E-learning Self-efficacy of Operating Room Nurses of a Selected Hospital in Cebu, Philippines

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Abstract

The conventional methods of education and training for operating room experience have been rendered impractical due to both the shortage and fast turnover of nurses in hospitals. Experts in the field of education are promoting e-learning modalities as a potential solution. However, issues were raised regarding the readiness of nurses to engage in e-learning due to lack of standardized competencies for practice, inconsistency in the integration of informatics courses in education, and lack of experts in the field. Literature reveals that self-efficacy is a major component of e-learning readiness. A descriptive-survey design was utilized to assess the e-learning self-efficacy of operating room nurses in a selected hospital in the Philippines. The Modified E-learning Readiness Assessment Tool (MERAT) captured the elements of the construct along with its sub-domains: computer, internet/online, and software utilization self-efficacy. The frequency distribution and item means were computed. Item analysis revealed that the respondents have positive e-learning self-efficacy based on item means obtained ranging from 3.29 to 4.58 on a 1.0 to 5.0 scale. A secondary analysis was conducted by clustering the e-learning self-efficacy indicators based on the nature of the competency and data trends. It revealed that the participants perceived themselves to be "Very Good" in terms of complex computer skills, online etiquette, troubleshooting computer-related issues, and usage of an e-learning platform, and "Excellent" in terms of basic computer and online skills. The results of this study implied that e-learning initiatives might be used to augment education and training of operating room nurses despite issues on manpower and competency base. It is further recommended that research explore other domains of e-learning readiness and determine the impact of this modality in the field of health care.

Keywords: e-learning, education, training, nurses, operating room, self-efficacy

Introduction

A global threat to the healthcare system is emerging as the demand for quality care increases with depleting medical resources. This scenario is exemplified with the shortage and fast turnover of nurses in hospitals**,** which negatively impacts the transition of knowledge and skills especially in areas that require highly technical competencies such as the operating room (Littlejohn, Campbell, Collins-McNeil, & Thembisile, 2012; Momanyi & Kaimenyi, 2015; Takase, 2010). This imbalance of supply and demand must be perceived and addressed with urgency and salience by the health sector in society. Training and education of medical practitioners have become more difficult as the context of health care becomes more demanding. The conventional preceptor-based method of education and training of nurses may not be sufficient for them to provide quality care in the face of heavy workloads, rigid schedules, and the low ratio of experienced to inexperienced personnel. The current scenario creates an opportunity for Information and Communication Technologies (ICT) and methods such as e-learning into the field of surgical training to showcase its potential and advantages. Studies have shown positive outcomes from e-learning utilization (Kadivar, Seyedfatemi, Zolfaghari, Mehran, & Hossinzade, 2016; Maertens et al., 2016), but concerns arise regarding the readiness of nurses to engage in e-learning. This stems from the lack of standardized competencies for practice, inconsistency in the integration of nursing informatics in education, and lack of experts in the field (Staggers, Gassert, & Curran, 2001). Nurses must be ready to embark on this new modality of learning as failure to do so will likely lead to the failure of e-learning initiatives (Demir & Yurdugűl, 2015). E-learning readiness was conceptualized by scholars to be multifaceted with self-efficacy one of its major components.

This study assessed the e-learning self-efficacy of operating room nurses of a selected hospital in Cebu, Philippines. Findings from this study shed light on the feasibility and potential of initiating e-learning modalities in the field of nursing to augment education and training in an environment of high demands and decreased resources.

Literature Review

The nursing labor force is the front liner of the healthcare system, yet there is nursing shortage on both local and global frontiers. The dearth of healthcare providers is recognized by agencies such as the International Council of Nurses (2004) and the High Level Forum on Health Millennium Development Goals (2004) and is a cause of concern for health delivery and outcomes. Littlejohn et al. (2012) delved into the nursing shortage in the US, Philippines and South Africa and reported that this setback in manpower exists in developed and third-world countries with different contexts, but with similar adverse effects to the health care system. The nature of the nursing shortage in South Africa due to migration, limited opportunities for employment, and attrition to diseases will not be highlighted in this paper. The shortage in the United States is due to an aging workforce and lack of faculty in nursing schools. This gap in their manpower is filled up by countries like the Philippines. The country is a top exporter of nurses overseas which is primarily intended to ease labor market concerns. However, this leads to repercussions as well-trained and skilled nurses in the country leave faster than they can be replaced. Statistics in 2010 show that 85% of Filipino nurses seek work abroad. Migrating and experienced nurses leave a knowledge and skills void which is associated to the “brain drain” phenomenon in the country. The International Labor Organization (2006) conceded that most of these professionals who migrate are highly skilled and are hard to replace. The cycle continues as more nurses leave to seek better opportunities in industrialized countries with aging populations. This translates to a rapid turnover at the hospitals particularly in specialized

units like the operating room where highly specialized and technical skills are required to provide quality care. Littlejohn et al. (2012) recommended actions to address these issues in the global health force by providing better practice environments, increasing financial compensation and improved policies on recruitment and retention. However, despite a wider and comparative view of the global nursing shortage, no offer was given regarding specific measures or action plans to deal with the ongoing issues which potentially threaten the future of health care.

