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*Article*

# Technological Caring Competence for Nursing Education (TCCNE) in Filipino Nurse Educators: Toward the Development of Basis for a Training Plan

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**Abstract:** **Background:** Nowadays, integrating online and remote instruction into education presents unique challenges, particularly in nursing education, where combining technology with the core value of caring is essential. Nurse educators must address students' holistic needs, as their circumstances can influence overall learning development. **Objectives:** This study aims to ascertain the technological caring competence of nurse educators **Methodology:** A descriptive design using an adapted tool on technological caring competence for nursing education (TCCNE) **Results:** A total of 243 Filipino nursing educators participated in this study. Overall, the participants' perceived level of TCCNE was quite high. This sample representative of nursing educators holds strong perceptions of their TCCNE with the values of being considerate, supportive, and respectful to their students as the highest rated competency. This result implies that the educators keep the essence of what nursing is about as they model the importance of caring even in an academic setting considering that these teachers are using remote instruction. **Conclusion:** The study opens up a discussion on assessing the TCCNE of nursing education in an academic setting. Thus, its advocacy could start from implementing the research training plan. Further, the nurse educators should strengthen in balancing care with appropriate technology is viewed as a necessary step to maintain the essence of nursing, which is on caring that can be modeled out not just in clinical practice alone, but in nursing education.

**Keywords:** Nursing Education, Caring, Nursing, Technological Competency as Caring in Nursing, TCCNE

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## 1. Highlights

### What is Known on the Topic

1. Nursing education requires a balance of theoretical knowledge and practical application, with adaptability to emerging challenges, including technological advancements and global disruptions like pandemics.
2. The integration of technological competency with caring practices is essential in both clinical and academic settings to ensure holistic student development and effective teaching.
3. Educators play a crucial role in fostering supportive and respectful learning environments, even in remote or technologically driven educational formats.

**What This Paper Adds**

1. This study provides a novel application of the "Technological Competency as Caring in Nursing" instrument modified for academic settings, specifically assessing nurse educators' competencies: Technological caring competence for nursing education (TCCNE)
2. There is a need to strengthen competencies related to balancing care and technology, ensuring that educators can demonstrate care while effectively using technological tools to enhance learning
3. Evaluating nursing educators' technological caring competence allows both educators and students to reinforce the value of caring amidst the growing presence of technological innovations.

## 2. Introduction

Nursing starts from an inherent value of caring, which serves as its cornerstone. Historical accounts and traditional practices attest that taking care of the sick and injured has been the prime commitment of individuals dedicated to saving lives and promoting well-being. Florence Nightingale, often regarded as the founder of modern nursing, exemplified this commitment. Her groundbreaking efforts during the Crimean War laid the foundation for professional nursing, emphasizing both the art of caring and the science of health care. She established the Nightingale School of Nursing in London [1], which formalized nursing education and introduced standardized training practices. Like Nightingale's motivation to save lives in wartime, her contributions inspired the professionalization of nursing and underscored the vital role of nurses in addressing public health challenges. Over the centuries, the field of nursing expanded from individual caregiving to a global public health affair [2], continually adapting to societal and technological advancements.

Nursing education has evolved significantly to meet the demands of modern healthcare systems, shifting from theoretical instruction alone to a more holistic approach that integrates immersive and practical learning experiences [3]. Students are now required to apply their theoretical knowledge in real-world settings through internships and clinical immersions [4]. The State of the World's Nursing report emphasized nursing's diversity, highlighting how each practitioner brings unique skills, experiences, and perspectives to the profession [5,6]. The advent of technology has transformed nursing education, making it essential to incorporate digital tools and platforms into the learning process. However, the COVID-19 pandemic disrupted traditional methods of training, confining both educators and students to remote environments. This shift necessitated the rapid adoption of online learning technologies, such as virtual simulations, applications, and digital platforms [7-9]. While these innovations provided temporary solutions, they also exposed gaps in preparedness and adaptability within nursing education systems, particularly in balancing technological proficiency with the nurturing of core nursing values.

The integration of technology into nursing education highlights the importance of developing Technological Caring Competence (TCC), a concept that blends technological expertise with the essence of compassionate care. Originally developed for clinical practice [18-22], TCC is increasingly relevant to academic settings as nurse educators are tasked with preparing students for technologically advanced healthcare environments. Educators must not only model technological competency but also foster caring attitudes in their students. However, this dual expectation presents challenges, as many students enter nursing programs with varying levels of technological literacy. Those with limited digital skills often feel overwhelmed by the demands of technologically integrated curricula, which can hinder their confidence and success [23]. Moreover, disparities in

access to technology and training resources exacerbate these challenges, particularly in underfunded or rural institutions. Standardized frameworks and evaluation tools, such as the Technological Competency as Caring in Nursing Instrument: Revised Practice Dimension [26], are critical for assessing and enhancing the TCC of nurse educators to ensure they meet the holistic needs of students and bridge gaps in preparedness.

