DEVELOPING, VALIDATING AND EVALUATING THE EFFECTIVENESS OF A BLENDED LEARNING FOR TEACHING CLINICAL SURGICAL NURSING SKILLS AMONG NURSING STUDENTS AT XIANGNAN UNIVERSITY IN CHENZHOU, CHINA

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by

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LIST OF SYMBOLS

α　　　　　Alpha

σ　　　　　Pooled standard deviation

χ^2　　　　　Chi-square

et al.　　　　　And others

&　　　　　And

%　　　　　Percentage

>　　　　　More than

<　　　　　Less than

=　　　　　Equal to

e.g.　　　　　For example

LIST OF ABBREVIATIONS

IPS	Institut Pengajian Siswazah
SD	Standard Deviation
USM	Universiti Sains Malaysia
SNA	Surgical Nursing Apprenticeship
SPSS	Statistical Package for Social Sciences
M	Mean
SDLI	Self-Directed Learning Instrument
SNABT	Surgical Nursing Apprenticeship Online and Offline Blended Teaching

LIST OF APPENDICES

PEMBANGUNAN, PENGESAHAN DAN PENILAIAN KEBERKESANAN PEMBELAJARAN TERADUN UNTUK PENGAJARAN KEMAHIRAN PEMBEDAHAN KEJURURAWATAN KLINIKAL DI UNIVERSITI XIANGNAN, CHENGZHOU, CHINA

ABSTRAK

Pengajaran dalam talian adalah kaedah pengajaran yang baru, dan terdapat sedikit penyelidikan mengenai pengajaran kemahiran kejururawatan klinikal, apatah lagi pengajaran dalam talian untuk aspek program perantisan kejururawatan. Kajian ini bertujuan untuk membangun, mengesahkan, dan menilai modul pengajaran teradun dalam talian dan luar talian untuk perantisan kejururawatan pembedahan menggunakan aplikasi mudah alih Pass Pembelajaran. Reka bentuk kajian kuantitatif ini dijalankan dalam dua fasa. Fasa I melibatkan pembangunan dan pengesahan module pengajaran perantisan kejururawatan pembedahan dalam talian dan luar talian menggunakan aplikasi Pass Pembelajaran. Penyelidik dan kupulan pengajar membangunkan modul pengajaran teradun berdasarkan sukatan pelajaran dan juga kajian literatur. Selepas itu, modul pengajaran teradun telah disahkan oleh sepuluh pakar menggunakan kaedah Delphi. Dalam Fasa II, percubaan kawalan rawak telah dijalankan dalam kalangan 166 pelajar kejururawatan di Universiti Xiangnan di Chenzhou, China, untuk menilai keberkesanan modul pengajaran teradun terhadap prestasi kemahiran, kemahiran keupayaan pembelajaran terarah kendiri, emosi akademik dalam talian dan sikap pembelajaran. Kumpulan intervensi menggunakan kaedah pengajaran teradun dalam talian dan luar talian menggunakan aplikasi Pas Pembelajaran, manakala kumpulan kawalan menggunakan kaedah tradisional pengajaran bersemuka. Perisian statistik SPSS 26.0 digunakan untuk analisis data. Ujian-t satu sampel, ujian-t bebas, dan ujian

khi kuasa dua telah dilakukan. Hasil Fasa I menunjukkan modul pengajaran teradun dalam talian dan luar talian untuk perasntisan kejururawatan pembedahan telah dipersetujui dengan 100% pakar melalui dua pusingan teknik Delphi. Keputusan Fasa II menunjukkan bahawa selepas intervensi, terdapat peningkatan ketara dalam keupayaan pembelajaran kendiri dalam kumpulan intervensi berbanding kumpulan kawalan ($p = 0.019$), dengan skor min bagi kumpulan intervensi 78.89 (SD = 13.32) dan kumpulan kawalan 74.48 (SD = 11.55). Skor kemahiran juga menunjukkan peningkatan yang ketara dalam kumpulan intervensi berbanding kumpulan kawalan ($p < 0.001$), dengan skor min bagi kumpulan intervensi 91.81 (SD = 3.54) dan kumpulan kawalan 89.65 (SD = 4.11). Nilai purata kumpulan intervensi bagi emosi akademik dalam talian (Purata = 3.33) adalah lebih tinggi daripada min teori (Purata = 3), dan perbezaannya adalah signifikan secara statistik ($p < 0.001$). Selain itu, tidak terdapat perbezaan yang signifikan dalam sikap pembelajaran pelajar. Kesimpulannya, kaedah pengajaran teradun dalam talian dan luar talian menggunakan aplikasi Pas Pembelajaran terbukti berkesan dalam meningkatkan kemahiran kejururawatan, kebolehan pembelajaran kendiri, dan emosi akademik dalam talian dalam kalangan pelajar kejururawatan. Pada masa hadapan, kajian pelbagai pusat diperlukan untuk mengesahkan keberkesanan aplikasi mudah alih ini dalam pengajaran dalam talian, serta kajian longitudinal untuk menilai hasil jangka panjang.

