EXPERIENCE EXCHANGE

Expanding the faculty capacity to help meet the increased national demand resulting from the addition of nursing informatics in the baccalaureate program: A Philippines experience

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ABSTRACT

With the increasing use of technology in health care and the inclusion of nursing informatics in the revised baccalaureate nursing program in the Philippines, there is a need to increase the number of faculty who can competently and confidently teach the course. This paper reports on the planning, development, implementation and evaluation of a professional development program, entitled "Teaching Nursing Informatics", an eight-week course offered via distance learning using synchronous and asynchronous modes. Topics included concepts and theories that influenced the rise of nursing informatics, its metastructures, classification systems, system planning and design, data mining, population health and precision medicine, decision support, electronic medical records, point of care technologies, and other related topics. The course was taught using problem-based learning to help critically analyze real system and process issues that can be mitigated by nursing informatics concepts and technologies. Using project management principles, educator-participants developed group projects to integrate and demonstrate lessons learned in the program. The pedagogical approaches used were deemed effective and appropriate that course participants gave it high marks and positive feedback. Some challenges and opportunities in terms of content, pedagogy, and technology were also highlighted as factors that influence program outcomes. Teaching Nursing Informatics, offered through open and distance learning, can be replicated locally and globally. It is a viable and practical model that increases faculty capacity, confidence, and competence in educating nurses and nursing students in the fundamentals and applications of nursing informatics to enhance their professional practice and ability to provide safe patient care.

Key Words: Continuing professioanl development, Global collaborations, Nursing informatics, Open and distance learning, Problem-based learning

1. INTRODUCTION

With the Fourth Industrial Revolution, exemplified by advances in artificial intelligence, robotics, genetic engineering, quantum computing, 3D printing, virtual realities, the Internet of Things, and other technologies, many product and process innovations are becoming more pervasive in everyday life. Many of our processes have been computerized, documents digitized, and patient care technologies prolifer-

ated particularly in high-end healthcare organizations. As technology becomes prevalent, educational institutions include these innovations in curricular content and use them in teaching. These advances are also spreading in other disciplines, leading to specializations such as health informatics, medical informatics and nursing informatics.

Nursing Informatics (NI) was officially named a specialization in nursing by the American Nurses Association in 1992. Its scope of practice was published in 1994 and its standard of practice in 1995.[1] All countries, whether economically-politically-technologically thriving or not, have transformed their structures and processes as a result of influences brought about by informatics and technology. While changes were not massive or fast in coming, the Philippines, along with other developing countries, were feeling the insidious changes brought about by informatics and technologies in nursing, health care, and across all types of industries.

As a result of a review of nursing education in the Philippines, schools switched its focus from competency to outcome-based standards. The Commission on Higher Education (CHED), the official administrative agency directly under the Office of the President of the Philippines which has oversight of higher education institutions (HEIs) in the country, issued Memorandum # 15, Series of 2017 that outlined the structure, goals and standards of the Bachelor of Science in Nursing (BSN) program. In this memorandum, the CHED clearly articulated the relevance of NI, specifically in the BSN education of nurses, with the inclusion in Article 4, Section 6.3, Item #i, stating that [nurses] "apply techno-intelligent care systems and processes in health care delivery".[2]

The University of the Philippines Manila, College of Nursing (UPCN), as a CHED Center of Excellence, felt the need to support nurse educators on how to teach nursing informatics. The conceptualization of the Nursing Informatics course for the undergraduate program started in 2014. The first author, an alumnus of UPCN and an informatics educator and scholar based in the United States, served as content expert consultant, with the UPCN faculty developing the course content and syllabus. Consulting with the first author was conducted remotely. The syllabus, along with the rest of the courses in the revised outcome-based curriculum, was submitted to the Board of Regents of the University of the Philippines for review and approval. The UPCN set the pace for other schools in the country to revise their curriculum and include Nursing Informatics. With Nursing Informatics now required in all nursing schools in the Philippines, the need for faculty who can effectively teach the course increased.

