all over the world (Williams et al., 2012). According to the website Statista, as of the first quarter of 2016, Facebook had 1.65 billion monthly active users. Additionally, close to 40 million people in the Philippines accessed social networks in 2015. The most popular social networks and mobile messenger apps were Facebook, with a 45% reach among internet users, followed by Google+, Instagram, and Facebook Messenger (Statista, 2016). Teachers are among these numbers. It has already become a necessary mode of communication among teachers, parents and all stakeholders. Group chats are used to disseminate information in the field. This leads to the attainment of literacy among teachers in emails, group sites, blogs, etc. to collect information and feedback directly from students, colleagues and parents. However, there are still a number of teachers and parents as well who prefer to communicate face to face.

Table 8

Level of Literacy of Teachers in Terms of Pedagogy

Pedagogy	Mean	Descriptive Equivalent
Standard 1 1. Encourage students to do data analysis, problem solving, decision making and exchange of ideas	2.59	Literate
Standard 2 2. Use appropriately slide presentations, videos, audio and other media in the classroom	2.69	Literate
Standard 3 3. Use various synchronous and asynchronous communication tools (email, chat, white boards, forum, blogs)	2.74	Literate
4. To facilitate cooperative learning and exchange of ideas and information	2.73	Literate
Standard 4 5. Design rubrics for assessing student performance in the use of various technologies	2.69	Literate
6. Use electronic means of administering quizzes and examinations	3.04	Literate
7. Analyze assessment data using spreadsheets and statistical applications	2.72	Literate
Standard 5 8. Use emails, group sites, blogs, etc. for disseminating information directly to students, colleagues and parents	2.29	Moderately Literate
9. Use emails, group sites, blogs, etc. to collect information and feedback directly from students, colleagues and parents	2.44	Moderately Literate
Standard 6 10. Explore the use of electronic assessment tools like online testing, submission of projects via email or online facilities	2.48	Moderately Literate
Set up online databases or repositories of student works	2.59	Literate
OVERALL Weighted Mean	**2.63**	**Literate**

Difference in the Level of Literacy in ICT in Technology Operations and Concepts, and Pedagogy

According To Age.

Table 9 shows that the null hypothesis is rejected. There is a significant difference in the level of literacy of teachers in technology operations and concepts in terms of age. The younger teachers have higher level of literacy compared to older teachers. This implies that teachers vary in their level of computer literacy as they get older. According to Prensky (2001a), students born after roughly 1980 are “digital natives” because they have grown up with digital media and spend a great deal of time engaging with new digital devices and exploring online. Additionally, youth born after roughly 1980 are presumably used to parallel

processing (simultaneously processing different incoming stimuli) and multitasking (completing different tasks simultaneously), and regard gaming as “serious” work.

Similarly, the difference in terms of age in the level of literacy of teachers in pedagogy, the null hypothesis is rejected. There is a significant difference on the level of literacy of teachers in pedagogy in terms of age. Teachers’ integration of ICT in the delivery of the lesson is affected by age. Same result was found in the study conducted by Payyac (2010) that the level of literacy of TLE teachers of Public Secondary Schools of Tabuk City manifested a significant difference on the responses along age groups.

Table 9

Difference in the Level of Literacy in ICT as to Age

Technology Operations and Concepts							
Source of Variation	*SS*	*df*	*MS*	*F*	*P-value*	*F crit*	*Decision*
Between Groups	28.39278	3	9.464259	61.01	2.69E-24	2.68	Reject Null Hypothesis
Within Groups	19.23681	124	0.155136				
Total	47.62958	127					
Pedagogy							
Source of Variation	*SS*	*df*	*MS*	*F*	*P-value*	*F crit*	
Between Groups	11.87542	3	3.958473	7.58	0.000471	2.87	Reject Null Hypothesis
Within Groups	18.80015	36	0.522226				
Total	30.67557	39					

According To Length of Service.

