A web-based clinical pedagogy program to enhance registered nurse preceptors' teaching competencies – An innovative process of development and pilot program evaluation

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ABSTRACT

Background: Registered Nurse Preceptors guide students to integrate theory into practice, assess clinical competencies, and enhance problem-solving skills. Researches have indicated that the teaching competencies of nurse preceptors can be transferred to students' clinical learning.
Objectives: The aims of the study are to develop a web-based clinical pedagogy (WCP) program for Registered Nurse Preceptors and conduct pilot program evaluation.
Design: A three-step process was applied to integrate the theoretical framework, evidence from the systematic review, and content validity by the experts and pilot test with the Registered Nurse Preceptors in the content and technical development of the program. The WCP program has unique features including use of dashboard, interactive videos, consultation with experts, discussion forum and backend data analysis.
Results: A committee of six content experts evaluated the comprehensiveness, appropriateness, and relevancy of the program. The item-Content Validity Index (CVI) score ranged from 0.83 to 1.00 and the scale-CVI score was 0.87, which indicated that the WCP program had a strong content validity. Ten nurse preceptors were invited to use the WCP program. Preceptors shared that the website was easy to use and navigate. They commented that the videos in each module are beneficial for nurses to understand the real situation in the clinical setting. This feature also makes the website more interactive. Feedback from preceptors was subsequently used to further refine the program.
Discussion and conclusion: The WCP program is an evidence-based program that provides a comprehensive coverage on clinical teaching pedagogy and assessment strategies. The unique web-based technology and interactive features provide a platform for nurse preceptors to discuss clinical encounters with peers and consult experts. The flexible and resource-rich nature of web-based learning encourages nurses to use it for continuing education.

1. Introduction

In clinical contexts, nursing students are able to learn in complex care settings, receive appropriate guidance, and foster the development of clinical competence and professionalism (AACN, 2008). Registered Nurse Preceptors take on the dual role of being a practitioner and an educator. Preceptorship is defined as a professional relationship between a student and a clinician in which they work together in clinical to achieve the student's learning objectives (Yonge, 2007). Nursing leaders and academics have often articulated concerns about preceptors' competence in clinical teaching and assessments (Wu et al., 2017). Preceptors' levels of competence will impact students' learning experiences and clinical competence.

Continuing education for healthcare professionals is an important

guideline across the world. In Singapore, the Ministry of Health encourages strategies that are innovative and promote the professional development of healthcare professionals who feel more motivated and dignified to care for the health of the population (Healthcare professionals-Nurses, n.d.). The preceptorship course provided by the hospital in Singapore is a face-to-face workshop. A previous study indicated that Registered Nurse Preceptors might not have time to attend the course due to busy work schedules (Wu et al., 2016). Faculty's involvement, appropriate course materials, and preceptors' training are identified as the essential elements to the preparation of preceptors (Bourbonnais and Kerr, 2007). There is definitely a need to look into how we can best provide professional development for Registered Nurse Preceptors that allows for flexibility in learning and improves responsiveness to their learning needs. It is paramount that continuing education courses increase the flexibility and responsiveness of the nursing workforce and offer alternative means for nurses to take up such courses.

1.1. Literature review

1.1.1. Nursing students' learning in clinical education

Clinical competence is defined as the integration of nursing knowledge, psychomotor skills, and problem-solving abilities to offer safe care for patients (Hickey, 2010). Clinical competence develops over time as nurses progress from a novice level to a proficient level (Benner, 1982). Achieving clinical competency is a key element in nursing education focusing on professional standards and patient safety (Kim, 2007).

Nursing students encounter several challenges in dynamic clinical environments and experience significant levels of anxiety during clinical assessments (Wu et al., 2015). Previous studies have demonstrated remarkable concerns among nursing students, e.g. variations in assessment standards, preceptors' competence in providing feedback, variations in clinical guidance and support by preceptors, and high expectations of students' clinical competence by Registered Nurse Preceptors (Wu et al., 2016; Wu et al., 2015). Students generally appreciate clinical guidance and seek responsibility and trust from preceptors. However, these students may experience frustration, anxiety, fear, and powerlessness periodically in dynamic clinical environments (Nabolsi et al., 2012). These unfortunate circumstantial experiences may affect students' learning outcomes in clinical education.

1.1.2. Nurse preceptors' learning and professional development

Registered Nurse Preceptors are appointed by clinical nurse leaders (CNLs), and the selection is based on clinical experience, job performance, and willingness to teach. The role and responsibility of nurse preceptors are clearly defined as guiding students to integrate theory into practice, assessing clinical competencies, and enhancing problem solving skills (Cant et al., 2013). Professional competence, interpersonal relationship skills, personality characteristics, and teaching abilities are highlighted as effective clinical teaching behaviors (Tang et al., 2005). Interactions with preceptors are positively correlated with increased competence in organization, collaboration, delegation, initiating nursing care, and communication for students (Kim, 2007).