This study assessed the Technological Caring Competence for Nursing Education (TCCNE) of Filipino nurse educators to establish a basis for a training plan. It sought to: 1) identify the demographic profile of educators, including age, sex, education, years of teaching experience, type of institution, and employment status; 2) determine their TCCNE levels; 3) explore significant differences in TCCNE levels based on these demographic factors; and 4) propose a training plan to address gaps in TCCNE. The study highlights several gaps in current nursing education. First, there is a lack of standardized definitions and frameworks for technological caring competence specific to academic settings, leaving educators without clear guidelines for integrating technology with caring practices. Second, disparities in technological resources across institutions result in unequal opportunities for educators to develop and demonstrate TCCNE. Third, many existing curricula fail to adequately address the emotional and psychological support students require when adapting to rapid technological changes. Lastly, while tools exist to assess TCC in clinical practice, they are rarely adapted or validated for use in academic environments. By addressing these gaps, the study contributes significantly to advancing nursing education, providing a foundation for creating training plans that align technological competence with the core values of caring and compassion.

## 3. Materials and Methods

### *3.1. Research Design*

This study employed a descriptive quantitative design to examine Filipino nurse educators' Technological Caring Competence for Nursing Education (TCCNE). A descriptive design was chosen because it allows researchers to systematically observe, analyze, and describe phenomena, enabling the identification of areas for improvement in practice and procedures [26,27]. This approach is widely used in medical sciences, epidemiology, and education due to its applicability in addressing real-world problems and generating actionable insights [26,27].

### *3.2. Instrumentation*

The primary instrument for this study was an adapted and modified survey questionnaire based on the Technological Competency as Caring in Nursing Instrument: Revised Practice Dimension [26]. Permission to use and modify the tool was obtained from the Rozzano Locsin Institute (RLI) for the Advancement of Technological Competency as Caring in Nursing and Health Sciences. The original 25-item questionnaire was adjusted to suit the academic context by replacing terms such as "nurses" with "I" and "patients" with "students." References to clinical practice were revised to reflect the teaching context, particularly remote teaching during the COVID-19 pandemic. The questionnaire utilized a 7-point Likert scale ranging from 1 ("Never") to 7 ("Always") (Table 1). The TCCNE tool (Table 2) was tailored to assess nursing educators' competence in integrating technology with caring practices during remote instruction.

### *3.3. Pilot Study of the Questionnaire*

A pilot study was conducted with 24 nurse educators, representing 10% of the total sample size, to evaluate the questionnaire's clarity, ease of use, and relevance. Participants provided feedback on the ease of answering, time required for completion, and comprehensibility of the questions. Based on their feedback, revisions were made to remove redundant and irrelevant items, ensuring alignment with the study objectives.

The final version incorporated suggestions from three nursing experts. Reliability testing using Cronbach's alpha yielded a score of 0.92, indicating high internal consistency.

**Table 1. The level of Technological Caring Competence for Nursing Education was determined using the 7-point scale**

| Relative Value | Statistical Limit | Scale |
|---|---|---|
| 7 | 6.16 - 7 | Always |
| 6 | 5.30 – 6.15 | Almost Always |
| 5 | 4.44 – 5.29 | Very Often |
| 4 | 3.58 – 4.43 | Often |
| 3 | 2.72 – 3.57 | Sometimes |
| 2 | 1.86 – 2.71 | Rarely |
| 1 | 1.00 – 1.85 | Never |

