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Exploring nursing students' learning experiences and attitudes toward older persons in a gerontological nursing course using self-regulated online enquiry-based learning during the COVID-19 pandemic: A mixed-methods study

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\textbf{ABSTRACT}

\textbf{Background:} During the COVID-19 pandemic, universities adopted online teaching as the primary teaching and learning method. Most of the online teaching, however, has been limited to the broadcasting of asynchronous lectures and sharing of teaching materials.

\textbf{Objectives:} To explore undergraduate nursing students' self-regulated learning experiences, satisfaction, and attitudes toward older persons in a gerontological nursing course using online self-regulated enquiry-based learning (EBL) during the COVID-19 pandemic.

\textbf{Design:} A mixed-methods design was adopted.

\textbf{Setting:} A university in Hong Kong providing pre-registration nursing programmes.

\textbf{Participants:} 155 students studying in the fourth year in a five-year Bachelor of Nursing programme participated in the quantitative study in which 18 joined the focus groups (4 groups with group size of 4–5).

\textbf{Methods:} Five video-based scenarios along with two interactive online workshops, a mind-map development exercise, gamified assessments, reading materials, group discussions, and presentations were adopted in a gerontological nursing course offered in 2019–2020 to enhance the students' learning, driven by a process of enquiry. Attitudes toward older people were measured at baseline and one week after the course (post-test). Information on self-regulated learning experiences, satisfaction, and confidence were collected at post-test only.

\textbf{Results:} A significant improvement was demonstrated in the students' attitude toward older people. The students appreciated the opportunities provided by the online EBL to apply key concepts of gerontology in the teaching and learning activities and to enhance their critical thinking skills. Three major themes were revealed from the focus group: Perception of the teaching pedagogy, Improvement of cognitive skills, and Positive and negative aspects of the learning experience.

\textbf{Conclusions:} The online self-regulated EBL improved the students' online learning experience in a gerontological nursing course during the pandemic and improved their attitudes toward older people.

1. Introduction

During the COVID-19 pandemic, online teaching and learning became a mainstream learning mode in higher education due to campus shutdowns and physical distancing measures (Bozkurt et al., 2020). According to the United Nations Educational, Scientific and Cultural Organization (UNESCO), 1.5 billion students around the world engaged in online learning because of the COVID-19 pandemic (United Nations Educational, 2020). Within a short period of time, many university teachers were forced to transition from traditional face-to-face teaching to an online mode (Mishra et al., 2020), posing a challenge for some with no experience of online teaching (Dhawan, 2020).

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In traditional lectures, passive learning involving the one-way delivery of information and course content from teacher to learners usually predominates. This old-fashioned instructional method may not fit in with the online mode of teaching, where students have already been immersed in an online environment with abundant information and can access all kinds of information from multiple sources on the Internet (Kennedy et al., 2009). Previous studies also found that online learning can promote independence and autonomy (Jansen et al., 2020; Zhu et al., 2020). In fact, online teaching and learning is about much more than replicating through the Internet what teachers and students previously did in a classroom. Although online teaching platforms such as a Blackboard and Moodle are widely used, the integration of technologies that support online teaching for specific pedagogical goals is still under development (Rapanta et al., 2020). Most previous studies focused on a specific type of web-based technology for online teaching, such as interactive whiteboards or voting systems; still lacking are online teaching methods integrated with theory-driven approaches to achieve pedagogical goals (Roddé et al., 2017). Several studies on online teaching highlighted the importance ofadult learning pedagogies (Balakrishnan, 2014; Lackovic et al., 2017).

An online course of purely digitalised materials, but without a pedagogical goal, would result in poor learning motivation, and hence in a high attrition rate (Esra and Sevilen, 2021). The design of the online programme is guided by a pedagogy that can help learners master the course contents and improve their critical thinking, problem-solving, and communication skills (Andrade, 2015).

Enquiry-based learning (EBL) is a student-centred pedagogy that gives students the opportunity to analyse and apply what they have learnt to problems similar to those encountered in the real world (Ashby et al., 2006). Contrary to traditional lectures, which generally involve a teacher presenting knowledge, EBL encourages learning driven by a process of enquiry made by the students themselves. EBL usually involves the adoption of real life situations as the learning environment for students to investigate. Students first have to identify some negative connotations in the situation before proposing an action plan (Price, 2001). In EBL, students engage with a situation in which they have to identify a problem, formulate questions, engage in discussions with peers, and find appropriate resolutions to questions and issues (Stacey et al., 2018).

