Effects of Online Learning with Reflective Thinking Technique to Promote Learning Skills among Nursing Students

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Abstract

This one–group quasi-experimental research aimed to investigate the effects of online learning through reflective thinking. This andragogy was designed to promote learning skills of nursing students at Boromarajonani College of Nursing, Buddhachinaraj, Phitsanulok Province, Thailand. A total of 125 third-year nursing students were purposely recruited for the study. The research instrument consisted of a combination of online teaching andragogy and reflective thinking assignment while studying Adult Nursing courses. Participants completed a reflective thinking assessment form and reflective thinking assignment, underpinned by Gibb's reflective cycle method. The form was developed by researchers with adequate validity (Cronbach's alpha coefficients 0.93). Data were analyzed using descriptive statistics, and paired t-tests. The processes of online learning with reflective thinking technique were observed, discussed and analyzed the content.

The results revealed a statistically significant improvement in the students' reflective thinking skill after participating (Mean=4.11, SD=0.51) compared to before participating (Mean=3.84, SD=0.53; $p < 0.001$). It also fostered learning skills, namely: cognitive skills development, collaboration and communication skills, career and learning skills, and computing and IT literacy skills, which are crucial for nursing students in the 21st century. We concluded that a combination of online teaching and reflective thinking could offer some inspiring and uplifting guidance regarding learning skills.

Keywords: Online learning, Reflective thinking, Learning skills, Nursing students

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Introduction

The Coronavirus-19 (COVID-19) pandemic has triggered educational institutions to teach outside classrooms as crowded areas became places at risk of COVID-19 transmission (Wayo, Charoennukul, Kankaynat & Konyai, 2020; Li, 2022; WHO, 2020). This new platform could help education and learning proceed continuously (Gupta, 2021, Thangkratok et al., 2021). Framed by course syllabus, while the methods of conveying knowledge changes, the learning outcomes of courses remain the same. In fact, online learning is applicable not only for the teachers to convey academics uninterruptedly during physical distance but also allows the students to participate actively such as group work learning, discussions, knowledge sharing, summarizing, and presenting (Kunavitikul, 2015). The students can manage knowledge by applying information from the internet as a major resource for learning such as searching, evaluating, analyzing, and applying information themselves within specific knowledge domain. At this point, the students were pushed to approach the lessons critically and have a potential of lifelong learning skills management as well as to improve academic performance (Kaya, Karatana & Yildirim, 2023).

Online learning approach fosters and develops technology skills and learning skills throughout the learning process alongside technological advancements (Gupta, 2021). However, while some students and teachers have adopted technology-driven learning strategies, health students may struggle to learn new health content or practice online, feeling overwhelmed by both the new knowledge and the new technology and digital tools (Abdulazeem, et al., 2023). They may also find it easier to lose interest and become disengaged, or they may be distracted by other activities (Bergdahl, 2022). In fact, to meet learning outcomes effectively, whether teaching in person, in a hybrid format, or fully online, careful planning is essential to meet students' needs and prevent burnout,

especially in higher education (National qualifications framework (Revised Edition). (2017).). Thus, online course planning may focus more on enhancing student interaction and enjoyment compared to in-person teaching (Mathuros, 2021).

In the rapidly evolving the 21st century, the acquisition of learning skills has become paramount. Educational institutions, from preschools to universities, must equip students with the knowledge, competencies, and essential skills necessary to navigate the dynamic and unpredictable world. Although there is no common consensus on these skills and their definitions, they are often referred as the 21st century skills. These skills are mostly broken into three categories, namely: 1) learning skills (the 4C's: critical thinking, creativity, collaboration, communication), 2) literacy skills (IMT: information, media literacy, technology literacy), and 3) life skills (FLIPS: flexibility, leadership, initiative, productivity, social skills) (Ministry of Education, Government of India, 2020; Kamany, 2014). While in Thailand, most nursing educational institutions apply Panich's learning skills (2017), 3R * 8C, which some duplicated with the 4C's. They include: 1) critical thinking and problem solving, 2) creativity and innovation, 3) cross-cultural understanding, 4) collaboration teamwork and leadership, 5) communication, information and media literary, 6) computing and IT literacy, and 7) career and learning skills, and 8) compassion. Boromarajonani College of Nursing, Buddhachinaraj [BCNB], Phitsanulok province, has well prepared the nursing graduators to achieve quality professional. A strong scientific foundation, developed through the 21st century skills, have been added strongly to the curriculum aiming a comprehensive understanding of theory-practice integration, which is crucial for promoting optimal health and well-being in individuals, families, and communities.