**Table 2. Level of Technological Caring Competence for Nursing Education**

| | Competencies |
|---|---|
| Q1 | I emphasize consideration and thoughtfulness towards my students. |
| Q2 | I express caring utilizing competency with technology. |
| Q3 | I provide care to my students by using necessary technologies. |
| Q4 | I am providing quality education through a harmonious relationship between technology and caring. |
| Q5 | I consider students' learning preferences because their learning styles vary. |
| Q6 | I am making learning objectives/plans together with the students to ensure quality education. |
| Q7 | I am assessing my students' learning needs as a basis for a training plan. |
| Q8 | I share information with students to get to know them better. |
| Q9 | I am providing quality nursing education with a thorough understanding of my own competency. |
| Q10 | I use technology to know my students as complete and to maintain honest relationships with them. |
| Q11 | I finish my work within the established work time even if I could not know the student's emotional needs or feelings. |
| Q12 | I respect my student's beliefs and anticipate their learning needs and desires. |
| Q13 | I am caring for my students by maintaining a healthy academic environment in the nursing school. |
| Q14 | I am considerate, supportive, and respectful to my students. |
| Q15 | I provide quality nursing education in accordance with my students' physical and emotional needs. |
| Q16 | I am caring for my students to fulfill their learning needs, hopes, and dreams. |
| Q17 | I am listening to the student's voices and showing my compassion. |
| Q18 | I provide care and consider the stress and anxieties that the student may possess during the conduct of different learning activities. |
| Q19 | I am working to know my students by understanding their learning needs. |
| Q20 | I use healthcare technologies as one of my nursing competencies in teaching from the perspective of caring in nursing. |
| Q21 | I am working to know my students by understanding them as a whole. |
| Q22 | I am providing quality nursing education by partnering with my students including me in their growth within the nursing situations. |
| Q23 | I use technologies with competence as an expression of my caring in order to know my students. |
| Q24 | I use technology to understand my student's learning needs and styles. |
| Q25 | I am using technology and providing caring to facilitate student's learning capability with enhanced self-esteem. |

### *3.4. Sampling*

The study involved 243 Filipino nurse educators from both private and public institutions, encompassing various teaching positions. All participants were Filipino nationals actively engaged in nursing education.

### *3.5. Ethical Considerations and Informed Consent*

Ethical approval for the study was obtained from the Ethics Review Committee of St. Paul University of the Philippines (Reference ID: 06232022). Participants were recruited with permission from their respective institutions, and the study's purpose and objectives were explained. Participation was voluntary, with no penalties for withdrawal. Risks and benefits were outlined, and privacy and confidentiality were ensured. The survey results were anonymized, and participants provided informed consent before participating.

### *3.6. Data Collection*

Data collection occurred between July and August 2022 using an online survey distributed via Google Forms. A combination of purposive sampling and the snowball technique was employed to recruit participants from nursing institutions across various regions in the Philippines. Researchers collaborated with deans, faculty members, and nursing academicians to disseminate the survey and encourage participation.

### *3.7. Data Analysis*

Data were analyzed using Minitab® 20 software. Descriptive statistics, including frequency counts, percentages, and weighted means, were used to summarize the data. Inferential statistical analyses included the two-sample t-test and confidence intervals to identify significant differences based on age, sex, and employment status. One-way ANOVA and Tukey pairwise comparisons were used to assess differences based on type of institution, years of teaching experience, and educational attainment. This rigorous approach ensured a comprehensive understanding of the factors influencing TCCNE among Filipino nurse educators.

## 4. Results

### *4.1. Participants' Demographic Profile*

Table 3 presents the demographic profile of the 243 nurse educators who participated in the study. The majority of participants were within the age bracket of 20–39 years, indicating a younger cohort of educators in the nursing academe. A greater number of male nurse educators participated compared to their female counterparts, suggesting a notable male representation in the field. Most participants had obtained a master's degree, reflecting the academic qualifications expected of nursing educators. Regarding teaching experience, the majority reported having either one to two years or more than five years of teaching experience. Most of the participants were employed in government institutions, and the majority held full-time employment status, demonstrating a stable professional commitment among nursing educators.

**Table 3. Participants' Demographic Profile**

| Demographics | Frequency | Percentage |
|---|---|---|
| Age (years)<br>20-39<br>40-59 | <br>162<br>81<br>n=243 | <br>66.67<br>33.33<br>100.00 |
| Gender<br>Male<br>Female | <br>136<br>107<br>n=243 | <br>55.97<br>44.03<br>100.00 |
| Highest Educational Attainment<br>PhD Level<br>Master's Level<br>Bachelor Level | <br>43<br>147<br>53<br>n=243 | <br>17.69<br>60.49<br>21.82<br>100.00 |
| Years of Experience in Teaching<br>< 1 year<br>1-2 Years<br>3-5 Years<br>> 5 years | <br>59<br>78<br>28<br>78<br>n=243 | <br>24.27<br>32.09<br>11.55<br>32.09<br>100.00 |
| Affiliated Institution<br>Government<br>Private<br>Both | <br>116<br>87<br>40<br>n=243 | <br>47.74<br>35.80<br>16.46<br>100.00 |
| Employment Status<br>Full-time<br>Part-time | <br>162<br>81<br>n=243 | <br>66.67<br>33.33<br>100.00 |