A fast nurse turnover at the hospitals may aggravate the current nursing shortage and loss of trained human capital (Takase, 2010; Momanyi & Kaimenyi, 2015). This perspective has turned into reality in the current setting of tertiary hospitals in the Philippines. To date, Cebu Doctors' University Hospital is serviced by less than 40 registered nurses to cover 8 operating room theaters that are utilized to provide surgical services on a 24-hour basis. Nurses newly assigned to the unit reported that they undergo preceptorship before being assigned to scrub or circulate in surgical cases. These nurses further claimed that the ratio of experienced to the novice nurses is too low to warrant good outcomes from this type of training. Heavy workloads and rigid schedules further make preceptorship impractical. This insider perspective of the hospital mirrors the report of Littlejohn et al. (2012) which described the movement of nurses from third-world countries to favor the developed ones. This renders the institution heavily disadvantaged in terms of manpower. Furthermore, poor return of investment in training and education is expected as workers are retained on a short-term basis and migrate to other settings. An alternative mode of training and education is needed to transmit knowledge and skills in the midst of low manpower, decreased time allocation for training and increased healthcare demands.

Training and education of medical practitioners have become more difficult as the context of health care becomes more demanding. The incongruence between the supply of skilled workforce and demand for quality care fast-tracked the ushering of Information and Communication Technologies (ICT) and methods such as e-learning into the field of surgical training. The conventional preceptor-based transition of knowledge and skills may not be a pragmatic method of surgical training due to rapid nurse turnover and demand for manpower. Kadivar et al. (2016) contended in their paper that nurses have high client loads and rotational shifts which make traditional education impractical; using e-learning, on the other hand, can decrease learning time by 30 to 35%. Further studies however are needed to specifically determine the value of e-learning as primary or supplemental modality of education and training. Some scholars report that this new modality may have similar effectiveness with conventional and non e-learning based interventions, but nonetheless, e-learning is at least as effective as other methods (Maertens et al., 2016).

Several scholars have appraised and recognized the value of e-learning in the field of surgical education and training. The advantages of e-learning such as accessibility, flexibility, and low-cost implementation, complement the "highly procedural" nature of surgery (Maertens et al., 2016). Competency in the surgical field involves psychomotor, cognitive and non-technical elements. Examples of technical psychomotor skills include operating room-specific proficiency in instrumentation (use or assist) and knot-tying. Cognitive elements include knowledge about the procedure or disease pattern recognition. The non-technical aspect includes generic, but important, characteristics such as communication, leadership, and professionalism. Overall, it is recognized that e-learning has the capacity to develop surgical competencies due to the mechanics of repetition, focused practice, and immediate feedback.

Maertens et al. (2016) posited that e-learning is an effective platform to develop surgical competencies. Its potential is best when combined with other modes of learning as it provides the impetus at the beginning of surgical skills development, before a degree of automaticity is achieved in clinical exposure to the operating room. The capacity to review the e-learning material also lessens the performance decay of the personnel. As an added effect, Momanyi and Kaimenyi (2015) presented from their investigation that exposing nurses to good training programs and continuing education may help decrease nurse turnover as it develops competencies and enhances morale and efficiency. These reports revealed a mechanism on how e-learning addresses manpower issues through retention of nurses. It operates on the presumption that nurses will stay longer in their line of work if they feel fulfilled in their roles as competent health care providers. In this perspective, e-learning may not be the prime mover but instead, a supplemental factor that influences deters fast nurse turnover.

The diffusion of e-learning into the surgical training of staff can indeed help augment the impact of high nurse turnover at the hospitals. However, several authors (Oliver, 2001; Akaslan & Law, 2011; Moftakhari, 2013, as cited in Demir & Yurdugűl, 2015) reiterated the need for users to be ready to engage in e-learning before embarking on this new modality. One major reason for the failure of e-learning initiatives to thrive is the lack of readiness (Demir & Yurdugűl, 2015). Confidence to handle e-learning materials among nurses may not be fully developed due to lack of standardized competencies, inconsistency in the integration of Nursing Informatics (NI) in the curricula and lack of nursing experts in the field (Staggers, Gassert, & Curran, 2001). These deficiencies were highlighted and associated to e-learning readiness as it hinders the capability of nurses to fully benefit and utilize the resource. The proponent of this paper, being an educator in nursing informatics, also notes that these are valid concerns in the current educational set-up in the country.

