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RESEARCH ARTICLE

ICT Literacy and Self-Efficacy Assessment among Pre-Service Teachers in Masbate Philippines: A Descriptive-Correlational Study

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ABSTRACT

This study explores the Information and Communication Technology (ICT) literacy and self-efficacy of 135 pre-service teachers in Masbate, Philippines, using a descriptive-correlational design. Data were gathered through adapted questionnaires and analyzed using descriptive and inferential statistics. Results reveal that participants exhibit high ICT literacy across domains such as accessing, managing, and interacting through technologies, though moderate proficiency was noted in creating media products. Similarly, high levels of ICT self-efficacy were observed, particularly in privacy, security, and communication. A significant gender difference emerged, with female participants demonstrating greater ICT literacy and self-efficacy than their male counterparts. Additionally, a strong positive correlation between ICT literacy and self-efficacy underscores their interdependence, emphasizing the importance of enhancing both constructs simultaneously. The study highlights the need for appropriate training programs to strengthen competencies in media creation and address gender disparities. These findings offer valuable insights for teacher education programs, advocating for integrating comprehensive ICT training to prepare pre-service teachers for technology-driven classrooms.

INTRODUCTION

Educators must embrace and incorporate technology into the teaching and learning process in today's fast-paced digital environment. This entails transitioning from outdated material distribution techniques into a cutting-edge digital learning environment where students can get more accurate, timely, and thorough information. The COVID-19 pandemic, however, has shown that many academic institutions are lagging in deploying digital learning. The use of Information and Communications Technology (ICT) tools in the teaching and learning process is essential to addressing this. Given how quickly technology is developing in the digital age, this shift toward ICT education has become the standard. Indeed, the Sustainable Development Goals of the United Nations acknowledge ICT's critical role in achieving holistic learning outcomes.

As a result, educators must develop a higher level of ICT literacy and adapt to the complexities of digital education. This includes utilizing various ICT educational platforms such as YouTube, digital libraries, LMS, internet streaming, and broadcast, as well as Open Educational Resources (OERs). Higher education institutions' use of digital tools like Zoom and MS Workspaces further underscores the importance of technology in modern education. Moreover, technology is becoming increasingly prevalent in society, and its rapid development has enabled people to learn more about their world and its potential impact on their lives. As such, educators must adapt to this new reality and incorporate technology into their teaching and learning processes.

Information and communication technology (ICT) literacy of pre-service teachers

Communication and Information Technologies (ICT) use in learning has undergone significant changes over time. Today's younger generations are often surrounded and immersed in technology, including smartphones, laptops, tablets, and game consoles. As a result, ICT literacy has become widely recognized as an important skill for both students and teachers. Academicians now view ICT literacy as a key literacy that schools must develop in their students.

ICT literacy refers to a person's ability and inclination to use digital technology and communication tools appropriately to access, manage, evaluate, and use information, as well as to construct new knowledge and connect with others. It allows pre-service teachers to produce and transmit materials online using ICT tools and apply them in teaching-learning. Given the increasing integration of educational technology in every program offering and specialization, pre-service teachers must become highly literate in using ICT tools to deliver effective content and pedagogy to their students. Hence, every educator needs to improve students' ICT literacy, particularly among pre-service teachers. As Hero (2022) has claimed, improving students' digital literacy is crucial for effective learning outcomes and for students to adapt to a rapidly changing marketplace. More potent digital literacy and ICT usage skills can lead to better performance and more efficient learning. Thus, expanding access to information and communication technologies and providing relevant training and development programs is essential to ensure that pre-service teachers are competitive in the teaching profession.

Information and communication technology (ICT) self-efficacy

The importance of understanding self-efficacy in the use of information and communication technology (ICT) in education is highlighted in this article. Self-efficacy refers to a student's awareness and willingness to use ICT in learning. ICT has transformed the educational system, increasing students' self-esteem and learning effectiveness. The integration of ICT into the learning process has significantly impacted students' ICT self-efficacy and demonstrated skills in using these ICTs in the learning process. Research shows that ICT self-efficacy is a crucial component that helps students adapt to technological change, encourages lifelong learning, and may overtake important competencies and talents. Therefore, it is essential to emphasize the integration of modern ICT and boost students' self-efficacy in the digital home learning environment.