### *4.2. Filipino Nursing Educators' Technological Caring Competence for Nursing Education*

Table 4 outlines the participants' levels of Technological Caring Competence for Nursing Education (TCCNE). Overall, the perceived TCCNE level was interpreted as "high," corresponding to an average scale score of 6 (almost always). Among the individual items, the highest-rated item was Q14 (M=6.72, SD=0.5, KS=0.46), which measured being considerate, supportive, and respectful to students. This result emphasizes the participants' commitment to fostering a supportive learning environment. Conversely, the lowest-rated item was Q11 (M=4.7, SD=1.71, KS=0.20), which assessed the ability to complete work within established timeframes while simultaneously addressing students' emotional needs. This suggests a potential area for improvement in balancing time management and addressing students' emotional well-being.

**Table 4. Level of Technological Caring Competence for Nursing Education (TCCNE)**

| | Competencies | Mean | Description |
|---|---|---|---|
| Q1 | I emphasize consideration and thoughtfulness towards my students. | 6.30 | Always |
| Q2 | I express caring utilizing competency with technology. | 5.86 | Almost Always |
| Q3 | I provide care to my students by using necessary technologies. | 5.90 | Almost Always |
| Q4 | I am providing quality education through a harmonious relationship between technology and caring. | 6.32 | Always |
| Q5 | I consider students' learning preferences because their learning styles vary. | 6.25 | Always |
| Q6 | I am making learning objectives/plans together with the students to ensure quality education. | 6.08 | Almost Always |
| Q7 | I am assessing my students' learning needs as a basis for a training plan. | 6.50 | Always |
| Q8 | I share information with students to get to know them better. | 6.14 | Almost Always |
| Q9 | I am providing quality nursing education with a thorough understanding of my own competency. | 6.58 | Always |
| Q10 | I use technology to know my students as complete and to maintain honest relationships with them. | 6.31 | Always |
| Q11 | I finish my work within the established work time even if I could not know the student's emotional needs or feelings. | 4.69 | Very Often |
| Q12 | I respect my student's beliefs and anticipate their learning needs and desires. | 6.49 | Always |
| Q13 | I am caring for my students by maintaining a healthy academic environment in the nursing school. | 6.69 | Always |
| Q14 | I am considerate, supportive, and respectful to my students. | 6.72 | Always |
| Q15 | I provide quality nursing education in accordance with my students' physical and emotional needs. | 6.57 | Always |
| Q16 | I am caring for my students to fulfill their learning needs, hopes, and dreams. | 6.60 | Always |
| Q17 | I am listening to the student's voices and showing my compassion. | 6.69 | Always |
| Q18 | I provide care and consider the stress and anxieties that the student may possess during the conduct of different learning activities. | 6.36 | Always |
| Q19 | I am working to know my students by understanding their learning needs. | 6.42 | Always |
| Q20 | I use healthcare technologies as one of my nursing competencies in teaching from the perspective of caring in nursing. | 6.42 | Always |
| Q21 | I am working to know my students by understanding them as a whole. | 6.48 | Always |
| Q22 | I am providing quality nursing education by partnering with my students including me in their growth within the nursing situations. | 6.53 | Always |
| Q23 | I use technologies with competence as an expression of my caring in order to know my students. | 6.25 | Always |
| Q24 | I use technology to understand my student's learning needs and styles. | 6.20 | Always |
| Q25 | I am using technology and providing caring to facilitate student's learning capability with enhanced self-esteem. | 6.30 | Always |

Noteworthy items include Q2 and Q3, with average means of 5.86 and 5.90, respectively. These items reflect competencies in expressing care through technology and providing student-centered support using technological tools. While the scores for these items were above average, they highlight areas where further strengthening is required to enhance educators' ability to integrate technology effectively with caring practices.

Test of Significant Differences in Technological Caring Competence for Nursing Education Levels of Participants When Grouped According to Profile

Table 5 shows the significant differences in participants' TCCNE levels based on demographic factors. The results indicated no significant differences in TCCNE levels when grouped according to age or years of teaching experience. This suggests that technological caring competence is relatively consistent across these demographic variables.

However, significant differences were observed when participants were grouped by sex, educational attainment, type of institution, and employment status. These findings imply that gender, academic qualifications, workplace setting, and employment status influence TCCNE levels. For instance, educators with higher educational attainment may demonstrate stronger competencies due to their exposure to advanced training and technologies. Similarly, variations between public and private institutions or full-time versus part-time employment might reflect disparities in access to resources, professional development opportunities, or institutional support systems. These differences underscore the need for targeted interventions to address inequities and enhance TCCNE across all groups.