Several healthcare leaders advocate for incorporating informatics competencies for nurses in the academe and clinical setting. However, no consensus was reached regarding the ideal informatics competencies to embody, and even local initiatives are slow to progress. Agencies such as the American Association of Colleges for Nursing (AACN), American Nurses Association (ANA), National League for Nursing (NLN) and the International Medical Informatics Association (IMIA) have published relevant papers on NI competencies but to no avail in developing a consistent list of competencies. IMIA released a set of NI competencies but these were not scientifically validated. Scholars such as Grobe (1989, as cited in Staggers, Gassert, & Curran, 2001) expressed the need for a current and validated list of NI competencies as a guiding framework for curricular development as this aids in preparing the nurses for their roles in practice and to manage expectations of potential employers and health care consumers.

Staggers et al. (2001) spearheaded a movement to create a valid and reliable set of NI competencies. It involved extracting competencies from existing literature and subjecting these for appraisal by a team of experts. A list of competencies was presented which included competencies in computer skills (data entry and access, use of email), informatics knowledge (ethical and practical use of data), and informatics skills (troubleshooting, screen layout) along four different skill levels. The most basic level, beginning nurse, has fundamental knowledge and skills in information management and computer technology. An experienced nurse is proficient in a chosen domain (education, administration) and can utilize data set and trends for productivity. An informatics specialist has advanced preparation and can use more sophisticated applications including systems development. An informatics innovator represents the highest level, and portrays one who can utilize research and generate theory in the field. There were more scholarly movements that led to the inception of other NI frameworks, but

this paper is anchored in the work of Staggers et al. (2001) as this is a pioneering empirical-based and validated model and one of the foundations of locally offered informatics courses familiar to the proponent of this paper.

Bernal, Tolentino, Gavino, Fontelo, and Marcelo (2008) discovered that nursing schools in the Philippines approach the field of NI in a superficial manner. It focuses only on basic computer skills or on applications which are expected to be basic in an environment of technological influx. The proponent's affiliated institution, as an example, offers the nursing informatics course in the bachelor's program for two semesters. The first segment of the course deals with basic computer skills such as word processing and spreadsheet application. Database concepts and applications of informatics to education, clinical care and research are given subsequently. Graduates of the program will still be far from the highest level of competency (Staggers et al., 2001) which involves capabilities to use sophisticated software, design and innovation. Nursing in the country is geared more towards delivery of health services to clients in a clinical or community setting. This is probably one reason why the Philippines is one of the highly favored exporters of nursing manpower (Littlejohn et al., 2012) as developed countries seek care providers at the bedside rather than informaticists. Other concerns in incorporating NI competencies in the country include the lack of a locally appropriate model for NI practice and a small number of experts in the field. This limits the training ground and exposure of potential nurse informaticists for developing their potential. Bernal et al. (2008) suggested the following actions to address the NI deficiencies in the country: evaluating NI models for practical application in the local arena, enhancing post graduate training, and increasing awareness for NI. The concerns relayed in literature may be reasons for poor utilization of e-learning as a means of surgical training despite its effectiveness. It is important, therefore, to assess the readiness of nurses to engage in e-learning before initiatives are started.

A state of readiness is achieved when users "believe" that they can optimize the use of e-learning platforms to attain expected outcomes. E-learning readiness is important for users to be able to optimize the use and attain benefits form online platforms. Demir and Yurdugűl (2015) investigated the most comprehensive and prevalent models of e-learning readiness available in literature with the aim of developing a current and validated model. They found out that most models were developed to suit different stakeholders, including learners, teachers and institutions. Common components of these frameworks were the belief in one's competency in technology usage and confidence in prerequisite skills for e-learning. This feature of e-learning readiness is equitable to self-efficacy. The model of Hung, Chou, Chen, and Own (2010) for example presented five components including computer and internet self-efficacy. Dray, Lowenthal, Miszkiewicz, Ruiz-Primo, and Marczynski (2011) named belief in technology skills as a dimension of learner self-efficacy. Smith (2005) tested the scale developed by McVay (2000) about e-learning readiness which included comfort with e-learning as one of its factors. Tubaishat and Lansari (2011) developed a scale which included the confidence and perception of e-learning among students as a dimension. Valtonen, Kukkonen, Dillon, and Vaisanen (2009) presented beliefs in online learning and ICT skills as a dimension of readiness for online learning. These are some of the models reviewed by Demir and Yurdugűl (2015). There were also other prominent dimensions of e-learning readiness tackled by other scholars such as personal factors (motivation, preference, time management) and infrastructure which is not covered in this paper.

