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Preservice Teacher's Digital Competence and its Psychological Impact: Input to Technology for Teaching and Learning Course

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ABSTRACT

The COVID-19 pandemic highlighted the Digital Divide and the issue of Digital Competence, prompting the authors to conduct a study on the digital competence of 209 College of Education Preservice Teachers across year levels and programs enrolled in the second semester of the academic year 2020-2021 at the ESSU-Can-avid Campus, Philippines, using stratified disproportionate random sampling adapted from the Digital Competence of Educators (DigCompEdu). The basic level of averages of (GM=1.77) and (GM=1.73) was found in all five(5) COED Preservice Teachers' Digital Competence items. When ascertained with demographic variables, it is higher than communication and safety but was found below the Intermediate level's borderline. In terms of gender, female preservice teachers(*76.07 percent ,n=159)* dominated to better at communication*(**$t_{(202)}$=-2.150, p< .033)* and safety ($t_{(202)}$=*-1.705, p<.090)* only. The dominance from 20-25 years of age*(59.8%, SD=1.12)* were mostly first-year returnees, and lifelong students (*33%,n=69*). The effect sizes of *(**d**=0.024057)* as (Cohen's d) calculated established genders' significance of effect size to be true and successful in two categories, contradicting recent studies were mostly male-dominated. Ascertaining with digital competence in area of Information Processing differ according to age*(Communication;($t_{(6)}$=2.309, p<.035) & (Problem-Solving; ($t_{(6)}$=2.595, p<.019),* year-level and program level *($t_{(3)=}$2.972,p<.033),* and related IT certificates attended/received (Information Processing; *($F_{(1)}$=5.571, p<.019, η^2=0.024), ($F_{(1)}$=2.100, p<.149, η^2=0.024), ($F_{(1)}$=2.370, p<.125, η^2=0.012)",* and Content creation; *($F_{(1)}$=6.510, p<.011, η^2=0.031), ($F_{(1)}$=4.4562, p<.067, η^2=0.031),* and found that female, freshmen COED Preservice Teachers, aged 20-25 are better than male in lower areas of digital competence.

The CoEd department must rethink these critical digital competencies at the fundamental level by retooling and integrating the Faculty with Digital Competence in Instructions Using Digital Technologies and resolving technically-related problems encountered while using digital media, tools, and devices weighted in the same faculty training.

Keywords: Competence, Digital, DigCompEdu, Preservice Teachers, Ascertaining

INTRODUCTION

While digital disparities existed and disadvantaged Preservice Teachers members before COVID-19, Digital Divide is one aspect of educational injustice, describing the disparity between pupils who have adequate access to and knowledge of technology to excel academically and those who do not. There is an opportunity to promote educational equity in these difficult times by confronting the Digital Divide head-on, affirmatively assessing inequities, and investing in solutions that support all students' access to and resilience to learning opportunities(Brown, 2020).

Having digital and pedagogical competencies in their professional career path is more necessary than not. At the same time, being active in digital societies (Instefjord & Munthe, 2017) is a must for preservice teachers. Preservice teachers' training is essential to improve their digital competencies (Organization of Economic Cooperation and Development [OECD], 2017).

Harnessing the basic knowledge and professional skill set related to digital competence and ICT literacy has become necessary for preservice teachers to integrate into curricula and employ during classes. (Khateeb, 2017).

This program to proactively bridge the digital divide in education among the stakeholders of education in our community is highly relevant and timely to maintain Eastern Samar State University's

commitment to quality in one of the four key final outputs, the field of instruction. As a result, this research study is being carried out.

Objectives of Study

This study aimed to determine the digital competency of preservice teachers in the College of Education, as they were instrumental in transforming the educational methods of K-12 students. This research sought to (1) identify the demographic profile of preservice teachers in terms of (a) their gender; (b)their age; (c) their program/major degree – background; (d) year level; and (e) information technology (IT) – related certificate; (2) Determine preservice teachers' digital competency in the areas of (a)the information processing; (b)the communication; (c)the content; (d)the safety; and (e)the problem solving, and (3) Ascertain a relationship between the two.