Many preceptors experience challenges in managing the dual role of being a registered nurse and a preceptor (Jonsén et al., 2013). While struggling to fulfil all their obligations, most preceptors place a higher priority on patient safety and care due to higher patient acuity and a lower priority on the precepting role (Jones, 2005). CNLs and nurse academics have clearly acknowledged the key role of preceptors in clinical assessments (Wu et al., 2017). However, research has found that there may not be adequate preparation for nurses preceptors to take up the essential role to train and educate nursing students (Mitchell et al., 2018). Preceptors may not be prepared with formal pedagogical education (Wu et al., 2016), resulting in inadequate teaching knowledge and experiences. Consequently, they may experience role ambiguity and unfamiliarity with clinical teaching and

assessments (Benner et al., 2009). Thus, the impetus for the educational program and the web-based platform came from previous studies by Wu et al. (2018; 2016; 2017; 2015).

Most of the organizations always prepare nurse preceptors either using the traditional face-to-face classes and/or e-learning online modules (Kennedy, 2019). With a preceptor training program, nurses are able to equip themselves with adequate knowledge of educational strategies to help them teach the preceptees effectively (Kennedy, 2019). In addition, the preceptor program also helps nurses to build a clear understanding of their roles as preceptors, which will lead to positive outcomes including reduced attrition rate, higher job satisfaction, and better performance (Painter, 2017).

1.1.3. Web-based professional development for nurse preceptors

Web-based programs have been used widely in preceptorship education. A web-based program utilises digital platforms for learning, which is recognised as an effective learning approach for nursing professional development (Lu et al., 2009). Myrick et al. (2011) built an online learning community to engage preceptors socially in a virtual workspace and to provide a platform for interaction. Foronda et al. (2015) facilitated learning for preceptors by applying an innovative pedagogy using avatars in a three-dimensional virtual clinical setting. Other studies used a virtual world as a medium to illustrate specific examples on student evaluation and a dynamic table on key concepts, observe the critical aspects of the behaviors performed by the model in the video clips, online storytelling on leadership experiences, and podcast scripts to present the unsafe practices and the caring approach by the preceptors when dealing with the unsafe situations (Blum et al., 2012; Parker et al., 2012; Parsons, 2006; Stutsky and Spence Laschinger, 2014; Wilkinson et al., 2015; Zahner et al., 2009). Overall, the findings of these studies revealed that web-based programs are informative, supportive, and highly valued. Qualitative findings revealed a precursor of anxiety and frustration with technical difficulties, followed by appreciation and learning. The findings of the aforementioned online programs will be considered and built-in when the WCP program is developed by the team. The usability and validity of the WCP program will be addressed.

Web-based learning has been widely utilised for nursing professional development in clinical settings (Chen et al., 2008). Nurses are willing to apply web-based continuing education due to flexibility, self-regulated nature, and minimal impact on family lives (Yu et al., 2007). Learners' internet attitudes, which are the dispositions towards or the perceptions of using the internet, may influence willingness and interest in learning (Peng et al., 2006). A previous study found that learners tend to participate in web-based learning more willingly with positive internet attitudes (Liang et al., 2011). Nevertheless, nurses' attitudes are regarded as one of the most important factors, which may promote web-based learning for professional development and continuing education.

2. Methods

The aims of the study are to develop a web-based clinical pedagogy (WCP) program for Registered Nurse Preceptors and conduct pilot program evaluation. To facilitate the content and technical development of the program, a three-step process was applied to integrate the theoretical framework, evidence from systematic review, and the content validity test by the experts and pilot test with the nurse preceptors. The pilot evaluation of WCP program was conducted through content validity and pilot test. Ethical approval for the study was obtained from the National Health Group Domain Specific Review Board.

2.1. Step 1: conceptual framework for the design of the WCP program

The WCP program draws on the conceptual framework of Bandura's self-efficacy theory (Bandura, 1977). Self-efficacy is defined as a future-

oriented belief that an individual possesses the requisite skills to reach a successful outcome. The theory suggests that individual behaviors are determined through continuous interactions between cognitive, behavioral, and environmental factors (Goldenberg et al., 2005). Bandura (1977) explained self-confidence as the belief of an individual about his/her ability to perform the activity. Professional confidence refers to a professional's dynamic and maturing personal belief. This includes an understanding of the role and scope of practice for the profession and the capacity to fulfil the expectations competently, fostered through a process of affirming experiences. Based on Bandura's theory (Bandura, 1977), self-efficacy is achievable through the mastery of experience, vicarious experience through mentors, social persuasions, and physiological factors. With increased self-efficacy and self-confidence in clinical teaching and assessments of preceptors, students will benefit and enhance their clinical competencies.

2.2. Step 2: evidence from our systematic review and program development

The research team conducted a systematic review to obtain evidence to develop the WCP program. The systematic review aimed to review and synthesise online learning programs for preceptors (Wu et al., 2018). Six electronic databases (CINAHL, Medline OVID, PubMed, Science Direct, Scopus, and Web of Science) were searched from January 2000 to June 2016. The search terms used in the search process included: 'online learning program', 'e-learning', 'online learning', 'train*', 'educate*', 'develop*', 'prepare*', 'support*', 'nurse preceptor', 'nurse mentor', 'nurse educator', and 'nurse leader' (Wu et al., 2018). In the end, 20 studies were selected from 56 retrieved full-text articles after filtration (Wu et al., 2018). Our systematic review found that online learning offers accessibility, convenience, and flexibility, which provides an alternative for preceptors who face challenges of workload and time (Wu et al., 2018). Therefore, it is paramount that continuing education courses are integrated with technology to increase the flexibility and responsiveness of the nursing workforce.