Self-efficacy research started in the 1970s, but it was not until 2008 that online self-efficacy came into focus. A major proponent of self-efficacy theory is Bandura (1997) who defined the term as the belief in one's capability to execute a task. This belief further influences a person's

choice, action, and satisfaction. Four major sources of information that determines self-efficacy include (1) performance accomplishments or inactive mastery experience which refers to validation of one's success in doing a task, (2) vicarious experience, inspiration from other people's capacity to perform the same task, (3) verbal persuasion referring to authentic feedback of achievement and (4) physiologic states as reflected by anxiety and stress involved in doing a task. The author of this paper initially was reluctant to ground this study on the theory of Bandura as the e-learning concept did not materialize yet during the early development of the self-efficacy theory. There were, however, studies which bridged the macro-level theory of Bandura to the recent concept of e-learning. A study by Lin, Liang, Yang, and Tsai (2013, as cited in Alqurashi, 2016) showed that the general concept of Bandura (1997) on self-efficacy is applicable among adult online learners. Embedding the concept of Bandura (1997) in the context of e-learning, a person with high self-efficacy has positive self-appraisal and recognizes the challenges of learning through an online environment. They seek available resources to fully utilize it and gain a sense of personal accomplishment. A person with low self-efficacy has low belief in self and will avoid engaging with the new mode of learning and deny diffusion of technology into practice. They linger on their failure and eventually disengage in e-learning.

Other studies were conducted and delved deeper into the context of self-efficacy in online learning. Alqurashi (2016) conducted a literature review of studies about online learning self-efficacy conducted between the years 1997 to 2015. Three major themes emerged as influential factors that determine online self-efficacy: (1) Computer Self-efficacy – utilization of computer and related technology, (2) Internet and Information Seeking Self-efficacy – navigation and accessing suitable information over the World Wide Web and (3) Learning Management System (LMS) Self-efficacy – interaction with the functionalities of a LMS platform. Computer self-efficacy refers to the confidence in using the computer and related technology. Alqurashi (2016) presented several studies such as those of Jan (2015), Lim (2001), Pellas (2014), Simmering (2009), and Womble (2007) which pointed out computer self-efficacy as a significant factor for e-learning. Internet and information seeking self-efficacy relates to the capability of navigating through the World Wide Web with confidence. The proponent also found several studies confirming the association between internet self-efficacy and e-learning which included those of Kuo, Walker, Schroder, & Belland, (2014), Tang and Tseng (2013), and Womble (2007). LMS self-efficacy refers to the confidence of users to utilize different functionalities of an e-learning platform such as asynchronous and synchronous communication, accessing course content and advanced tools. This component was found to have a positive impact on course performance in an online environment. This paper conceptualized e-learning self-efficacy based on these published works as the nurses' trust in their ability to succeed in e-learning through proficiency in using computer-related technology, online navigation, and platform utilization.

The mandate to incorporate e-learning competencies in the Philippine curriculum did not concretely materialize until 2012 through the Commission on Higher Education (CHED) Memorandum Order 46. With the said timeline, it is safe to say that e-learning is still in the infancy stage in the country. This supported the notion of Doculan (2016) that most research instruments on e-learning were developed for "e-mature" countries. Models that have been proposed to assess the degree of e-learning readiness such as those of Aydin and Tasci (2005), Chapnick (2000), and Watkins (2004) were not meant for developing countries. She further stated that e-learning models may not universally apply due to varying needs of stakeholders. Research tools should consider the culture, norms and infrastructure of a country. The Modified E-learning Readiness Assessment Tool (MERAT) was developed based on a Philippine study

assessing online self-efficacy. It addressed issues of compatibility and was created in the context of the local setting to capture the domain of e-learning self-efficacy of operating room nurses working in the Philippines. Furthermore, efforts were made to validate the applicability of the items on the MERAT to the Philippine setting by appraisal from authorities in the fields of computer and nursing. As it was developed within the local context, the questions on the tool cover only the first 2 levels of informatics competency presented by Staggers et al. (2001). The MERAT may not be applicable for developed countries with high-level technology use. The tool specifically included items relating to computer skills, internet, and online skills, and software application, which aligned with the conceptualization of experts previously mentioned. It was also intended to help in creating a comprehensive and sustainable e-learning strategy for the country.