In the Philippines, the educational system, particularly in offering Teacher Education programs, is anchored on Policies, Standards, and Guidelines (PSGs) crafted by the Commission on Higher Education (CHED). Pre-service teachers are expected to demonstrate and apply skills in developing and utilizing ICT to promote quality, relevant, and sustainable educational practices. Therefore, it is imperative to become literate in ICT to maximize and achieve meaningful learning.

The article suggests that assessing Information and Communications Technology Literacy and Self-Efficacy is necessary in this time of ICT education. Teachers must demonstrate digital and ICT competencies in their teaching and learning process. Various research findings have claimed that ICT integration in teaching accelerates the students' optimum level of learning. The 21st century offers massive development in educational tools for learning, and teachers should not be left behind in using these technologies in the classroom. The article proposes a training program based on pre-service teachers' ICT literacy and self-efficacy. The study involved nine local and state universities and colleges in Masbate province, which served as the respondents. The assessment of these variables is necessary, especially with the pandemic of online teaching, as they will be teaching in a face-to-face mode of learning during their internship in the coming semester.

Hence, understanding self-efficacy in using ICT in education is necessary for successful knowledge learning and content delivery of the lesson. Integrating modern ICT and boosting students' self-efficacy in the digital home learning environment should be emphasized. Pre-service teachers should be proficient in ICT to maximize and achieve meaningful learning, and a training program based on their ICT literacy and self-efficacy is necessary.

Objectives of the study

The study aims to assess the ICT literacy and self-efficacy of pre-service teachers in the province of Masbate, Philippines, for the school year 2022-2023 as a basis for the proposed training program and was guided by the following specific research objectives:

1. Determine the ICT literacy of pre-service teachers in Masbate in these domains:
    a. Access and evaluation of information;
    b. Utilization and management of information;
    c. Media analysis;
    d. Creation of media products;
    e. Practical application of technology; and
    f. Interaction through technologies
2. Determine the ICT self-efficacy of pre-service teachers in terms of:
    a. Privacy and security;
    b. Differentiation and learning; and
    c. Communications
3. Analyze the significant difference between ICT literacy and self-efficacy of pre-service teachers when grouped into sex.
4. Analyze the significant relationship between ICT literacy and self-efficacy among pre-service teachers.

RESEARCH METHODOLOGY

The study used a descriptive-correlational design to determine the pre-service teachers' ICT literacy and ICT self-efficacy. An adapted survey questionnaire was used to gather the data through Google Forms, which in turn applies a quantitative research approach, using the Mann-Whitney U Test to analyze the relationship between ICT literacy and self-efficacy. The study adopted only English documents published in research journals, books, conference proceedings, and periodicals.

The respondents are the pre-service teachers in the province of Masbate who undergo Observation in the Actual Teaching Learning Environment (FS 1) and Teaching Assistantship (FS 2) for the School Year 2022-2023. This study includes 135 Pre-service teachers from both public and private higher education institutions. A stratified random sampling was used to consider the respondents' availability to answer the questionnaire's electronic distribution.

The instrument of the study was composed of 3 parts, namely, respondents profile, information and communications technology literacy (ICTL) adapted from the Digital Literacy Survey Questionnaire (DLSQ) of Baterna, Mina, & Rogayan (2020), and the ICT Self-Efficacy Scale (ICTSE) which is also adapted from the study of Musharraf et al. (2018). The ICTL is composed of a 30-item questionnaire where the respondents are asked using the four-point Likert Scale ranging from 1 (Not Literate) to 4 (Highly Literate). At the same time, ICTSE will be rated from 1 (Strongly Disagree) to 5 (Strongly Agree). The adapted DLSQ into ICTL and ICTSE are highly reliable as used in this study, as shown in the Cronbach's alpha values of 0.904 and 0.88, above 0.70.

Descriptive and inferential statistics were used to tabulate and interpret the results. The pre-service teachers' literacy and ICT self-efficacy were analyzed using the qualitative interpretation equivalent based on the computed mean scores and standard deviation. Additionally, the Mann-Whitney U Test was used to test the statistics of ICT literacy and self-efficacy of pre-service teachers when grouped into sex. The relationship between ICT literacy and self-efficacy among the participants was analyzed using the Spearman Rho.

