

Research Article

Readiness and exposure to information and communication technology instructional resources among pre-service teachers

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Readiness of teachers to use Information and Communication Technology [ICT] to teach is currently a major issue in the education system as it plays a significant role to teacher-learning continuity due to its relationship to flexible teaching/learning as the country's education response during pandemic. Preparing future teachers to use ICT to teach effectively to facilitate variety of learning modes is an enormous challenge for teacher training institutions. In this study, the ICT readiness of the 148 pre-service teachers in the College of Education was assessed. Quantitative design was used utilizing a validated and reliability tested researchers' made survey questionnaire. The data are analysed using frequency and percentage distribution, Mean, Mann-Whitney U test and Kruskal Wallis Test. Generally, the pre-service teachers are ready to use ICT to teach while access to ICT enabling environment and infrastructure at school is moderate. Likewise, pre-service teachers are exposed to ICT in teaching and have experience the pedagogical use of ICT in school and their field of placements and they gain confidence to integrate ICT in teaching-learning process. Finally, pre-service teachers consider technology integration as the future of teaching and learning that will change the landscape of the Philippine Education System towards achieving sustainable development goal 4 'Quality Education'.

Keywords: ICT integration readiness and exposure; ICT teaching-learning; Pre-service teacher education; Student teachers' programs

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1. Introduction

The use of Information and Communication Technology [ICT] in teaching and learning has gained recognition globally as essential for the achievement of sustainable development via education. Hence, teacher training institutions should aim to produce well-motivated teachers who are capable of adopting appreciable expertise in pedagogy and utilizing ICT in teaching through streamlined academic policies. At present, the readiness of teachers to use ICT to teach, which supports online teaching, is crucial and of paramount consideration to disruption-responsive education (Li & Lalani, 2020; UNESCO, 2020).

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The preparation of all teachers to use ICT to facilitate a variety of online learning is an enormous responsibility of teacher training institutions. For optimal success in the utilization of ICT in education, especially in developing countries like the Philippines, all teachers irrespective of gender should be trained and encouraged to integrate ICT into their teaching at all levels (Egede, 2021).

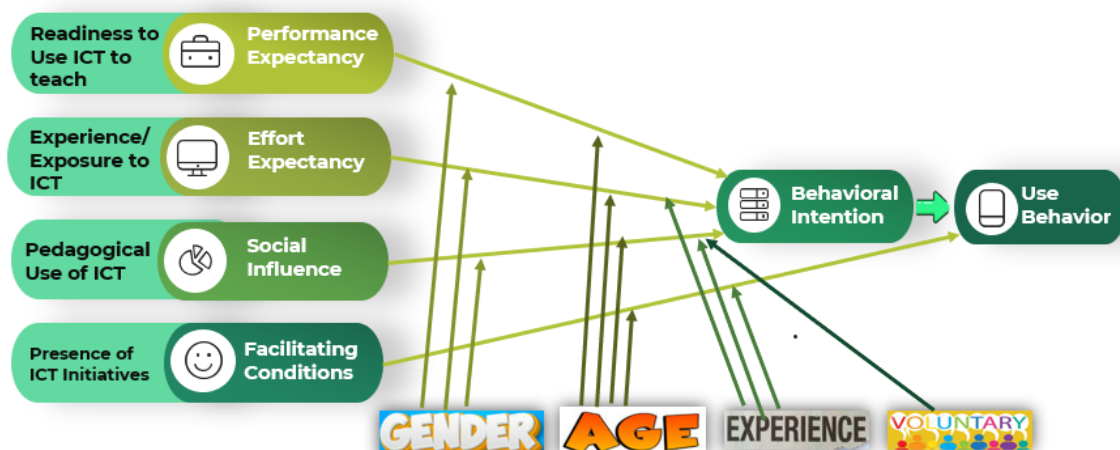
Integrating ICT into teaching and learning is a complex process that requires preparedness to make the learning more meaningful and fruitful. As highlighted by Ramirez-Montoya et al. (2017), teachers' preparedness to use ICT in education effectively, together with their digital competence, becomes vital and recognized as the key element for the construction of useful pedagogical knowledge for practice, thus improving students' learning. The integration of ICT in the classroom will help teachers create lessons that allow students to construct their knowledge and improve problem-solving skills through simulation, manipulation, mind-mapping, guided discovery, and creative expression (Eickelmann & Vennemann, 2017). As an agent of change and a facilitator of learning, teachers must be prepared to accept the paradigm shift in learning and teaching because of technology integration (Avidov-Ungar & Shamir-Inbal, 2017). To sum up, to successfully attain ICT integration in education, all parties must cooperate and participate in infusing ICT in the teaching and learning process (Hero, 2019; Roblin et al., 2018).

While ICT integration in education shows potential and advantages in the learning process, still teachers' preparedness and utilization (acceptance), and also its implementation seems to develop slowly in attaining its goals in the education process. Still, many countries, especially those belong to the developing world, facing the same dilemma and problems in ICT in education. Chai et al. (2011) reported that teachers' preparedness and use of ICT infrequently and more for information transmission than the promising benefits mentioned above.