Major players in education emphasized the need for incorporating e-learning into the country's school system. Some of the e-learning initiatives have gained ground and were sustained despite some limitations in infrastructure and user competencies. The University of the Philippines established the UP Open University (UPOU). The University of Santo Tomas has its own e-Learning Access Program (e-Leap). TESDA, a government agency, spearheaded the use of Moodle, an online-based course management system that allows trainers to implement e-learning programs. Arimbuyutan, Kim, Song, and So (2007) on the contrary, conceded that Filipinos are used to the traditional classroom set-up, which may slow down the transition to a new learning modality. They, however, saw potential from a large sector of Filipinos utilizing the internet and engaged in online gaming. This may lead to a promising combination of users and infrastructure. Fung (2016) further proclaimed the youths of today as "digital natives" who are familiar with computer functionalities. These users are expected to harness the potential of e-learning. The current cadre of nurses working in the hospitals falls into this generation. It remains to be seen if this innate instinct to use technology outweighs the deficiencies of the nursing educational sector. Arimbuyutan et al. (2007) implored for the advancement of e-learning in the Philippines to remain competitive in the global market. The community must address issues towards this new frontier, particularly in infrastructure, investment, pedagogy, cost, and resistance to change.

Methodology

Objective

This study sought to assess the e-learning self-efficacy of operating room nurses in a selected hospital in Cebu, Philippines.

Research Design

A descriptive survey design was used to determine the e-learning self-efficacy of the respondents of the study.

Research Environment

This study was conducted at the operating room unit of Cebu Doctors' University Hospital (CDUH). The institution is a tertiary unit hospital providing general to specialized care to different clienteles. CDUH-OR has 8 operating room theaters that cater to general and specialized surgical cases and a special unit dedicated to eye surgeries. It also has a Post

Anesthesia Care Unit (PACU) where clients are monitored after surgery. Data collection was conducted in the conference room situated inside the unit.

Research Participants

A total of 31 operating room nurses were recruited and completed the survey during March 2019. The roster of nurses was obtained from the list provided by the nursing department. Nurses who refused to participate, were on leave status during the data collection, and those with pending resignation were not included. The data collection package, which includes the informed consent form and questionnaire were printed on paper prior to data collection. The sheets were distributed and collected personally by the proponent to the respondents of the study. New nurses assigned to the unit relayed that they needed another avenue for learning as the preceptorship they undergo during the training process is not comprehensive enough to deal with more sophisticated and specialized surgical cases. The rigid schedule of nurses also makes it difficult to participate in continuing education courses. They also utilize printed and downloaded materials for additional learning.

Research Instrument

This study utilized the Modified E-learning Readiness Assessment Tool (MERAT). It is a 16-item questionnaire that assesses for self-efficacy in using the computer, navigating the internet and online environment, and utilization of software such as the Learning Management System (LMS) for e-learning. Each statement in the MERAT is matched to a 5-point Likert Scale represented by 1 (Not at all), 2 (Very Least), 3 (Little), 4 (Great) and 5 (Very Great) which refers to the respondent's confidence to perform the activity.

The items on the MERAT cover the indicators of e-learning self-efficacy as conceptualized in this study, which includes: Computer Skills, Internet/Online Skills, and Software Application Skills. Computer Skills Self-efficacy refers to the confidence in the utilization of computer and related technology. These include item numbers 1 (Knowledge on Basic Computer Function), 4 (Troubleshooting Hardware Problems), 14 (Utilization of Word Processing Software), 15 (Multitasking in Multiple Workstations) and 16 (Utilization of Spreadsheet). Internet or Online Skills Self-efficacy refer to confidence in accessing and navigation on the World Wide Web and information-seeking capabilities over the net. These include item numbers 5 (Email Attachment), 6 (Online Etiquette), 7 (Internet Navigation), 8 (Internet Browser Usage), 9 (Troubleshooting Internet Connection Problem) and 13 (File Downloading). Software Application Skills refer to the users' confidence in utilizing computer programs or applications. There are 5 items related to the utilization of the e-learning platform, including item numbers 2 (Document Access), 3 (Configuration Setting), 10 (File Search and Download), 11 (Online Library) and 12 (Asynchronous Tools).

The instrument also possessed good psychometric properties based on its administration to respondents in Luzon and Cebu, Philippines. It has a Cronbach's alpha ranging from 0.7 to 0.75.

Treatment of Data

Descriptive statistics were used to determine the e-learning self-efficacy of the respondents. An item analysis was primarily conducted using percentage and mean computation. An inductive process was made to identify patterns and clusters of indicators for a secondary

analysis of the e-learning self-efficacy. The statistical software IBM SPSS version 22 was used to process the data. Data were organized and presented through tables.