One of the essential thinking skills that should be emphasized in educational institutions in the 21st century is reflective thinking along with critical thinking as they

have been linked to academic success (Akpur, 2020). Introduced by Dewey (1933), reflective thinking is a powerful tool for enhancing critical thinking and academic achievement. It involves reviewing past experiences, knowledge, perceptions, reasoning, and understandings. It enables learners to identify facts, find solutions, and address complex problems (Altın & Saracaloğlu, 2018; Liao & Wang, 2019). It is an active, careful thinking process based on a thought process that leads to definitive conclusions. It involves the ability of learners to critically examine their past learning experiences when faced with new situations (Choy, Lee & Sedhu, 2019). Reflective thinking promotes rational thinking, the establishment of connections between ideas, and the selection of appropriate strategies (Colomer, et al., 2013). It also enables individuals to draw upon prior knowledge and experiences to make informed decisions (O'Flaherty & Phillips, 2015; Salido & Dasari, 2018). By reviewing past experiences, perceptions, and reasoning, reflective thinking empowers learners to identify patterns, find solutions, and address complex problems (Altın & Saracaloğlu, 2018; Liao & Wang, 2019).

Another vital thinking skills in the 21st century is critical thinking (Akpur, 2020). By understanding critical thinking in nursing education, educators can develop strategies to enhance its development in nursing students, preparing them for clinical practice. Critical thinking is a deliberate and self-regulating process of judgment that leads to the interpretation, analysis, evaluation, and inference of information (Facione, 2015). It involves considering various factors such as evidence, concepts, methods, and context. Critical thinking refers specifically to the processes of analyzing and making judgments about what has happened (Mueannadon, et al., 2019). Wah Chu, Lau and Li. (2017) defined reflective thinking as an integrated process that emerges from the interaction between critical and creative thinking. Similarly, Facione (2015) and Ghanizadeh (2017) argued that creativity, a crucial skill for the

21st century is closely related to problem-solving, critical thinking, and reflective thinking. That creative thinking paves the way for critical thinking (Wah Chu, Lau & Li. 2017).

In nursing education, preparing effective 21st-century nursing graduates with a multifaceted teaching approach is essential ensuring optimal health outcomes for patients. Consistent with nursing professional knowledge and skills, teaching approach requires a shift from traditional teaching methods to accommodate the changing learning styles of students and the readily available information sources. Diverse approaches such as flipped classrooms, reflective thinking, and problem-based learning (PBL) have been shown to improve student development. These approaches considered as an active teaching style, while maintaining two-way communication between instructors and students, can help instructors to assess students' foundational knowledge and tailor lesson plans accordingly, potentially differentiating instruction based on student groupings (Kunavikitikul, 2015).

Effective teaching needed to be plan effectively as the pervasive use of technology has led to students favoring self-directed learning and collaborative learning environments over solely instructor-led instruction (Kunavikitikul, 2015). This study used online learning with reflective thinking practice toward case study analysis assignments, and a valid assessment to enhance comprehension and provide instructors with feedback on student learning outcomes. The case studies involving orthopedic diseases and trauma to stimulate thinking skills, particularly reflective thinking and critical thinking. Case study is an effective method for developing nursing students' competencies in critical thinking, problem-solving, clinical judgment, and nursing care during hospital practicums (Chaisa & Janwijit, 2020). Consistent with the view of reflective thinking as an integrated process of critical thinking, this study focuses solely on reflective thinking

through an online andragogy approach to enhance students' learning skills. Here, we noted that orthopedic nursing care is in the Adult Nursing I. Although there are two Adult Nursing courses: Adult Nursing I and II. Both of which are arranged for the second-year nursing students simultaneously in the same semester at BCNB (Boromarajonani College of Nursing Buddhachinaraj, 2020).

A reflective cycle of Gibbs (1988) was used to underpin this study through thinking and learning experience. This is because the six steps of reflective thinking, namely: describing, feeling, evaluating, analysis, conclusion, and action, has been proved for promoting a better understanding of concepts and theories, a higher level of cognition, longer memories, and rationally explainable phenomena and knowledge (Gibb, 1988; Khumtorn, Suppasri & Akarasuwankun, 2017). However, the number of studies examining the use of online tools to teach reflective thinking among nursing students is scant. Thus, this study was designed to investigate the effects of online learning through the reflective thinking technique on nursing programs. It was expected to be centered on the students to reflect the quality of pedagogy and didactics in the nursing program as well.