With the Coronavirus disease (COVID-19) besetting more countries worldwide, it brought changes to society, most especially in education. In the Philippines to continue the learners' education, the Department of Education [DepEd] and the Commission on Higher Education [CHED] encourages the teachers to fully maximize the utilization of ICT in teaching to keep the learners safe from the threat of the virus. Thus, teachers are now at the height of embracing and accepting the changes already happening in the country. And since that there were no clear national vision or direction and no related national standards to meet in terms of ICT integration in teaching (Hero, 2020; Vergel de Dios, 2016), it is the intention of this study to evaluate and describe the pre-service teachers' preparedness and acceptance towards ICT integration and to determine differences of teachers' preparation and ICT integration.

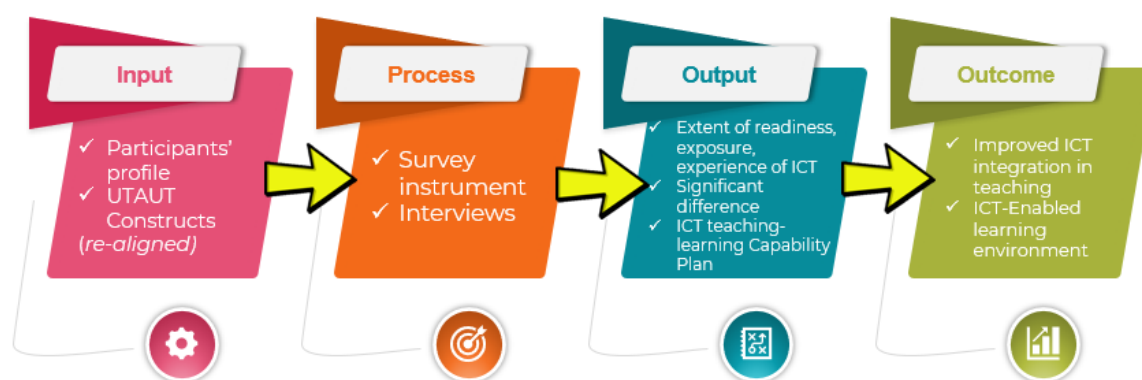
The study is grounded on the Unified Theory of Acceptance and Use of Technology (UTAUT) Model of Venkatesh et al. (2003). According to UTAUT's theoretical paradigm, behavioral intention determines actual technology use. The anticipated likelihood of adopting the technology is influenced by four important constructs: performance expectancy (readiness to use ICT to teach), effort expectancy (experience/exposure to ICT), social influence (pedagogical use of ICT), and facilitating factors (presence of ICT initiatives). Age, gender, experience, and voluntariness of use all moderate the effect of predictors (Venkatesh et al., 2003). Performance expectancy is the capability of the technology to providing benefits and enhancing the performance to the user according to his/her expectations (Venkatesh et al., 2003). Effort expectancy is the users' expectations about the ease of use of technology (Venkatesh et al., 2003). On the other hand, social influence is the expected influence of others on the user to start and continue using the technology (Venkatesh et al., 2003). While facilitating conditions is the expected level of organizational and technical infrastructure that can support the use of technology (Venkatesh et al., 2003) Figure 1 below illustrates the UTAUT theoretical model as anchorage of the study.

Figure 1
The UTAUT Theoretical Model (Venkatesh et al., 2003)



Moreover, Figure 2 illustrates the conceptual framework of the study that explains the interplay or relationship of the variables and/or parameters or constructs/indicators considered in the study. The researchers utilized the input-process-output-outcome framework that guides the researchers and the readers as to how the study was conducted. The input includes the identification of the profile of the participants and the UTAUT constructs as re-aligned to include, readiness to use ICT to teach, experience/exposure to ICT, pedagogical use of ICT, and presence of ICT initiatives. The conduct of the study was done using the validated and reliability tested survey instrument and random interviews were used during the validation of responses. The processing and evaluation of data results to the extent of readiness, exposure, and experience to ICT in teaching-learning and shows whether a significant difference exists in the constructs as influenced by the participants' profiles. ICT integration in the teaching-learning capability program and the plan is expected to be implemented towards an improved ICT integration in the classroom or in education and the provisions of ICT-enabled learning environment.

Figure 2
Schematic Diagram Illustrating the Conceptual Framework of the Study



1.1. Statement of the Problems

The study's goal was to identify the factors influencing the preparation and use of ICT instructional resources among pre-service teachers. Particularly, the study sought answers a response to the following questions:

RQ 1) What characteristics best describe the pre-service teachers such as a) age; b) gender; c) civil status; and d) field of study.

RQ 2) How prepared are aspiring teachers to use ICT in the classroom during the COVID-19 pandemic: a) consciousness and drive; b) ICT in teaching and learning

perceptions; c) utilizing technology for networking and/or communication; d) utilizing technology for personal growth and education; and e) access to ICT enabling environment and infrastructure.

