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# Integration of information and communication technology in nursing education in Southeast Asia: A systematic literature review

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## Abstract:

**BACKGROUND:** The integration of information and communication technology (ICT) in education has been a major agenda of the Association of Southeast Asian Nations and its adoption has been found effective in nursing education.

**OBJECTIVE:** This study aims to identify and review existing literature on ICT integration in nursing education within the context of Southeast Asia and to identify the themes of these studies, ICT tools of concern and the research methods adopted.

**METHODOLOGY:** A systematic review of six eligible literatures was conducted with thematic analysis. The data for this systematic review of literature are from published studies based on the formulated research question. Electronic databases of Medline, Scopus, PubMed, CINAHL, Mendeley, and Google Scholar were searched and literatures retrieved and screened for eligibility. No date limit was considered in the literature search. This systematic review utilized the Preferred Reporting Items for Systematic Reviews and Meta-Analyses.

**RESULTS:** The studies originated from the Philippines ( $n = 3$ ), Malaysia ( $n = 2$ ), and Singapore ( $n = 1$ ). One study originated from both the Philippines and Thailand. Four themes emerged from the thematic analysis which include: (1) use of ICT to enhance teaching and learning in nursing, (2) challenges with ICT integration in nursing education, (3) attitude and perceptions toward ICT integration in nursing education, and (4) suggestions for improvement. The most important ICT tools were computers, projectors, and internet. Majority of the studies were descriptive quantitative studies.

**CONCLUSION:** Despite increasing concern on the use of ICT in Southeast Asia, ICT integration in nursing education has not been given significant attention. Governments of the Southeast Asian countries should provide sufficient support for ICT integration in the various nursing institutions. Institutional administrators are encouraged to key into the ICT trend and render their support when and where necessary.

## Keywords:

Information and communication technology, nursing education, Southeast Asia

## Introduction

Nursing informatics has been described as an integration of basic computer skills, information literacy, and information management which are vital and essential

components of modern nursing practice.<sup>[1]</sup> The current health-care environment is dynamic and rapidly changing in line with modern technological breakthroughs. To keep pace with these changes, the nursing profession has to respond and integrate appropriate technologies, especially in educational settings.

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Information and communication technology (ICT), which has achieved some tremendous advancement and improvement over the past years, is a very powerful, potent, and valuable tool in the health-care setting.<sup>[2]</sup> With the dynamic nature of health care, nurse educators are faced with many challenges in preparing students for the increasingly sophisticated practice environment. The complexity of ICT adoption in health-care environment demands that nursing students are prepared to think critically and effectively adopt these technologies while delivering safe quality care.

Inconsistent integration of ICT skills into nursing education is a common phenomenon that needs to be addressed.<sup>[3]</sup> The lack of uniformity on how to integrate informatics content into nursing curriculum is complicating this problem.<sup>[4]</sup> The principal factor contributing to this challenge is the impression that the younger generation students are not only skillful at using technology but may also be more efficient at using it than faculty.<sup>[5]</sup> There continues to exist a significant hiatus in informatics education in nursing programs that need to be addressed in order to ensure that faculty and students are proficient in managing and using health-care ICT.<sup>[6]</sup>

Southeast Asia is a region of significant cultural, economic, and social diversity. It consists of eleven countries: Brunei, Cambodia, Indonesia, Laos, Malaysia, Myanmar, Philippines, Singapore, Thailand, Timor, and Vietnam, collectively known as the Association of Southeast Asian Nations (ASEAN).<sup>[7]</sup> The total population of this region is approximately 600 million (9% of the world's population) with Indonesia being the region's most populated country (comprising 40% of the total population of Southeast Asia), while Brunei is the least populated.<sup>[8]</sup>

Considering that ICT is becoming a priority in many health research agenda in Southeast Asia, it is very imperative to assess how ICT is being integrated into nursing education in the different Southeast Asian countries. The Philippines, a member of the ASEAN, is one of the several developing nations that have considered ICT as a tool to improve teaching and learning. Certainly, implementation suffers from several shortcomings. In realizing this, the Philippine Department of Education (DepEd) emphasizes that ICT must be incorporated into all learning activities. Therefore, e-learning and the utilization of ICT must be applied in schools as a viable intervention in educational reform (Philippines Information Agency, 2017).<sup>[9]</sup> Faculty should incorporate informatics into the nursing curriculum and use informatics to guide, document, analyze, and inform nursing education.<sup>[10]</sup> This will eventually be translated to quality nursing care for all.