METHODOLOGY

Profiling of Participants

A stratified disproportionate random sample of 209 people was chosen and surveyed three programs from the College of Education Department at all levels enrolled in the second semester of 2020-2021. There are, however, some respondents who would rather not tell what they answered in the questionnaires but who were nevertheless included in the study. Females made up *76.07 percent (n=159)* of the study participants, while males made up 21.53 percent (n=45) and (n=2.39) for those who did not want to say. An age range registered between 20 and 25 was 59.8% (SD=1.12), broken down: 33 percent were a first-year (n=69), 25.4 percent a second year (n=53), 21.1 percent a third-year (n=44), and 17.7 percent fourth year (n=37) Bachelor of Elementary Education (n=81), 16.3 percent Bachelor of Secondary Education major in Mathematics (n=34), and 44 percent Major in Social Studies teaching (n=92), with 33 percent being first year (n=69), 25.4 percent a second year (n=53), 21.1 percent a third-year (n=44), and 44 percent major Finally, 17.2 percent of preservice teachers identified as having attended and acquired corresponding IT certificates on digital competence.

Gathering data procedure and instrumentation

Khateeb (2017) employed the Digital Competence Questionnaire to assess preservice teachers' digital competence, broken down into five (5) categories (information processing, communication, control creation, safety, and problem-solving). Ferrari (2013) claims that the Digital Competence Framework for Citizens (DigComp) helps European citizens. Their study also helps others in various circumstances develop their digital abilities**.** DigComp helps 'organizations, businesses, and individuals identify digital knowledge and the digital culture needs citizens to have in their social and personal lives (Vuorikari et al., 2016). It has also registered a Cronbach alpha of 0.9013, Khateeb (2017) suggesting that the items' internal consistency is relatively high. Moreover, that indicates strong inter-correlations among test items; hence, the adaption in this research.

Furthermore, the said questionnaire used by Cebi and Reisolugo (2020) in their study was evaluated by experts from the College of Computer Studies faculty members to be in tune with the ESSU-Can-avid setting without regard to the digital divide. It was a 5-point Likert scale quiz, with one (1) being "strongly disagree" and five (5) being "strongly agree." The surveys were distributed in print or online (Google form) to the respondents and gathered thru the download format readable by the Office Productivity tool(spreadsheets) for more accessible and organized statistical analysis.

Analyzing Statistical Data

This study utilizes the descriptive analysis approaches to pretest the assumptions regarding the analysis. Respondents' answer to each item is evaluated based on the normalcy distributions, which are disproportionately stratified. However, this study contrasted with the determined value for each item in the range of -0.218 to -114 of Skewness and Kurtosis values (Cebi, A. & Reisolugo I.,2020). It did not fall within the limits indicated by (Tabachnick and Fidell,2013); the precise standard distribution assumptions utilize an Independent Sample t-test. Both Skewness and Kurtosis values found the calculated mean and standard deviation for the preservice teachers' attendance status a similar standard error, 0.168 and 0.335, respectively. Furthermore, the difference in perspectives is seen based on demographic characteristics examined with an independent t-test. A difference in

their degree of digital competencies was tested using One-Way ANOVA using IBM SPSS 25.0 software with more means to be compared.

RESULTS

Preservice teachers' view on digital competences

Table 1 summarized condensed preservice teachers' responses to the Digital Competency Questionnaire for Educators in the categories of information/data literacy, communication/collaboration, digital content creation, safety, and problem-solving.

Taking a look at Table 1, discovered that preservice teachers' average response to items in the domains of "information processing" and "communication" was **1.30** above but not more than **2.00,** so overall digital competence is very basic.

Table 1. Results of the descriptive survey conducted to the Preservice Teachers

General Competencies	No.	Specific and Detailed Digital Competencies	Mean	Grand Mean	Standard Deviation	Adjectival Description
INFORMATION PROCESSING	A1	Searching for specific information using a variety of search engines and innovative techniques to locate trustworthy data/information	**1.88**	**1.77**	**.809**	Basic
	A2	Believing that all data and information acquired online is reliable and that all data and information must be filtered using conventional procedures to assess the correctness and integrity of all data and information gathered online	**1.71**		**.806**	
	A3	Able to save/store data/content, recover/retrieve data/content, create folders, categorize, etc., and back up to numerous storage locations in various formats, whether on the cloud or hardware.	**1.81**		**.739**	
COMMUNICATION	B1	Communicate with anyone utilizing various chat tools, including basic and advanced online communication features.	**1.62**	**1.72**	**.835**	Basic
	B2	Capable of sharing information/content using simple tools, consolidating many collaboration tools, managing to exchange documents/files made by others, and utilizing online e-commerce via public/private services.	**1.59**		**.695**	
	B3	Ability to use online services features and join online spaces, both private and public, such as e-banking, online shopping, and buying and selling	**1.96**		**.796**	
	B4	Via collaborative technologies, join social networking sites/communities and share multimedia information using networking, sharing, and application tools.	**1.70**		**.803**	