The contents of the program were analysed with the selected (Blum et al., 2012; Bradley et al., 2007; Foronda et al., 2015; Myrick et al., 2011; Parker et al., 2012; Parsons, 2006; Stutsky and Spence Laschinger, 2014; Wilkinson et al., 2015; Zahner et al., 2009). Roles and responsibilities of a preceptor covered contents on what a preceptor is, and policies and procedures. The adult learning theory included precepting adult learners, learning styles, and teaching styles. Clinical teaching composed of coaching, facilitating student learning, facilitating students' critical thinking skills, clinical teaching and learning strategies, learning cultural competence, intergenerational workplace settings, and guiding students through assessment, communication, and crisis management. Clinical assessments emphasised student evaluation. Feedback skills covered giving and receiving feedback, timing and relevancy of giving feedback, and effective feedback. Handling challenging situations encompassed precepting unsafe students or practices, attitude problems, poor communication skills, inabilities to demonstrate knowledge and skills, and unprofessional behaviors. Caring attributes of preceptors included having a welcoming presence, demonstrating empathy, encouraging growth, patience, building relationships, and communicating therapeutically. The recommendations in the systematic review have guided the content development of the WCP program.

2.3. Step 3: content validity and pilot test

A committee of six content experts consisting of three nursing academics from different higher learning institutions, a clinical nurse educator, a hospital nurse administrator, and a Singapore Nursing Board (SNB) representative was formed. Clinical nursing experts evaluated the clinical relevance of the program, and academics contributed in the pedagogy and assessment sections. Furthermore, the SNB

representative shared the perspective of Ministry of Health on the professional development of nurses. The preliminary program was sent to content experts for individual evaluations. Content validity was evaluated in three aspects, including comprehensiveness, appropriateness, and relevancy. The content experts reviewed the program and completed the Content Validity assessment form by rating each item from 1 (not comprehensive, appropriate, relevant) to 4 (very comprehensive, appropriate, relevant). The experts indicated comments if the rating was 1 or 2 for any item.

Formative evaluation took the form of multi-modal usability testing (Krug, 2010; Nielsen, 1994), which sought to elicit feedback on the applicability, content, ease-of-use, acceptance, and time to completion of the modules. For the pilot test, ten nurse preceptors were invited to use the WCP program and provide feedback.

3. Results

3.1. Content development of the WCP program

The research team consists of five nursing academics and two clinical educators from the hospitals. The team had many rounds of deliberation on the contents of the WCP program and developed the contents based on the systematic review, national guidelines on clinical nursing education, and relevant literatures. The WCP program consists of eight modules: 1) introduction of preceptorship, 2) planning care with preceptee, 3) conducting clinical assessment, 4) facilitating clinical learning, 5) creating positive clinical learning environment, 6) providing constructive feedback, 7) handling challenging situations, and 8) managing underperforming preceptee. A brief summary of each module is provided in Table 1.

One distinctive feature of the WCP program is that the preceptors can learn through real scenarios. Scenarios used in the program are pre-recorded as videos that capture the interaction among the preceptor, the student, and the patient. Interestingly, while situations evolve, participants need to make certain decisions on clinical teaching and assessment. Such a feature offers a simulated situation, and the participants feel a real sense that they are actually in the clinical situations and guiding the students. The WCP program consists of seven scenarios (Table 2). Once the participant logs in to the WCP program, he/she is able to access the eight modules listed on the main page. As a learning process, the participant first watches the scenarios in the video, which engages the participant in the process of decision-making. Secondly, the participant proceeds with learning theories and concepts in clinical education. With the simulated experiences, nurse preceptors can understand and transfer these learning theories and concepts into daily practices. Thirdly, the participant is required to complete a quiz for self-evaluation after each module. Quizzes is utilised to reinforce the key points in the modules. In addition, continuous support is provided for the preceptors on clinical teaching and assessment skills through the 'Discussion Forum' and the 'Expert Consultation' sections in the WCP program. (Insert Table 2 here).

3.2. Technical development of the WCP program

The technology team worked closely with the researchers to streamline and enhance the key features, i.e. flexibility and ease of use. A general model for planning and implementing a comprehensive evaluation, as recommended by Cook and Ellaway (2015), was adopted to evaluate the WCP program. The WCP program is a web-based program that involves the use of smart devices (laptop, tablet, or smartphone) to facilitate self and peer-learning of preceptors. It is built using modern web technologies (React.js, Node.js, and MongoDB) with a dashboard-like interface. Dashboard interfaces are extremely easy to interact with, even for users with minimal web experiences. Additionally, every new user is on-boarded using an interactive step-by-step website walkthrough to reduce user-interface complexities (Fig. 1).

Table 1
Modules of the WCP program.