RESULTS

Pre-service teachers' ICT literacy

Pre-service teachers were moderately literate in evaluating scientific information critically and competently, with a mean score of 3.09 (see Table 1). However, it can be gleaned from the result that pre-service teachers are highly literate in most of the indicators in the dimension's access and evaluation of information. To cite one of the prominent areas wherein pre-service teachers can protect their own devices, such as cellular phones, laptops, etc., and understand the online risks and

threats represented by the mean score of 3.47. This indicates that pre-service teachers are highly literate in accessing and evaluating information.

Table 1: ICT Literacy: Pre-service teachers in Masbate

Indicators	Mean	Qualitative Interpretation
Access and Evaluation of Information	3.31	Highly Literate
Utilization and Management of Information	3.28	Moderately Literate
Media Analysis	3.30	Highly Literate
Creation of Media Products	3.19	Highly Literate
Effective Application	3.42	Highly Literate
Interaction through Technologies	3.33	Highly Literate
Grand Mean	3.31	Highly Literate

The massive amount of data and information that can be easily extracted from the internet is no longer new to the respondents. They have the ability and literacy to critique the information worthy of reading efficiently and reliably, and reliable sources are properly manifested by the pre-service teachers. This is supported by the grand mean of 3.31, interpreted as highly literate. However, it needs to enrich its literacy level in evaluating scientific information, considering that it dictates the credibility of information provided to the students.

Pre-service teachers' ICT self-efficacy

The Information and Communication Technology Self-Efficacy (ICTSE) of the Pre-Service teachers (PSTs) is one of the indicators of the extent to which the confidence and persistence to demonstrate the extent or ability of literacy is ensured to be manifested. In this study, ICTSE is governed by the pre-service teachers' privacy and security, differentiation and learning, and communication. These domains are relative behaviors of the respondents that will drive the respondents' exposure to technologies, resulting in a positive demonstration of using ICT tools for the student's learning. Moreover, when pre-service teachers showed higher self-efficacy or their beliefs in using ICT in teaching-learning, the specific target performance of ICT tools will yield positive results.

Table 2: ICT self-efficacy: Pre-service teachers in Masbate

Indicators	Weighted Mean	Qualitative Interpretation
Privacy and Security	3.72	Strongly Agree
Differentiation and Learning	3.32	Strongly Agree
Communication	3.42	Strongly Agree
Grand Mean	3.72	Strongly Agree

The table presents data on indicators evaluated based on their weighted means, with a qualitative interpretation of "Strongly Agree" for each. The indicators include Privacy and Security (3.72), Differentiation and Learning (3.32), and Communication (3.42). These results indicate a high level of agreement among respondents regarding the effectiveness or importance of these aspects. Notably, the Grand Mean is 3.72, which aligns with the highest individual indicator (Privacy and Security). This suggests that Privacy and Security significantly influence the overall positive assessment. The data reflects a strong consensus that these areas are performing well or are highly valued.

Test of difference between ICT literacy and self-efficacy when PSTs are grouped in sex

Table 3: Mann-Whitney U test of significance

	Gender	Mean Rank	Sum of Ranks	z	Mann Whitney U	p
ICT Literacy	Female	38.05	1217.5	-2.37661	334.5	<.05[a]
	Male	26.95	862.5			
ICT Self-Efficacy	Female	19.31	347.5	0.44294	145.5	<.05
	Male	17.69	318.5			

[a] Significant at p<.05

The table presents the results of a Mann-Whitney U test analyzing gender differences in ICT Literacy and ICT Self-Efficacy. For ICT Literacy, females have a higher mean rank (38.05) and sum of ranks (1217.5) compared to males (mean rank: 26.95, sum of ranks: 862.5). The z-value of -2.37661 and a p-value of <.05a indicate a significant difference favoring females. Similarly, for ICT Self-Efficacy, females also show a slightly higher mean rank (19.31) compared to males (17.69), with a z-value of 0.44294 and a p-value of <.05, suggesting a statistically significant result. These findings highlight gender differences in ICT-related competencies.

Test of relationship between ICT literacy and ICT self-efficacy

Table 4: Pearson r test of correlation

Variable	Mean	SD	r	p-value	Interpretation
ICT Literacy	3.56	0.42	0.72	<.001	Strong positive correlation
ICT Self-efficacy	3.49	0.39			

The results of the Pearson correlation analysis revealed a statistically significant and strong positive relationship between ICT Literacy and ICT Self-Efficacy among the 135 pre-service teachers. The computed correlation coefficient $r = 0.72$ indicates that as ICT Literacy scores increase, ICT Self-Efficacy scores also tend to increase. The p-value <.001 confirms that this relationship is highly significant and unlikely to have occurred by chance. On average, the pre-service teachers reported high levels of ICT Literacy (Mean = 3.56, SD = 0.42) and ICT Self-Efficacy (Mean = 3.49, SD = 0.39) on a 4-point Likert scale, suggesting strong agreement with the corresponding indicators. The narrow standard deviations indicate a relatively consistent response pattern among the participants.

