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Trends and research issues of mobile learning studies in nursing education: A review of academic publications from 1971 to 2016



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ABSTRACT

In the past decades, the issues related to mobile learning have been widely discussed around the globe; however, the development and trends of applying mobile technologies in nursing education still lack systematic analysis. In this study, a meta review of the studies published in academic journals from 1971 to 2016 was conducted to analyze the application domains, subjects, adopted learning strategies, investigated research issues and findings of mobile technology-supported nursing education. From the review results, it was found that the use of mobile technologies in nursing education and training have made great progress in the past decades. In addition to the changes in mobile technologies and the increasing number of mobile learning studies in nursing education, the subjects and research issues have also become more diverse in recent years. It was also found that mobile learning has mainly been applied to the training of basic nursing concepts and skills as well as to long-term care and obstetrics and gynecology, while few or even no studies are related to other nursing education domains. In addition, several widely adopted mobile learning strategies, such as inquiry-based learning, contextual mobile learning, synchronous sharing, Mindtools, project-based learning and peer assessment, have seldom been adopted in mobile nursing education. This also reflects the fact that most of these studies focused on skills training and basic knowledge comprehension, while few were conducted in the domains aimed at fostering learners' higher order thinking competences, such as problem solving or critical thinking. On the other hand, it was found that the number of studies using an experimental design has increased in recent years; moreover, most studies reported the learners' cognitive performance and perceptions, while their learning behaviors were seldom analyzed. Accordingly, the research trends and potential research issues of mobile nursing education are proposed as a reference for researchers, instructors and policy makers.

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1. Introduction

The advancements in wireless Internet, sensing technology, and mobile technology have boosted the transformation of education and learning conceptions. [Hwang, Wu, and Chen \(2007\)](#) indicated that the development of wireless

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communication and sensing technologies provides researchers and instructors with new thinking perspectives. In particular, the portability and accessibility of digital learning content supported with mobile technology provide the opportunity for learners to link the textbook knowledge with real life environments; for instance, Vogel, Kurti, Milrad, Johansson, and Muller (2014) applied mobile technology in an ecology learning activity to guide students to observe and collect data in the real environment. Such a learning approach enables learners to have real-world problem-solving experience using the knowledge learned from textbooks.

These advancements in technologies have brought a tremendous change to the education of all subjects in the 21st century. Besides leading in mobile learning in normal subjects, implementing mobile technology in nursing education is also an issue worth discussing. Not only can the integration of innovative techniques help students or trainees learn effectively within limited clinical learning time, but it can also help nursing staff conduct training and reinforcement of professional skills. For instance, Wu, Hwang, Tsai, Chen, and Huang (2011) developed a mobile guiding system for a clinical nursing course; through the mobility of the mobile devices, learners were guided to interact with simulated standard patients in real scenarios. The sensing technology can lower the obstacle of entering information into mobile devices during the learning process, and can guide students to identify the abnormal symptoms by observation; the results showed that the students using the mobile guiding system outperformed those using conventional ways in disease identification learning achievement, which confirmed that mobile learning can effectively increase nursing students' learning results. Applying the function of instant information of mobile technology can control examinees' inspection progress and movements, while also providing them with health education services and correct identification of patients (Athilingam et al., 2016). Furthermore, mobile technology can help nurses take control of the medical golden treatment time and let them deliver and record medical information to increase clinical efficiency (Colton & Hunt, 2016; Hwang et al., 2007; Lee & Daugherty, 2016). For instance, Wang and Kim (2015) applied mobile phones and the Internet system to let midwives, pregnant women, and other health professionals have two-directional interaction, easy operation, instant medical messages, and feedback.

It was found that digital learning platforms in mobile technology can support nursing students' learning in clinical medical environments (Lai & Wu, 2016). However, as with the innovations in technology, instant and accurate medical and nursing professional knowledge must also be accumulated by clinical learning and experience to avoid any abnormal event or medical malpractice. Through relevant research development and discussion, professional medical groups can be cultivated to improve the quality of medical practice. To understand the application and trends of mobile technology in nursing, literature on mobile devices in nursing from 1971 to 2016 was analyzed in this study. From the analysis results, some research issues are proposed for nursing education which can serve as relevant research for mobile technology in nursing education for medical education institutes or researchers.

2. Literature review

There are various definitions of mobile learning. One frequently adopted definition is the teaching mode that employs mobile technologies to provide learning materials, guidance or supports to learners (Sharples, Milrad, Arnedillo Sánchez, & Vavoula, 2009). Another, which is a broad-sense definition, refers to the learning mode that is not constrained by physical locations (Hwang, Tsai, & Yang, 2008). The former emphasizes the use of mobile technologies, while the latter emphasizes the mobility of learners or learning equipment. With the portability of mobile devices, learners can read teaching materials, practice, and collect data at any time; meanwhile, with the help of sensing technologies, learning systems can detect learners' location and provide learning guidance and supports based on their needs in real-world contexts (Phillippi & Wyatt, 2011; Wu et al., 2011). This is of great help for promoting learning results (Wu & Sung, 2014; Wu, 2014a, 2014b).

There have been many successful examples of applying mobile technology in medical education. For instance, clinical teachers applied iPads to help midwives simulate the clinical learning environment (Brown & McCrorie, 2015); health professionals applied smart phones and QR codes to cultivate students' rapid learning (Jamu, Lowi-Jones, & Mitchell, 2016). Meanwhile, mobile technology in nursing education has received emphasis. For instance, Wu (2014a, 2014b) adopted mobile devices to enhance nursing students' professional knowledge and skills. With the facilitation of mobile technology, learning of nursing professional knowledge can be effectively enhanced. Furthermore, scholars have also indicated that nursing education with mobile technology can enhance the interaction among peers and teachers, and has received strong affirmation from students (Wu & Sung, 2014).

Another important goal of applying mobile technology in nursing education is to facilitate students' skills training or on-the-job training (Ashby, Snodgrass, Rivett, & Russell, 2016; Tower, Cooke, Watson, Buys, & Wilson, 2015). For instance, Lai and Wu (2012, 2016) adopted mobile devices to guide students to operate systems to help them connect theories with practice in order to improve the records, evaluation, and feedback of the e-system.

In addition to skills training, mobile technologies also have good potential in terms of benefiting learners in other dimensions of nursing education. For instance, Ashby et al. (2016) as well as Tower et al. (2015) discussed the application of mobile synchronous feedback systems and their effect on learning perceptions. Athilingam et al. (2016) indicated that the mobile learning mode can increase patients' cognition of heart failure knowledge and improve their confidence in health education knowledge. Wu et al. (2011) also confirmed that leading mobile learning in the respiratory and circulatory system in nursing education allowed students to use personalized instruction and supplement teaching materials to learn professional knowledge. It was found that most students showed a positive attitude toward using mobile learning systems and participating in the training program.

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