## Objectives

The major objective of this study is to examine existing literature on ICT integration in nursing education within the Southeast Asian context.

Specifically, this study examined the following:

1. Themes of existing literature on ICT integration in nursing education
2. ICT tools being adopted in various nursing educational settings
3. Research methods used to examine ICT use in nursing education.

## Methodology

### Design

This study adopted a qualitative approach based on review of studies conducted by researchers in Southeast Asia. The studies used for this study are those that investigated ICT application into nursing.

### Data collection method/search strategy

The data for this systematic review of literature are from published studies based on the research objectives. Electronic databases of Medline, Scopus, PubMed, CINAHL, Mendeley, and Google Scholar were searched using the keywords that are consistent with the medical subject heading (MeSH), and literatures retrieved and screened for eligibility. No date limit was considered in the literature search which was conducted by the first and second authors. This systematic review utilized the Preferred Reporting Items for Systematic Reviews and Meta-Analyses framework by Moher *et al.*<sup>[11]</sup> as shown in Figure 1.

Key words used for the data search included: nursing education, information and communication technology, ICT, Southeast Asia, and nursing informatics. We defined our topic of interest and what we were looking for. Then, we broke it down into its individual concepts and decided on the words/phrases to describe the concepts. Finally, we searched for each concept as a separate set and used subject headings consistent with the MeSHs.

### Eligibility criteria

Table 1 shows the inclusion and exclusion criteria that were considered to identify eligible publications through the analysis of publication titles. Both full text and abstract were examined. The following types of studies were eligible: randomized control trials, nonrandomized control trials, longitudinal studies, and descriptive studies. Only studies conducted in any of the Southeast Asian countries or within the context of ASEAN were included. Reviews, case studies, conference papers, and letters to the editor were excluded.

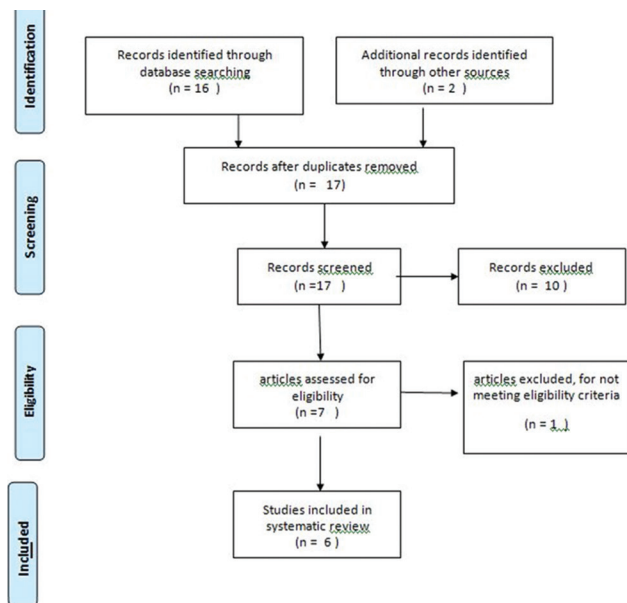


Figure 1: Preferred Reporting Items for Systematic Reviews and Meta-Analyses flow diagram

### Data analysis

The data analysis for this study was achieved through content analysis. The goal is to identify and organize various themes from the reviewed literature. The type and pattern of ICT used as well as the research methods in the literature were analyzed and critically examined.

## Results

A comprehensive literature search was carried out using the set guidelines. In the initial search, a total of 18 studies were retrieved and assessed for eligibility. Eleven studies were eliminated from the initial assessment. Further analysis resulted in the exclusion of 1 more study due to not meeting the exact criteria set leaving only 6 studies which were finally included in this review.

A critical analysis of the studies was conducted to identify the themes, ICT tools adopted and the research methods used.

Table 2 shows that majority of the retrieved studies originated from the Philippines, followed by Malaysia. Only one study originated from Singapore and Thailand. There were no eligible studies from Vietnam, Brunei, Laos, Cambodia, Myanmar, and Timor.

### Themes of the reviewed studies

Content analysis revealed four major themes. Although each of the identified themes is not consistent across all the studies, they form part of the significant findings in these studies.