Table 10 shows that the null hypothesis is rejected. There is a significant difference on the level of literacy of teachers in technology operations and concepts in terms of length of service. The younger teachers in the service have higher level of literacy compared to those who already taught more than 16 years. This implies that teachers who already taught less than 6 years are more literate in terms of technology operations and concepts. In a similar study conducted by Payyac (2003), it was revealed that the youngest group of teachers is better exposed to the use of technological advancements as they themselves are products of an academic environment with computer lessons. It is expected that the young

teachers are very knowledgeable about computer use because they learned their skills as individuals preparing for a career during their formative years. Thus, they are really supposed to be more knowledgeable than their older colleagues, who in their younger years did not have the benefit of its usage.

Similarly, the difference in terms of length of service in the level of literacy of teachers in pedagogy, the null hypothesis is rejected. There is a significant difference on the level of literacy of teachers in pedagogy in terms of length of service. This implies that new teachers in the service are more knowledgeable about designing lessons and using computers for easy assessment. Prensky (2001a) revealed that ICT competence, the number of years of teaching experience, and the number of attended ICT trainings are highly significant. This means that respondents with fewer years of teaching experience assess themselves as more competent in the use of ICT in teaching. This result is consistent with his finding on the relationship between their age and level of ICT competence. That is, younger teachers are more likely to be exposed to technology-driven education. They were already trained before emerging to the field of education.

Table 10

Difference in the Level of Literacy in ICT as to Length of Service

Source of Variation	*SS*	*df*	*MS*	*F*	*P-value*	*F crit*	
Technology Concepts and Operations							**Decision**
Between Groups	47.5534	3	15.85113	151.1038	3.05E-41	2.677699	
Within Groups	13.00788	124	0.104902				Reject Null Hypothesis
Total	60.56128	127					
Pedagogy							
Between Groups	22.19762	3	7.399207	45.00075	2.88E-12	2.866266	Reject Null Hypothesis
Within Groups	5.919268	36	0.164424				
Total	28.11689	39					

According To Educational Attainment

Table 11 shows that the null hypothesis in terms of technology operations and concepts is acted. This means that there is no significant difference in terms of educational attainment. This implies that teachers in Northern Tabuk District II, regardless of educational background, know the functions and uses of the different ICT materials available in the school. This result agrees with the study of Payumo (2017), which also revealed that educational attainment among teachers does not have a bearing on their ICT competence. Most postgraduate education curricula do not emphasize computer application and operation.

On the other hand, the null hypothesis in terms of pedagogy is rejected. This means that there is a significant difference on the level of literacy of teachers in terms of educational attainment. This implies that teachers, regardless of educational background, use ICT in the delivery of lessons. This contrasts with the study of Lacuesta (2003), which revealed that there is a significant difference on the level of computer literacy among workers of Local Government of Tabuk City based on educational attainment.

Table 11

Difference in the Level of Literacy in ICT as to Educational Attainment

Source of Variation	*SS*	*df*	*MS*	*F*	*P-value*	*F crit*	*Decision*
Technology Operations and Concepts							
Between Groups	2.406713	2	1.203357	1.33	0.27	3.09	The null hypothesis is accepted
Within Groups	92.23714	102	0.904286				
Total	94.64385	104					
Pedagogy							
Between Groups	1.772681	2	0.88634	2.343444	0.115222	3.35	The null hypothesis is rejected
Within Groups	10.21198	27	0.378221				
Total	11.98466	29					

According to Number of Trainings Attended Related to ICT

Table 12 shows that the null hypothesis is rejected. There is a significant difference on the level of literacy of teachers in technology operations in terms of number of trainings attended related to ICT. This implies that teachers apply whatever learning they gain from attending training to their respective schools. Their level of computer literacy increases with more training sessions. Moreover, teachers who attend more training as expected are more knowledgeable in the use of computers so they can do their work easier. The teachers who have less training are the old teachers that held the least positive attitude towards the use of computers. They are generally fearful and stressful of changes that involve new and complex technologies that is why they do not use computers (Payyac, 2017).