This paper reports on the planning, development, implementation and evaluation of a professional development course,

entitled "Teaching Nursing Informatics", delivered through open and distance learning, to increase the number of faculty in the Philippines who can competently and confidently teach the course to baccalaureate nursing students.

2. OBJECTIVES

This program evaluation aims to document and evaluate processes in the development and implementation of the Teaching Nursing Informatics course offered through the use of open and distance learning. Specifically, this evaluation aims to: (1) describe the process of course development and course implementation of Teaching Nursing Informatics; (2) evaluate the course processes and performance of participants of the continuing professional development course; and, (3) discuss the challenges and opportunities in the course implementation of Teaching Nursing Informatics.

3. LITERATURE REVIEW

Since Nursing Informatics (NI) became a specialization in nursing, there have been many compelling and indelible influences to nursing practice, education, administration, and research.[3] Many initiatives followed since then, marking the real surge of NI in healthcare and nursing. The seminal report from the Institute of Medicine (IOM) To Err is Human[4] resulted in several recommendations, such as a heightened focus on patient-centered care, better interprofessional collaboration, less reliance on routine care, and the optimal use of technology by nurses to address the increased incidence of medical errors. A consortium of educators, school officials, technology experts, and parents called Technology Informatics Guiding Education Reform (TIGER)[5] got together to determine how best to integrate the use of technology in the education of students. Many years since this initiative began, TIGER now has competencies incorporated in educational curricula where various technologies are in place to enhance learning and increase the rate of students' success in their education.

Quality and Safety Education for Nurses (QSEN) began in 2005 with funding from Robert Wood Johnson Foundation to focus the education of nurses on seven competencies based on knowledge, skills and attitudes (KSAs). These competencies include patient-centered care, teamwork & collaboration, evidence-based practice, quality improvement, safety and informatics.[6] The focus on patient safety and quality care emphasized the importance of using patient care technologies and NI concepts in nursing practice, research and education.

The earlier version of the Essentials of Baccalaureate Education in Nursing for Professional Nursing Practice written by the American Association of Colleges of Nursing (AACN)[7]

outlined nine core competencies required of nursing students in order to practice safe, quality, effective and professional care. The fourth competency focused on information management and application of patient care technology, a relevant concept in NI. The revised guidelines integrated two-levels of AACN core competencies (entry and advanced level professional nursing sub-competencies) with 10 domains, at least seven of these are either directly or indirectly interposing with NI concepts, e.g., information and healthcare technologies, population health, quality and safety, systems-based practice, scholarship for nursing practice, person-centered care, and interprofessional partnerships.[8]

The revision in core competencies merely emphasizes ANA's latest iteration of the definition of NI focusing on four elements: (1) that NI integrates nursing science with most disciplines; (2) full incorporation of all the processes involved in the transformation of data and information into knowledge and wisdom; (3) the important role of nurses and nursing in interpersonal relationships and collaborations; and, (4) the important role of nurses in decision making focused on evidence and outcome-based practice in all healthcare settings.[9]

From the brief account of the evolution of nursing informatics, the incorporation of NI in the education of pre-licensure nurses cannot be overemphasized. We have seen how nurses and nursing roles have adopted many changes and innovations that come with the increasing pervasiveness of the relevance of NI. The proliferation of new technologies that complement the roles of nurses, as well as their impact, effectiveness and relevance in patient care is now even more pronounced.

Recent healthcare innovations propelled by technology and informatics continue to be introduced in all healthcare settings. Whether nurses like it or not, these changes have redefined nurses' roles in varying degrees. Electronic health records, barcode medication administration, computerized provider entry, point of care technologies, monitoring devices with built-in decision support, robotics, artificial intelligence and data gathering tools that help to organize, manage and mine data and information for targeted projects (precision medicine and population health) are just some examples. These technologies have influenced and changed the work of nurses. Many more innovations will be forthcoming, and NI will continue to give rise to role transformations, process and structural changes, and astounding impact on quality and safe care.