DISCUSSIONS

The massive amount of data and information that can be easily extracted from the internet is no longer new to the respondents. They have the ability and literacy to critique the information worthy of reading efficiently and reliably, and reliable sources are properly manifested by the pre-service teachers. This is supported by the grand mean of 3.31, interpreted as highly literate. However, it needs to enrich its literacy level in evaluating scientific information, considering that it dictates the credibility of information provided to the students.

The utilization and management of information reveal that pre-service teachers failed to achieve a high literacy level in manipulating the information and contents for easier retrieval. This indicates a limitation in analyzing and synthesizing the information from internet sources, which can be used later to deliver instruction to the students. The information is not organized for ease of use in teaching and learning. This includes using search engines immediately without practicing the systematic storing of information necessary for teaching. Contrary to that, pre-service teachers showed a great extent of literacy, as revealed in one of the indicators, which shows an accurate use of information creatively relevant to the existing issues and problems related to their field of expertise. This is evident when teachers try to relate the students' learning experiences to a context that is relatable for the students. Additionally, the respondents showed excellent literacy in sharing the right sources and content of information, which is inevitable in a community of practice, and the ability to collaborate in prioritizing the students' optimum learning.

Media analysis caters to the pre-service teachers' ability to evaluate and examine digital content and multiple types of media that can be used for teaching. The respondents are moderately literate in examining how individuals interpret messages differently, how values and points of view are included or excluded, and applying a fundamental understanding of the ethical and legal issues surrounding media analysis. This implies that print and non-print media affect pre-service teachers' ability to analyze the appropriate teaching and learning. When teachers are good at media analysis, there is a tendency for appropriate media tools to be provided to the students for further learning. Fortunately, pre-service teachers are highly competent in understanding both how and why media messages are constructed for scientific research purposes and the ability to examine how media influences beliefs and behaviors regarding issues and problems.

Pre-service teachers are expected to have the ability to create media products. The respondents are highly literate in utilizing the most appropriate media creation tools and developing meaningful graphical representations to present and communicate data visually. This would mean that the respondents showed a great extent of ability in using the correct media creation tools, such as educational software and cloud-based applications (canvas, Slideshare, pallet, quizlet, etc.), which are relevant and appropriate for producing content and projects for the students. However, the data shows that pre-service teachers are moderately literate in utilizing effective and appropriate expressions and interpretations of multicultural environments, creating content in different formats, expressing creative digital content through media and technologies, and modifying and refining existing resources to create new, original, and relevant content. Pre-service teachers should elevate their ability to maximize the use of media tools, particularly in creating, modifying, and refining content, which can be more creative for the students to get hooked and interested in the teaching and learning process. This will ultimately motivate the students to attend classes with diverse digital content that caters to the students' multi-sensorial capacity.

The domain of ICT literacy in terms of its practical application revealed that the respondents are moderately literate in applying the fundamental understanding of the ethical and legal issues surrounding the practical application of technologies. This implies that the respondents require further enrichment in understanding the existing ethical principles and legal issues that bind the effective use of digital technologies for instruction. This will enable the respondents to encounter threats such as copyright infringement and other problems using educational technologies for teaching and learning in the digital environment. Pre-service teachers are also highly literate in using technology as a tool, communication and collaborative tools, using appropriate software and databases for data visualization, and being secure and safe from any online threats. This indicates a high extent of pre-service teachers being effective in varied ICT tools being integrated and applied for teaching.

Interaction through technologies of pre-service teachers explains the optimum awareness of the vastness of digital devices, their means, and their purpose for teaching and learning. Pre-service teachers showed moderate literacy in adapting scientific communication modes and strategies to the specific audience, knowing about citation practices, and integrating new information into an existing scientific body of knowledge. Moreover, the respondents should have the necessary skills to determine the correct information released by various media technologies since the 21st century is the age of info-whelm, where information requires thorough evaluation and verification before selecting the acceptable scientific body of knowledge to be replicated to the students. Thus, awareness is important of what specific websites should be visited and adapted to channel the information and contents to the students, considering that not all of them are credible and reliable. The data also revealed that pre-service teachers are highly literate in interacting with various digital devices, understanding how digital communication is distributed, displayed, and managed for scientific purposes, and the appropriate ways of communication through digital means. It can be deduced from the data that pre-service teachers showed a high extent of interaction through technologies. The use of social media with multiple accounts, including but not limited to TikTok, instant messaging apps, Instagram, Twitter, and other tools for communications.