Module name	Theories/principles/protocols	Module description
Introduction of preceptorship	Learning theory Learning style	This module explains the roles and responsibilities of a preceptor. Understanding learning theories and principles provides fundamental knowledge for nurse preceptors.
Planning care with preceptee	Patient care planning Learning contract for goal-setting	This module elaborates the importance of planning care for patients with preceptee. In addition, the module explains how a learning plan assists a nurse preceptor and a preceptee in setting goals and creating a realistic plan at the beginning of the clinical attachment.
Conducting clinical assessment	Clinical assessment strategy Clinical evaluation	This module provides practical guidance for nurse preceptors when conducting clinical assessment and evaluation. Nurse preceptors are able to have a better understanding of the factors should be taken into considerations in clinical assessment and evaluation and learn hands-on skills and strategies in clinical assessment.
Facilitate clinical learning	Effective clinical teaching and learning Adult learning theory One-minute learner tool	This module provides useful information on facilitate learning in clinical settings. Nurse preceptors learn how to facilitate learning in a more effective way. The one-minute learner tool can be used as a guide for teaching preparation during busy shifts.
Creating positive clinical learning environment	Positive learning environment	This module highlights the benefits of creating positive learning environment. In addition, the module guides nurse preceptors on how to create positive learning environment for their preceptee.
Providing constructive feedback	Constructive feedback Techniques in feedback	In this module, nurses are able to learn the methods of providing constructive feedback to preceptee in various circumstances. Additionally, practical guidance is offered on the techniques of providing constructive feedback.
Handling challenging situations	Reporting for incident Emotional support	This module offers strategies on how to handle challenging situation, e.g. incident. The module provides useful information on how to react to such incident and offer emotional support to preceptee who may be undergoing emotional stress in the incident.
Managing underperforming preceptee	Learning contract Healthcare institution's protocol for the escalation of an underperforming preceptee	This module provides knowledge on how to create a learning contract when there are concerns regarding preceptee's performance. Nurse preceptors learn practical skills to guide preceptees when they are underperforming. Additionally, nurse preceptors learn the pathways for support and escalation in handling such situation.

Table. 2
Description of the scenarios.

Scenario name	Characters involved	Story timeline	Description
Planning of shift	RN Yuchen SN Jun Mr. David Mr. Raj	Second week of clinical attachment Mr. David: POD 2 of wound debridement Mr. Raj: Newly admitted to the hospital	It is the second week of SN Jun's clinical attachment. He is familiar with the patients' conditions. How does RN Yuchen plan the care of the patients with SN Jun at the beginning of the shift?
Readiness for clinical assessment	RN Yuchen SN Wei Wei Mr. David	Mr. David: POD 3 of wound debridement Mr. Raj: Going for laparoscopic cholecystectomy today	SN Wei Wei has an opportunity to perform wound dressing and pre-operational preparation for Mr. David. She needs to complete her clinical assessment as well. However, she does not feel confident to perform the skills due to lack of experience. How will RN Yuchen plan for the clinical assessment? Mr. David complains of severe pain when SN Wei Wei is trying to change the wound dressing for him. How will RN Yuchen make the decision, to let SN Wei Wei continue with the changing of dressing or otherwise?
Guiding the student for administration of medication	RN Yuchen SN Jun Mr. Raj	Mr. David: POD 5 of wound debridement Mr. Raj: POD 2 of laparoscopic cholecystectomy	RN Yuchen notices that SN Jun does not have sufficient knowledge regarding the administration of medication. What could RN Yuchen do to help him?
Precious learning opportunity	RN Yuchen SN Wei Wei Mr. David Mr. Raj	Mr. David: POD 7 of wound debridement, going home today Mr. Raj: POD 5 of laparoscopic cholecystectomy	RN Yuchen and SN Wei Wei are about to perform the discharging procedure for Mr. David. SN Wei Wei is looking forward to learn the discharge procedure. However, Mr. Raj is calling for help. How will RN Yuchen delegate the work?
Art of feedback	RN Yuchen SN Wei Wei Mr. David	Mr. David: POD 7 of wound debridement, going home today Mr. Raj: POD 5 of laparoscopic cholecystectomy	RN Yuchen notices that SN Wei Wei is performing the procedure wrongly in front of the patient. How will she react? How will RN Yuchen provide feedback to SN Wei Wei regarding her performance?
Medication error	RN Yuchen SN Jun Mr. Raj	Mr. David: Discharge to home. Mr. Raj: POD 5 of laparoscopic cholecystectomy	SN Jun reports to RN Yuchen that he caused a medication error. How will RN Yuchen manage the incident? What could RN Yuchen do when she discovers SN Jun is in emotional distress after the incident?
Unexpected result of clinical learning	RN Yuchen SN Wei Wei	Final week of hospital attachment Mr. David: Discharged to home Mr. Raj: Discharged to home	SN Wei Wei gets to know her poor performance upon receiving the final evaluation of her clinical attachment. She feels very upset and angry. How will RN Yuchen handle the situation?