RQ 3) What is the extent of aspiring teachers' ICT experiences and exposure to teaching-learning in relation to:

- A) Technology
 - a. technological devices used in the course taken
 - b. technical equipment accessible in the institution
- B) Pedagogical use of ICT
 - c. extent use of technology present in the courses taken
 - d. extent use of technology present in the field of placements
 - e. extent confident in implementing technology in the following areas;
 - f. c.1 use of technology for networking and/or communication
 - g. c.2 using technology for personal growth and education
 - h. c.3 utilizing technology as a management tool
 - i. c.4 future technology integration

RQ 4) What is the importance of technology integration in the classroom among future teachers?

RQ 5) Is there a significant difference in aspiring teachers' readiness to use ICT to teach based on their demographic profile?

RQ 6) Is there a significant difference in the extent of aspiring teachers' experiences and exposure to technology in teaching based on their profiles?

RQ 7) Is there a statistically significant difference in the extent of aspiring teachers' experiences and exposure to pedagogical use of technology in teaching based on their profiles?

2. Methodology

2.1. Research Design and Participants

A descriptive research design utilizing quantitative analysis was used in the conduct of the study participated exclusively by 148 pre-service teachers of the college of education of Northern Negros State College of Science and Technology [NONESCOST]. The College of Education has a total pre-service teacher of 236 during the academic year 2021-2022 across all programs, where 71 are male and 165 are female as based on College registrar's record using the Student Information and Accounting System [SIAS]. Of the 236 pre-service teachers 148 (63%) participated the study. Table 1 shows the summary of the participants of the study categorized as to profile. As can be seen from Table 1, 60 percent of the participants are 18-22 years old, where 103 are female and 139 are single. In terms of program; 58 percent are Bachelor in Secondary Education, 32 percent are Bachelor in Technology Livelihood Education, and 10 percent are Bachelor in Physical Education. This implied that teacher education program is still subscribed mostly by female or women. Numerous studies have affirmed how teaching as a profession has been regarded as feminine work. According to Mim (2020), economic factors contribute to masculine and feminine work experience and because of this; teaching is viewed with the assumed gender-related characteristics that go with it. Similarly, a majority of women are observed in the teaching sector since "they feel accepted" and the profession provides them tenure (Wang & Samba, 2019). Perceptions of teaching as "women's work" (Kelleher, 2011) are very much evident in the feminization of teaching. This is true at the primary level where 67% of teachers are females and 54% at the secondary level as of 2020 according to World Bank Data. The same is true in the Philippines where it recorded 87% female teachers at the primary level while 71% female teachers at the secondary level as of 2020 (World Bank, 2022a, 2022b).

Table 1
Profile of the Participants (n=148)

<i>Profile of Respondents</i>	<i>Frequency</i>	<i>Percent</i>
Age		
18-22	88	59.5
23-27	48	32.4
28-32	12	8.1
Gender		
Male	39	26.4
Female	103	69.6
Gender Diverse	4	2.7
Prefer not to say	2	1.4
Civil Status		
Single	139	93.9
Married	9	6.1
Field of Study		
BPED	14	9.5
BSED	86	58.1
BTLED	48	32.4
Total	148	100.0

2.2. Instruments and Data Analysis

A validated and reliability-tested researchers' made survey instrument was used to gather data. Part I of the instrument gathers data on the age, gender, civil status, and field of study of the participants. Part II includes 21 items relating to; pre-service teachers' readiness to use ICT to teach while part III includes items relating to pre-service teachers' experiences and exposure to ICT in teaching-learning with major categories such as; on technology and pedagogical use of ICT and also items relating to importance of ICT integration in teaching-learning. 5-point Likert scale is used for all items under part I and 4-point Likert scale is used for items under part III. The instrument was validated using the Lawshe's Content Validity Ratio [CVR] having a validity index of 0.94 and a reliability Cronbach alpha of .975, interpreted to be very highly valid and very highly reliable, respectively.

Online platform such as Google form and Messenger were utilized in the gathering of data to ensure maximum participation of the pre-service teachers-and participants of the college of education. Aside from the online platform, pre-service teachers who are involved in the limited face-to-face activities of the college were given an instrument for them to answer. The data gathered was treated and analysed using frequency and percentage distribution, mean, Mann-Whitney U test and Kruskal Wallis test. All participants of the study were required to check the informed consent button of the Google form prior to answering the survey instrument. Likewise, they were informed that their participation to the study is voluntary and that participating or withdrawing from the study while it is in progress will not do any harm to them and to the study. The participants at their pace have ample time reading the information sheet before deciding whether they wanted to be involved in the study. Checking the button indicates that they fully understand the purpose of the study and the data collection process and their permission to be part of the study, hence, the administration of the Google form questionnaire is enabled. The anonymity and confidentiality of the participants and their responses were preserved by not revealing their names and identity in the data collection, analysis and reporting of the findings of the study and as well as in the publication and dissemination of results in conferences or research fora.