DEVELOPING, VALIDATING AND EVALUATING THE EFFECTIVENESS OF A BLENDED LEARNING FOR TEACHING CLINICAL SURGICAL NURSING SKILLS AMONG NURSING STUDENTS AT XIANGNAN UNIVERSITY IN CHENZHOU, CHINA

ABSTRACT

Online teaching is a new teaching method, and there is not much research on teaching clinical nursing skills and even less on the online teaching of this aspect of nursing apprenticeships. This study aimed to develop, validate, and evaluate a surgical nursing apprenticeship online and offline blended teaching module using the Learning Pass mobile app. This quantitative study design was carried out in two phases. Phase I involved the development and validation of a surgical nursing apprenticeship online and offline blended teaching module using the Learning Pass mobile app. The researchers and teaching team developed a blended teaching module based on the syllabus and literature review. After that, the blended teaching module was validated by ten experts using the Delphi method. In Phase II, a randomized control trial was conducted among 166 nursing students at Xiangnan University in Chenzhou, China, to evaluate the effectiveness of the blended teaching module towards skill performance, self-directed learning ability, online academic emotions, and learning attitude. The intervention group utilized online and offline blended teaching methods using the Learning Pass mobile app, while the control group used traditional face-to-face teaching methods. SPSS 26.0 statistical software was used for data analysis. One-sample t-tests, independent t-tests, and chi-square tests were performed. As a result of Phase I, the online and offline blended teaching module for the surgical nursing apprenticeship was

agreed upon with 100% experts through two rounds of the Delphi technique. Phase II results showed that after the intervention, there was a significant increase in self-directed learning ability in the intervention group compared to the control group ($p = 0.019$), with the mean score for the intervention group 78.89 (SD = 13.32) and the control group 74.48 (SD = 11.55). The skill scores also showed a significant increase in the intervention group compared to the control group ($p < 0.001$), with the mean score for the intervention group 91.81 (SD = 3.54) and the control group 89.65 (SD = 4.11). The intervention group's mean value of online academic emotions (Mean = 3.33) was higher than the theoretical mean (Mean = 3), and the difference was statistically significant ($p < 0.001$). Besides that, there were no significant differences in the students' learning attitudes. In conclusion, online and offline blended teaching method using the Learning Pass mobile app effectively improves nursing skills, self-directed learning ability, and online academic emotions among nursing students. In the future, multicenter studies are needed to validate the effectiveness of this mobile app for online teaching, as well as longitudinal studies to assess long-term outcomes.

CHAPTER 1

INTRODUCTION

1.1   Background of Study

Nursing is a discipline based on practical application and needs the integration of theoretical knowledge and clinical practice. Clinical nursing skills education is a type of nursing education in which nursing students have access to a variety of practice opportunities in hospitals, clinics, and simulation laboratories, as well as the ability to repeat clinical scenarios and reflect on decision-making immediately. It is an essential component of nursing education that applies classroom knowledge to real-world patient care (Chen et al., 2021).

With the progress of modern medical technology and the improvement of people's living standards, the demand for quality nursing services has increased. Nurses need to have more comprehensive knowledge, skills, and comprehensive quality ability to solve various health problems of patients. As the reserve force of the nursing team, the level of clinical practice ability of nursing students will directly affect the quality of future nurses, which is related to the safety of patient care, quality of care, and retention rate of nursing staff (Huston et al., 2018). With the deepening of the concept of "competency-based" in nursing education, the clinical ability of nursing students has become a key indicator of the quality of undergraduate nursing education and the effectiveness of clinical teaching (Li et al., 2016).

The traditional way of teaching in the clinical nursing skills education center involved the demonstration of skills in a class lecture to a group of students (25 to 40), followed by practice of the skills under the supervision of department-approved supervisors. For these high-strength classes, managing the timetable and availability of

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trained teaching staff required lots of effort with numerous challenges. Some issues are associated with procedural consistency for a large number of staff members (McKenny, 2011). Traditional practical teaching is mainly carried out through teacher demonstration, student practice, and teacher guidance. Affected by many factors, such as teachers, sites, funds, and equipment, it greatly restricts the cultivation of students' self-learning abilities and innovative abilities (Li et al., 2019; Paul & Jefferson, 2019). Therefore, it is urgent to explore more effective practical teaching methods.

In present years, it has become vital for nursing organizations to add technological advancements within the current curriculum in delivering compulsory knowledge and clinical skills to nursing students (Durmaz et al., 2019). The professional training of nurses consists of two fundamental components: Teaching opportunities, which include theoretical instruction, and hands-on learning experiences, such as clinical practice. There is always a space for upgrading the teaching and improving students' learning abilities regarding their clinical nursing skills (Chiang, 2015).

Clinical apprenticeship refers to a hands-on, immersive training model in nursing education that bridges classroom-based theoretical knowledge with real-world clinical practice. Clinical apprenticeship is pivotal in developing nursing students' abilities in clinical practice. It facilitates the transition from theoretical learning to multifaceted clinical reasoning, promoting the holistic improvement of their clinical competence (Peng et al., 2023). Through clinical apprenticeship, nursing students enhance their professional attitudes, deepen their nursing knowledge, refine their operational skills, and cultivate critical thinking, leading to a comprehensive boost in their practical capabilities. Some researchers conducted a cross-sectional survey of 20 trainers and 43 senior nursing students and concluded that the problems faced by

apprenticeship teaching were insufficient welfare and educational facilities. Therefore, the researchers suggested that in order to enhance the quality of the nursing apprenticeship curriculum, it is essential to improve the welfare facilities and teaching aids in the clinical environment, and ensure better coordination between theoretical education and practical training (Hasanpour-Dehkordi & Shohani, 2016).