Meanwhile, the teacher plays a role in establishing productive learning conversations and keeping the students focused on the teaching and learning tasks, paying special attention to unequal participation and work progress (Pinhorn, 2020). Several previous studies showed that using EBL in nursing education could improve the critical thinking ability, learning motivation, deep learning skills, and communication skills (Andrade, 2015).

EBL was collected after the course through a survey, followed by focus groups. The aim in the focus groups was to explore the students’ experiences, learning satisfaction, and confidence in the self-regulated online learning environment, including the metacognitive, cognitive, behavioural, motivational, and emotional aspects of learning (Schraw et al., 2006). It is a crucial element in an online EBL environment, which relies heavily on a student’s ability to actively monitor and engage in the teaching and learning activities (Wang et al., 2013). Thus, the design of subjects for online EBL would differ from that of traditional classroom-based EBL. For example, students would need to be given clear expectations and instructions before the start of an online course and to adopt several self-regulated learning strategies.

Gerontological nursing education plays a key role in fostering the development of positive attitudes toward older adults (Hovey et al., 2017), and in this EBL can be used as a potential learning approach. Among young adults, stereotypes of ageing are common, with older people often perceived as being ‘physically frail’ and ‘dependent’ (Mosher-Ashley, 1999). Nursing students also displayed negative attitudes about working with older adults. Among all career choices, taking care of older people was the least preferred among nursing students (Happell, 2002; Stevens and Crouch, 1998). There is a need to foster more positive attitudes among nursing students toward older adults because they will then be more likely to provide care for older adults (Cheng, 2021). Given the benefits of integrating EBL into online tertiary education teaching and the need to foster more positive attitudes toward older adults among university students, our research team developed an online self-regulated EBL programme for undergraduate nursing students in Hong Kong. The aim of this study was to explore their learning experience in this programme, and evaluate its impact on their self-regulated learning experience, learning satisfaction, self-confidence in learning, and attitudes toward older people. 

2. Methods

2.1. Design

This mixed-methods study adopted a sequential explanatory design employing quantitative and qualitative approaches. A pre-/post-test design was used to investigate the students’ attitudes toward older people before and after the course, which was held in the academic year 2019–2020. Information on the students’ self-regulated learning experience, learning satisfaction, and confidence in the self-regulated online EBL was collected after the course through a survey, followed by focus groups. The aim in the focus groups was to explore the students’ experiences, and their perception of the benefits and difficulties of the self-regulated EBL, in order to describe the strengths and limitations of the course and explain the findings from the quantitative data. This manuscript followed the reporting guideline of the Journal Article Reporting Standards for Mixed Methods Research in Psychology (Levitt et al., 2018).

2.2. Participants and recruitment

For the quantitative arm, all of the nursing students (who were in their fourth year in a five-year Bachelor of Nursing programme) taking the gerontological nursing course at the School of Nursing, The Hong Kong Polytechnic University were invited to take part in the study. Gerontological nursing is regarded as a nursing speciality subject in the nursing programme, and students take it in their second-last year.

For the qualitative arm, we adapted purposive sampling to include a range of students taking the course with different levels of participation. Eighteen students with different durations of access to our online platform joined the focus group discussions (low access (<45 min per week)/moderate access (45–90 min per week)/high access (>90 min) – with 4–6 students in each group).

2.3. Intervention

Online self-regulated EBL was adopted in the gerontological nursing course, with the aim of enabling students to develop the professional knowledge and skills to identify the health needs of older people, plan and implement holistic nursing care for older people and their caregivers in various settings, and promote positive attitudes toward older people. It was developed based on the EBL model and the principles of online EBL course development (Kahn and O’Rourke, 2005; Rigby et al., 2012). The following elements were included:

- Students would engage with a complex problem in a scenario that is sufficiently open-ended for discussion.
- Students would specify the need for enquiry and the strategies employed.
• Students would be required to make use of their existing knowledge and identify their required learning needs.
• The teaching and learning tasks would stimulate the student's curiosity, encouraging them to actively explore and seek out new evidence.