**Table 5. Significant Differences in Technological Caring Competence for Nursing Education (TCCNE) Levels of Participants When Grouped According to Profile**

| Demographics | Mean | F-value | P-value |
|---|---|---|---|
| Age (years) | | | |
| 20-39 | 6.28 | -1.025 | 0.307 |
| 40-59 | 6.35 | | |
| Gender | | | |
| Male | 6.49 | 5.766 | 0.000 |
| Female | 6.16 | | |
| Highest Educational Attainment | | | |
| PhD Level | 6.42 | | |
| Master's Level | 6.21 | 8.428 | 0.000 |
| Bachelor Level | 6.49 | | |
| Years of Experience in Teaching | | | |
| < 1 year | 6.27 | | |
| 1-2 Years | 6.36 | 0.621 | 0.602 |
| 3-5 Years | 6.26 | | |
| > 5 years | 6.29 | | |
| Affiliated Institution | | | |
| Government | 6.40 | 19.049 | 0.000 |
| Private | 6.08 | | |
| Both | 6.52 | | |
| Employment Status | | | |
| Full-time | 6.24 | -3.364 | 0.001 |
| Part-time | 6.45 | | |

## 5. Discussion

Highlighting the profiles of 243 Filipino nursing educators across the Philippines, this study reveals that the majority are young, full-time educators, predominantly employed in government colleges and universities, and hold master's degrees. These

findings suggest that the nursing academe in the Philippines is composed of a new generation of educators eager to learn and refine their teaching practices. Younger educators are typically more adaptable and open to integrating innovative methods, including technology, into their teaching. This does not imply that seasoned educators are less effective, as their expertise and experience remain vital in shaping nursing education. Rather, it reflects the natural evolution of teaching dynamics, where younger teachers exhibit enthusiasm while seasoned educators bring stability and depth, as noted by Kini and Podolsky (2016) [29].

The study found that Filipino nursing educators strongly perceive their Technological Caring Competence for Nursing Education (TCCNE), with being considerate, supportive, and respectful to students emerging as the highest-rated competency. This demonstrates their commitment to maintaining the essence of nursing—caring—even in an academic setting and through remote instruction. Their ability to foster a healthy academic environment through compassion and attentiveness underscores their dedication to student well-being. This aligns with Salehian et al. (2017), who emphasized that caring in nursing education stems from ethical and human values embedded in faculty-student interactions [30]. The caring framework in nursing education encompasses values and principles that can be strengthened through positive support, healthy relationships, and reflective practices.

Despite the high overall levels of TCCNE, the study identified areas requiring improvement. Three competencies were highlighted: finishing work within established timeframes while addressing students' emotional needs, expressing care through technological means, and providing care using appropriate technologies. These gaps point to challenges in integrating technology with care, particularly in remote instruction. Filipino nursing educators, like their global counterparts, face difficulties in balancing lesson delivery, assessment responsibilities, and timely feedback. Limitations such as unreliable internet connectivity, lack of technological resources, and insufficient access to advanced tools exacerbate these challenges, especially in the Philippines [31,32]. Moreover, the need to incorporate both low-fidelity and high-fidelity technologies into nursing practice adds another layer of complexity. These findings echo the work of Raman (2015) and Hinshaw (2001), who reported that resource shortages and technological barriers are significant hurdles for nurse educators [31,32]. While face-to-face instruction has resumed in many institutions, the use of technology remains critical, particularly in clinical practice, where limitations in access to resources can hinder the balance between technology and care.

The challenges in demonstrating care through virtual platforms are further compounded by the persistent technological issues in the Philippines. Many educators prioritize lesson delivery over the "caring" aspect due to time and resource constraints. However, caring for students remains an essential component of education and can be demonstrated through flexible activities and accommodating student needs. Richter and Schuessler (2019) highlighted the importance of addressing technological challenges while maintaining caring interactions with students [33]. Similarly, Vandenberg and Magnuson (2021) recommended seeking institutional support to ensure both technological competence and care are delivered effectively [34].