The Coronavirus Disease 2019 (COVID-19) pandemic affected education systems around the world, causing significant organizational changes to traditional teaching methods (Abbasi et al., 2020; Alsoufi et al., 2020; Camargo et al., 2020; Rose, 2020). In order to stop the spread of the virus, schools around the world were closed, which had a great impact on students from all over the world. Students in the medical, dental, and nursing fields in many countries adopted online courses and exams. All conferences and lectures were switched to online mode, and clinical placements were suspended. Therefore, to adapt to the changing situation, the innovation of clinical nursing skills teaching is very urgent and important. From the perspective of the whole world, internet resources and mobile learning are becoming the mainstream trend of modern education, and China's nursing network education is still at the exploratory stage.

1.2   Problem Statement

New developments in information and communication technologies have led to significant advancements in mobile learning practices. The three components of mobile learning include mobile devices (e.g., smartphones), applications, and internet services. Recently, mobile learning has been introduced into the field of clinical education as a new form of learning (Willemse & Bozalek, 2015), which uses wireless network technology and communication devices to obtain educational information, resources,

and services. Students can now learn anytime, anywhere, with the help of mobile devices (Kim & Park, 2019). The delivery of education in tertiary health institutes is greatly influenced by information and communication technology (Arguel & Jamet, 2009; Johnson et al., 2010). E-learning is frequently endorsed in higher education settings and encouraged as the best approach to learning clinical nursing skills.

In recent years, especially after the COVID-19 pandemic, the rise of online teaching has promoted the popularity of online courses. There are many types of research on online teaching of theoretical courses, but there are few reports on online teaching of clinical nursing skills. For example, Hester et al. (2021) conducted a study on using mobile phone apps to teach nursing practical skills. It was found that mobile apps and in-person instruction teaching methods produced a similar levels of competency in students. The study demonstrated that the mobile app can be an effective replacement for in-person teaching. However, the study looked only at the topic of vital signs. This is not enough to verify the role of mobile app teaching. Some researchers adopted a combination of online and offline teaching for nursing interns and carried out online teaching through the Tencent conference platform based on regular offline teaching inwards, and achieved certain results (He et al., 2023). However, the research was only limited to the topic of mechanical ventilation for respiratory rehabilitation. Therefore, online teaching of clinical nursing skills needs to be explored in the future.

Some researchers used a meta-analysis to investigate the effectiveness of mobile learning on skills, knowledge, satisfaction, and self-confidence in nursing students' clinical education (Chen et al., 2021). The results show that mobile learning improves students' skills, knowledge, satisfaction, and self-confidence. Mobile learning can be used as an adjunct teaching method for clinical nursing education. However, due to the

limited number of studies examining mobile device-based learning in clinical nursing education, especially in clinical nursing apprenticeship education, more future research on mobile learning using mobile devices (e.g., smartphones, tablet computers) is needed to confirm these findings.

Information and communication technology has a great impact on the provision of quality education in colleges and universities. In particular, the strengthening of online learning of clinical nursing skills may be a potential trend, but there is still a lot of room for development. There are many studies evaluating the effect of online learning on theoretical components, but there is limited research on the learning of clinical skills. The effectiveness, application, and teaching quality of online clinical nursing skills education are key research areas that need further exploration. Therefore, improving the quality of online teaching for clinical skills will be a key challenge to address in the future. Thus, this study intends to create an online and offline teaching module on surgical nursing apprenticeship and evaluate its effect on skills performance, self-directed learning ability, online academic emotions, and learning attitude among nursing students.

1.3   Significance of Study

Nursing practical courses are important for cultivating the practical operation ability of nursing students. Online learning is a learning activity that uses the functions and resources of the internet to establish a meaningful learning environment and to support and promote students' learning. It can provide students with a relaxed and harmonious independent learning environment, which can enhance students' learning interests and independent learning ability. It is not just about moving traditional classrooms online but integrating high-quality educational resources online.

This study is significant to investigate how mobile technology (the Learning Pass mobile app) facilitates clinical nursing skills teaching and learning. Nursing education has historically been dependent on conventional methods of learning that require real-time experience with the use of limited resources, which may hinder them from acquiring knowledge academically. Integration of a mobile application (app) in this process provides a flexible pathway for nursing education, that could significantly improve the clinical competence of nursing students. The mobile app offers interactive and easily accessible learning experiences that complement in-person clinical training, potentially leading to a more cohesive and comprehensive learning journey.

Among the challenges in nursing education is how to adequately close the gap between theory and practice. The significance of this study is how an online and offline blended model through a mobile app can address such challenges. This mobile application enables students to continue learning by offering tools and resources that complement the face-to-face teaching method in class and help them to integrate theory with practice more effectively. Given today's educational paradigm, it has become imperative to inculcate self-directed learning among students to equip them well with lifelong learning skills and professional advancement. The mobile app in this study was designed to support and affect students' self-regulation of learning. With these learning resources that are available anytime and anywhere, the app empowers students to take charge of their education, customize their learning activities to their needs, and engage more deeply with the course material.