The self-regulated EBL was embedded in the course developed by three nursing academics (PK, RK, JL) with over 10 years of clinical and teaching experience in gerontology. Originally, this course was conducted face-to-face. Due to covid-19, it was conducted on the online teaching platform Blackboard. Based on the above EBL principle in relation to EBL, five video-based scenarios (15–20 min each) simulating the life of an older person were produced as the core components of the EBL. The five scenarios were on ‘chronic disease management’, ‘acute medical problems in hospitals’, ‘rehabilitation and transitional care’, ‘nursing home placements’, and ‘family caregiving’. In addition, two 90-minute online interactive workshops on course expectations, an introduction to EBL, and mind mapping development were provided to the students before the release of the scenarios. The aim of the scenarios was to mimic real life situations. The students were encouraged to work in a small group (10–12 students per group) on the online platform to identify one core problem related to gerontology from the video, and then to develop a mind map explaining the problem/situation, discuss it with peers, analyse the problem using evidence supported by the literature, look for a solution, and eventually present the evidence in appropriate ways to support their own response to the problem found in the video. Some common problems or situations that were identified and discussed by the students related to the cultural issue of using Traditional Chinese medicine, the use of restraints in hospital settings, policies supporting family caregivers, and the quality of nursing homes. All teaching materials were uploaded to Blackboard and the students had unlimited access to them within the 3-month course period.

2.4. Data collection

2.4.1. Quantitative data

The Qualtrics XM Online Surveys Platform was adopted to collect quantitative data for the study. All of the students joining the study received an email to access the self-administered questionnaires on the online platform. Demographic data, including data on age and gender, were collected at baseline (T0). The outcome measure of ‘attitudes towards older people’ was assessed at both T0 and the week following the completion of the intervention (T1). The outcome measures of ‘self-regulated online learning’ and ‘student satisfaction and self-confidence’ were assessed at T1 only. Because the students’ experience through the online EBL was being examined, a pre-test was not applicable. Given that the medium of instruction in tertiary education institutions in Hong Kong is English, the English version of the following scales which was validated in Chinese population was adopted:

2.4.2. Attitudes toward older people

Promoting positive attitudes toward older people is one of the intended learning outcomes of the course, and it was measured using the 34-item Attitudes Toward the Elderly Scale (Kahn and O’Rourke, 2005). The tool contains 17 positively rated and 17 negatively rated statements about older adults. Each item was rated using a 6-point Likert scale from strongly disagree (1) to strongly agree (6). To obtain a score, the values of the negative responses were reversed and tallied with those of the positive responses. Higher scores indicated a more positive attitude toward older adults. The Cronbach’s alpha ranged from 0.81 to 0.83 in the subscale in the previous study (Kahn and O’Rourke, 2005).

2.4.3. Self-regulated online learning strategies

The Self-Regulated Online Learning Questionnaire (Revised version) (SOL-Q-R) was used to assess the students’ self-regulated learning in online education (Jansen et al., 2018). The SOL-Q-R consists of 42 items, with each item rated using a 7-point scale from 1 (not at all true for me) to 7 (very true for me). SOL-Q-R generates five subscales: metacognitive skills (further divided into three subscales, i.e., before, during, and after learning; for the ‘before’ and ‘during’ subscales, the scores ranged from 7 to 49, while for the ‘after’ subscale, the scores ranged from 6 to 42); time management (scores ranged from 5 to 35); environmental structuring (scores ranged from 4 to 28); persistence (scores ranged from 7 to 49); and help seeking (scores ranged from 6 to 42). The reliability of all of the subscales in the SOL-Q-R was good, with the Cronbach’s alpha of all of the subscales rated as being above 0.67 (Jansen et al., 2018).

2.4.4. Student satisfaction and self-confidence

Student satisfaction and self-confidence were measured using the 13-item Student Satisfaction and Self-Confidence in Learning Scale (Franklin et al., 2014), which includes two subscales: Student Satisfaction and Self-Confidence in Learning. Each item was rated using a 5-point scale from 1 (strongly disagree) to 5 (strongly agree). The Cronbach’s alpha ranged from 0.94 to 0.92 for the satisfaction subscale and 0.87 to 0.83 for the self-confidence subscale (Franklin et al., 2014).