Under these circumstances, educating nurses on the basics of nursing informatics and how its applications affect the roles and responsibilities of nurses is imperative. The decision to mandate the inclusion of NI in the baccalaureate nursing program in the Philippines is a necessary step to facilitate students' appreciation of how technologies and innovations affect nursing roles and healthcare processes. Once students understand the principles behind basic NI concepts, such as, information access, processing and use, data mining and analytics, decision support, programming of artificial intelligence devices, monitoring equipment with alert parameters, telehealth and secure interconnections and interoperability of devices for optimal data exchange, system design and usability studies, and project management, it is even more evident that the value and benefits of these structural, systemic and technological changes outweigh its disadvantages. The appreciation and application of NI concepts and principles will lead to the optimal functioning of nurses. The more nursing students and nurses understand the implications and relevance of NI, the better they will be able to conduct themselves more effectively and safely.

4. METHODS
This program evaluation examined structures and processes related to the course development and implementation of Teaching Nursing Informatics. It used the evaluation tools embedded in the course which include quantitative ratings of activities as well as open-ended questions to provide context to the numerical evaluation of the course by the participants. The course evaluation forms were analyzed using descriptive statistics. The participants' answers to the open-ended questions were analyzed using content analysis.

5. FINDINGS AND DISCUSSION
The results of this program evaluation are presented using five major components: (1) course development, (2) course implementation, (3) course evaluation, (4) course completion, and (5) challenges and opportunities.

5.1 Course development
The program content was developed by the course faculty team. The project proponent is the first author and the same alumnus of UPCN Manila who initially served as consultant in the development of the NI curriculum. He is based in the northeast region of the United States for about forty years and has extensive knowledge and expertise in NI, collaboration with various health and nurse informaticists, and teaching NI in graduate and undergraduate programs. The dean and professor of UPCN Manila, who has the education (doctorate in public health epidemiology and postdoctoral education in data mining) and experience in informatics, and two other UPCN Manila faculty with diverse experiences in the application of NI in nursing practice, education, research and administration are also part of the teaching team.

The course content was developed based on a preliminary needs assessment among nursing institutions and potential nursing faculty participants through an online inquiry. Responses of nursing faculty in past activities offered by the host institution were also considered. The assessment revealed the main issues in teaching NI which include (1) the lack of competent faculty with adequate experience in NI, (2) limited opportunities for students to demonstrate NI competencies in laboratory and actual practice, and (3) lack of awareness and availability of nursing-focused technology applications in practice settings. These issues guided the faculty team in developing the course.

Course objectives were established. At the end of the program, students would be able to define NI and explain data, information, knowledge and wisdom as the metastructures of NI; discuss the various disciplines that influenced NI and its evolution into a specialization; describe some relevant theories and concepts used in NI; describe ethical and legal considerations in NI; explain what decision support systems are and provide some examples; identify some applications of NI in nursing education, research, practice and administration; and, develop an informatics-mediated project.

Topics included in the course were the history and evolution of NI, relevance and metastructures of NI, legal and ethical components in the planning, implementation and use of technological programs and applications, decision support systems, project management, and current applications available and its influences in nursing practice, education, research and administration. Pedagogical strategies used were short video lectures, threaded discussions, synchronous discussions to clarify topics deemed to be unclear to students, individual online consultations, and group exercises (done incrementally to identify, analyze practice gaps, conduct research, design and prepare the project presentation).

The course content was divided into eight modules. These provided substantial emphasis on the foundations of NI and context-based examples to allow the participants to explore ways to teach NI in their respective educational settings. An online blended format, with more asynchronous sessions, was designed to be offered over an eight-week period. Three sessions (kick-off, midterm and final) were scheduled to be synchronous for course orientation and discussion of course requirements, preliminary project presentation and guidance, and final project presentation and course evaluations, respectively. The asynchronous sessions were designed in a way where students would have more opportunities to engage with their group and offer flexibility to collaborate, taking into consideration their personal and professional responsibilities.

5.2 Course implementation

5.2.1 *Participants*

The target participants were faculty members or would-be faculty members interested in teaching NI. Registration was open to the entire country since the course was offered in a virtual learning environment. Participants were enrolled in the host institution's online learning management system in advance of the course start date to allow familiarity in navigating the platform. The course site was maintained by a faculty facilitator focused on course management and addressed participant inquiries. The participants had continued access to the course site and all course materials to ensure a self-paced progression.