The findings of this study on self-directed learning ability, academic emotions, learning attitudes, and clinical skill proficiency could demonstrate the app's effectiveness and justify its integration into the nursing curriculum, potentially leading

to its broader formal adoption. These outcomes are important and can directly relate to the preparedness of nursing graduates, ultimately affecting the quality of patient care they will provide later.

The study's timing and relevance are important as higher education institutions face growing demands for flexible and scalable learning solutions. Mobile applications in nursing education or general education address the need for accessible learning options, accommodating diverse student needs. By investigating the effectiveness of the mobile app in a real-world setting at a higher education institution in Chenzhou, China, this research could provide a model for other institutions seeking to innovate their teaching methods and enhance their educational offerings. The findings could be relevant to similar settings worldwide, enriching the evidence on the role of digital tools in professional education, especially in course that required high levels of practical skill and competency. In conclusion, this study's significance lies in its potential to revolutionize nursing education through innovative, blended teaching methods that leverage the capabilities of mobile technology.

1.4   Research Questions of the Study

(1) What are the contents of online and offline blended teaching module for teaching surgical nursing apprenticeship?

(2) Are the surgical nursing apprenticeship online and offline blended teaching module reasonable or applicable?

(3) What are the effects of the surgical nursing apprenticeship online and offline blended teaching module on nursing student's skill performance, self-directed learning ability, online academic emotions, and learning attitude?

1.5   Research Objective

1.5.1   General Objective

The general objective of this study is to develop and validate an online and offline blended teaching module for surgical nursing apprenticeship using the Learning Pass mobile app and evaluate the effectiveness of the module on skills performance, self-directed learning ability, online academic emotions, and learning attitude among nursing students at Xiangnan University Chenzhou, China.

1.5.2   Specific Objective

Phase I: Development and Validation a Blended Teaching Module

1.   To develop a surgical nursing apprenticeship online and offline blended teaching module for undergraduate nursing students using the Learning Pass mobile app.

2.   To validate the surgical nursing apprenticeship online and offline blended teaching modules using Learning Pass mobile app among the experts at Xiangnan University in Chenzhou, China.

Phase II: Intervention Study

3.   To evaluate the effectiveness of surgical nursing apprenticeship online and offline blended teaching module using the Learning Pass mobile app on skill performance, self-directed learning ability, online academic emotions, and learning attitude among nursing students at Xiangnan University in Chenzhou, China.

1.6   Hypothesis of Study

Hypothesis 1: There are significant differences in skill performances between online and offline blended teaching module using the Learning Pass mobile app and

traditional teaching methods among nursing students at Xiangnan University in Chenzhou, China.

Hypothesis 2: There are significant differences in self-directed learning ability between the online and offline blended teaching module using the Learning Pass mobile app and the traditional teaching method among nursing students at Xiangnan University in Chenzhou, China.

Hypothesis 3: The online and offline blended teaching module using Learning Pass mobile app effectively improves the online academic emotions of nursing students at Xiangnan University in Chenzhou, China.

Hypothesis 4: There are significant differences in learning attitudes between the online and offline blended teaching module using Learning Pass mobile app and traditional teaching methods among nursing students at Xiangnan University in Chenzhou, China.

Hypothesis 5: There is no significant difference in the baseline demographic information and the pre-test mean of nursing students between the interventional and control groups.

1.7   Definition of the Study Terms

1.7.1   Mobile Application

A mobile application, also known as a mobile app, is a piece of software that is specifically designed to run on mobile devices like smartphones and tablets. These applications, typically downloaded from app stores or installed via the internet, provide users with a wide range of functions and services, including games and entertainment,

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productivity tools, and social networking platforms. In this study, the mobile application refers to the specific digital tool used for educational purposes.

1.7.2   Learning Pass Mobile App

The three components of online learning include devices, applications, and internet services (Chen et al., 2021). These applications are created to support learning and skill development on mobile devices such as smartphones and tablets. These applications capitalize on mobile technology's interactive and easily accessible nature to make learning more engaging, convenient, and personalized for users of all ages. Mobile application teaching aims to make learning more accessible, engaging, and convenient for students, teachers, and lifelong learners (Oyelere et al., 2018).

The online teaching used in this study is based on the Learning Pass mobile app, which is a professional platform for mobile learning for smartphones, tablets, and other mobile terminals developed by China's Beijing Century Superstar Information Technology Development Limited Liability Company, supporting Windows, iOS, and Android platforms. Instructors created online courses on the Learning Pass app and invited students to join. Students installed the application on their smartphones and logged in with their accounts and passwords to study. This app has many functions, these are, "Publishing Resources", "Online Discussion" , "Data Statistics", and "Management". The function of 'Publishing Resources' means that instructors can upload teaching courseware, operation videos, exercise tests and expand knowledge on the app. The function of 'Online Discussion' means that instructors and students can post notifications, discussions and messages on the app. The function of 'Data Statistics' means that instructors can get the students' learning progress, assignment completion, answering questions and achievement through this app. The 'Management' function means that instructors can manage classes, teaching resources, exercise library and