Table 1: The eligibility criteria of literatures included in the review

Inclusion criteria	Exclusion criteria
The study was conducted in the Philippines and within the Philippines context	The study was not conducted within the context of the Philippines
The study addresses ICT integration in nursing education	Studies addressing other issues than ICT integration in nursing education
The study was conducted or published in English language	The study was conducted or published in other languages than English language
The full text of the article is free	There is a financial implication of obtaining full text

ICT=Information and communication technology

### Theme 1: Use of information and communication technology to enhance teaching and learning in nursing

Some studies identified that ICT tools are useful in enhancing nursing education. This theme was identified in four studies.<sup>[12-15]</sup> In the Philippines, Pugoy *et al.*,<sup>[12]</sup> Austria,<sup>[14]</sup> and Penaflor-Espinosa,<sup>[13]</sup> reported that technology-enhanced nursing education was more effective than the traditional methods. It was also reported that ICT-enhanced learning experience among nurses.<sup>[12]</sup> In Malaysia, Arunasalam reported that despite expressing some frustrations with technology-enhanced teaching, nursing students developed confidence in using computer technology to enhance learning.<sup>[15]</sup> Importantly, however, Penaflor-Espinosa reported that the use of ICT among nursing faculty was found to be very useful in their teaching responsibilities.<sup>[13]</sup> Penaflor-Espinosa also found that student perceived ICT integration in nursing education to be very relevant.<sup>[13]</sup> In addition, Pugoy *et al.* found that technology was also useful in learning clinical scenarios and communication in English among nurses.<sup>[12]</sup> From the account of Austria, ICT was found to make nursing education enjoyable and help to maximize teacher-learner engagement.<sup>[14]</sup>

### Theme 2: Challenges with information and communication technology integration in nursing education

Three studies identified some challenges faced with the use of ICT in nursing education. Austria, identified that complex technology in nursing education creates some degree of distraction and one major factor reported was poor internet connection.<sup>[14]</sup> Furthermore, Arunasalam reported that nursing students experience some frustration with the use of ICT principally due to lack of support from faculty and staff.<sup>[15]</sup> Kowitlawakul *et al.* also reported that technology integration in nursing education has some challenges, but the pattern of challenges was not reported.<sup>[16]</sup> In general, Austria itemized technological delay, poor government support, inadequate exposure, and technological dependence as key problems users face while using ICT in nursing education.<sup>[14]</sup>

**Table 2: Illustrates the number of studies retrieved from each of the Southeast Asian countries**

Study title and authors (years)	Journal	Country
Technology-enhanced learning in trans-national higher education by Aninasalam N (2016)	British Journal of Nursing	Malaysia
Exploring faculty perceptions towards electronic health records for nursing education by Kowitlawakul Y., Chan, SWC and Wang L (2014)	International Nursing review	Singapore
Access to, interesting and attitude towards e-learning for continuous education among Malaysian nurses by Chong MC, Francis K, Cooper S, Abdullah KL, Hmwe NTT and Sohod S. (2016)	Nursing Education Today	Malaysia
Exploring the influence of informatics in Nursing. The Filipino student nurses' perspective by Austria P. (2017)	Online Journal of Nursing informatics	Philippines
Technology integration in Nursing Education: Its implications to colleges of Nursing in Western Visayas, Philippines by Penaflor-Espinosa MJ (2016)	International Journal of Hybrid Information Technology	Philippines
Augmented reality in Nursing education: Addressing the limitations of developing a learning material for Nurses in the Philippines and Thailand by Pugoy RAD, Ramos RC., Figueroa Jr. RB, Rivera MH, Siritarungsri B <i>et al.</i> (2016)	International Journal of Development of e-learning	Philippines and Thailand

### Theme 3: Attitude and perceptions toward information and communication technology integration in nursing education

Four of the reviewed studies reported participants attitude toward ICT integration in nursing education. The most significant was the findings of Kowitlawakul *et al.* who reported that nursing faculty members in Singapore consider technology integration in nursing education as innovative and of important value.<sup>[16]</sup> Austria also found that Filipino nursing students had positive attitude toward technology in nursing education, particularly in the practical demonstrations.<sup>[14]</sup>

Similarly, Chong *et al.* reported that 58% of Malaysian nurses had positive attitude toward ICT use in continuing education, whereas 42% has less than positive attitude toward ICT.<sup>[17]</sup> Nurses interests were significantly associated with their positive attitude. Furthermore, Chong *et al.* found that average hours of weekly computer use was significantly associated with positive attitude toward e-learning.<sup>[17]</sup> A positive attitude toward technology integration in nursing education was also observed in the study conducted by Penaflor-Espinosa.<sup>[13]</sup> From the findings, most nursing teachers hold positive attitude toward application of ICT in nursing education.