The study also explored significant differences in TCCNE levels across demographic profiles. It found no significant differences based on age or years of teaching experience, suggesting that technological caring competence is consistent regardless of these factors. This finding is consistent with Dela Fuente and Biñas (2020), who noted that age does not significantly affect ICT competence [35]. However, significant differences were observed based on sex, educational attainment, type of institution, and employment status. Educators with master's degrees, those in state colleges and universities, and those with full-time positions exhibited higher levels of TCCNE. This is likely due to advanced academic preparation, which provides deeper exposure to technology and care, and the

institutional support available in state-funded institutions. Marjon and Nugroho (2019) similarly found that academic qualifications significantly impact teaching competence, although this finding contrasts with Dela Fuente and Biñas (2020), who concluded that teaching positions and educational attainment had no significant effect on ICT-related teaching competence [35,36]. These discrepancies underscore the need for further research to explore how various factors influence TCCNE in different contexts.

### *5.1. Proposed Training Plan*

The results and discussion of this study have provided valuable insights and clear guidance on the development of a proposed training plan. This plan is a one-day training and workshop that focuses on two critical topics: curriculum adjustments for conducting remote instruction and balancing technology with the essential nursing value of care in education. The plan details its objectives, target participants, program of activities, and budgetary requirements. The primary goal is to enhance nursing educators' TCCNE by offering a practical and interactive training session delivered via both face-to-face and virtual formats.The two main objectives of the training are: 1) to familiarize participants with best practices for curriculum adjustments in remote instruction, enabling them to demonstrate these practices through writing and presentation workshops, and 2) to provide a platform for discussing how TCCNE can be effectively applied in academic settings. This will include reflections on the experiences of invited resource speakers who are experts in nursing education and technology integration. These experts will share theories, strategies, and concepts to guide participants in balancing the use of technology with the nurturing of care in their educational practices. The target participants are nursing educators, regardless of demographic background, while the researchers of this study will act as the planners and implementers of the training.

### *5.2. Implications for Practice*

This study presents three significant implications for nursing education practice. First, the evaluation of nursing educators' TCCNE using the modified tool must be promoted across nursing colleges and universities. Doing so provides a structured opportunity for educators and students alike to recognize and uphold the value of caring amidst the increasing use of technological innovations. Second, as nursing educators serve as role models in balancing technology and care, their participation in professional development programs focused on these competencies is vital. Such initiatives strengthen advocacy for maintaining the core of nursing—caring—even in technologically advanced educational settings. Moreover, as institutions prepare for face-to-face instruction after the pandemic, they must provide adequate support for educators to facilitate caring interactions using technology in laboratories and simulation facilities. Leaders in nursing education can play a pivotal role by creating avenues to institutionalize TCCNE, ensuring its integration into both teaching methodologies and institutional policies.

### *5.3. Limitations and Recommendations*

This study has several notable limitations. The primary focus on remote teaching contexts excluded face-to-face instruction in laboratories and simulation facilities, where technological machines and hands-on interaction play a crucial role in nursing education. As a result, the findings may not fully capture the competencies required in these critical educational environments. Additionally, the sample size of 243 participants, while providing valuable insights, may not be fully representative of the broader population of Filipino nursing educators. Differences in institutional policies, access to technological resources, and regional disparities could influence TCCNE levels, limiting the generalizability of the results. Lastly, the proposed training plan, though addressing essential competencies such as time management, expressing care through technology, and providing care using appropriate tools, may not comprehensively cover all aspects of

TCCNE that need strengthening. A more expansive training framework could provide deeper insights and greater impact.

To address these limitations, future studies should expand the scope of TCCNE assessment to include face-to-face instruction in laboratories and simulation facilities, where the integration of technology and care takes on unique challenges. Employing a mixed-method approach that combines quantitative data with qualitative insights from interviews or focus group discussions would provide a more comprehensive understanding of the issues faced by educators and students. Increasing the sample size and diversity by including educators from a wider range of institutions and geographic regions would enhance the representativeness and applicability of the findings. Additionally, training programs should expand beyond the identified competencies to include areas such as advanced simulation technology use, fostering student engagement in virtual settings, and effective communication through digital platforms. These enhancements would support a more robust framework for strengthening TCCNE and maintaining the essence of nursing care in education.

## 6. Conclusions

This study has contributed to the discussion on assessing and strengthening TCCNE among nursing educators in academic settings. The modified tool used for assessment has been statistically validated and proven reliable, providing a strong foundation for its continued advocacy and implementation. The proposed training plan is a practical step toward addressing gaps in TCCNE, equipping educators to balance care with technological competence effectively. Strengthening these competencies is essential for preserving the essence of nursing—caring—not only in clinical practice but also in classrooms, laboratories, and simulation facilities. This balance ensures that nursing education remains holistic, relevant, and impactful in a rapidly evolving academic and healthcare landscape.