2.4.5. Qualitative data

Four sessions of semi-structured focus group interviews with a group size of 4 to 5 were conducted online by an independent senior research assistant who had received training in how to conduct semi-structured interviews. Another research assistant helped to take notes. A guiding question was employed, which opened up new testimonies: “What was your learning experience in taking the online gerontological nursing course?” The participants were then asked about how the experience impacted their studies, the elements that they liked/disliked, and the skills, knowledge, and any other benefits that they gained. Each focus group lasted for about 60 min. The focus group was conducted in Cantonese and digitally audio-recorded on Blackboard Ultra (a virtual classroom system that allows for online interaction). Following the interview, the audio-taped data were transcribed verbatim and analysed. Essential findings were then translated from Chinese to English by a professional translator, and back-translated by two bilingual researchers for checking.

2.5. Data analysis

2.5.1. Quantitative data

IBM SPSS 25.0 software was used to analyse the quantitative data. With regard to descriptive statistics, means and standard deviations were adopted for continuous data, and frequency and percentage for categorical variables. Differences between the pre-test and post-test were analysed using paired t-tests. The level of significance was set at 0.05. The missing data were replaced with the mean values of the group.

2.5.2. Qualitative analysis

NVivo version 11 was used to manage the focus group data. The interview data were examined and analysed through inductive content analysis, with the aim of identifying the main categories (themes) in the data, and patterns among the sub-categories (Graneheim and Lundman, 2004). The unit of analysis was a statement from the transcripts of the focus groups. The exploration and interpretation of the meanings of data led to the emergence of meaningful units of sub-categories, and a name was given to each sub-category corresponding to the meanings of its coding. Lastly, the sub-categories were condensed to achieve the status of a theme. To ensure trustworthiness, each transcript was analysed independently by two researchers (Kor, Liu), who then met to discuss the data and come to a consensus on the themes (Graneheim and Lundman, 2004). The researchers analysed the data until they reached the point of data saturation when no new findings emerged.

2.5.3. Integration of data and emergent themes

To integrate qualitative and quantitative data, the findings were
displayed together (Fetters et al., 2013). Convergence was assessed by focusing on the extent to which both types of data corroborated and expanded each other.

2.6. Ethical considerations

Ethical approval for the study was granted by the Ethical Committee of The Hong Kong Polytechnic University (HSEARS20190622001). Electronic version of informed consent for participating in the study was obtained from the eligible participants before any assessment, focus group interview or intervention was performed. All of the collected data were anonymous and the names of the subjects were replaced by codes.

3. Results

3.1. Demographics

All of the students (n = 155) in the study were in the Bachelor of Science in Nursing (Pre-registration General Nursing) programme, and all participated in the quantitative arm of the study. The majority were female (75.9%) and their mean age was 21.39 (SD = 0.78). Of the participants, 18.1% (n = 28) had obtained a higher diploma/associate degree in health sciences before enrolling in the nursing programme. In the qualitative study (n = 18), the majority were also female (67.5%) and their mean age was 21.21 (SD = 0.23).

3.2. Self-regulated learning strategies

Table 1 summarised the students' self-regulated learning strategies for studying the online course. Our result indicated a high level of metacognitive skills (before: Mean = 38.41, SD = 7.50; during: Mean = 39.34 SD = 7.78; after: Mean = 33.29, SD = 6.10) and persistence (mean = 39.23, SD = 7.61) in online education, a moderate level of time management skills (mean = 24.26, SD = 4.20) and environment structuring skills (mean = 21.87, SD = 4.39), and an acceptable level of help-seeking skills (mean = 25.60, SD = 6.66). Regarding metacognitive activities, a majority of students reflected on what and how they had learnt during and after the online course (items 14, 16, 17, mean score > 6 out of 7). A majority would also check if they could keep up with the timeline and choose their study location to avoid too many distractions (Items 23, 26, mean score > 6 out of 7). When the students faced problems, they would seek support from group members (Items 37, 38, 41, mean score > 6 out of 7).

3.3. Student satisfaction and self-confidence

Table 1 also summarised the students’ level of satisfaction and self-confidence when studying the course. Our result indicated a high level of student satisfaction, with a mean of 20.23 (SD = 3.29) in learning and a mean of 33.08 (SD = 5.48) in self-confidence. A mean score of 4 or above out of 5 was obtained for 11 items (out of 13 items). The two items that received the highest score (mean score > 4.5 out of 5) were ‘The course provided me with a variety of learning materials and activities to promote my learning curriculum (Item 2)’ and ‘The teaching materials used in the course were motivating and helped me to learn (Item 4)’. The two items that received the lowest score were ‘I am confident that I am developing the skills and obtaining the required knowledge from the courses to perform necessary tasks in a clinical setting (Item 8)’ and ‘It is the teachers’ responsibility to tell me what I need to learn of the course activity content during class time (Item 13)’ (Table 2).