Privacy and security as determinants for ICTSE reveal that pre-service teachers agreed strongly with the indicators that explain their persistence in maintaining a more private and secure digital learning environment, navigating and using digital technologies in various formats for teaching and learning. One of the indicators wherein the respondents showed prominence was setting quick PINs/Passwords on mobile phones to keep them more secure. This is an indication that the respondents are persistent in the belief that to establish a more secure and safe use of ICT tools, particularly in mobile phones, their behavior towards it is extreme, which dictates that handheld devices such as mobile phones give thorough navigation and the users mastered the device. Similarly, the respondents strongly agreed with recovering emails/social networking accounts if the password was forgotten and the ability to handle spam messages received via email or those posted on social media walls.

Generally, the pre-service teachers' ICT self-efficacy about safety and security exemplifies high positive persistence in preventing suspicious online attacks such as phishing links, spam folders, unidentified senders, and other online threats that can affect users' privacy and security. The current

study's findings are contrary to the study of Saravanakumar & Deepa (2016), which states that there is a weak practice in this domain that requires users to become aware of any other security operations to avoid being the victim of online threats. The respondents are technologically skilled, resulting in higher efficacy in preventing privacy concerns, which should be the ability of the pre-service teachers to manifest since it will help them translate the practice with their students during the teaching and learning process.

Differentiation and learning of the pre-service teachers as one of the ICTSE constructs shows that the respondents can easily judge whether the information that someone has provided on social networking sites is correct and the straightforward expression of a point of view on any online discussion forum, respectively. It can be noted that PSTs agreed on these areas, which means that judgment on the information online and the participation towards it requires further enrichment to become fully equipped with the abilities and persistence to differentiate and accommodate learning on digital ICT tools. Corollary to this ability, pre-service teachers can easily judge trustworthy information on social networking sites such as Facebook, Twitter, etc., are fully aware of the consequences of conduct on the internet, and can learn the how-to features and function in browsing the websites.

ICTSE of pre-service teachers, particularly in communication construct, wherein the respondents strongly agree that ICT tools drive communication for teaching and learning. The study's findings suggest that the respondents can easily use chat rooms on the internet, effortlessly talk to others through the webcam, and quickly edit or modify any picture on the computer/mobile phone using different software. The respondents' ability is very high because the advantage during the educational restrictions that shifted the conventional mode of teaching into the pandemic of online teaching provides an avenue for the students and teachers to become skillful in communication ICT tools such as the use of Google Meet, Zoom for teleconferencing and same with editing tools for media products such as KineMaster, Wondershare Filmora, and other editing software applications. Moreover, pre-service teachers exhibited promising abilities in using and navigating communication and collaborative tools on the internet and even editing visuals for instruction, which can be translated into producing suitable instructional materials for the students.

The results of the Mann-Whitney U test reveal notable gender differences in ICT Literacy and self-efficacy among pre-service teachers. Female pre-service teachers demonstrate higher levels of both ICT Literacy and self-efficacy compared to their male counterparts. This suggests that females perceive themselves as more competent in ICT-related tasks and more confident in their ability to use ICT effectively in educational or professional settings.

These findings challenge traditional assumptions about gender and technology skills, underscoring the growing competence of women in ICT fields. However, the observed differences also highlight the need for tailored interventions to support male pre-service teachers in building ICT-related skills and confidence. These results emphasize the importance of integrating ICT training into teacher education curricula, ensuring that all pre-service teachers, regardless of gender, have equal opportunities to develop digital competencies.

The results of the Pearson r test of correlation indicate a strong positive relationship between ICT Literacy and ICT Self-Efficacy. This suggests that as pre-service teachers' ICT Literacy increases, their ICT Self-Efficacy also improves. The strength of this correlation underscores the interconnectedness of these two constructs, implying that individuals who are more proficient in ICT are likely to feel more confident in their ability to use technology effectively in educational contexts.