3. Results and Discussion

3.1. Pre-service Teachers' Readiness to Use ICT to Teach

The use of ICT in education has grown at an exponential rate globally and its advantages have been widely acknowledged in this 21st century. At the tertiary education level ICT gadgets should be available in the educational technology laboratory of teacher-training institutions, where pre-services teachers should have been exposed and acquired basic ICT skills to be able to use ICT to each at the basic educational level. While as important as the concept of ICT is to humanity in the modern society, its usage and acceptance by everybody is not guaranteed. Teachers must accept and be ready to use ICT to teach and their training programmes must be geared towards achieving this. Generally, E-readiness—measuring tool is used to evaluate the ability of consumers in any organization to utilize ICT for their own benefit (Alaa et al., 2017). When applied to education, teachers' readiness can be seen as their perceptions of their capabilities to integrate ICT into their classroom instruction (Inan & Lowther, 2010). A teacher should be mentally and physically prepared to use ICT to teach in the classroom because it is a paradigm shift from the traditional method which has been in use in teaching. Results below revealed the extent of pre-service teachers' readiness to use ICT to teach.

The results of this study, summarized in Table 2, showed that the pre-service teachers generally have high level of readiness to use ICT in teaching as they agreed in terms of awareness and motivation on the use of ICT. Likewise, they also expressed positive and acceptable perceptions about the use of ICT in teaching and learning and high level of readiness on the use of technology for communication and/or networking. Similarly, pre-service teachers also agreed that using technology or ICT contributes to personal and professional development as teachers. However, in terms of access to ICT enabling environment and infrastructure, the pre-services teachers showed a moderate level of readiness indicative of their agreement attributable to the availability of ICT technologies or gadgets provided by the school (KIs interviews to some pre-service teachers). These results is similar to the study of Egede (2021) where pre-service teachers are ready to use ICT to teach in terms of their awareness and motivation, perception about ICT, and confidence to use ICT in teaching. While the study results further suggest that they have internet access in their various locations, they did not possess personal computers/laptops and did not perceive that their training offered them enough ICT skills to use it to teach. Similarly, Padmavathi (2016), that student teachers' possessed positive attitude towards the use of computer for classroom teaching. Studies of Fransica and Samsudin (2018), and Mohammed (2017) showed that, student teachers possessed positive attitude towards the use of ICT to teach but possessed inadequate ICT skills. The results contradict those of Enemali et al. (2016) who found that final year pre-service teachers of their study were not ready.

3.2. Pre-service Teachers' Experiences or exposure to ICT in Teaching-Learning

ICT are increasingly used in education settings, and graduates from teacher education programs are expected to have adequate knowledge and skills to integrate ICT in their teaching. The rapid change in ICT innovations allows exchange of information vastly in just a matter of second. To keep pace with these innovations, the integration of ICT in education is urgently demanded at present as ICT is being used in almost all sectors all over the world. Teachers are demanded to be skilful in operating and integrating ICT during their teaching. Hence, ICT-integrated curriculum in teacher training institutions is a paramount consideration where pre-service teachers' ICT teaching-learning capacity-building programs, projects, and initiatives shall be given more premiums for them to acquire professional digital competence [PDC]. Table 3 presents the pre-service teachers' exposure or experiences to technology in teaching-learning.

Table 2
Extent of Pre-service Teachers' Readiness to Use ICT to Teach (n=148)

Profile of Respondents	Awareness and Motivation			Perception About ICT in Teaching and Learning			Use of technology for communication and/or networking			Use of technology for your own development and learning			Access to ICT Enabling Environment and Infrastructure		
	Mean	SD	VI	Mean	SD	VI	Mean	SD	VI	Mean	SD	VI	Mean	SD	VI
Age															
18-22	4.35	.78	HLR	4.49	.77	HLR	4.05	.73	HLR	4.03	.72	HLR	2.93	1.21	MLR
23-27	4.20	1.24	HLR	4.14	1.03	HLR	3.82	.95	HLR	3.98	1.27	HLR	3.34	1.03	MLR
28-32	4.50	.32	VHLR	4.54	.45	VHLR	3.85	.71	HLR	4.0	.50	HLR	2.79	1.25	MLR
Gender															
Male	4.34	.64	HLR	4.5	.80	VHLR	3.94	.83	HLR	4.06	.69	HLR	3.26	1.18	MLR
Female	4.29	.93	HLR	4.33	1.0	HLR	3.98	.87	HLR	4.0	.83	HLR	3.00	1.29	MLR
Gender Diverse	4.25	.59	HLR	4.38	.95	HLR	3.81	.55	HLR	3.62	.59	HLR	2.5	.70	MLR
Prefer not to say	4.90	.14	VHLR	4.63	.53	VHLR	4.0	.35	HLR	4.13	.18	HLR	3.12	1.24	MLR
Civil Status															
Single	4.33	.83	HLR	4.38	.94	HLR	3.95	.82	HLR	4.01	.79	HLR	3.05	1.23	MLR
Married	4.11	1.08	HLR	4.36	1.07	HLR	4.14	1.25	HLR	4.03	.68	HLR	3.22	1.53	MLR
Field of study															
BPED	4.42	.62	HLR	4.52	.76	HLR	4.0	.66	HLR	4.09	.69	HLR	3.30	1.19	MLR
BSED	4.36	.76	HLR	4.44	.89	HLR	4.03	.73	HLR	4.06	.63	HLR	3.06	1.21	MLR
BTLED	4.20	1.03	HLR	4.22	1.08	HLR	3.82	1.07	HLR	3.90	1.03	HLR	2.99	1.33	MLR
TOTAL	4.31	.85	HLR	4.38	.94	HLR	3.96	.85	HLR	4.01	.78	HLR	3.06	1.24	MLR

Note: Weighted Mean: 1.00-1.49 → Strongly Disagree; 1.50-2.49 → Disagree; 2.50-3.49 → Somewhat Agree Moderate Level of Readiness; 3.50-4.49 → Agree; VLLR: Very Low Level of Readiness; LLR: Low Level of Readiness; MLR: Level of Readiness; HLR: High Level of Readiness.