Ethics Review Process

The study protocol was submitted for initial review to Cebu Doctors' University - Institutional Ethics Review Committee (CDU-IERC) on February 20, 2019. The study qualified for expedited review under the protocol code 2019-040-Aventurado-OperatingRoom. The issuance of the CDU-IERC code signified fulfilment of the institutional requirement for mandatory registration of the research study. The paper was subjected for appraisal by a primary and secondary reviewer. The result of the first review by the panel was released February 26, 2019 with minor modifications required prior to approval. Revisions were made and the study was granted approval for implementation February 27, 2019. The CDU-IERC Final Report was accomplished by the proponent at the completion of the study and ethical clearance was secured on April 8, 2019.

The study was conducted in compliance with the prescribed institutional guidelines for ethics which specifically included the following: (1) Informed consent was obtained from the respondents which signified their understanding of the nature of the study, voluntary participation and willingness to partake the benefits from the study; (2) study protocols such as controlled room entry and appropriate spacing were strictly adhered during data collection to ensure protection of the participants' rights and integrity; and (3) data obtained from the study were collected and kept with confidentiality through removal of identifiers and using of code numbers.

Findings

Item Analysis

An item analysis of the e-learning self-efficacy of the respondents was conducted based on the Modified E-learning Readiness Assessment Tool (MERAT). Presented below are the items on the MERAT on the first column, followed by the distribution of responses according to percentage. Item mean was also computed to describe the scale and provide a basis of indicator clustering for further analysis.

Item mean interpretation was based on the following hypothetical ranges and descriptors: 4.21-5.00 (E – Excellent), 3.41-4.20 (VG – Very Good), 2.61-3.40 (Good), 1.81-2.60 (Satisfactory), 1.00-1.8 (Poor). The table below presents the item analysis of each indicator of e-learning self-efficacy among the operating room nurses of the selected institution.

Table 1: E-learning self-efficacy item analysis

Indicators	Not at all	Very least	Little	Great	Very Great	Item Mean	Intr.
1. I know the basic functions of computer hardware components (CPU, monitor) including its peripherals like printer, speaker and mouse.	0%	0%	3.2%	41.9%	54.8%	4.52	E
2. I know how to open documents in an e-learning platform.	0%	9.7%	22.6%	48.4%	19.4%	3.77	VG
3. I am comfortable in changing the configuration settings of an e-learning platform.	0%	12.9%	16.1%	58.1%	12.9%	3.71	VG
4. I know how to resolve common computer hardware or software problems or I can access technical support in case I encounter a problem.	0%	9.7%	29%	45.2%	16.1%	3.68	VG
5. I can send an email with file attachments.	0%	3.2%	3.2%	41.9%	51.6%	4.42	E
6. I am familiar with online etiquette.	0%	6.5%	22.6%	61.3%	9.7%	3.74	VG
7. I know how to surf the internet and navigate the web.	0%	0%	3.2%	38.7%	58.1%	4.55	E
8. I can use web browsers (Internet Explorer, Google Chrome) confidently.	0%	0%	3.2%	45.2%	51.6%	4.48	E
9. I know how to resolve common errors while surfing the internet like “page cannot be found” or “connection time out”.	0%	12.9%	25.8%	35.5%	25.8%	3.74	VG
10. I am comfortable with things like doing searches and downloading files in an e-learning platform.	0%	12.9%	25.8%	41.9%	19.4%	3.68	VG
11. I know how to access an online library in an e-learning platform.	0%	6.5%	25.8%	41.9%	25.8%	3.87	VG
12. I know how to use asynchronous tools in an e-learning platform like discussion boards and chat tools effectively.	0%	12.9%	19.4%	51.6%	16.1%	3.71	VG
13. I know what PDF files are and I can download and view them.	0%	0%	3.2%	48.4%	48.4%	4.45	E
14. I am comfortable with word processing and use it comfortably.	0%	0%	6.5%	29%	64.5%	4.58	E
15. I am able to open several applications at the same time and move between them.	0%	0%	6.5%	35.5%	58.1%	4.52	E
16. I know how to use spreadsheet applications.	3.2%	12.9%	41.9%	35.5%	6.5%	3.29	VG

Most of the participants' responses were positive (great or very great) among all the items of MERAT except item 16. Most of the respondents answered "great" for items 2, 3, 4, 6, 9, 10, 11, 12 and 13. Most of the respondents answered "very great" for items 1, 5, 7, 8, 13, 14 and 15. The highest item mean was computed for item number 14 which reflects utilization of word processing software, and item number 7 which depicts capability in internet navigation. The lowest item mean was obtained for item 16 which reflects spreadsheet mastery, item 4 which involves troubleshooting hardware issues and item 10 which reflects ability to search and download files. The participants obtained mean score ranges of 3.29 to 4.55, with nine out of 16 indicators interpreted as "Very Good" self-efficacy and 7 indicators rated as "Excellent" in self-efficacy.