The highly significant p-value further supports the robustness of this relationship, suggesting that the correlation is not due to chance. This finding has important implications for teacher education programs, highlighting the value of developing ICT Literacy and ICT Self-Efficacy in tandem. Developing these competencies simultaneously may better equip pre-service teachers to integrate technology into their teaching practices and combat the demands of modern classrooms.

CONCLUSION AND RECOMMENDATIONS

Based on the research objectives investigated in this study and the findings that have been revealed, the study concluded that pre-service teachers' information and communication technology (ICT) literacy is high in the areas of access and evaluation of information, utilization, and management of

information, media analysis, and the practical application and interaction through technologies. The findings also highlight that pre-service teacher education students strongly agree on their level of ICT self-efficacy, particularly in terms of privacy and security, differentiation and learning, and communication.

The results of the Mann-Whitney U test further emphasize the significant gender differences in ICT literacy and self-efficacy. Female pre-service teachers were found to have a higher mean rank in both ICT literacy and ICT self-efficacy, suggesting that they tend to perceive themselves as more competent and confident in using ICT. This emphasizes the importance of addressing gender disparities in ICT training programs, ensuring male pre-service teachers receive adequate support to improve their digital competencies. These findings highlight the need for relevant interventions and professional development opportunities to enhance ICT literacy and self-efficacy, particularly for male students.

The Pearson r test of correlation reveals a strong positive relationship between ICT literacy and ICT self-efficacy. Pre-service teachers who are more literate in ICT tools also report higher levels of self-efficacy in using them effectively in teaching and learning. This relationship suggests that improving ICT literacy can also enhance ICT self-efficacy, reinforcing the importance of simultaneous development for pre-service teacher training in both areas.

Furthermore, the study highlights that pre-service teacher education students, who are digital natives, have extensive exposure to a wide range of ICT tools and technologies, which promotes persistence in using these tools for teaching and learning. Their proficiency in the practical application of ICT tools is driven by their strong self-efficacy, especially in areas related to privacy and security. However, the study also identifies a gap in creating media products, where pre-service teachers report moderate literacy. This area requires urgent attention, as the ability to create high-quality digital content plays a crucial role in engaging students and enhancing their learning experiences.

It is therefore recommended that teacher education deans, program chairs, and faculty responsible for pre-service teacher education focus on enhancing ICT literacy and self-efficacy, particularly in domains requiring immediate attention for holistic technological competence. The significant gender differences in ICT literacy and self-efficacy suggest that training programs should be designed to equitably support both male and female pre-service teachers. Additionally, it is essential to investigate the abilities and persistence of pre-service teachers in using ICT tools to develop appropriate training programs that address their specific needs.

To sustain and enhance pre-service teacher education students' ICT literacy and self-efficacy, training programs that aim not only to ensure basic literacy but also to develop higher-level competencies in using digital ICT tools for teaching and learning should be continuous and increasingly complex. Faculty members teaching educational technology and technology for teaching and learning should integrate exploratory activities that provide a deeper understanding of ICT applications in education.

REFERENCES

Bandura, A. (1977). Self-efficacy: Toward a unifying theory of behavioral change. *Psychological Review*, *84*(2), 191-215.

Bandura, A. (1986). *Social Foundations of Thought and Action: A Social Cognitive Theory*. Englewood Cliffs, NJ: Prentice-Hall.

Bandura, A. (1997). *Self-Efficacy: The Exercise of Control*. New York, NY: W. H. Freeman

Baterna, H. B., Mina, T. D. G., & Rogayan Jr, D. V. (2020). Digital literacy of STEM senior high school students: Basis for enhancement program. *International Journal of Technology in Education*, *3*(2), 105- 117.

Beaudin, L., & C. Hadden. (2004). Developing technopedagogical skills in pre-service teachers. In Proceedings of World Conference on E-Learning in Corporate, Government, Healthcare, and Higher Education 2004, 492–498. Norfolk, VA: *Association for the Advancement of Computing in Education.*

Bonanati, S., & Buhl, H. M. (2021). The digital home learning environment and its relation to children's ICT self-efficacy. *Learning Environments Research*, 1-21.