### Theme 4: Suggestions for improvement

In few of the studies reviewed, the participants themselves made some suggestions that they perceive to be important in the effective integration of ICT in nursing education. Austria reported that Filipino nursing students are of the strong opinion that the government should allocate sufficient funds to technology.<sup>[14]</sup> Kowitlawakul *et al.* found that Singaporean nursing faculty members are of the position that nursing faculty members require more time to fully integrate technology into nursing education. They also requested for support from administrators for ICT integration.<sup>[16]</sup>

### Information and communication technology tools in the reviewed studies

Some studies included in this review focused on specific ICT tools which were deemed important in the different settings. Although few studies generalized ICT and did not mention specific ICT tools, others had specific focus. For example, Pugoy *et al.* concerned about the use of augmented reality (AR) in improving Filipino nursing students' learning of clinical scenarios and communication in English.<sup>[12]</sup> Kowitlawakul *et al.* focused on the use of electronic health records in nursing education in Singapore.<sup>[16]</sup> In the study conducted by Penaflor-Espinosa among Filipino colleges of nursing, the ICT tools involved in the study were laptop/computers, overhead multimedia projector, televisions, simulation laboratory, use of internet, and the use of software applications.<sup>[13]</sup> Their findings showed varying levels of utilization of these tools among the different colleges of nursing in the Western Visayas region of the Philippines. Furthermore, in the study conducted in the Philippines by Austria (2017), the ICT tools identified in the study were internet facilities, laptops, e-books, projectors, computers, tablets, and social media.<sup>[14]</sup> In Malaysia, Chong *et al.* were interested in the use of e-learning for continuous nursing education and found that most nurses (85.3%) have access to home computers and 85% had access to computer at work, with majority having internet access both at work and at home.<sup>[17]</sup> From their study, Chong *et al.* found that the main computer activities for nursing continuing education in Malaysia were internet searches and word processing, while library searches and data analysis were less frequently performed among Malaysian nurses involved in continuing education.<sup>[17]</sup>

### Research methods adopted

Various methodologies were used in the different studies reviewed. Majority were descriptive quantitative,



while few were qualitative studies. The two studies conducted in Malaysia utilized two different approaches. Arunasalam<sup>[15]</sup> utilized a hermeneutic phenomenological approach which is qualitative in nature while Chong *et al.* utilized a cross-sectional descriptive survey.<sup>[17]</sup> The study conducted in Philippines and Thailand by Pugoy *et al.* did not specify the exact research method used, but from the analysis conducted, the study was a quasi-experimental, whereby AR was developed and introduced to nursing students, and their perceptions were assessed using survey questionnaires.<sup>[12]</sup> The study conducted by Austria among Filipino student nurses adopted a qualitative-descriptive phenomenological approach using semi-structured questionnaire.<sup>[14]</sup> Penaflor-Espinosa adopted a descriptive cross-sectional survey approach to assess technology integration in the colleges of nursing in Western Visayas.<sup>[13]</sup> In Singapore, Kowitlawakul *et al.* utilized an exploratory qualitative approach.<sup>[16]</sup> This shows that this review incorporated studies that utilized various methods.

## Discussion

It is clear that there is limited evidence of ICT integration in nursing education within the Southeast Asian region. From this review, it was observed that majority of the studies originated from the Philippines which supports the fact that the Philippines has turned to ICT as a tool to improve teaching and learning. As noted earlier, The Philippine DepEd stresses that ICTs must be an integral part of all learning areas, both hardware and software. Hence, it is paramount to use and apply e-learning and ICT in all subjects because this is now the most critical and viable practice in educational reforms.<sup>[8]</sup> Certainly, there is a dearth of sufficient evidence to show how much is been done in this direction.