Similarly, the null hypothesis is rejected on the level of pedagogical literacy of teachers in terms of the number of trainings attended related to ICT. This means that there is a significant difference on the level of literacy of teachers in pedagogy in terms of number of trainings attended. This means that teachers apply pedagogical features of computer-related training in their delivery of lessons such as in assessing and integrating lessons using different multimedia. Integrating ICT into teaching and learning is a complex process and one that may encounter several difficulties. These difficulties are known as “challenges” (Schoepp, 2005). A challenge is defined as “any condition that makes it difficult to make progress or to achieve an objective” (WordNet, 1997, as cited in Schoepp, 2005, p. 2).

Table 12

Difference in the Level of Literacy in ICT as to Number of Trainings Attended Related to ICT

Source of Variation	*SS*	*df*	*MS*	*F*	*P-value*	*F crit*	*Decision*
Technology Operations and Concepts							
Between Groups	18.97743	2	9.488713	139.6617	9.7E-29	3.094337	The null hypothesis is rejected
Within Groups	6.318486	93	0.067941				
Total	25.29591	95					
Pedagogy							
Between Groups	8.087422	2	4.043711	60.52772	1.05E-10	3.354131	The null hypothesis is rejected
Within Groups	1.803805	27	0.066808				
Total	9.891227	29					

Challenges experienced by the teacher on the use of ICT

Table 13 shows that the challenges of teachers on the use of ICT is rarely observed. This means that these challenges faced by the teachers were experienced once or twice and they can find solutions on their own. This is attributed to the high literacy level of teachers in terms of technology operations and pedagogy applied in their respective schools. However, some teacher-respondents said they are using their personal computers, speakers, and other multimedia equipment to meet the demand of the new trend in education. Moreover, insufficient technical assistance are sometimes experienced by the teachers. This can be attributed to teachers who are designated as ICT coordinators in schools with full-time teaching loads. As a result, they have little time to devote to providing technical assistance to their fellow teachers.

In Sicilia's study (2005), technical problems were found to be a major barrier for teachers. These technical barriers included waiting for websites to open, failing to connect to the Internet, printers not printing, malfunctioning computers, and teachers having to work on old computers. "Technical barriers impeded the smooth delivery of the lesson or the natural flow of the classroom activity" (Sicilia, 2005, p. 43).

Table 13

Extent of Occurrence on Challenges Experienced by the Teachers on the use of ICT

Challenges	Mean	Descriptive Equivalent
1. Insufficient number of computers	1.56	Rarely
2. Insufficient number of internet-connected computers	1.73	Rarely
3. Insufficient internet speed	1.72	Rarely
4. School computers out of data and/or needing repair	1.60	Rarely
5. Lack of adequate skills of teachers	1.56	Rarely
6. Insufficient technical support for teachers	1.79	Sometimes
7. Insufficient pedagogical support for teachers	1.67	Rarely
8. Too difficult to integrate in ICT use into curriculum	1.67	Rarely
9. Lack of pedagogical models on how to use ICT for learning	1.67	Rarely
10. School space organization (classroom size and furniture etc.)	1.74	Rarely
11. Most teachers not in favor of using ICT in school	1.66	Rarely
12. Using ICT in teaching and learning not being a goal in our school	1.75	Rarely
13. Others, pls specify:		
Overall Weighted Mean	**1.68**	**Rarely**

Conclusions and Recommendations

Conclusions

This study, which aims to assess the level of computer literacy of teachers in Northern Tabuk District II, revealed that:

1. The teachers' level of literacy ICT technology operations and concepts; and pedagogy is "Literate" wherein they can perform the competencies with least assistance.
2. Significant differences were noted on the ICT literacy level of teachers as to age, length of service, and number of trainings attended related to ICT. On the other hand, there is no significant difference in terms of highest educational attainment on teachers ICT literacy level.
3. The extent of occurrence of the challenges experienced by the teacher on the use of ICT is "Rarely" indicating that the challenges were experienced once or twice, and they can find solutions on their own.