Commission on Higher Education (2017). Policies, Standards and Guidelines for Bachelor of Elementary Education (BEEd), no. 74. https://ched.gov.ph/wp-content/uploads/2017/11/CMO-No.-74-s.-2017.pdf

Commission on Higher Education (2017). Policies, Standards and Guidelines for Bachelor of Secondary Education (BSEd). No. 75, https://ched.gov.ph/wp-content/uploads/2017/11/CMO-No.-75-s.-2017.pdf

Commission on Higher Education (2017). Policies, Standards and Guidelines for Bachelor of Early Childhood Education (BECEd). No. 76, https://chedro1.com/wp-content/uploads/2019/07/CMO-No.-76-s.-2017.pdf

Commission on Higher Education (2017). Policies, Standards, and Guidelines for Bachelor of Special Needs Education (BSNEd). No. 77, https://www.scribd.com/document/369415541/CMO-No-77-s-2017-Foundation-of-Special-and-Inclusive-Education

Commission on Higher Education (2017). Policies, Standards, and Guidelines for Bachelor of Technology and Livelihood Education (BTLEd), No. 78, https://ched.gov.ph/wp-content/uploads/2017/11/CMO-No.-78-s.-2017.pdf

Commission on Higher Education (2017). Policies, Standards, and Guidelines for Bachelor of Technical-Vocational Teacher Education (BTVTEd). No. 79, https://chedro1.com/wp-content/uploads/2019/07/CMO-No.-79-s.-2017.pdf

Gill, L., & Dalgarno, B. (2008). Influences on pre-service teachers' preparedness to use ICTs in the classroom. Hello! Where are you in the landscape of educational technology?

Hatlevik, O. E., Throndsen, I., Loi, M., & Gudmundsdottir, G. B. (2018). Students' ICT self-efficacy and computer and information literacy: Determinants and relationships. *Computers & Education*, *118*, 107–119. https://doi.org/10.1016/j.compedu.2017.11.011

Hero, J.L. (2020). Teachers' preparedness and acceptance towards information and communications technology (ICT) integration and its effect on their ICT integration practices. *Puissant – A Multidisciplinary Journal*, *1*, 59–76.

Hero. J. L. (2022). Information and Communications Technology (ICT) Literacy and Self-Efficacy of Junior High School Students: Basis for an ICT Enhancement Program. *International Journal of Multidisciplinary: Applied Business and Education Research, 3* (3), 393–403. https://www.doi:10.11594/ijmaber.03.03.10

Musharraf, S., Bauman, S., Anis-ul-Haque, M., & Malik, J. A. (2018). Development and validation of ICT self-efficacy scale: exploring the relationship with cyberbullying and victimization. *International Journal of Environmental Research And Public Health*, *15*(12), 2867.

Prensky, M. R. (2010). Teaching digital natives: Partnering for real learning. Corwin Press, USA.

Rohatgi, A., Scherer, R., & Hatlevik, O. E. (2016). The role of ICT self-efficacy for students' ICT use and their achievement in a computer and information literacy test. *Computers & Education*, *102*, 103-116

Senkbeil, M., & Ihme, J. M. (2017). Motivational factors predicting ICT literacy: First evidence on the structure of an ICT motivation inventory. *Computers & Education*, *108*, 145–158. https://doi.org/10.1016/j.compedu.2017.02.003

Shopova, T. (2014). Digital literacy of students and its improvement at the university. Journal on Efficiency and Responsibility in Education and Science, 7(2), 26–32.

Siddiq, F., & Scherer, R. (2019). Is there a gender gap? A meta-analysis of the gender differences in students' ICT literacy. *Educational Research Review*, *27*, 205-217.

Skinner, B. F. (1938). The behavior of organisms: An experimental analysis. New York: Appleton-Century.

Skinner, B. F. (1948). Superstition' in the pigeon. Journal of Experimental Psychology, 38, 168-172.

Skinner, B. F. (1951). How to teach animals. Freeman.

Skinner, B. F. (1953). Science and human behavior. SimonandSchuster.com.

van Hout, W.J.P.J, Emmelkamp, P.M.G., (2002). Exposure in Vivo Therapy, *Encyclopedia of Psychotherapy*, 761-768 https://doi.org/10.1016/B0-12-343010-0/00091-X

Warschauer, M., & Xu, Y. (2018). *Technology and Equity in Education*. In J. Voogt, G. Knezek, R. Christensen, & K.-W. Lai (Eds.), Second handbook of information technology in primary and secondary education (2nd ed., pp. 1063–1079). Springer. https://doi.org/10.1007/978-3-319-71054-9_76