teaching team members on the app. The features of this online teaching Learning Pass mobile app are shown in (Figure 1.1).
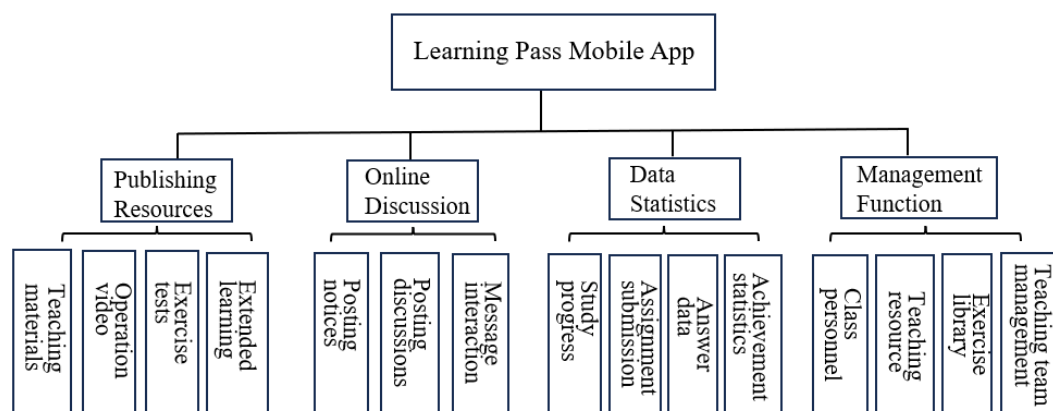
Figure 1.1 The features of Learning Pass Mobile App in Online Teaching

1.7.3   Surgical Nursing Apprenticeship

Surgical Nursing is a core course in nursing higher education that requires students to have a strong foundation in both theory and practical skills. The focus is on developing students' scientific thinking and their ability to identify and solve clinical problems (Guo et al., 2020). Clinical apprenticeship is the beginning of nursing students' entry into the clinic, and it is also the key link between theory and practice, the exercise of nursing practice ability and clinical thinking, and it plays an important role in the completion of the transition from theory to practice for nursing students (McIntyre et al., 2020).

The research content of this topic is the Surgical Nursing Apprenticeship course including the Nursing Apprenticeship for Gastroduodenal Disease; Nursing Apprenticeship for Patients With Hepatobiliary Diseases; Nursing Apprenticeship for Patients with Colorectal Diseases; Nursing Apprenticeship for Patients with Craniosurgical Diseases; Nursing Apprenticeship for Patients with Bone and Joint

Diseases; Nursing Apprenticeship for Patients with Urologic and Male Reproductive Organs Diseases; Nursing Apprenticeship for Patients with Breast Diseases; Nursing Apprenticeship for Patients with Chest Diseases; and Nursing Apprenticeship for Patients with Thyroid Diseases. A total of nine themes are included. Surgical nursing is the core course of the nursing specialty, and teaching practical skills is an important part of teaching surgical nursing. The quality of experimental teaching will directly affect the quality of clinical nursing in the future.

1.7.4 Online and Offline Blended Teaching

Blended teaching, also known as hybrid teaching, is an educational strategy which combines traditional classroom instruction with online learning activities (Jowsey et al., 2020; Leidl et al., 2020). This method integrates technology and digital tools into the learning process, creating a hybrid learning environment. Students may engage in a variety of online activities, such as watching video lectures, participating in online discussions, completing interactive assignments, and accessing digital resources. Offline components typically involve in-person class sessions, hands-on activities, group projects, and discussions. The goal of blended teaching is to leverage the benefits of both online and offline learning to provide a more flexible and personalized educational experience for students. This study created an online course for surgical nursing apprenticeship based on the Learning Pass mobile app, to supplement the content of online teaching on the basis of traditional teaching, to form an online and offline blended teaching model for surgical nursing apprenticeships.

1.7.5 Skills Performance

Nursing skills assessment is a process where a nurse's competencies and proficiencies in various areas of nursing practice are evaluated. This assessment typically involves reviewing a nurse's clinical skills, knowledge, communication

abilities, critical thinking skills, and professionalism. It helps identify areas of strength and areas needing improvement, which can inform training and development plans. Skills assessment is essential for ensuring that nurses are equipped to provide high-quality care to patients (Alkhelaiwi et al., 2024). Using a valid assessment competence tool may be beneficial in promoting and developing high-quality nursing education.

The skills are assessed by using the practical skills operation test. At the end of the semester, students were randomly selected for a skill test on one surgical nursing operation, the skill performance evaluation was adopted from an existing checklist at Xiangnan University by researchers and was used to evaluate nursing students' skill performance on surgical nursing practice skills, and skill test by the direct observation of procedural skills exam. A previous study used a skills grading score from 0-100 (Chamorro-Premuzic & Furnham, 2003). In the current study conducted at Xiangnan University, the same scale was used and distributed to the grades as follows: Scores of less than 60 were classified as failing, 60-74 as passing, 75-89 as good, and 90-100 as excellent. Higher scores indicated higher skill levels.

Skill tests were given after both groups of students had completed the course. The same academic grading scale, which was formulated with the approval of the Teaching and Research Section, was used for both groups. It should be noted that the exam scores would only be used for this study and would not impact the students' overall scores or grading. The exam scores served solely as a measure for the study, without any bearing on the students' final grades.