CONTENT CREATION	C1	Produce at least one format that is both simple and sophisticated website design, digital content in various formats is created using digital tools, and multimedia formats utilize diverse settings and programming languages.	**1.41**	**1.57**	**.660**	Basic
	C2	Using basic and advanced formatting digital tools of various standards/productivity tools, perform basic/advanced editing for information created by others.	**1.67**		**.679**	
	C3	When necessary, apply licenses and copyrights when referencing or reusing copyright-protected content.	**1.85**		**.808**	
	C4	Change default settings or use multiple programming languages and databases with a computer tool to modify and build simple features of software applications.	**1.35**		**.642**	
SAFETY	D1	Basic security to safeguard my devices, to browse the internet, installing security programs while accessing, and reviewing security programs, system, and application security regularly	**1.63**	**1.73**	**.810**	Basic
	D2	Knowledgeable credentials can be stolen; therefore, users should not reveal personal information online; users should use regularly changed passwords to access equipment, devices, and digital services; and users should take precautions when infected with viruses or worms by configuring security firewall settings.	**1.30**		**.458**	
	D3	Understanding the risk of addiction, preventing health problems, and the benefits of utilizing ICT are all important aspects of being aware of the health risks connected with excessive use of digital technology.	**1.91**		**.698**	
	D4	Understanding the fundamental measures, behaviors, and data of positive and negative effects of digital technology on energy conservation and technology's impact on daily life and the environment	**2.09**		**.670**	
PROBLEM-SOLVING	E1	Troubleshoot technical issues, such as basic, regularly used programs, applications, and digital technologies, can cause practically any problem.	**1.38**	**1.26**	**.593**	Basic
	E2	Knowing that digital technologies can help me address problems (technical and non-technical) by using the appropriate tool, device, application, or program and that I can change the firewall and security settings on my digital devices.	**1.86**		**.891**	
	E3	Exploring configuration settings, using application/program tools, and being informed of new technological advanced tools/programs and how they work to solve immediate technical difficulties using digital technologies	**1.81**		**.715**	
	E4	Aware of the need to regularly update digital skills, limitations, and gaps and the necessity to lower and enhance digital knowledge limits.	**1.51**		**.723**	

However, items classified as "safety" had a slightly higher response average than others but fell short of the Intermediate level "D3" item. The average for "safety" is slightly higher (M=2.09; SD=.670). "D2" is another item in the "safety" category with the lowest average (M=1.30; SD=.458). Preservice teachers score the lowest (M=1.35, SD=.642) when the means of items relating to "Digital Content Creation" are evaluated. Their response to "Communication" on the item "B3" (M=1.96; SD=.796) is discovered to be quite high.

In general, all item averages (GM=1.71) and (GM=1.73) fall below the Basic level. The findings indicated that preservice teachers' digital competence was below the borderline of the Intermediate level. It contradicts the findings of (Cebi, A., & Reisolugo, I., 2020), who discovered a relatively high rate of preservice teachers who are digitally competent.

Ascertaining preservice teachers' digital competency based on demographic variables

Preservice teachers' view on digital competence according to gender

The gender differences in preservice teachers' perspectives on digital competence were identified in "Communication" and "Safety." Unlike the study (Cebi, A. & Reisolugo, I.,2020) that registered more male preservice teachers and favored moderate rate responses to four areas of digital competence.

In the items "***B2***, *($t_{(202)}$=-2.150, p< .033),* in the "Communication" area; and in the items "***D4***, *($t_{(202)}$=-1.705, p<.090),* in the "Safety" area; however, in the things that are not close to the 95 percent confidence level of significance, "***A2*** ($t_{(202)}$= -1.095, p<.275)," in the "Information Processing" area; It is in direct opposition to the findings of (Cebi, A. & Reisolugo, I.,2020), which advocates four domains of digital competency. (Cohen's d) calculated the effect sizes for these significant changes to establish their significance *(**d**=0.024057).* Simply put, the significant impact sizes based on gender can only be said to be true in two categories.