Indicator-Clusters Analysis

The researcher analyzed the results of the item analysis and synthesized the individual indicators of e-learning self-efficacy into clusters. Clustering was done by utilizing the principle of similarity and contrast while considering the data trends within a set of indicators. For example, indicators that point to basic computer competencies may be grouped together, but may be subdivided based on the complexity or resources required to perform the skill. The different themes that emerged from clustering are presented on the table below.

Table 2: E-learning self-efficacy indicator-clusters analysis

Cluster	Description	Set of Indicators	Interpretation
A	Basic Computer Skills	Basic Computer Function, Word Processing, Spreadsheet Application	E
B	Complex Computer Skills	Troubleshooting, Spreadsheet Application	VG
C	Basic Online Skills	Email Attachment, Internet Navigation, Browser Utilization, File Downloading	E
D	Online Etiquette	Online Etiquette	VG
E	Troubleshooting	Troubleshooting: Hardware and Software, Internet Connection	VG
F	E-learning Platform	E-learning Platform: Document Access, Configuration, File Search and Download, Online Library, Asynchronous Tools	VG

The indicators relating to computer skill self-efficacy are items 1, 4, 14, 15 and 16. Participants rated items 1 (Basic Computer Function), 14 (Word Processing) and 15 (Multiple Workstations) with "Excellent" self-efficacy. These indicators are labeled as Cluster A and are considered as very basic computer skills. Cluster B are indicators related to computer skills but are more complex and not within the entry-level domain of nursing. This includes items 4 (Troubleshooting: Hardware and Software) and 16 (Spreadsheet Utilization) which obtained a rating of "Very Good" self-efficacy among the respondents.

The indicators relating to internet and online self-efficacy were items 5, 6, 7, 8, 9 and 13. Cluster C consolidated items 5 (Email Attachment), 7 (Internet Navigation), 8 (Browser Utilization) and 13 (File Downloading). These online skills are the basic ones and are part of regular internet activity which justified the "Excellent" self-efficacy rating of the respondents to these items. Item 6 was placed on a separate cluster due to its unique nature and lower rating among its counterpart. Cluster D represents online etiquette which obtained a mean item interpretation of "Very Good".

Cluster E grouped items number 4 and 9 which shares the domain of troubleshooting hardware and internet issues. The last set of indicators, Cluster F, relate to software application self-efficacy which include item 2 (Document Access), 3 (Configuration Setting), 10 (File Search and Download), 11 (Online Library) and 12 (Asynchronous Tools). Respondents rated themselves "Very Good" in terms of self-efficacy in Clusters E and F.

Clustering of the indicators based on their similarity and data trends is a preliminary step to determine the need for improvement. Grouping together similar indicators economically allowed for more specific measures to address the concern. This subsection culminates with the categorization of the indicators for e-learning self-efficacy into clusters: Cluster A (Basic Computer Skills), Cluster B (Complex Computer Skills), Cluster C (Basic Online Skills), Cluster D (Online Etiquette), Cluster E (Troubleshooting) and Cluster F (Utilization of E-learning Platform).

Discussion

The findings of this study revealed that participants have acceptable levels of e-learning self-efficacy with the majority of the indicators rated positively based on item responses and means. This contradicts the prior assumption that nurses are not prepared to engage in e-learning due to lack of standardized competencies, inconsistency in the integration of Nursing Informatics in the curricula and lack of nursing experts in the field (Staggers, Gassert, & Curran, 2001). The operating room nurses of the selected hospital reflect individuals with good self-efficacy who recognize the challenges and seek the full potential of online learning (Bandura, 1997). This tendency has been attributed in part to the younger generation of nurses getting into the workforce who have been educated in nursing informatics in the newly revised nursing curriculum. They may have gained competencies from the nursing educational program prior to their nursing career.

A look into the history of nursing informatics in the Philippines revealed that despite the lack of standardized model and experts, the nursing informatics course was already incorporated into the nursing curriculum during the year 2008 through the Commission on Higher Education (CHED) Memorandum Order 5, Series of 2008. This was later revised and revived as Health Informatics by CHED Memorandum Order 14 implemented in the summer of 2010 (Sumabat, 2010). The current batch of nurses moving into the workforce has already been exposed to the course considering the timeframe of implementation. This may have provided the impetus to be confident in dealing with the e-learning environment.