Table 3
Extent of Pre-service Teachers' Experiences or Exposure to Technology in Teaching-Learning (n=148)

Profile of Respondents	Technological devices used in the course taken			Technical equipment accessible in the institution		
	Mean	SD	VI	Mean	SD	VI
Age						
18-22	2.70	.54	Always	2.52	.49	Free Access
23-27	2.63	.55	Always	2.54	.46	Free Access
28-32	2.67	.47	Always	2.51	.41	Free Access
Gender						
Male	2.60	.63	Always	2.46	.52	Free Access
Female	2.71	.51	Always	2.54	.46	Free Access
Gender Diverse	2.42	.19	Always	2.19	.42	Restricted Access
Prefer not to say	2.73	.08	Always	2.62	.08	Free Access
Civil status						
Single	2.65	.55	Always	2.51	.48	Free Access
Married	2.93	.22	Always	2.52	.51	Free Access
Field of study						
BPED	2.98	.50	Always	2.80	.29	Free Access
BSED	2.67	.49	Always	2.48	.46	Free Access
BTLED	2.59	.60	Always	2.48	.53	Free Access
Total	2.67	.54	Always	2.51	.48	Free Access

Note. In terms of ICT use: 1.00-1.50 → Never; 1.51-2.00 → Rarely; 2.01-3.50 → Always; 3.51-4.00 → Almost always. In terms of ICT access: 1.00-1.66 → Not accessible; 1.67-2.33 → Restricted access; 2.34-3.00 → Free access.

Results showed that pre-service teachers are exposed to technology in teaching and learning with free access provided by the institution to this technological or technical equipment. However, results of the interviews and focus group discussions revealed that provisions of ICT or technological/technical equipment are limited to include only the use of TV sets, LCD projector, limited desktop computers, and limited internet connectivity, hence, optimum provisions of ICT devices or gadgets in teaching and learning are not maximized. Indeed, some of the pre-service teachers are investing their personal resources for ICT devices and gadgets. Study of Lausa and Arceño (2020) reported that teacher education faculty of state universities and colleges have limited utilization and application of ICT or computer-mediated tools, social media, and learning management system for instruction due to limited exposure and access to technology. Likewise, Correos (2014) findings revealed that there was a limited use of ICT in language teaching where teachers experienced challenges that demotivate them from using ICT in language activities. Hence, exposure to technologies and full access to all ICT equipment or gadgets other than mentioned above must be provided with intensive ICT-based trainings as part of the courses taken to equip them with knowledge of ICT and its utilization. Further, Table 4 showed the pre-service teachers' experiences or exposure to pedagogical use of ICT in teaching-learning.

Table 4 showed that pre-service teachers have experienced or generally exposed to pedagogical use of ICT in teaching and learning with regards to the following; use of technology present in the course taken, use of technology present in the field placements, and confidence to integrate technology---for communication and/or networking, for their own development and learning, as a management tool, and for future technology integration. Chang et al. (2014) reported that instructors who received enough training support performed better in the dimension of instructional design and technology use in teaching than instructors who receive little training support. Similarly, study of Lausa and Arceño (2020) support the findings of the study, that the principle that utilization of ICT tools or technology is dependent on the kind of perceptions, exposure, and experience the faculty has during their stay in school. How they acquired their learning, competencies, and the license to teach contribute or gauged their ability to integrate ICT and other technology-based teaching-learning tools.

Table 4
Extent of Pre-service Teachers' Experiences or Exposure to Pedagogical Use of ICT in Teaching-Learning (n=148)