POD - post-operative day; RN - registered nurse (preceptor); SN - student nurse (preceptee); Mr. David - patient, admitted for diabetic foot, underwent wound debridement, going home with wound dressing; Mr. Raj - patient, admitted for abdominal pain, went for ultrasound, going for cholecystectomy.
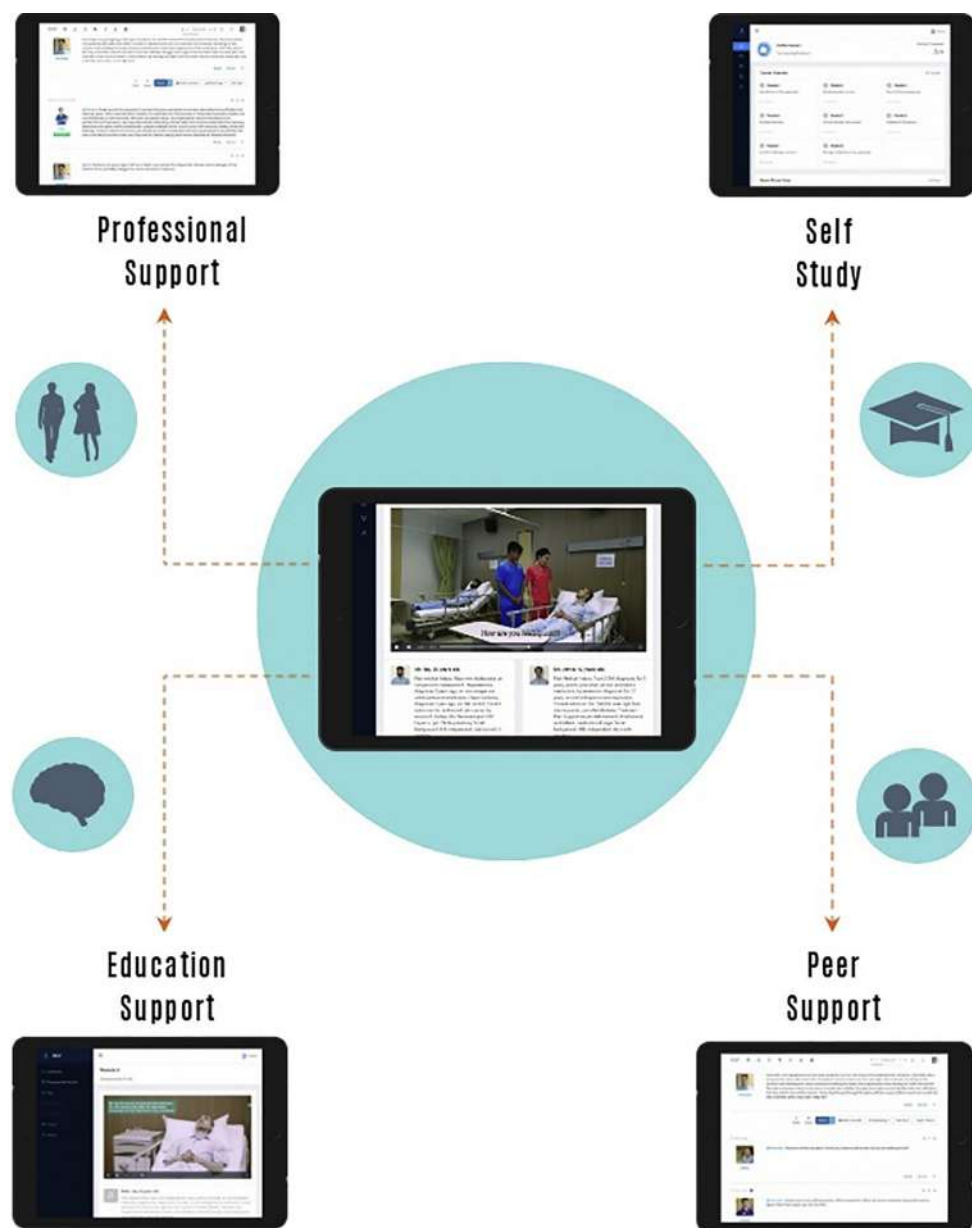
Fig. 1. User story box of WCP Program.

The participant is able to view the patients' clinical histories, vital signs, and radiological examination results on the WCP program. Subsequently, they can use a device to observe interactions between the preceptor, the nursing student, and the patient in the videos. This interface also allows the nurse preceptor to assess students' clinical competence and provide feedback.

The WCP program provides flexibility in learning by dividing the entire course into smaller modules, which can easily fit into preceptors' tight work schedules. Although flexible, the modules are designed to be completed in a sequential manner. The website ensures that all modules are completed in a pre-defined order and that no module is skipped. The completion time for each module for every preceptor is recorded in the web-program for the research study. After the completion of each module, the preceptor has to take a quiz before moving on to the next module (Fig. 2). Upon the successful completion of the entire course, the participant is awarded with an e-certificate of course completion, which can be downloaded and kept as part of professional portfolio.

The WCP program allows multiple ways of knowledge sharing and active discussions through an online discussion forum. Forums create discussion environments on certain topics visible to others at any time. Hence, the discussion forum in the WCP program allows preceptors to share their clinical teaching experiences and support each other along their learning journeys. Apart from peer-to-peer discussions, a panel of clinical education experts is available online to provide guidance and feedback. At the back-end, the WCP program is able to generate the demographic data of the participants and conduct certain levels of data analysis (Fig. 3).