3.4. Attitudes toward older people

The baseline total mean score on the students’ attitude toward older people was 144.15 (SD = 25.8). A significant increase was found in the post-test (mean = 159.12, SD = 8.21, p < 0.001) in both the positive and

### Table 1

| Items                                                                 | Mean | SD   |
|----------------------------------------------------------------------|------|------|
| **Metacognitive activities before learning**                         |      |      |
| 1. I think about what I really need to learn before I begin a task in this online course. | 5.11 | 1.26 |
| 2. I ask myself questions about what I am to study before I begin to learn for the online course. | 5.64 | 1.14 |
| 3. I set short-term (daily or weekly) goals as well as long-term goals (monthly or for the whole online course). | 5.63 | 1.29 |
| 4. I set goals to help me manage my studying time for the online course. | 5.38 | 1.34 |
| 5. I set specific goals before I begin a task in the online course. | 5.54 | 1.27 |
| 6. I think of alternative ways to solve a problem and choose the best one in this online course. | 5.64 | 1.37 |
| 7. At the start of a task I think about the study strategies I will use. | 5.47 | 1.22 |
| **Subtotal score**                                                   | 38.41| 7.50 |
| **Metacognitive activities after learning**                          |      |      |
| 8. When I study for the online course, I try to use strategies that have worked in the past. | 5.54 | 1.22 |
| 9. I have a specific purpose for each strategy I use in the online course. | 5.56 | 1.31 |
| 10. I am aware of what strategies I use when I study for this online course. | 5.50 | 1.27 |
| 11. I change strategies when I do not make progress while learning for the online course. | 5.52 | 1.23 |
| 12. I periodically review to help me understand important relationships in this online course. | 5.66 | 1.24 |
| 13. I find myself pausing regularly to check my comprehension of the online course. | 5.76 | 1.27 |
| 14. I ask myself questions about how well I am doing while learning something in the online course. | 6.12 | 1.23 |
| **Subtotal score**                                                   | 39.34| 7.78 |
| **Time management**                                                  |      |      |
| 21. I make good use of my study time for the online course. | 5.15 | 1.36 |
| 22. I find it hard to stick to a study schedule for the online course. | 4.62 | 1.58 |
| 23. I make sure I keep up with the weekly readings and/or assignments for the online course. | 6.04 | 1.29 |
| 24. I often find that I don't spend very much time on the online course because of other activities. | 3.86 | 1.57 |
| 25. I allocate studying time for this online course. | 5.40 | 1.12 |
| **Subtotal score**                                                   | 24.26| 4.20 |
| **Environmental structuring**                                        |      |      |
| 26. I choose the location where I study for the online course to avoid too much distraction. | 6.23 | 1.15 |
| 27. I find a comfortable place to study for the online course. | 5.60 | 1.21 |
| 28. I find where I can study most efficiently for this online course. | 5.63 | 1.25 |
| 29. I have a regular place set aside for studying in the online course. | 5.11 | 1.13 |
| **Subtotal score**                                                   | 21.87| 4.39 |
| **Persistence**                                                      |      |      |
| 30. When I am feeling bored studying for the online course, I force myself to pay attention. | 5.68 | 1.18 |
| 31. When my mind begins to wander during a learning session for the online course, I make a special effort to keep concentrating. | 5.64 | 1.29 |
| 32. When I begin to lose interest for the online course, I push myself even further. | 5.42 | 1.31 |

(continued on next page)
generates two subscales, namely student satisfaction (score ranging from 5 to 7 to 49) and help seeking (score ranging from 6 to 42).

The SOL-Q-R consists of five subscales: Metacognitive skills (further divided into three subscales before, during and after learning. For ‘Before’, the score is ranged from 7 to 49 respectively, whereas for ‘after’, the subscale score is ranged from 6 to 42), time management (score ranging from 5 to 35), environmental structuring (score ranging from 4 to 28), persistence (score ranging from 7 to 49) and help seeking (score ranging from 6 to 42). Higher score indicates greater levels of self-regulated learning in online education.