Table 1 presents the profile of participants. A total of 32 nurses with a mean age of 36.43 ($\pm$ 7.325) years participated in the training. Majority were female (59.38%) and have post-baccalaureate education (Master's 56.25%, Doctorate 28.13%). Since the professional development program was offered online, three participants were from outside the Philippines (United Arab Emirates and the United States of America). All the three major islands of the Philippine archipelago were represented with 65.63% from Luzon, 15.62% from Visayas, and 9.38% from Mindanao. Participants had varied lengths of experience in nursing practice with the majority having < 5 years of experience in the profession (43.75%) and teaching nursing courses (53.12%). One participant had significant experience in teaching NI (between 5-10 years [3.12%]).

5.2.2 *Faculty*

The presence of faculty experts in NI and nursing education were maximized in small-group mentoring sessions. They were particularly helpful to the participants as they conceptualized and planned their respective group projects. Participants chose projects generated from real life scenarios that address main issues in nursing practice and the education of students about NI. This problem-based, collaborative learning environment aimed to foster and develop a strong network of support in a community of NI educators.[10]

5.2.3 *Teaching-learning activities*

The learning activities included individual exercises and participant interactions through discussion boards, group exercises, and exchange of ideas and experiences during synchronous sessions. Using innovative teaching strategies follow a framework described by Lowenstein.[11] Following this structure, the pedagogical approaches afforded clarification of topics that were unclear, synthesis of past and current topics, and supplemental input from the faculty team. These teaching approaches incorporate principles of universal design for learning which have shown to enhance

learning, retention and successful completion of educational programs.[12]

Table 1. Profile of participants (n=32), Teaching Nursing Informatics course

Items	
Age (years)	Mean = 36.43 (± 7.325)
Sex (f, %)	
Male	13 (40.62%)
Female	19 (59.38%)
Highest educational attainment	
BSN	5 (15.62%)
Master's	18 (56.25%)
Doctorate	9 (28.13%)
Current nursing practice	
Academic faculty	26 (81.25%)
Clinical practice	3 (9.38%)
Other industry (corporate health facility)	1 (3.12%)
None	2 (6.25%)
Practice location	
Philippines	29 (90.62%)
Abroad	3 (9.38%)
Length of experience	
< 5 years	14 (43.75%)
5-10 years	12 (37.50%)
> 10 years	6 (18.75%)
Length of teaching experience in nursing	
< 5 years	17 (53.12%)
5-10 years	6 (18.75%)
> 10 years	9 (28.13%)
Length of teaching experience in nursing informatics	
< 5 years	31 (96.88%)
5-10 years	1 (3.12%)
> 10 years	0

The course was offered using problem-based learning (PBL) methodology. PBL is a student-centric pedagogy that relies on teaching students how to solve gaps and challenges in daily professional practice. Using the principles of project management[13] and system design, students worked in groups to identify relevant and persistent issues that hamper safe and quality care that can be mitigated with the use of NI concepts and applications. Students gained skills in critical thinking, problem solving, teamwork and collaboration, research, consensus building and professional communication.[14]

The three synchronous sessions were held for three hours at 830 in the morning Manila time, or 730 in the evening EDT using Zoom to accommodate faculty and students based in both the Philippines and elsewhere. The online Moodle-based learning platform of UPCN Manila was used for course content delivery, group collaborations, class discussions,

seminar workshops and individual consultation sessions with the teaching team. Participants were encouraged to use the discussion forums in the online management system and other collaborative tools such as Google Docs during the project conceptualization, needs assessment, individual and group consultations, research and brainstorming, and establishing the project management components to complete the project proposal.