3.3. Content validity test

The Content Validity assessment forms completed by content experts were consolidated for the calculation of the content validity index (CVI). As recommended by literature (Gilbert and Prion, 2016; Polit et al., 2007), only when both item-CVI and scale-CVI are above 0.80, the content of the program is considered valid. There are 8 modules within WCP program. Each module has its specific learning points developed based on educational theories and concepts, systematic review, and knowledge contributed by the research team. In total, there are 21
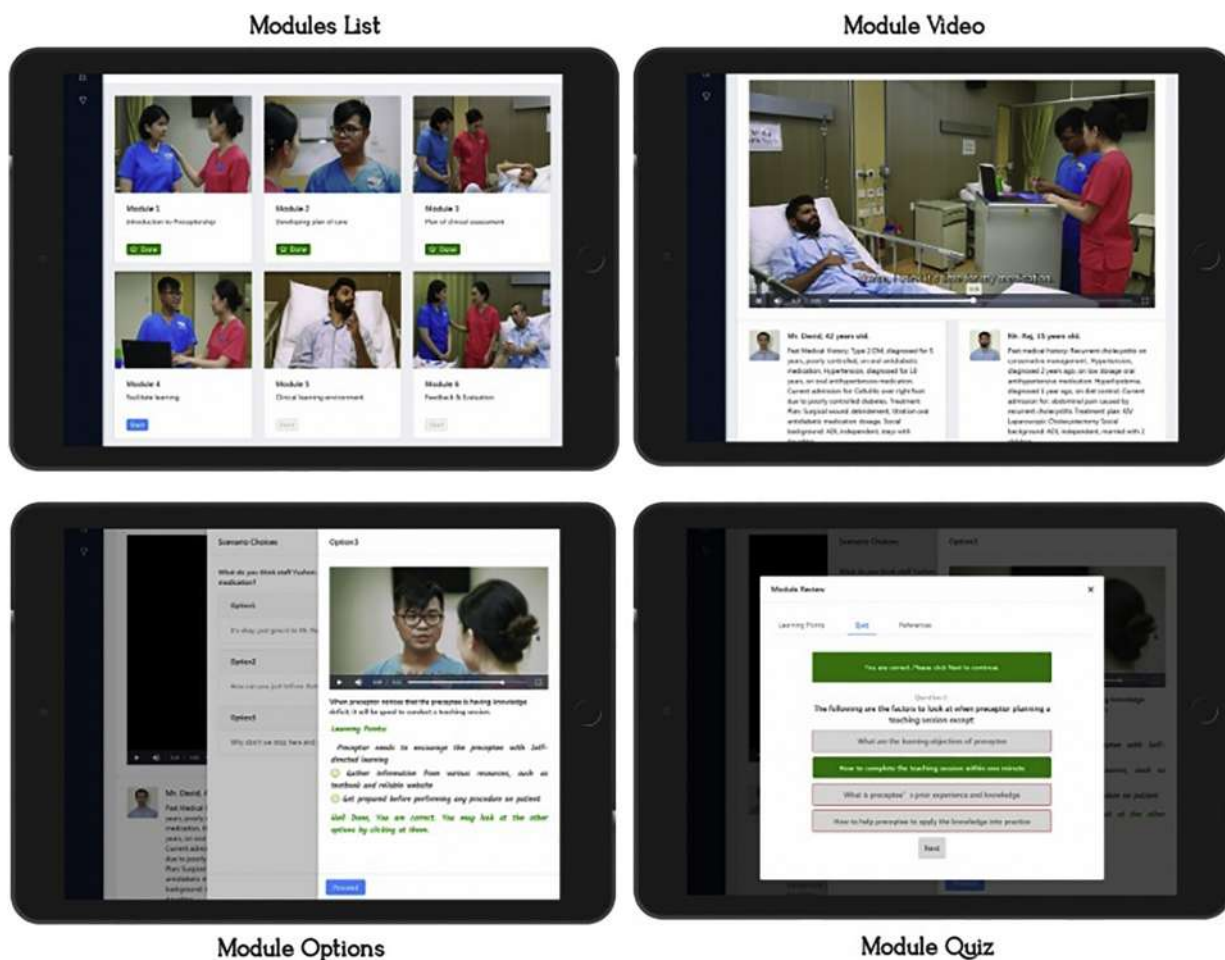
Fig. 2. Modules of WCP Program.

learning points. Every learning point was assessed and scored as one item based on its relevancy, appropriateness and comprehensiveness. The learning points are the summary of the contents of modules. The content validity test has been conducted to assess the educational contents provided in the modules. The item-CVI score ranged from 0.83 to 1.00 and the scale-CVI score was 0.87, which indicated that the WCP program had a strong content validity.

The content experts also shared feedback related to the program. In addition, an education specialist was invited to review the pedagogical aspects of the WCP program. Subsequently, the research team discussed the revised contents to finalise the WCP program in consideration of the comments by the expert panel. The most common feedback by the content experts is that some of the learning theories explained in the program might be too abstract for nurses to understand, in consideration of their various educational background. Content experts also shared some real situations they have experienced in clinical settings. In fact, we have used those situations as references when developing case scenarios. Next, the research team revised the contents of WCP program to ensure all the educational theories and concepts in the program are relevant and succinct. Meanwhile, real case scenarios were added to assist with the understanding of educational theories or concepts. This rigorous review process enhanced the content validity of the WCP program.