1.7.6 Self-directed Learning Ability

Self-directed learning ability refers to an individual's capacity to take initiative and responsibility for their own learning process. It involves setting goals, identifying

resources, and actively seeking out information to acquire new knowledge and skills. A self-directed learner exhibits traits such as motivation, self-discipline, critical thinking, time management, goal-setting, and reflection. They are able to plan their learning path, monitor their progress, and adjust their strategies as needed to achieve their objectives. Self-directed learning empowers individuals to be more autonomous and independent in their pursuit of knowledge, making them better equipped to adapt to new challenges and opportunities in various learning environments. Nurses with strong self-directed learning abilities are able to continuously improve their knowledge and skills, adapt to changes in their field, and pursue ongoing professional development opportunities.

In this study, Self-directed Learning Instrument (SDLI) developed by Cheng et al. (2010) was used to detect the level of students' self-directed learning ability, which consists of four dimensions: Learning motivation, plan and implement, self-management, and interpersonal communication, a total of 20 items, the total score ranges from 20-100, with higher scores representing a higher level of self-directed learning ability.

1.7.7   Online Academic Emotion

Online academic emotions refer to a variety of emotional experiences related to online learners' ongoing learning activities or academic progress, including boredom, pride, disappointment, shame, anxiety, enjoyment, etc. (Gao, 2016).

This study refers to the positive high arousal emotions, negative high arousal emotions, and negative low arousal emotions embedded in the learning activities and learning tasks of nursing students during the online learning process. The Online Academic Emotions Scale for College Students developed by Liu et al. (2019) was used.

The scale had three dimensions with 25 items: Negative low arousal emotion (8 items), negative high arousal emotion (9 items), and positive high arousal emotion (8 items).

1.7.8   Learning Attitude

The term "learning attitude" describes an individual's approach and mindset toward acquiring new information, skills, or concepts. It involves having a positive and open mindset, being willing to explore new ideas, being curious, being proactive in seeking knowledge, being adaptable to change, and being resilient in the face of challenges. Having a learning attitude is essential for personal and professional growth as it allows individuals to continuously improve themselves and adapt to new situations.

This study used the learning attitude scale developed by researchers Liu et al. (2020) to assess the level of students' satisfaction with teaching. The scale consisted of 10 items with a total score of 100, where higher scores indicated a higher level of satisfaction.

1.8   Chapter Summary

This chapter provided an overview of key elements pertaining to the topic of this study and the significance of this study. To be more precise, this chapter included an outline of the research questions, objectives, and hypotheses, definitions of terms, and a description of the problem statement that this study attempts to solve. In Chapter 2, prior research that is pertinent to the topics of this study is reviewed.

CHAPTER 2

LITERATURE REVIEW

2.1   Introduction

This chapter provides an overview of the mobile application for online teaching and summarizes the literature on online learning of clinical nursing skills, the effectiveness of online learning in specific to self-directed learning, skill performance, online academic emotions, and students' attitudes to online learning. At the end of the chapter, the researchers presented the theoretical framework used in the current study. The study's conceptual framework was synthesized based on the described literature review.

2.2   Literature Search Strategies

The following databases were utilized for the comprehensive literature review search: Google Scholar, PubMed, Embase, CINAHL, Scopus, Sci-Hub, Web of Science, and CNKI. The search was specifically limited to studies that extensively discussed updated methodologies and strategies for online teaching and were published between the inception period and the year 2024.

A wide range of associated search terms were utilized independently or in combination, including but not limited to nursing education, online learning, practical nursing, nursing students, surgical nursing, nursing apprenticeship, blended learning, mobile application education, nursing skills, practical nursing techniques, learning attitudes, self-directed learning abilities, and online academic emotions and theoretical frameworks.

The literature review encompassed a total of 59 relevant studies. These studies were published between 2007 and 2024, encompassing a comprehensive temporal scope. This breadth is further underscored by the geographic diversity of the included studies. 44 of these studies were conducted in Asia: in China (n = 31), in Pakistan (n = 1), in Turkey (n = 4), in Israel (n = 1), in South Korea (n = 5), in Iran (n = 1), in Indonesia(n = 1). Three studies were conducted in Africa: in Libya (n = 1), in Ethiopia(n = 1), and in Morocco (n = 1). Four studies were conducted in Europe: in Norway (n = 1), Sweden (n = 1), United Kingdom (n = 1), Croatia (n = 1). Seven studies were conducted in North America: in the USA (n = 6) and in Canada (n = 1). Finally, one study was conducted in South America: in Brazil (n = 1). The 31 Chinese literature reviews significantly guided the development of the module by providing insights into current best practices, gaps, and innovations in online and blended learning for clinical nursing skills education. The studies highlighted deficiencies in nursing students' clinical practice competence, such as weaknesses in critical thinking, handling emergencies, and integrating knowledge into holistic practice. Addressing these gaps, the module emphasizes real-world scenarios to enhance practical problem-solving skills. Research supporting the effectiveness of blended learning models, which combine online and traditional teaching methods, informed the inclusion of self-directed tasks, interactive content, and face-to-face debriefing to enhance flexibility and engagement. Additionally, findings on the use of mobile apps and virtual simulations demonstrated their value in improving knowledge retention and practical skills.