Profile of Respondents	Extent use of technology present in the courses taken			Extent use of technology present in the field placements			Communication and/or networking			Own development and learning			Management tools			Future technology integration		
	Mean	SD	VI	Mean	SD	VI	Mean	SD	VI	Mean	SD	VI	Mean	SD	VI	Mean	SD	VI
Age																		
18-22	3.24	.55	GE	3.27	.57	GE	3.14	.59	GE	3.23	.60	GE	3.24	.56	GE	3.20	.61	GE
23-27	3.27	.57	GE	3.25	.53	GE	3.13	.65	GE	3.17	.63	GE	3.16	.58	GE	3.19	.62	GE
28-32	3.06	.56	GE	2.96	.54	GE	2.89	.43	GE	2.92	.67	GE	3.15	.41	GE	3.06	.48	GE
Gender																		
Male	3.27	.55	GE	3.23	.55	GE	3.13	.67	GE	3.13	.66	GE	3.21	.51	GE	3.26	.52	GE
Female	3.23	.57	GE	3.26	.57	GE	3.14	.57	GE	3.20	.62	GE	3.20	.57	GE	3.16	.64	GE
Gender Diverse	3.00	.07	GE	2.98	.10	GE	2.67	.61	GE	3.25	.50	GE	3.19	.55	GE	3.21	.53	GE
Prefer not to say	3.43	.60	GE	3.00	.00	GE	2.50	.71	GE	3.00	.00	GE	3.38	.53	GE	3.09	.12	GE
Civil Status																		
Single	3.23	.56	GE	3.23	.56	GE	3.10	.61	GE	3.18	.62	GE	3.21	.56	GE	3.19	.61	GE
Married	3.30	.58	GE	3.41	.53	GE	3.26	.43	GE	3.22	.44	GE	3.19	.46	GE	3.20	.46	GE
Field of study																		
BPED	3.37	.61	GE	3.51	.58	GE	3.10	.63	GE	3.14	.53	GE	3.29	.49	GE	3.38	.52	GE
BSED	3.27	.52	GE	3.25	.52	GE	3.17	.59	GE	3.23	.62	GE	3.22	.56	GE	3.19	.59	GE
BTLED	3.13	.60	GE	3.13	.58	GE	3.02	.61	GE	3.10	.63	GE	3.15	.56	GE	3.13	.64	GE
Total	3.24	.56	GE	3.24	.55	GE	3.11	.60	GE	3.18	.62	GE	3.21	.55	GE	3.19	.60	GE

Note. Verbal Description: 1.00-1.50 → Never; 1.51-2.00 → Rarely; 2.01-3.50 → Always; 3.51-4.00 → Almost always. **Verbal Interpretation: NE:** Not Experience/Exposure; ME: Moderate Experience/Exposure; GE: Great Experience/Exposure; VGE: Very Great Experience/Exposure.

3.3. Importance of Technology Integration in Teaching among Future Teachers

Technological devices are developing rapidly which produces relevant and useful devices. The industrial revolution 4.0 (IR 4.0) caused explosion of rapidly-changing technology that makes the world without limits recognized by the occurrence of e-banking and e-learning among others. This shift created a global trend in research and education policy to recognize the need to reform education from the traditional paradigm of teaching and learning into more innovative forms of pedagogical practices that integrate ICT (Hossain et al., 2016). Hence, Education 4.0 drives the new paradigm of educational landscape where educational institutions provide facilities that allows the use of advance technologies including robotics, Internet of Things (IoT), digitalization, automation, and teleconferencing to name a few. Therefore, the 21st century learning demands the integration of ICT in the educational system and the education system should realize and leverage the potential of ICT as a valuable tool in teaching and learning. Table 5 shows the extent of importance of technology integration in teaching among future teachers.

Table 5

Extent of Importance of Technology Integration in Teaching among Future Teachers (n=148)

<i>Following suggestions for helping future teachers to increase the integration of technology in their teaching</i>	<i>Mean</i>	<i>SD</i>	<i>Verbal Interpretation</i>
Better access to technological equipment	3.53	.64	Very Important
Reliability of equipment	3.47	.66	Important
Availability of high-end equipment	3.46	.68	Important
Training/ courses in pedagogical use of ICT	3.58	.61	Very Important
Pedagogical ICT support (e.g. hotline, helpline)	3.51	.64	Very Important
Technological hands-on training/ courses	3.57	.61	Very Important
Technological support (e.g. hotline, helpline)	3.51	.64	Very Important
Policies on using ICT across curriculum	3.55	.62	Very Important
Dedicated time in courses to prepare, explore and develop	3.55	.62	Very Important
Total	3.53	0.59	Very Important

Note. 1.00-1.50 → Not important (NI); 1.51-2.00 → Little importance (LI); 2.01-3.50 → Important (I); 3.51-4.00 → Very important (VI).

Table 5 shows that to ensure and assure learners, teachers, and the school successful and effective integration of ICT in teaching-learning, the pre-service teachers rated very important to seven, while important to two indicators or suggested parameters of technology integration. Facilities of higher education institutions in education 4.0 must be modeled with the type of learners (in this study, PDC pre-service teachers) it produces based on the demands of industry 4.0. Edge in educational facilities empowers learners, facilitators, and the system of education (Pangandaman et al., 2019).

3.4. Differences on the Extent of Pre-Service Teachers Readiness to Use ICT to Teach, Experiences or Exposure to Technology in Teaching-learning, and Experiences or Exposure to Pedagogical Use of Technology in Teaching-learning

The use and integration of ICT in teaching-learning is viewed as enabling tool that has the potential power for educational change and reform. While new technologies help teachers enhance their pedagogical practice, they can also assist students in their learning. The importance of ICT is used in learning so that it can directly foster learner's interest in learning material through the media used by the teacher (Yusrizal et al., 2019). Wong et al. (2006) pointed out that technology can play a part in supporting face-to-face teaching and learning in the classroom. With ICT applied in learning, it can change the learning paradigm that was originally teacher-centered to be student-centered, the learning model is active and collaborative, and can increase motivation, skills, and thinking structures. The main key to success of education in a country lies in the quality of teachers the country has. In other words, the better the quality of teachers in a country, the better the quality of education in that country. The right step that can be done by the teacher is to change the

learning pattern by integrating elements of technology as a tool in the learning process given the rapid development of technology today (Yusrizal et al., 2019). Results in Table 6 reported the presence and absence of differences on the integration and use of ICT in teaching-learning.