Being an educator of nursing informatics at the university, the proponent reinforced that the course is taught at the nursing academe following the framework set by international experts. A primary reference of the course was based on the works of Staggers et al. (2001) who emphasized the competencies of computer skills, informatics competencies, and informatics skills. Provision of the course in the undergraduate level may have influenced the e-learning self-efficacy of the participants. Availability and utilization of research-based materials further molded the development of nursing informatics on a standardized scale.

Higher scores on items dealing with basic computer and online skills reinforced the notion that nursing informatics in the country is superficially taught covering only basic computer skills (Bernal et al., 2008; Sumabat, 2010). It is also highly unlikely that operating room nurses have enrolled in post-graduate education, which covers advanced informatics competencies as this is only highly required in the academic field. Another perspective may also be given on the experiential point of view as the scope of nursing in the area includes the application of skills

such as electronic encoding of surgery-related documents, use of word processing documents, accessing the internet and file downloading and uploading. Results obtained by the respondents on Cluster A (Basic Computer Skills) and Cluster C (Basic Online Skills) indicators supported this claim.

The indicators relating to Cluster B (Complex Computer Skills) is an area of concern. The data supports the perspective of local experts that only basic computer skills are focused on in the nursing informatics education of students in the Philippines (Bernal et al., 2008; Sumabat, 2010). The framework made by Staggers et al. (2001) regarding informatics competencies at 4 levels of practice also suggests that these skills belong to a higher level of complexity. This line of logic and the traditional delivery of education in the country also supports the need the improve Cluster F (Utilization of E-learning Platform) indicators. As of date, there are only a handful of academic institutions in the country fully equipped and utilizing online platforms.

Cluster D (Online Etiquette) was also pointed out as an area of concern. It is quite surprising with the participants rating themselves good with basic online skills; there still remains a need to improve online etiquette. Online etiquette involves behaviors over the net that portrays respect to others in the internet community. The course content of nursing informatics course offered locally was reviewed, and it was found out that there is no specified unit to tackle the concept of online etiquette, but this might be discussed along with the topic of online privacy and security.

Cluster E (Troubleshooting) indicators apparently are problematic. Nurses are not trained to solve computer-related issues by profession. In fact, the informatics competencies collectively merged by Staggers et al. (2001) along the four levels of practice, and the list of competencies presented by the Technology Informatics Guiding Educational Reform (TIGER) (Fung, 2016) did not include troubleshooting of computer hardware, software or networking as an essential skill of a nurse.

Limitations

The exposure of participants to e-learning and similar technology along their course of work may affect the findings of this study. As of date, Cebu Doctors' University Hospital (CDUH) has started incorporating an electronic health record and hospital information system in selected units of the institution such as the emergency room and pharmacy. These systems have yet to be streamlined into the overall operations of the hospital. The participants may have been oriented to these applications according to their previous assignments and rotation. Some staff nurses may also have enrolled in post graduate programs which deliver courses through e-learning and other online modalities.

Recommendations

This paper has dealt with e-learning self-efficacy as a major indicator of e-learning readiness. It is one of the major prerequisites to initiate and sustain e-learning as a new modality of education and training among operating room nurses. In line with this, it is recommended to explore and look into other domains of readiness to fully utilize and harness the potential of this technology into the field of health care. Literature offers other factors that may influence e-learning readiness such as availability of human resources, access to technology, infrastructure support and personal attributes including study habits, motivation, time management and self-directed learning. With the findings that the operating room nurses are

in the positive spectrum of readiness in terms of e-learning self-efficacy, future researches may be conducted to develop, incorporate and determine the effects of e-learning towards the education and training of these care providers.

Conclusion

The operating room nurses of the selected hospital have positive e-learning self-efficacy based on the item analysis and secondary indicator-clusters analysis. Item analysis reflected the distribution of responses and item means of the respondents to be on the higher end level of self-efficacy based on the Modified E-learning Readiness Assessment Tool (MERAT). Cluster analysis also revealed that the participants perceived themselves to be "Very Good" in terms of complex computer skills, online etiquette, troubleshooting computer-related issues and usage of an e-learning platform, and "Excellent" in terms of basic computer and online skills.

The operating room nurses involved in the study portray individuals with good self-efficacy (Bandura, 1997) as those who recognize the challenges and seek the full potential of online learning. Hence, e-learning initiatives may still diffuse well into the health care system to augment education and training of nurses despite manpower shortage and issues surrounding the incorporation of informatics competencies into their knowledge and skills base.

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