Preservice teachers' view on digital competence according to age

To see if their attitudes on digital skills varied according to their age level, the Preservice teachers of the COED who have a range gap in their age level are grouped succeeding to the other age levels. The varied education courses completed by different age levels of preservice teachers were similar and assessed under distinct groupings. As a result of the investigation, preservice teachers' age levels differ in all digital competence areas. In the area of "Communication," found a large effect size in "***B1***, *($t_{(6)}$=2.309, p<.035).* In the area of "Problem-Solving," also found a large effect size in *"E1, ($t_{(6)}$=2.595, p<.019).*

In the area of "Safety," found almost the same effect size in "***D4***," *($t_{(6)}$=1.656, p<.134.* Almost the same effect size found in "***B1***," *($t_{(6)}$=1.653, p<.134)* items in the "Communication" area, and all this different from large to small effect size favor the age range between 20-25 preservice teachers.

Preservice teachers' view on digital competence according to program and year level

In the area of "Communication," the "***B1***" *($t_{(3)=}$2.972,p<.033),* same results found in *"**B3**"* A difference in item found a more significant effect size than the program that favors the BSEd Social Studies major. The effect size of "***A1***, (t(6)=1.984, p<.098)" items was found to be bigger than the year level.The same within "***A2***,*($t_{(6)}$=2.008, p<.095)* items. The researcher found a significant effect size comparable to the year level, mostly first-year students' first-year level.

When ascertained to program/course, it is found in "Problem Solving," in items ***"E2"*** *(**$t_{(6)}$**=2.008, p<.095),"* likewise found to have more significant effect size and holds for BSEd Social Studies program. Apparently, in "Content Creation," it is found in items *"**C2**", ($t_{(6)}$=1.988, p<.098).* Similarly, in the same competence, in item ***"C4"***, *($t_{(6)}$=2.696, p<.032), w*hen comparing the year level, the most first-year and BSEd majors in Social Studies were shown to have the biggest effect size.

Preservice teachers' view on digital competence according to the IT-related attendance or certificates they received and the perceived private use of technologies and learning environment

The studies determined that preservice teachers' perceptions of digital competencies have changed. Each item in the questionnaire has altered digital competence, with higher digital competence preservice teachers

rating higher than others. It was shown that certain characteristics had a considerable effect on views of digital competence.

The effect size of the vital difference in the "**A1**" *(($F_{(1)}$=5.571, p<.019, η^2=0.024),* "**A2**" *($F_{(1)}$=2.100, p<.149, η^2=0.024),"* and "**A3**",*($F_{(1)}$=2.370, p<.125, η^2=0.012)"* the things discovered to be small. In other words, the status of preservice teachers' ability to perform information-processing-related tasks and possess IT credentials varies according to their level of digital competence.

Same effect size found in "**C4**" *($F_{(1)}$=6.510, p<.011, η^2=0.031,* and*;* "**D4**"*($F_{(1)}$=4.4562, p<.067, η^2=0.031)"* found to be with a significant difference though small in effect size. There was no vital difference in the "**A1**" ($F_{(1)}$=1.356, *p*<.246, η^2=0.007), "**B1"** ($F_{(1)}$=0.116, *p*<.734, η^2=0.001), "**B4**" ($F_{(1)}$=1.042, *p*<.309, η^2=0.005)", and ($F_{(1)}$=1.515,*p*<.220, η^2=0.007) in **"C1".**

Digital competence compares Preservice teachers' intermediate level with that poor digital competence knowledge on these issues. Only preservice teachers with a high level of digital competence and the other two groups differed in these items. Finally, in the "in the **"B3",** *($F_{(1)}$=3.823, p<.052, η^2=019) s;* and "**E1***", ($F_{(1)}$=3.400, p<.067, η^2=0.017)* only comparing groups with high and low digital competence was a significant difference found.