## 7. Patents

**Author Contributions: RN**: Conceptualization, Methodology, Formal analysis, Investigation, Resources, Data Curation, Writing - Original Draft, Project administration Writing - Review & Editing **EAL, SN, RT:** Conceptualization, Methodology, Formal analysis, Investigation, Resources, Data Curation, Writing - Original Draft, Project administration **MEB, JP, TT:** Methodology, Validation, Formal analysis, Writing - Review & Editing, Supervision

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**Conflict of Interest:** The authors declare no conflict of interest. The original abstract of this study was presented during the 4th International Conference on Technological Competency as Caring in Nursing and Health Sciencesl 2022.

## References

[1] Glasper A. The legacy of Florence Nightingale's educational reforms for nursing. *Br J Nurs*. 2020;29(16):980–1. https://doi.org/10.12968/bjon.2020.29.16.980

[2] Roux G, Halstead JA, editors. *Issues and Trends in Nursing: Essential Knowledge for Today and Tomorrow*. 4th ed. Burlington, MA: Jones & Bartlett Learning; 2018.

[3] Fowler SM, Knowlton MC, Putnam AW. Reforming the undergraduate nursing clinical curriculum through clinical immersion: A literature review. *Nurse Educ Pract*. 2018;31:68–76. https://doi.org/10.1016/j.nepr.2018.04.013

[4] Malone RE. Nursing's unique opportunity to lead public health responses. *Nurs Outlook*. 2021;69(2):153–5.

[5] World Health Organization. *State of the World's Nursing 2020: Investing in Education, Jobs and Leadership*. Geneva: WHO; 2020. https://www.who.int/publications/i/item/9789240003279

[6] Castro TC, Gonçalves LS. The use of gamification to teach in the nursing field. *Rev Bras Enferm*. 2018;71:1038–45. https://doi.org/10.1590/0034-7167-2017-0023

[7] Riantini RE, Tjhin VU, Kusumastuti DL. Mobile-based learning development for improving quality of nursing education in Indonesia. 2019 IEEE Conf Sustain Utiliz Dev Eng Technol. 2019:39–44. https://doi.org/10.1109/CSUDET47057.2019.9214755

[8] Lee H, Min H, Oh SM, Shim K. Mobile technology in undergraduate nursing education: A systematic review. *Healthc Inform Res*. 2018;24(2):97–108. https://doi.org/10.4258/hir.2018.24.2.97

[9] Gause G, Mokgaola IO, Rakhudu MA. Technology usage for teaching and learning in nursing education: An integrative review. *Curationis*. 2022;45(1):1–9. https://doi.org/10.4102/curationis.v45i1.2261

[10] O'Keefe R, Auffermann K. Exploring the effect of COVID-19 on graduate nursing education. *Acad Med*. 2022;97(3) https://doi.org/10.1097/ACM.0000000000004537

[11] Iwasiw CL, Goldenberg D. *Curriculum Development in Nursing Education*. Burlington, MA: Jones & Bartlett Publishers; 2015.

[12] Ard N, Beasley SF, Nunn-Ellison K, Farmer S. Responding to the pandemic: Nursing education and the ACEN. *Teach Learn Nurs*. 2021;16(4):292–5. https://doi.org/10.1016/j.nepr.2018.04.013

[13] Hill K, Murphy M, Hollywood E, O'Neill T. Impact of COVID-19 on teaching an undergraduate children's nursing module: Rapid responses. *All Ireland J High Educ*. 2020;12(3). https://ojs.aishe.org/index.php/aishe-j/article/view/461

[14] Leaver CA, Stanley JM, Veenema TG. Impact of the COVID-19 pandemic on the future of nursing education. *Acad Med*. 2022;97(3) https://doi.org/10.1097/ACM.0000000000004528

[15] Silva CM, Toriyama ATM, Claro HG, Borghi CA, Castro TR, Salvador PICA. COVID-19 pandemic, emergency remote teaching and Nursing Now: Challenges for nursing education. *Rev Gaucha Enferm*. 2021;42 https://doi.org/10.1590/1983-1447.2021.20200248

[16] Eggenberger TL, Keller KB, Chase SK, Payne L. A quantitative approach to evaluating caring in nursing simulation. *Nurs Educ Perspect*. 2012;33(6):406–9. https://doi.org/10.5480/1536-5026-33.6.406

[17] Sitzman K, Leners DW. Student perceptions of caring in online baccalaureate education. *Nurs Educ Perspect*. 2006;27(5):254–9. https://journals.lww.com/neponline/Abstract/2006/09000/Student_Perceptions_of_CARING_in_Online.10.aspx

[18] Locsin RC. *Technological Competency as Caring in Nursing: A Model for Practice*. Indianapolis, IN: Sigma Theta Tau International; 2005.