### Table 1 (continued)

| Items                                                                 | Mean | SD  |
|-----------------------------------------------------------------------|------|-----|
| 33. I work hard to do well in the online course even if I don’t like what I have to do. | 5.53 | 1.23 |
| 34. Even when materials in the online course are dull and uninteresting, I manage to keep working until I finish. | 5.72 | 1.26 |
| 35. Even when I feel lazy or bored when I study for this online course, I finish what I planned to do. | 5.62 | 1.25 |
| 36. When work is difficult in the online course, I continue to keep working. | 5.82 | 1.26 |
| Subtotal score                                                        | 39.23| 7.61|

**Help seeking**

37. When I do not fully understand something, I ask other team members in this online course for ideas. 6.01 1.22
38. I share my problems with my classmates about the online course so we know what we are struggling with and how to solve our problems. 6.35 1.33
39. I am persistent in getting help from the instructor of the online course. 5.21 1.28
40. When I am not sure about some material in the online course, I check with other people. 5.43 1.16
41. I communicate with my classmates to find out how I am doing in the online course. 6.11 1.17
42. When I have trouble learning, I ask for help. 5.71 1.12
| Subtotal score of Satisfaction in Learning | 25.60 | 6.66 |

**Subtotal score of Self confidence in Learning**

8. I am confident that I am developing the skills and obtaining the required knowledge from the courses to perform necessary tasks in a clinical setting. 4.91 0.82
9. My teachers used helpful resources to design the courses. 4.19 0.89
10. It is my responsibility as the student to learn what I need to know from the course activity. 4.59 0.84
11. I know how to get help when I do not understand the concepts covered in the courses. 4.15 0.84
12. I know how to use course activities to learn critical aspects of these skills. 4.45 0.9
13. It is the teachers’ responsibility to tell me what I need to learn of the course activity content during class time. 2.45 0.96
| Subtotal score of Self confidence in Learning | 33.08 | 5.48 |

### Table 2

Student satisfaction and self-confidence in learning (n = 155).

| Items                                                                 | Mean | SD  |
|-----------------------------------------------------------------------|------|-----|
| 1. The teaching methods used in the course were helpful and effective | 4.60 | 0.8 |
| 2. The course provided me with a variety of learning materials and activities to promote my learning curriculum. | 4.08 | 0.92 |
| 3. I enjoyed how my instructor taught the course.                     | 4.64 | 0.85 |
| 4. The teaching materials used in the course were motivating and helped me to learn. | 4.17 | 0.88 |
| 5. The online course was suitable to the way I learn.                 | 20.23| 3.29|
| **Subtotal score of Satisfaction in Learning**                         | 6.41 | 0.83|
| 7. I am confident that the courses covered critical content necessary for the mastery of the curriculum. | 4.05 | 0.84 |
| 8. I am confident that I am developing the skills and obtaining the required knowledge from the courses to perform necessary tasks in a clinical setting. | 3.91 | 0.82 |
| 9. My teachers used helpful resources to design the courses.          | 4.19 | 0.89 |
| 10. It is my responsibility as the student to learn what I need to know from the course activity. | 4.59 | 0.84 |
| 11. I know how to get help when I do not understand the concepts covered in the courses. | 4.15 | 0.84 |
| 12. I know how to use course activities to learn critical aspects of these skills. | 4.45 | 0.9 |
| 13. It is the teachers’ responsibility to tell me what I need to learn of the course activity content during class time. | 2.45 | 0.96 |
| **Subtotal score of Self confidence in Learning**                     | 33.08| 5.48 |

The student satisfaction and self-confidence scale (SS-SC) contains 13 items. It generates two subscales, namely student satisfaction (score ranging from 5 to 25) and self-confidence in learning (score ranging from 8 to 40), with higher score indicating higher satisfaction and greater level of self-confidence.