3.4. Pilot test - formative and user-centred evaluation

The main purpose of the pilot study was to evaluate the website in terms of usability, navigation, website design, and quality of information. Hence, the pilot study did not evaluate outcomes related to clinical teaching competence, self-efficacy, and attitudes towards web-based learning. During pilot test, nurse preceptors were given access to the WCP program that allowed them to navigate the dashboard and review the modules of the program. The nurse preceptors were required to rate the website from the 4 aspects as highlighted above. There were additional questions on asking users' likes and dislikes of the website features, and what are improvements required.

Nurse preceptors shared that the website was easy to use and navigate. They commented that the videos in each module are beneficial for nurses to understand the real situation in the clinical setting. This feature also makes the website more interactive. Preceptors recommended replacing wordy content with graphics and pictures will attract users' attention. Feedback from nurse preceptors was subsequently used to further refine the program. The formative and user-centred evaluation generated input regarding revisions and modifications (Dick and Carey, 1990) that informed the design and development of the WCP program. Since nurse preceptors participated in the pilot test provided positive feedback towards the features including dashboard and interactive videos, no major change was made after the pilot test. Some minor changes were made based on the feedback of the nurse preceptors, including replacing wordy content with more attractive graphs and tables, and increase font size at certain parts of the website to make the content easier to read. Some minor issues highlighted by pilot test users including some experienced slow speed of the website and system errors of the quiz layout were addressed by the technical assistant.
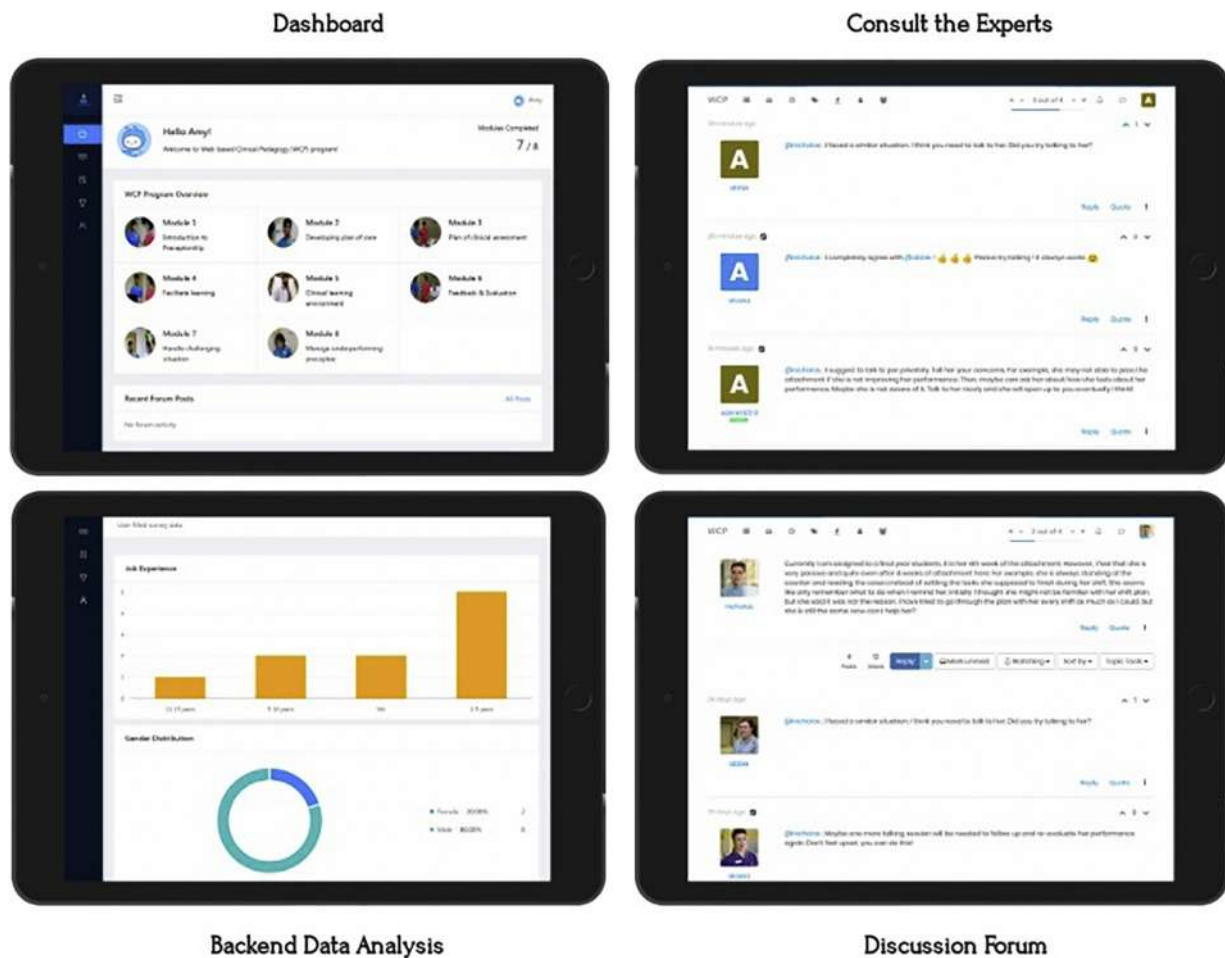
Dashboard

Consult the Experts

Backend Data Analysis

Discussion Forum

Fig. 3. Unique features of WCP Program.