Formative evaluations were in the form of students' responses to threaded discussions and live Q & A discussions, as well as a midterm examination to evaluate their understanding of topics already covered as reflected in their project concepts. The summative evaluation was conducted during the final synchronous session when student teams presented their projects and successfully articulated their responses to oral assessments and evaluative questions posed to them by the teaching team.[15]

Table 2 shows a summary of the group project proposals developed as part of the requirement for successful completion of the course. Despite the limitations in course time, students' expertise, and access to laboratory resources, the participants were able to come up with interesting and practical project proposals that demonstrate integration of NI concepts to nursing.

To cite some examples, one group identified challenges in community health nursing practice that include poor documentation, student evaluations and tracking students to make sure they are safe in the neighborhood where they are assigned to. This is, of course, with the students' knowledge and permission. The group proposed a downloadable phone app to serve as a platform to assist with these concerns. The app has a GPS tracker for the clinical instructor to be able to have direct contact with any of the students doing clinicals in the community. Both the clinical instructor and students can readily access each other for any questions that might arise, or more importantly, to make sure that students are safe in the community and are providing appropriate care. The app also has prompts for comprehensive and accurate individual and family health assessments and interventions. Students are also able to obtain prompt and timely feedback with their submitted assignments.

Another example was the proposal that another group submitted which provided students with evidence-based information regarding changing protocols, guidelines, identification and management of COVID-19 or related infections. With COVID-19 information being fluid, this phone accessible app can offer students real-time information to any COVID-19 related questions that are readily updated by health authorities when warranted.

Table 2. Group project proposals

Group	Identified Practice Gap	Project Focus	Type of Innovation
A	Lack of accessible mental health and psychosocial support for students	Mental wellness support pathway	Online platform for students based on the national mental health program that enables: (1) self-assessment of depression, (2) faculty monitoring, (3) timely referral for counseling and mental health support
B	Lack of holistic approach in guiding patients in diabetes self-care management	A comprehensive diabetes self-care management mobile application	A mobile application that provides diabetes self-care management providing: (1) Cognitive support - simplified health information (2) Lifestyle support - dietary and exercise guide; blood glucose monitoring tracker with prompts/alerts (3) Social support from peer (a community of diabetics) (4) Emotional support - daily encouragements from health professionals (5) Motivation strategies - games, badges, rewards for goal achievement
C	Limited practice opportunity for BSN students to apply NI competencies	E-Kardex for Simulation	Electronic documentation system to teach nursing documentation and other NI patient care concepts
D	Limited mechanisms to ensure safety during field work, poor documentation of family health nursing care, and challenging paper-based student evaluations	Student performance monitoring system for community health nursing practicum	Learning platform that facilitates: (1) GPS tracking of students deployed during field work (with students' knowledge and permission) (2) Online documentation of clientele assessment and documentation of nursing care (3) Timely feedback on submitted online requirements
E	Heightened need for evidence-based information to guide nurses in COVID-19 response	Development of an algorithm and repository of evidence-based resources for emerging and re-emerging infections	Development of an information system that is able to collect, review, consolidate, and summarize current available and best evidence for infection control surveillance and response.

The projects are seemingly simple, however, the project proposals that students thought of are relevant, practical and within the scope of their beginning understanding of how to apply NI concepts and technologies learned during this professional development program. The quality of the project proposals demonstrates that the faculty-students were able to conceptualize NI-mediated solutions to practice, and knowledge gaps that they can use as examples when they teach nursing informatics.

5.3 Course completion

Out of the total number of participants who began the program (32), one deferred early in the course due to major Internet connectivity issues as a result of three typhoons that hit the Philippines when the course was being conducted.

Among the 31 participants who stayed throughout the course period, only one (1) failed to complete the course requirements (i.e., discussion forums, groups participation, attendance in synchronous activities) due to the inability to balance course demands, personal and professional priorities, and conflicting challenges as a full-time faculty.

Each participant was expected to devote five (5) hours per week to complete course-related activities and work on group assignments throughout the 8-week timeframe for the course. Engagement was measured based on the number of hits or navigation clicks performed by the participant each week, the number of posts in the discussion forums, and the frequency of views of the module materials. There was wide variance in terms of participant engagement based on the online platform hits and forum posts.