The module incorporates app-based tools to ensure learners can access content flexibly and repeatedly. Evidence from virtual and game-based simulation studies further underscored the importance of realistic clinical scenarios, prompting the integration of these methodologies for skill reinforcement through practice and

feedback. Accessibility was another critical factor, with studies emphasizing the need for seamless and inclusive platforms. The module addresses this by integrating the Learning Pass app, which allows easy access to learning materials, assignments, and performance analytics. By synthesizing these elements, the module bridges identified gaps, leverages technological advancements, and aligns with evidence-based practices to improve nursing students' clinical competencies effectively.

2.3   Current Status of Nursing Students' Clinical Practice Skills

Many scholars have researched and analyzed the current status of the clinical practice ability of nursing students and found that there are still many deficiencies in the current clinical practice ability of nursing students. Da et al. (2019) used a mixed research method to analyze the job competence of 3,247 undergraduate nursing graduates in China. They found that the graduates rated themselves the lowest in their own clinical care abilities and were weak in dealing with complex events such as emergencies, as well as in using clinical or critical thinking to solve practical problems for patients. Amsalu et al. (2020) conducted a cross-sectional survey of the clinical practice competence of 105 nursing students at Mettu University, and the study found that the overall clinical practice competence of nursing students was significantly deficient, particularly in their ability to integrate knowledge for holistic nursing practice. The authors recommended that nursing colleges and teaching hospitals should strengthen their collaboration to improve nursing students' clinical practice competence. Lachmann and Nilsson (2021) conducted a cross-sectional survey of 151 nursing students at a university in Sweden. They used the Nurse Professional Competence Scale - Short Form and the Assessment of Clinical Education instrument to assess the professional competence of recent graduates. The study found that the nursing students

scored high in clinical nursing skills but had competence deficits in coping with clinical complexities and challenges in various healthcare scenarios. Li et al. (2022) conducted a study analyzing the humanistic caring ability, critical thinking, and clinical communication skills of nursing interns. The results revealed that the interns displayed low humanistic caring ability and had a generally average level of clinical communication skills. While their critical thinking ability was positive, there is room for improvement in their overall level of critical thinking.

2.4   The Evolution of Teaching Clinical Nursing Skills

2.4.1   Traditional Face-to-face Teaching Model

Clinical nursing education is a nursing education method in which nursing students are given multiple opportunities for practice, clinical scenario repetition, and the ability to immediately engage in decision-making reflection in clinics, hospitals, and simulation laboratories (Chen et al., 2021). The traditional way of teaching in the Clinical Education Centre involved the demonstration of skills in a class lecture to a group of students (25 to 40), followed by practice under the supervision of department-approved supervisors. For these high-strength classes, managing the timetable and availability of trained teaching staff required lots of effort and numerous challenges. Some issues are associated with procedural consistency for a large number of staff members (McKenny, 2011). Traditional teaching has long been the dominant teaching model in nursing education, and it is a teacher-centered approach (Du et al., 2022).

In traditional education, students rely too heavily on teachers to develop the habit of actively acquiring knowledge, lecturers deliver knowledge to students face-to-face, and students accept it passively without actively learning (Li et al., 2019; Paul & Jefferson, 2019).

2.4.2 Online Teaching Mode

Education settings and encouraged as best approaches in learning clinical nursing skills. The current potential benefits of advanced communication technologies in nursing education have not been demonstrated, and the effectiveness of E-learning for teaching clinical nursing skills needs to be clearly pointed out. There are various modes of online teaching, such as online teaching using websites alone, online teaching based on mobile apps, blended teaching combining online teaching on websites and traditional teaching, and blended teaching mode combining online teaching on mobile apps and traditional teaching.

2.4.2(a) Pure Online Teaching Mode

Online education, e-learning, or distance education, is a web-based learning behavior. In psychiatric mental health nursing education, Graber, (2018) presented the PowerPoint on Blackboard, an online learning platform. Cases are discussed asynchronously using Blackboard's discussion boards. A web-based teaching methodology was used in the teaching of paediatric nursing clinical decision-making process, this website was created by the Dokuz Eylul University Distance Education Centre, where lectures and videos of the instructor, as well as content from other websites, were directed to students. Additionally, instructors can interact with students in real-time by providing lectures, questions, and presentations through a virtual classroom application. The results of the research found that this type of web-based instruction increased students' confidence levels and reduced nursing anxiety (Bektas & Yardimci, 2018). Liu et al. (2020) used self-directed e-learning in teaching Paediatric Nursing, where students in the pain management program watched a 20-minute video that was uploaded to the e-campus server and could be accessed via a computer at any

time, but this online teaching method did not significantly improve students' knowledge, skills, and satisfaction levels compared to face-to-face teaching in the classroom.