Recommendations

With these conclusions, it is highly recommended that:

1. To attain "Much Literate" in technology operations and pedagogy, teachers are encouraged to enhance computer skills by using the different computer applications specially on the use of online and offline help facilities for troubleshooting and maintenance, making computation, use formula and create graphs using spreadsheets, use of electronic assessment tools like online testing, submission of projects via email or online/ offline facilities.

2. Provision of technical assistance to teachers should be consistently conducted focusing on age older age groups.
3. To have a smooth implementation of ICT related activities in the school, leaders of the department should provide necessary ICT infrastructures, technical support, time,

and promote access to available facilities to encourage teachers to use ICT in the delivery of lessons.

4. ICT coordinators in schools should not be given a full-time teaching load to conduct rigid mentoring and coaching to fellow teachers for continuous improvement of their computer literacy.

5. Similar studies should be conducted in other districts in the Division of Tabuk City.

Dissemination and Advocacy Plans

The results of this study will be cascaded to the teachers of Northern Tabuk District II through their learning action sessions for them to be aware of their strengths and weaknesses as a school. With this, appropriate training designs will be formulated and implemented. Thus, the results of this study will serve as the blueprint of the district in coming up with trainings related to ICT.

References

Abad, F. (2004). Policy Directions for ICT Use in Primary and Secondary Schools in the Philippines. Paper delivered during the First National ICTs in Basic Education Congress, 6-7 December 2004, Cebu City, Philippines.

Abecede, M. (2003). “Projects: ICT in Education. UNESCO Bangkok. Policy.” http://www.unescobkk.org/index.php?id=1229

Andal, R. (April 03, 2002). 3-4 guro sa public schools hindi marunong gumamit ng computer, Pilipino Star Ngayon.

Becta, A. (2004). review of the research literature on Barriers to the uptake of ict by teachersa. London, UK, BECTA) http://publications. becta. org. uk/display. cfm.

Beskeen, D. et. al. (2009). Microsoft Office 2007 Illustrated: Introductory Premium Video Edition, Cengage Learning Inc. United States of America.

Buabeng-Andoh, C. (2012). An exploration of teachers‘ skills, perceptions and practices of ICT in teaching and learning in the Ghanaian second-cycle schools. Contemporary Educational Technology, 3(1), 36-49.

Cajilig, N. G. (2011). Integration of Information and Communication Technology in Mathematics Teaching in Metro Manila Public Secondary Schools. Education Quarterly, 67(1).

Dollado, R. F. Jr. (2002). “A Computer Education Program for the Teachers of Calbayog Pilot Central School: A feasibility study.” Unpublished Master’s Thesis, Tiburcio Tancinco Memorial Institute of Science and Technology, Calbayog City.

IFIP Curriculum-Professional Development of Teachers . Retrieved April 4, 2005

ISTE National Educational Technology Standards for Teachers . Retrieved April 4, 2005

International Telecommunication Union. (2015). ICT Facts and Figures - The World in 2015. ITU.

Johnson, D. W. (1991). Cooperative Learning: Increasing College Faculty Instructional Productivity. ASHE-ERIC Higher Education Report No. 4, 1991. ASHE-ERIC Higher

Education Reports, George Washington University, One Dupont Circle, Suite 630, Washington, DC 20036-1183.

McCabe, D. (2005). Cheating: Why students do it and how we can help them stop. Guiding students from cheating and plagiarism to honesty and integrity: Strategies for change, 237-246.

Mason, J., & McMorrow, R. (2006). YACLD (yet another computer literacy definition) [Electronic Version]. Journal of Computing Sciences in College, 21(5), 94-100.

National Framework Plan for ICTs in Basic Education (2005-20010) Harnessing ICTs for Quality Basic Education for All.