On the average, participants had 498.23 ($\pm$ 251.59) hits per week. Despite having only seven (7) discussion forums, participants had an average of 26.99 ($\pm$ 16.83) posts per module indicating active engagement in idea exchange among fellow participants. Lastly, during the 8-week sessions, module views averaged 350 views (349.95, $\pm$ 167.29) by an average of 28 participants (27.90 $\pm$ 5.31).

5.4 Course evaluation

All participants had very favorable evaluations of the course, rating its overall course content and delivery as very satisfactory (23.3%) to excellent (76.7%). Given the blended teaching approach, the pedagogical technique used to deliver the course was also evaluated. The majority (76.7%) found the duration of the course to be adequate, while the few remaining indicated that the course duration was too short to cover all the concepts. A small number of the participants (10%) found the duration of the three synchronous sessions to be too short, and a little over a quarter (26.7%) said that the amount of independent work (e.g., assignments, online discussion forums, and readings) for the asynchronous component was too much.

Descriptive evaluation of the course generated three themes that reflect aspects of the content and delivery that had the most impact among the participants. These include (1) synchronous sessions are essential for synthesis and exchange of ideas; (2) project planning fosters group learning; and, (3) connectivity issues create challenges to active participation.

5.4.1 *Synchronous sessions are essential for synthesis and exchange of ideas*

Although the asynchronous sessions allowed greater flexibility in engaging in course work, the participants expressed the value of synchronous sessions. These sessions allowed for exchange of ideas as the faculty provided additional learning vignettes, addressed questions that were raised through the virtual platform, and allowed for free-flowing discussions in small breakout sessions. Participants were actively engaged in discussion forums, but expressed the desire for synchronous discussion formats. They shared:

> "I really appreciate the synchronous sessions. I wish there were more so we can discuss together." (Participant-06)

> "I just had a hard time with the topic on ethics. I just hoped that there were more synchronous days for that topic." (Participant-13)

5.4.2 *Project planning fosters group learning*

Project planning was an essential component of the course where participants worked with their pre-assigned groups to develop their NI projects and present their proposals. The activity was threaded through the course as a strategy for applying the concepts learned from each module. Meeting in small groups outside the course schedule posed a challenge to the participants but these limitations were outweighed by their commitment to finish their projects. Participants shared their thoughts on this activity:

> "I [also] like the idea of project presentation wherein there is brainstorming and collaboration to come up [with] a start-up project/invention." (Participant-07)

> "The project proposal, although tedious, provides opportunities to collaborate with other members of the team." (Participant-23)

Likewise, several projects focused on creating platforms for students to practice learned NI competencies. This addressed the identified gap among undergraduate students who have limited opportunity to apply the skills on the use of technology in the clinical setting. One participant identified how this can be enhanced through project management:

> "I never imagined that I'll use project management that I use in my current work in this course, Teaching NI (from planning up until the deliverance and support of our project)...I think I will use this when teaching my students NI." (Participant-10)

5.4.3 *Connectivity issues create challenges to active participation*

The blended approach was used in the course partly to work around the anticipated Internet connectivity issues. However, three typhoons, one after another within two weeks, significantly disrupted communication and caused power outages across the Philippine archipelago. These disruptions became more apparent as participants requested for extensions in forum deadlines and requested for assistance to keep up with the course.

> "Online learning is challenging. I have been absent several times due to poor or lack of Internet connectivity, power blackouts, and other personal matters that I have to attend to. I still prefer face to face classes, but I have to live with the new normal." (Participant-05)

> "The challenges of the [disastrous] weather and the disruptions in Internet connectivity made it extremely difficult to cope with asynchronous course work." (Participant-01)

Recognizing the difficulty, the faculty team provided recordings of sessions and conducted a brief session to provide psychosocial support to participants during the second synchronous activity, which the participants appreciated. They shared:

> "I find the second synchronous activity unforgettable because of the incorporation of psychoso-

cial support to all the participants." (Participant-12)

"These [recorded sessions] help those who have difficulty accessing materials because of slow or no Internet connection." (Participant-05)

The high rate of course completion, achievement of course objectives, variety and creative group projects, and positive feedback from participants demonstrate the successful outcomes of the course.