Four themes were identified in this review. The most important theme is the observation that ICT integration in nursing education enhancing teaching and learning.<sup>[12-15]</sup> This theme agrees with the findings of Button *et al.*<sup>[6]</sup> This finding also corroborates the findings of Webb *et al.* who found that ICT improves the learning environment for staff and students.<sup>[18]</sup> Moreover, Neville *et al.* reported that ICT increased Australian health students' confidence in their subjects.<sup>[19]</sup>

The second theme identified in this review was related to challenges with ICT integration in nursing education. This theme was derived from the expressions made by different participants. Austria, identified that complex technology was a big distractor whereby students lost focus of the lesson content.<sup>[14]</sup> Arunasalam reported that nursing students experience some frustration with the use of ICT principally due to lack of support from faculty and staff.<sup>[15]</sup> This is in consonance with the

findings of Webb *et al.*<sup>[18]</sup> Austria itemized technological delay, poor government support, inadequate exposure, and technological dependence as key problems users face while using ICT in nursing education.<sup>[14]</sup> In a study conducted by Bello *et al.* in Egypt, findings showed that challenges faced by nursing students with regard to the use of ICT include slow/poor internet speed/access (84.3%), lack of ICT facilities (80.4%), difficulty in accessing the required information (68.7%), and expensive internet subscription (68.5%).<sup>[20]</sup> The findings of this review has indicated that despite strong evidence on the advantages of ICT, there are some inherent challenges with its integration in nursing education.

The third theme that emerged was participants' attitude and perceptions toward ICT integration in nursing education. The findings from this study showed that positive attitude toward ICT integration in nursing education was observed in Singapore,<sup>[16]</sup> the Philippines,<sup>[13,14]</sup> and in Malaysia.<sup>[17]</sup> This finding supports the finding of Atay *et al.* who also reported positive attitude among nursing and midwifery students in Turkey.<sup>[21]</sup> Positive attitude seems to be a key attitude for competent provision of nursing care through ICT. Previous researches prove that nurses have negative attitude towards technology. O'Keefe-McCarthy concludes that technology distances nurses from patients,<sup>[22]</sup> while Adams *et al.* state that it disrupts the rapport between nurses and patients.<sup>[23]</sup> Positive attitude toward ICT has a potential of helping nurses overcome these challenges.

The fourth team that emerged from the critical analysis of retrieved literature was suggestions for improvement. Participants in the studies<sup>[14,16]</sup> made some suggestions, particularly hoping for support from government and institutional administration. In support of this, Lee *et al.* made strong recommendation about the importance of South-Korean government's support in ICT integration in health education.<sup>[24]</sup>

The findings from this study showed that the most commonly mentioned ICT tool in the studies was computer, projector, internet, and simulation laboratory tool.<sup>[12,14,16,17]</sup> This study is consistent with the study on Danish Educational System where similar tools were the major interest.<sup>[25]</sup> In another previous study, the computer skills included starting up the computer, accessing the Internet, logging into a website, logging off from a website, accessing the computer-based applications, and locating the information on the computer.<sup>[26]</sup>

In terms of the research method adopted in the reviewed studies, majority were descriptive quantitative, while few were qualitative studies. Out of all the 6 studies, only the study by Chong *et al.* presented some comprehensive

results.<sup>[17]</sup> The qualitative studies included in this review seemed to have been too shallow and did not capture the true essence of ICT application in Nursing education. Previous studies on ICT integration had adopted a quantitative approach. Certainly, none of the reviewed studies conducted an experimental study to identify which of the ICT tools are more effective than the other. This would have been an added advantage as previous studies have identified that video-assisted teaching program was effecting in enhancing learning of testicular cancer and testicular self-examination in an Asian country.<sup>[27]</sup>

## Conclusion

ICT has been viewed as an essential facilitator of nursing education in the Southeast Asian nations. Although the studies addressing this fact are very few, nevertheless, they serve as evidence as to the level of ICT integration within the studied region. Despite being a major part of the Agenda of ASEAN, only the Philippines, Malaysia, Singapore, and Thailand have been concerned about how this can be actualized, with the Philippines contributing most in this regard. Based on the result of this study, ICT has been proven to be a very effective tool in the enhancement of nursing education. Positive attitude was also observed among faculty and nursing students. The major challenge facing the integration of ICT in nursing education is the lack of support from administration and government.

Based on the findings of this study, it is therefore recommended that governments of the Southeast Asian countries should provide sufficient support for ICT integration in the various nursing institutions. Institutional administrators are encouraged to key into the ICT trend and render their support when and where necessary. More studies should be conducted, especially within the countries that are yet to initiate any studies on ICT integration in nursing education. Experimental studies should be conducted to identify the specific ICT tools that have more effectiveness over others.

## Limitations

Citations were derived from electronic databases and limited to original studies published in English. Although the literature search was systematic, it is possible that valuable sources may have gone undetected.

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## Conflicts of interest

There are no conflicts of interest.

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