4. Discussion

The three-step process which integrated the theoretical framework, evidence from systematic review, and the content validity test and pilot test, facilitated the content and technical development of the WCP program.

The conceptual framework offered an overarching idea of using web-based platform for the WCP program (Bandura, 1977). Furthermore, the systematic review supported that online learning offers accessibility, convenience, and flexibility for preceptors (Wu et al., 2018). The unique web-based technology and interactive features in WCP program provide a platform for nurse preceptors to discuss clinical encounters with their peers and to consult experts. The WCP program provides flexibility in learning that could better fit into preceptors' busy schedules.

The Manpower Minister in Singapore highlighted that fast-changing technology "will change the way we work, the way we communicate, and the way we do business" (Yong, 2015). Furthermore, there will be a plunge in employment growth in a few years due to baby boomers gradually leaving the workforce and smaller cohorts entering the workforce. Therefore, the existing workforce needs to explore other ways with fewer workers and leverage on new technology. It has been widely encouraged that the workforce needs to embrace technology to keep ahead of the curve (Yong, 2015).

The content development was guided by the systematic review of the literatures (Wu et al., 2018). Therefore, the WCP program is an evidence-based program that provides comprehensive coverage on clinical teaching pedagogy and assessment strategies. The findings of prior studies further highlight the importance of preparing preceptors

to be pedagogically ready (Wu et al., 2016; Wu et al., 2017; Wu et al., 2015). In addition, as the systematic review focused on the preceptorship programs in a wide range of clinical settings, the WCP program applied the key analytic results from the systematic review. The evidenced-based nature of the WCP program thus can be applied in wide array of the settings, such as, acute care hospitals, community hospitals, primary care settings, higher education institutions during clinical practicum.

The results of the Content Validity Assessment enhanced the quality of the contents. The content experts are experienced academics and clinicians from various fields of nursing, ranging from clinical nursing, nursing education, specialist in pedagogy and assessment, and government sector. The item-CVI and scale-CVI score indicated that the contents of the WCP program had a good level of validity. The qualitative feedback by the content experts contributed to the creation of the clinical scenarios, and ensured the educational theories and concepts in the WCP program are relevant and succinct.

The Pilot Test reassured the technical features have reasonable level of usability, easy navigation, desirable website design, and high quality of information. Some pilot test users stated that they encountered problem in viewing the answers of some quizzes due to incorrect format. Our technical assistant has changed the format of display and solved the problem. There were also comments mentioned that the speed of the website was a bit slow. Hence, the research team decided to engage a server which is able to support the website efficiently. Subsequently, the speed of the website has been improved.

Research has indicated that the teaching competency of nurse preceptors can be transferred to students' clinical learning to enhance their clinical competencies (Wu et al., 2016). Role modelling and adequate

support from preceptors can nurture students in developing essential resilience traits and enhance their confidence in problem-solving in the ever-changing clinical situations (Coşkun et al., 2014). Consequently, the introduction of a robust online preceptorship program enhances students' learning outcomes, i.e. clinical competence, by preparing and supporting preceptors, particularly in maintaining consistency in their supervision and guidance, and standard setting of students' clinical assessments.

4.1. Limitations

The limitations of this study include there is one hospital engaged for the development of WCP program. It is expected that upon the completion of the program development, the WCP program will be shared with other hospitals and tested further. In addition, the three-step process of program development is time-consuming. Thus, time lags may occur due to fast-paced technological developments. There are also limitations when conducting the pilot test of the WCP program. The outcomes related to clinical teaching competence, self-efficacy, and attitudes towards web-based learning were not evaluated. The research team intended to include the evaluation of these outcomes in the larger-scale experimental study in the subsequent phase.

4.2. Clinical implications

Nurse preceptors facilitate students' learning in clinical setting. Researches have indicated that the teaching competencies of nurse preceptors can be transferred to students' clinical learning. Traditionally, nurse preceptors attend preceptorship courses at a face-to-face workshop that is provided by the hospital. Nurse educators at the hospital conduct the workshop. With the increasing acuity of patients and manpower constraint, it is challenging for clinical institutions to release nurses for training and development. The flexible web-based learning platform offers an alternative for preceptors who are working adults and strive to maintain a balance between work and family life.

Based on the results of a systematic review by the research team (Wu et al., 2018), it has been noted that all reviewed studies were conducted in North America. Thus, a relevant research is especially valuable in the Asia-Pacific region. The team has planned to conduct an experimental research to examine the effects of the WCP program on the clinical teaching competence, self-efficacy, and attitudes towards web-based learning of the Registered Nurse Preceptors in clinical pedagogy and assessments.

5. Conclusion

This study has applied an innovative three-step design process to develop the WCP program for nurse preceptors. The WCP program adopted an evidence-based approach to develop a comprehensive learning program on clinical teaching and assessments. The WCP program provides a platform for preceptors with tight work schedules. The flexible learning platform offers an alternative besides traditional face-to-face learning. The unique features of the WCP program, e.g. peer-learning, consultation with experts, and interactive features, can have great advantages for preceptors who are working adults.

Ethical approval details

Ethical approval for the study was obtained from the National Health Group Domain Specific Review Board.

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