DISCUSSIONS

Preservice teachers responded better to digital competency items in information and data literacy, communication and cooperation, and safety than communication and safety. It resulted in a low rating mean computed average due to a lack of content creation procedures and technological issues. Ironically, they feel more advanced in communication and security due to social media. They found themselves lacking in digital content development skills. (Gutiérrez-Porlán & Serrano-Sánchez, 2016; Hinojo- Lucena et al., 2019), information processing(Gutiérrez-Porlán & Serrano-Sánchez, 2016; Porlán & Sánchez, 2016), and problem-solving (Esteve-Mon, Ángeles Llopis, & Adell-Segura, 2020). (Gutiérrez-Porlán & Serrano-Sánchez, 2016). Napal-Fraile et al. (2018) study demonstrated the fundamental importance of copyright, integration, and licensing in digital content creation. The acquired results do not fully match the literature.

To improve communication and safety, female preservice teachers dominated. The study found that females outperform males in online services and other online features. It is maybe because many COED first-year students can avail themselves of the CHED-financial assistance thru Landbank ATM-based distribution and that during the pandemic booming of online shopping (buy and sell) widespread seen.

In digital content creation, female preservice teachers outperformed male preservice teachers. Female preservice teachers better protect digital devices and content online, probably because they are more cognitively mature at 20-25 years old, mostly returnees and lifelong students. Believing that too much internet exposure is bad for their health and knowing the risks associated with digital technology (e.g., risk of addiction, - male COED preservice teachers prone to becoming addicted to the famous ML-Mobile Legends).

Female preservice teachers outperformed male preservice teachers in developing digital competence and going to the service center for technological issues, whereas male preservice teachers tend to self-diagnose. This finding contradicts Keskin and Yazar's (2015) findings that male preservice teachers are more enthusiastic in using digital technologies and have higher competencies in basic computer use and information acquisition in digital media than female teachers.

Furthermore, according to the research of Keskin and Yazar (2015), men teachers are more effective than female teachers. Esteve-Mon et al. (2020) could not conclusively prove that female preservice teachers are less qualified than male preservice teachers when solving technical challenges and programming. Based on the study's findings, female preservice teachers were found to have a basic level of digital competence compared to male preservice teachers in only two areas. The study is evident from various programs and year levels. They have a basic level of communication and safety.

Moreover, slightly beyond the basic level of male preservice teachers from different programs and years, especially when employing information searching tactics to acquire information, data, and digital content. Preservice teachers are more adept at collaborating online in communication utilizing digital technologies than teachers from other programs and year levels. Also, using advanced features of communication tools than preservice teachers from other COED programs in communication and safety.

The university and the COED preservice teachers focused heavily on the covid-19 pandemic new expected delivery of instruction. In their study, Keskin and Yazar (2015) did not include preservice teachers from the main campus and other external campuses. The same survey discovered that digital skills of using essential online tools and accessing information from digital media differ according to age and year-level, and program. Using digital technologies to create innovative solutions and new advances is a way of problem-solving. On the other hand, male preservice teachers tend to self-troubleshoot, whereas female preservice teachers resort to the service center.

While creating digital content, preservice teachers were required to go beyond their current digital ability, according to Instefjord and Munthe (2017). Training of Preservice teachers should be in digital content development, according to Rkenes and Krumsvik (2016). Taking these studies into account and the current study's findings confirm that COED preservice teachers are freshmen, ranging in age from 20 to 25, are likely to be successful.

CONCLUSION & RECOMMENDATIONS

Future research may benefit from measuring studies that cover all domains of digital competence. Generalizable results about digital competency, including cause-effect analysis, can be achieved. In addition, according to the study's findings, preservice teachers should improve their communication and safety skills. Therefore, instructors must include digital competence skills into their technology for teaching and learning subjects. The COEd department must rethink these critical digital competencies below the basic level by retooling and integrating the Faculty with Digital Competence in Instructions Using Digital Technologies and solving technically-related problems faced using digital tools, media, and devices. Integrate skillset training such as using information search techniques to access information, data, and digital material online, using digital technologies for collaborative work, creating basic and varied types of digital content, and so on.

Such pertinent skills may also form part, 10% in the weighted Registry of Qualified Applicant (RQA) in DepEd, the Philippines in their application for permanent position having possessed a skillset in digital competencies, seventy points(70pts.) for senior high and 60 points for junior high. It might be beneficial to give more weight to the training programs in the Department of Education that other campuses teachers will receive about digital competence.

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