[19] Locsin RC. The theory of Technological Competency as Caring in Nursing: Guiding nursing and health care. *Shikoku Acta Medica*. 2016;72(5):6. https://core.ac.uk/download/pdf/197209758.pdf

[20] Locsin RC, Tanioka T, Kondo K. Advancing the theory of technological competency as caring within nursing and the health sciences: From philosophical and theoretical to praxis. *J Med Invest*. 2019;66(1.2):1. https://doi.org/10.2152/jmi.66.1

[21] Nakano Y, Yokotani T, Betriana F, et al. Perceptions of nurse managers and staff nurses regarding technological competency as caring in nursing theory in general hospitals in Japan. *Belitung Nurs J*. 2021;7(6):467–75. https://doi.org/10.33546/bnj.1767

[22] Bahari K, Talosig AT, Pizarro JB. Nursing technologies creativity as an expression of caring: A grounded theory study. *Glob Qual Nurs Res*. 2021;8:2333393621997397. https://doi.org/10.1177/2333393621997397

[23] Edwards J, O'Connor PA. Improving technological competency in nursing students: The passport project. *J Educ Online*. 2011;8(2) https://eric.ed.gov/?id=EJ941410

[24] Clark M, Raffray M, Hendricks K, Gagnon AJ. Global and public health core competencies for nursing education: A systematic review of essential competencies. *Nurse Educ Today*. 2016;40:173–80. https://doi.org/10.1016/j.nedt.2016.02.026

[25] Bennett PC. Senior students' experiences, perspectives, and attitudes of technological competencies in nursing education. [Dissertation]. Walden Dissertations and Doctoral Studies. 2017;(4125). https://scholarworks.waldenu.edu/dissertations/4125

[26] Yokotani T, Tanioka T, Betriana F, et al. Psychometric testing of the Technological Competency as Caring in Nursing Instrument: Revised (English version including a practice dimension). *Nurse Media J Nurs*. 2021;11(3):346–58. https://doi.org/10.14710/nmjn.v11i3.41409

[27] Siedlecki S. Understanding descriptive research designs and methods. Clin Nurse Spec. 2020;34(1):8–12. https://doi.org/10.1097/NUR.0000000000000493

[28] Koh ET, Owen WL. Descriptive research and qualitative research. In: Introduction to Nutrition and Health Research. Springer; 2000. p. 219–48. https://doi.org/10.1007/978-1-4615-1401-5_12

[29] Kini T, Podolsky A. Does teaching experience increase teacher effectiveness? A review of the research. Learning Policy Institute. 2016. https://learningpolicyinstitute.org/product/does-teaching-experience-increase-teacher-effectiveness-review-research

[30] Salehian M, Heydari A, Aghebati N. Faculty-student caring interaction in nursing education: An integrative review. J Caring Sci. 2017;6(3):257–67. https://doi.org/10.15171/jcs.2017.025

[31] Raman J. Mobile technology in nursing education: Where do we go from here? A review of the literature. Nurse Educ Today. 2015;35(5):663–72. https://doi.org/10.1016/j.nedt.2015.01.018

[32] Hinshaw AS. A continuing challenge: The shortage of educationally prepared nursing faculty. OJIN: Online J Issues Nurs. 2001;6(1):3. https://doi.org/10.3912/OJIN.Vol6No01Man03

[33] Richter SL, Schuessler JB. Nursing faculty experiences and perceptions of online teaching: A descriptive summary. Teach Learn Nurs. 2019;14(1):26–9. https://doi.org/10.1016/j.teln.2018.09.004
[34] Vandenberg S, Magnuson M. A comparison of student and faculty attitudes on the use of Zoom, a video conferencing platform: A mixed-methods study. Nurse Educ Pract. 2021;54:103138. https://doi.org/10.1016/j.nepr.2021.103138
[35] Dela Fuente J, Biñas L. Teachers' competence in information and communications technology (ICT) as an educational tool in teaching: An empirical analysis for program intervention. JREST. 2020;5:61–76. https://jrest.net/index.php/jrest/article/view/50
[36] Marjon S, Nugroho NA. Competence analysis of professional teacher candidates based on the teacher professional education program. JP2M. 2019;7(2):103–15. https://doi.org/10.26418/jppk.v7i2.32637