5.5 Challenges and opportunities

The challenges and opportunities faced when offering Teaching Nursing Informatics as a continuing education course can be summarized into three perspectives: content, pedagogy and technology.

5.5.1 Content issues

There is a need to contextualize the development of nursing informatics in the Philippines vis-à-vis the evolution of health informatics. The field of NI is young and nurses in the Philippines face difficulties that may be related to their roles and collaboration with other disciplines, as well as being familiar with new software or hardware. The heightened attention on electronic medical records in clinical practice and the sudden, increased use of telehealth are two imminent topics that need rapid consideration and educational focus because of the surging effects of the COVID-19 pandemic. Nurses must be part of designing and developing nursing point of care technologies and electronic medical records, and integrating these into telehealth and telenursing.

The use of nursing informatics in teaching and learning is evolving very quickly as schools transitioned to flexible learning formats due to the pandemic. The type of technology and pedagogical approaches present both challenges and opportunities for nurse educators and students alike. Nurse educators need to know how to teach the content online and how to ensure that clinical skills are demonstrated using technology. On the other hand, faculty must constantly be mindful that students are also progressing and understanding the subject matter, as they struggle with Internet issues, learning new educational technologies, and the mental struggles associated with online learning.[16]

5.5.2 Pedagogical issues

There are important principles of effective teaching and learning using technology. One is interactivity. Online learning must foster interactivity in several ways: learners interacting with the resources, learners interacting with faculty, and learners interacting with each other. Providing learning activities using technological resources should enhance students'

interaction with the content. Providing feedback on learning activities, as well as conducting Q & A in synchronous sessions allow interaction between students and faculty. Having discussion forums facilitate interaction with each other. Active and collaborative learning activities are also key to ensure learners' engagement in the course.[17–19] This was exemplified by the group project that students had in the course. Recognizing diversity of learners when designing the course and setting expectations for a varied group of participants also contribute to the success of an online course.

5.5.3 Technological issues

Technological issues can be summarized in terms of access and skills. Some learners may not have stable Internet connections, or might not be able to use a computer at any given time. These can affect their access to the course. In terms of skills, some nurses who belong to the higher age range tend to have limited computer skills and find it difficult to navigate the course site and participate in synchronous sessions, or worse, in asynchronous sessions. The shift to online learning in the midst of the pandemic accelerated the adoption and use of technology in teaching and learning, including work and study-from-home arrangements for some. This also facilitated nurses' comfort level in the use of technology when completing assignments. As always, there are some barriers such as lack of administrative support for nurses to learn new systems or technology, inadequate time to fully understand and adopt technology-mediated solutions, and inadequate integration of technology solutions to existing workload and tasks.[20]

6. CONCLUSION

While this professional development program showed evidence of success and positive learning outcomes, there were roadblocks along the way. Some were simple and were readily addressed. Others were force majeure that there was nothing that could be done, such as the three successive typhoons that incapacitated some parts of the country and shut down some essential and non-essential activities. The COVID-19 pandemic, another major hurdle, brought forth effects that no one could swiftly address, affecting everyone's psychological state, learning and motivation.

Despite these barriers, interprofessional collaboration works best particularly when it comes to knowledge sharing and dissemination, especially on topics that are quite relevant to nursing practice, education, and research. Developed countries such as the United States already experience the pervasive and palpable influence of nursing informatics in nursing and healthcare. We know that nursing informatics can be the driving force for innovation, professional role transformation, multidisciplinary initiatives, and the delivery of safe

and quality patient care. This hybrid online continuing professional development program, using informatics-mediated projects for PBL, is a viable and practical model that can be emulated through partnerships between developed and developing countries. Knowledge collaboration and sharing, as in Teaching NI, not only increases faculty capacity, but also their confidence, knowledge, and competence in educating nurses and nursing students the rudimentary and applications of NI to enhance their professional practice and ability to provide safe patient care.

CONFLICTS OF INTEREST DISCLOSURE
We declare no conflict of interest.

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