### Table 1

| Items of Student Satisfaction and Self-Confidence in Learning | Mean | SD  |
|-------------------------------------------------------------|------|-----|
| 1. The teaching methods used in the course were helpful and effective | 4.24 | 0.75 |
| 2. The course provided me with a variety of learning materials and activities to promote my learning curriculum. | 4.60 | 0.8 |
| 3. I enjoyed how my instructor taught the course. | 4.08 | 0.92 |
| 4. The teaching materials used in the course were motivating and helped me to learn. | 4.64 | 0.85 |
| 5. The online course was suitable to the way I learn. | 4.17 | 0.88 |
| **Subtotal score of Satisfaction in Learning** | 20.23 | 3.29 |
| 6. I am confident that I am mastering the content of the course. | 4.14 | 0.83 |
| 7. I am confident that the courses covered critical content necessary for the mastery of the curriculum. | 4.05 | 0.84 |
| 8. I am confident that I am developing the skills and obtaining the required knowledge from the courses to perform necessary tasks in a clinical setting. | 3.91 | 0.82 |
| 9. My teachers used helpful resources to design the courses. | 4.19 | 0.89 |
| 10. It is my responsibility as the student to learn what I need to know from the course activity. | 4.59 | 0.84 |
| 11. I know how to get help when I do not understand the concepts covered in the courses. | 4.15 | 0.84 |
| 12. I know how to use course activities to learn critical aspects of these skills. | 4.45 | 0.9 |
| 13. It is the teachers’ responsibility to tell me what I need to learn of the course activity content during class time. | 2.45 | 0.96 |
| **Subtotal score of Self confidence in Learning** | 33.08 | 5.48 |

### Discussion

This study explored the learning experience of nursing students in a gerontological nursing course using online enquiry-based learning during the COVID-19 pandemic. The findings showed that the students adopted various self-regulated learning strategies during online learning and that the course improved their attitude toward and knowledge of older people. The teaching and learning activities also enhanced their motivation to learn and their satisfaction with the online teaching.

#### 4.1. Impact on self-regulated learning ability

Self-regulated learning is regarded as a critical attribute in online teaching and learning (Broadbent and Poon, 2015). The self-regulated learning survey showed that the students performed well in several aspects. For example, they would check to see if they could keep up with...
the timeline and choose a study location to avoid excessive distraction. Also, they reflected on what and how they had learnt during and after the online course (Siles-González and Solano-Ruiz, 2016). This self-regulated learning skill is not only important for online learning but also for lifelong learning in the nursing profession. As a practice profession, nurses have to learn from day-to-day clinical experiences. Therefore, nursing students must be empowered to make self-assessments of what they know and do not know. Arguably, the student nurses of today must first learn self-regulation in order to learn during practice experiences (Sharples and Moseley, 2011).

The habit of self-regulated learning (SRL) does not come naturally; rather, support and facilitation are required to make it happen (Petty, 2013). Previous studies on effective instructional practices that promote SRL included direct strategy instructions, open and authentic learning tasks, mastery-oriented assessments, sufficient autonomy for students to engage in discussions, and a scaffolding design to develop independent learning (Lau and Ho, 2016; Lombaerts et al., 2009). Self-regulated online learning that allows students to learn anytime and anywhere with little monitoring by teachers has usually been adopted to promote students' self-regulated learning ability, because students must learn to become more autonomous, self-aware, and reflective in the online environment (Chau et al., 2021). In the online environment, students can also work and engage in discussions with peers on an online platform to find appropriate ways to resolve questions and issues.

A qualitative study was conducted by Razak and Hua (2018) to assess the impacts of the self-regulated learning strategies adopted by the students. The findings will be of help in developing a teaching pedagogy to enhance the self-regulated learning ability of students.
4.2. Impact of the students’ attitude on older people

Myths about older people and negative attitudes toward them are ubiquitous. A previous study indicated that a satisfactory level of knowledge of ageing care was positively associated with a positive attitude toward older people (Liu et al., 2013). In their systematic review, Liu et al. (2013) pointed out that since 2000 the attitudes of nursing students toward older people appear to have become less positive. To ameliorate such ageism, training in gerontological nursing has been made a core element of the pre-registration nursing programme, with the aim of equipping nursing students with knowledge about the needs and care of older people. However, a previous study highlighted the point that effective educational strategies targeting attitudinal changes (e.g., attitude toward older people) should involve experiential learning such as clinical placements (Burbank et al., 2006). However, during the COVID-19 pandemic, students had minimal exposure to and experience in working with older people (Martin-Delgado et al., 2021).

To enhance their experience, we developed several video-based scenarios and introduced them in our teaching. Both qualitative and quantitative data indicated that this online, enquiry-based learning improved their attitudes toward and understanding of older people. A student expressed the view that the scenarios are quite good because they bring out the issues that older people have to face in real life. During the COVID-19 pandemic, some universities adopted the use of simulations in high-fidelity laboratories to deliver the teaching, but several barriers were reported, such as the lack of a simulation laboratory, technical staff, and equipment (Al-Ghareeb and Cooper, 2016; Esposito and Sullivan, 2020). The use of online, enquiry-based learning provides an alternative approach that is less costly and involves less manpower than clinical simulations.