2.4.2(b)   Online and Offline Blended Teaching Model

Although the above studies have focused on the use of online teaching in nursing practice education, they have mainly investigated online courses or programs as an alternative to, rather than a complement to, traditional teaching methods. As a result, some studies have begun to focus on the role of e-learning as an adjunct to face-to-face classroom teaching in improving nursing students' nursing practice skills. This is also known as online and offline blended teaching model. Sheikhaboumasoudi et al. (2018) used a blended approach in teaching the Fundamentals of Nursing course, where students received traditional training in clinical skills and then received a Uniform Resource Locator (URL) address to access the designed educational website with text files, pictures, and video clips of nursing procedures, students downloaded text files and video clips and used them when they were unable to access the network. After the intervention, it was found that this blended approach combining e-learning with traditional learning significantly improved students' skills performance compared to traditional teaching alone. Chuang et al. (2018) taught urinary catheterization using a blended approach, whereby students first received a typical nursing skills lab demonstration and then downloaded the demonstration skill video to their smartphone to watch at any time and in any location. After the intervention, it was found that the blended approach significantly improved students' knowledge and skill scores when compared to regular laboratory instruction alone.

Moon and Hyun (2019) implemented a standardized blended learning program for cardiopulmonary resuscitation (CPR), which included three online video lessons and

one offline face-to-face debriefing lecture. The outcome effectively improved the knowledge and attitudes of nursing students, enabling them to respond quickly and effectively in unexpected situations such as cardiac arrest. Gouifrane et al. (2020) utilized a blended learning approach in the teaching of the blood transfusion course, where students received traditional instruction and then used the online learning resources placed on "CANVAS" at any time and place. The resultant outcomes effectively improved students' skills performance.

In a study by Chang et al. (2021), a blended teaching approach was used for a medication administration and nasotracheal suctioning course. The approach involved traditional instruction followed by virtual simulation-based mobile app-based learning, and it resulted in significant improvements in students' knowledge scores, skill scores, and satisfaction. Similarly, Huang et al. (2021) used a blended teaching approach, combining traditional instruction with Google Classroom teaching on the e-campus, to teach the clinical pathology course. This approach led to improved knowledge and satisfaction among the students. Furthermore, Tang et al. (2023) used a blended teaching approach for teaching venous blood specimen collection, where students first received traditional instruction and then used a game-based mobile app as a simulation exercise for the next seven days, which effectively improved their skill scores.

In the online and offline blended teaching model, students participate in a variety of online learning activities, including watching pre-recorded lectures, completing assignments, participating in online discussions, and attending some in-person classes or activities. This combination allows for flexibility and personalized learning experiences, catering to a variety of learning styles and requirements. It combines the advantages of online learning, such as accessibility and convenience, with those of in-

person interaction and hands-on learning (Niu et al., 2023). A study by Ulhaq et al. (2023) concluded that online clinical skills laboratory learning may not be sufficient for medical students to acquire critical skills. The study also found that blended instruction was more valuable than online instruction in teaching clinical skills to undergraduate medical students. Blended learning in the field of nursing clinical practice mainly focuses on basic nursing and acute and critical care nursing. There has been less research in the field of nursing apprenticeship. The teaching course in this study was a surgical nursing apprenticeship course, which is a clinical nursing skills teaching course. It used a blended teaching method that combined traditional and online teaching.

2.4.3 The Impact of the COVID-19 on Online Teaching

The 2019 coronavirus disease (COVID-19) pandemic impacted education systems around the world and brought about profound organizational changes in traditional teaching methods. Schools around the world were closed to prevent the virus from spreading, which had a significant impact on students worldwide. Many countries' medical, dental, and nursing students took online courses and exams. All conferences and lectures were moved to online mode, and clinical placements were canceled, which have greatly contributed to the process of information technology teaching and learning (Abbasi et al., 2020; Alsoufi et al., 2020; Camargo et al., 2020; Rose, 2020). Many educational institutions have started to experiment with online or blended learning, which has stimulated researchers' interest in blended teaching strategies (Berga et al., 2021; Gouifrane et al., 2020; Gronlien et al., 2021; Huang et al., 2021).

2.4.4 Conclusion of Teaching Evolution in Clinical Nursing Skill

Clinical nursing skills education refers to a nursing education method in which nursing students obtain multiple internship opportunities, repeat clinical scenarios, and

can immediately participate in hospitals, clinics, and simulation laboratories to reflect on decision-making. Translating classroom fundamentals into practical nursing is an important aspect of nursing education. The primary goal of clinical nursing skills education is to improve the comprehensive ability of nursing students in skills application, knowledge understanding, and humanistic care so as to provide high-quality and safe nursing care for patients (O'Connor & Andrews, 2018).

In conclusion, the evolution of teaching clinical nursing skills has undergone significant changes over the years, focusing on online teaching and blended learning, reflecting advancements in medical knowledge, technology, and educational practices. Continued advancements in technology and methodologies will likely shape the future of nursing education even further.

2.5   The Use of Mobile Technology for Teaching Clinical Nursing Skills

The integration of mobile technology into nursing education has gained significant attention in recent years, offering innovative approaches to teaching clinical nursing skills. Various studies have explored the efficacy of mobile-based learning tools, revealing promising outcomes in enhancing student engagement, satisfaction, and competency. Methods such as downloading learning videos, blended learning approaches, virtual simulations, and game-based applications have been employed to facilitate nursing education. (Table 2.1) revealed the intervention study that use of mobile technology applications in nursing education. Two studies combined virtual simulations with mobile app-based learning, two studies combined game design with mobile app-based learning, three studies required learning videos to be downloaded to mobile phones for watching and learning, one study used Massive Open Online Courses (MOOC) app-based blended learning, one study used Google Plus as the mobile