Results revealed that the extent of pre-service teachers' readiness to use ICT to teach in terms of; awareness and motivation, perception about ICT in teaching and learning, use of technology for communication or networking, use of technology for their own development and training, and access to ICT enabling environment and infrastructure do not differ significantly across all variable groupings.

Various studies have documented that there is no significant influence of gender on the various aspects of the use of ICT in education. Past studies have shown that there was no gender difference in the use of ICT tools in education in various places Chekponga (2015) and Mutsiya et al. (2017) in Kenya; Takachi et al. (2018) in Lebanon; Uko et al. (2020) in Nigeria; Hoque et al. (2012) in Malaysia and Jumba (2019) in Nigeria. Considering perceptions on the general use of ICT, Yuan and Lee (2012) found no gender difference among Taiwan teachers while Yukselturk and Bulut (2009) found no gender difference for self-motivation for online learning course.

The readiness of teachers to use ICT to teach is an aspect of the use of ICT in education, which has been shown to be one of the factors that influence online teaching/learning (Ampofo & Abigail, 2020). For serving teachers, the results of some studies (Ameen et al., 2019; Chege, 2014; Rahimi & Yodallahi, 2010) showed no gender difference in their readiness to use ICT to teach. Results of some other studies (Bakar & Mohammed, 2008; Francisca & Samsudin, 2018; Morreale et al., 2015) showed no significant gender difference in the readiness of pre-service teachers to use ICT to teach. However, studies of Badri et al. (2014), Lee et al. (2009), and Summak et al. (2010) found significant gender difference in the readiness of serving teachers to use ICT to teach their subjects.

As shown in Table 7, results revealed that there is no significant difference exists on the extent of pre-service teachers' experiences or exposure to technology in teaching and learning with regards to technological devices used in the course taken and technical equipment accessible in the institution, when grouped according to age, gender, and civil status. However, when grouped according to field of study or course, a significant difference exists at 0.05 level of significance. Study of Lausa and Arceño (2020), reported that in terms of age and gender the ICT teaching-learning exposure or experience of new and experienced teachers do not differ significantly. And that the longer they stay and embrace the process of integrating computer-mediated tools and social media in instruction the more they experience gratification of use or utilization of ICT in teaching-learning.

Results in Table 8 revealed that there is no significant difference exists on the extent of pre-service teachers' experiences or exposure to pedagogical use of technology in teaching and learning with regards to; extent of use of technology present in the courses taken and extent of confidence to integrate technology for communication or networking, for own development and learning, as management tools, and for future technology integration when grouped as to profile. However, when grouped as to age, a significant difference exists at 0.05, on the pre-service teachers' experiences or exposure to pedagogical use of technology in teaching and learning with regards to extent of use of technology present in the field placements, while no difference exists when grouped as to gender, civil status, and field of study/course.

4. Conclusions and Recommendations

The pre-service teachers participated in this study were ready to use ICT to teach in terms of their awareness and motivation, perceptions about ICT in teaching and learning, use of technology for communication and/or networking, and use of technology for their own development and learning, while moderate in terms of access to ICT enabling environment and infrastructure.

Table 6
Significant difference on the extent of pre-service teachers' readiness to use ICT to teach when grouped as to profile (n=148)

Profile of Respondents	Awareness and Motivation			Perception About ICT in Teaching and Learning			Use of technology for communication and/or networking			Use of technology for your own development and learning			Access to ICT Enabling Environment and Infrastructure		
	Mean Rank	df	Sig.	Mean Rank	df	Sig.	Mean Rank	df	Sig.	Mean Rank	df	Sig.	Mean Rank	df	Sig.
Age															
18-22	74.91			77.94			77.82			73.84			70.62		
23-27	73.49	2	.979	69.10	2	.452	70.59	2	.484	77.44	2	.746	83.85	2	.169
28-32	75.54			70.83			65.79			67.63			65.54		
Gender															
Male	72.55			77.41			74.78			76.69			81.44		
Female	74.98	3	.493	73.27	3	.953	75.06	3	.917	74.75	3	.500	72.45	3	.601
Gender Diverse	60.63			75.00			60.25			43.50			58.13		
Prefer not to say	65.50			80.00			68.75			81.00			77.50		
Civil Status															
Single	75.07	1	.518	74.30	1	.815	73.18	1	.137	74.45	1	.951	74.21	1	.747
Married	65.67			77.56			94.89			75.33			78.94		
Course															
BPED	78.07			81.71			76.36			76.54			82.86		
BSED	74.97	2	.903	77.03	2	.355	76.25	2	.766	74.40	2	.981	74.40	2	.715
BTLED	72.63			67.86			70.82			74.09			72.24		

Note. *0.05 level of significance.