Payyac, D.T. (2003), "The Computer Literacy of Teachers in Northern Pinukpuk District, Division of Kalinga," Unpublished Master's Thesis, Kalinga-Apayao State College, Tabuk, Kalinga

Payumo, Lilia (2017). "ICT Literacy of Teachers in Kalinga Division: Basis for Development Plan." Unpublishe thesis, Kalinga State University, Tabuk City, Kalinga

Pelgrum, W. J. (2001). *Obstacles to the integration of ICT in education: results from a worldwide educational assessment*. *Computers & Education, 37*, 163-178.

Plair, S. (2008). Revamping professional development for technology integration

Preston, C., Cox, M., Cox, K. (2000). Teachers as innovators: an evaluation of the motivation of teachers to use Information and Communications Technology. MirandaNet

Robles, M. (2006). Designing and Implementing an Effective Teacher Professional Development Program on ICT Integration: A Framework for Decision-Making.

Rodriguez, C. (2007). Building teachers' capacity to make better use of ICT in Philippines schools

Slavin, R. E. (1987). Cooperative learning and the cooperative school.DOCUMENT RESUME EA 023 724 Brandt, Ronald S., Ed. Cooperative Learning and the Collaborative School: Readings from" Educational Leadership., 45, 2.

Statista: The Statistics Portal (2016). Number of Facebook users in the Philippines from 2014 to 2019 (in millions).

Teo, T. (2008). Pre-service teachers‘ attitudes towards computer use: A Singapore survey. Australasian Journal of Educational Technology

Tinio, V. L. (2002). Survey of Information & Communication Technology Utilization in Philippine Public High Schools. Foundation for Information Technology Education and Development.

Turner, L. (2005). 20 Technology Skills Every Educator Should Have. The Journal.

van Braak, J., Tondeur, J., & Valcke, M. (2004). Explaining different types of computer use among primary school teachers. European Journal of Psychology of Education, 19(4), 407-422.

Valenzuela, M. F. (March 2005). “Perceived Technology Orientation and Competency of Non-Computer Teachers in Dasmarinas National High School–Main: Input for Staff Development.” Unpublished Master’s Thesis. Technological University of the Philippines, Manila.

Veer, U. (2005).Modern Teacher Training, Anmol Publications Pvt. Ltd. Daryagani, New Delhi

Veerman, A., & Veldhuis-Diermanse, E. (2001, March). Collaborative learning through computer-mediated communication in academic education. In Euro CSCL (pp. 625-632)

Williams, D.L., Crittenden, V.L., Keo, T. and McCarty, P. (2012), —The use of social media: an exploratory study of uses among digital natives‖, Journal of Public Affairs, Vol. 12 No. 2, pp. 127-136.

Financial Report

Supplies and Materials							
Activity	Item	Unit	Quantity	Estimated Cost	Total	Actual Cost	Total
Implementation of the study, Preparation of Research Papers, and Tools	A4 bond papers	Ream	10	250	2500	280	2800
	A4 Folder Tagboard with Fastener	Pc	25	20	500	25	500
	Printer Ink Black	Bottle	10	300	3000	300	3000
	Printer Ink cyan	Bottle	2	300	600	300	600
	Printer Ink magenta	Bottle	2	300	600	300	600
	Printer Ink yellow	Bottle	2	300	600	300	600
	USB Flash Drive	Pc	1	1000	1000	1000	1000
Domestic and Travel Expenses							
Submission of First Tranche Deliverables with wet signatures	Courier/ Private Vehicle		1	350	350	350	350
Communication Expenses for the Implementation/ Conduct of the Study							
Validation of Instruments	Load of Validators	card	5	500	2500	600	3000
Implementation of the study – Data Gathering/ Collection, Preparation of Research Papers and other documents	Regular Load of Proponent	Card	8	500	4000	500	4000
	Internet Load of Proponent	card	8	500	4000	500	4000
				TOTAL	19 650		20, 450

Prepared by:

JAYSON B. ADUCA
Proponent