Given that older people tend to be accorded a high degree of respect in the Chinese culture, our nursing students in Hong Kong reported higher scores in the Attitudes Toward Older People Scale compared with the nursing students in other countries (e.g., Thailand, Sweden), which aligned with previous findings (Runkawatt et al., 2013; Voss et al., 2018). All aspects of the Attitudes Toward Older People Scale demonstrated improved attitude after the course, with the domains related to the Residential Aspect among older people demonstrating the largest improvement. Hong Kong is one of the most densely-populated cities in the world and housing is always a big problem, especially for older people who have no income after retirement (Bai, 2019). The housing problem aggravates myths about the poor and unclean living environment of older people. Our online gerontological course covered the topic of an age-friendly environment policy in Hong Kong (Yu et al., 2019). The students presented ideas about various policies and interventions that could be implemented to support older people in their residential environment. This could explain the large improvement in the Residential Aspect among older people domains in the Attitudes Toward Older People Scale.

4.3. Impact on student satisfaction and self-confidence in learning

A majority of the students were satisfied with the teaching and especially appreciated the use of a wide variety of learning materials and activities (mean score 4.60 out of 5 in the Student satisfaction and self-confidence questionnaire). It is evident that the use of different media in nursing education could improve the students’ learning experience (Xiong et al., 2017). Therefore, we integrated several media into the online EBL teaching, such as a video simulating the life of older people, gamified assessments through the online platform, and online discussions in the teaching, aimed at arousing their interest and motivation to learn. We adopted the gamified assessment because we would like to provide a less stressful environment for the students to learn and engage with different teaching and learning activities. Both qualitative and quantitative findings also indicated that the teaching materials were motivating the students to learn.

Lack of confidence and support from teachers are invariably reported as barriers in e-learning courses (Regmi and Jones, 2020). To address these limitations, we added two online interactive sessions delivered by the instructors, who covered course expectations, the teaching activities of EBL, and mind map development, and answered questions from the students.
students prior to the self-learning process. When students initially encountered difficulties adjusting to the new learning process, they were told to refer to the guideline on EBL (distributed during the briefing) which included FAQs, and to share their thoughts and engage in discussions with their peers about strategies to overcome the difficulty. After their discussion, the tutor would provide feedback if appropriate. The findings of the survey demonstrated that the majority of the students knew how to get help during the learning process and reported a high level of confidence in mastering the teaching contents. However, the lowest score given by the students related to the clinical skills and knowledge required to perform necessary tasks in a clinical setting. The online course included information on some clinical skills, such as performing cognitive assessments. However, the students could only watch the demonstrative video about the skills without trying their hand at practising them, which was regarded as a limitation of the course. A further study should consider how to enhance the students’ learning experience when learning practical skills online.

4.4. Limitations

This study has a few limitations. First, we only included one undergraduate nursing cohort in this study, which may limit the generalisability of the findings. Second, most outcomes were measured via self-reported questionnaires, which could lead to expectation bias, but anonymity was adopted to minimise the bias. Also, the single group design without a control group would limit information about the causal relationship between an improvement in outcomes and the online course. Lastly, the findings from this study only reflected the experiences of nursing students taking a speciality subject. The use of online EBL can be further explored in other subjects in a nursing programme.

5. Conclusions

Online teaching and learning became mainstream in nursing education during the COVID-19 pandemic. The findings of this study showed that our innovative online self-regulated EBL provided nursing faculties with an effective way to develop the students' knowledge of gerontological nursing, foster positive attitudes toward older people, and promote positive learning during the pandemic.

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Ethical approval

The ethical approval was obtained from the Hong Kong Polytechnic University (HSEARS20190622001). The research team complied with all of the requirements of a study involving human subjects as stated in the Helsinki Declaration and subsequent updates (World Medical Association, 2013).

CRediT authorship contribution statement

Patrick Kor: Conceptualization, Methodology, Formal analysis, Investigation, Resources, Data curation, Writing – Original draft, Writing – Review & editing, Supervision. Justina Liu: Conceptualization, Methodology, Investigation, Data curation, Writing – Review & editing. Rick Kwan: Methodology, Investigation, Data curation, Writing – Review & editing.

Declaration of competing interest

The authors have no relationships of financial support or other relationships that might pose a conflict of interest.

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