Table 7
Significant difference on the extent of pre-service teachers' experiences or exposure to technology in teaching-learning when grouped as to profile (n=148)

Profile of Respondents	Technological devices used in the course taken			Technical equipment accessible in the institution		
	Mean Rank	df	Sig.	Mean Rank	df	Sig.
Age						
18-22	76.90			76.19		
23-27	70.56	2	.703	77.79	2	.091
28-32	72.67			48.96		
Gender						
Male	70.56			71.27		
Female	76.95			76.91		
Gender Diverse	47.00	3	.501	43.75	3	.445
Prefer not to say	80.25			75.00		
Civil Status						
Single	72.77			74.44		
Married	101.17	1	.054	75.44	1	.945
Course						
BPED	99.79			101.32		
BSED	73.66	2	.054	70.49	2	*.041
BTLED	68.63			73.85		

Note. *.05 level of significance.

Table 8
Significant difference on the extent of pre-service teachers' experiences or exposure to pedagogical use of technology in teaching-learning when grouped as to profile (n=148)

Profile of Respondents	Extent use of technology present in the courses taken			Extent use of technology present in the field placements			Communication and/or networking			Extent of confidence to integrate technology Own development and learning			Management tools			Future technology integration		
	Mean Rank	df	Sig.	Mean Rank	df	Sig.	Mean Rank	df	Sig.	Mean Rank	df	Sig.	Mean Rank	df	Sig.	Mean Rank	df	Sig.
Age																		
18-22	76.61			78.23			76.01			77.11			77.16			75.99		
23-27	76.91	2	.096	74.54	2	*,046	74.40	2	.628	73.60	2	.284	71.09	2	.591	74.73	2	.561
28-32	49.42			46.96			63.83			58.92			68.58			62.67		
Gender																		
Male	74.76			76.79			75.21			71.47			75.13			79.06		
Female	74.90			74.74			75.95			75.80			74.34			72.92		
Gender Diverse	57.00	3	.847	55.25	3	.702	48.88	3	.345	77.38	3	.883	67.13	3	.960	68.63	3	.858
Prefer not to say	83.75			56.00			37.50			61.00			85.00			78.75		
Civil Status																		
Single	74.35	1	.866	73.89	1	.478	73.73	1	.372	74.43	1	.931	74.71	1	.798	74.68	1	.831
Married	76.78			83.89			86.33			75.56			71.28			71.72		
Course																		
BPED	86.43			91.25			74.50			71.32			76.32			85.68		
BSED	75.77	2	.345	75.55	2	.157	77.95	2	.428	77.65	2	.483	76.79	2	.605	74.80	2	.471
BTLED	68.74			67.74			68.31			69.79			69.86			70.71		

Note. *0.05 level of significance.

Hence, teacher training institutions may consider equitable if not substantial funding for ICT infrastructure commensurate to the needs of learners assuring the acquisition of the 21st century ICT skills at school.

Likewise, pre-service teachers are exposed to ICT in teaching-learning in terms of technological devices used in the course taken and in the technical equipment accessible in the institution for free. Similarly, they also have experience in the pedagogical use of ICT in terms of the use of technology present in the course taken and in the field placements as well as the confidence to integrate ICT in different uses and aspects. However, training institutions may also invest overriding consideration for relevant, modern, and high-end ICT equipment and devices at par with other leading institutions and presently used in industries.

Integrating ICT or technology in teaching-learning is regarded by future teachers as important, relevant, and useful that drives the new paradigm of educational landscape allowing the use of robotics, IOT, and digitalization. A pre-service teacher ICT enabling environment room may be provided by the institution for exclusive use by all student-teachers while in school. In addition, pre-service teachers may consider having personal computers and other ICT accessory tools or devices to enable them to gain more opportunity to acquire ICT skills by practicing both at school and at home.

Pre-service teachers' readiness to use ICT to teach is not influenced by age, gender, civil status, and field of study or academic program of the participants. However, pre-service teachers' experiences and exposure to technology in teaching-learning is influenced by academic program relative to access of technology in the institution with BPED scoring high access. Thus, equitable access and provision of ICT infrastructure and resources across academic programs and across campuses may be given paramount consideration leveraging on ICT resources that are commonly used or in place in schools, institutions or industries.

Likewise, gender, civil status, and academic programs do not influence the experiences or exposure of pre-service teachers on the pedagogical use of technology in teaching-learning, while age influences particularly on the use of technology present in the field placements with 18-22 years old scoring high.

Further, pre-service teachers consider technology integration as important mechanism or driver or enabler of change for quality education achieving academic excellence that will change the landscape of the Philippine Education System. A continuous quality improvement [CQI] exposure for pre-service teachers and faculty to experience a wide range of ICT resources, techniques, and approaches for pedagogical use has a significant role to play in this area.

Hence, to optimally exploit the usability of technology or ICT in teaching and learning a continuous ICT capability-building may be implemented for faculty at the institution level and for the pre-service teachers at the college or program level. Lastly, further studies may be conducted to include; (1) assessment on the extent to which ICT is embedded in the Teacher Education curriculum, (2) factors affecting ICT integration during teaching practices, and (3) academic leaders' perception of ICT integration in teaching-learning.

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