Research objective

This research aimed to investigate the effects of online learning with reflective thinking technique to promote learning skills among nursing students during studying Adult Nursing course online, at BCNB, Phitsanulok Province, Thailand.

Research hypothesis

The nursing students participating in a combination of online learning and reflective thinking during studying Adult Nursing I course would gain a higher score of reflective thinking and learning skills than before participation.

Conceptual framework

Gibb's reflective model (1988) was utilized online in interactive lessons, Adult Nursing I course. It was originated by Professor Graham Gibbs (1988) which consisted of six steps as follow. Step 1. **Description** refers to describing the situations in detail; step 2. **Feeling** refers to conveying how you thought and felt during and after facing the situations; step 3. **Evaluation** refers to asking what was positive or negative about this situation; step 4. **Analysis** refers to making sense of and analyzing the situation; step 5. **Conclusion** refers to describing the information that one has searched or learned; and step 6. **Action** refers to being able to utilize such information for a better solution. The conceptual framework of effects of online learning with reflective thinking technique to promote learning skills among nursing students, underpinned by Gibb's reflective model (Figure I).
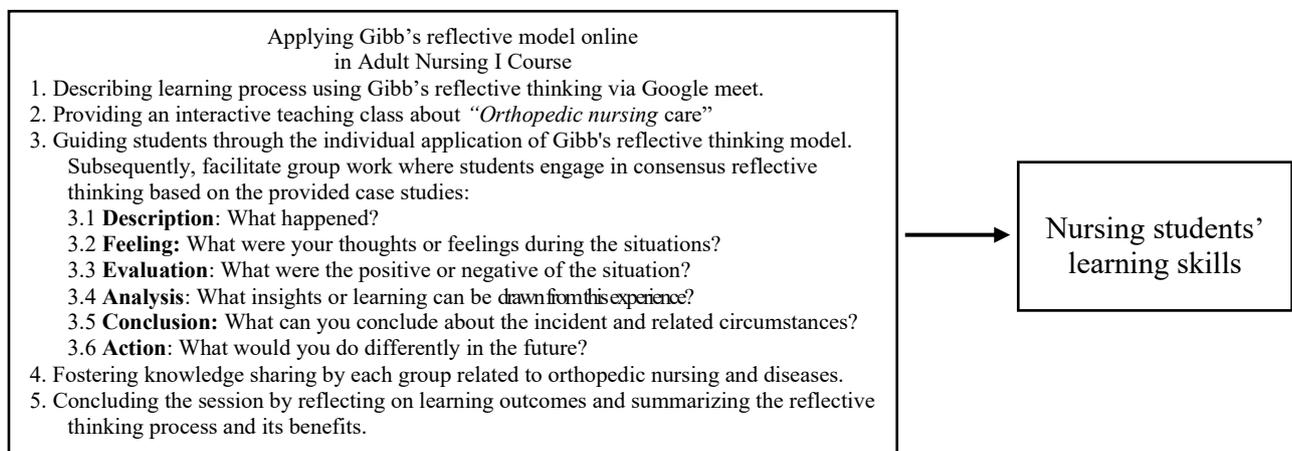

Applying Gibb's reflective model online
in Adult Nursing I Course
1. Describing learning process using Gibb's reflective thinking via Google meet.
2. Providing an interactive teaching class about *"Orthopedic nursing* care"
3. Guiding students through the individual application of Gibb's reflective thinking model. Subsequently, facilitate group work where students engage in consensus reflective thinking based on the provided case studies:
   3.1 **Description**: What happened?
   3.2 **Feeling:** What were your thoughts or feelings during the situations?
   3.3 **Evaluation**: What were the positive or negative of the situation?
   3.4 **Analysis**: What insights or learning can be drawn from this experience?
   3.5 **Conclusion:** What can you conclude about the incident and related circumstances?
   3.6 **Action**: What would you do differently in the future?
4. Fostering knowledge sharing by each group related to orthopedic nursing and diseases.
5. Concluding the session by reflecting on learning outcomes and summarizing the reflective thinking process and its benefits.

Nursing students' learning skills

Figure I: Conceptual framework showing Gibb's reflective model online in Adult Nursing I course

Research methodology

The research methodology used for this study was a one–group quasi-experimental research.

Study population and sample

This study's population and sample consisted of purposive 125 third-year nursing students enrolled in the Adult Nursing I course at BCNB, Phitsanulok Province, Thailand.

Inclusion criteria:

1. Fully attended all lessons and participation in all required activities related to Adult Nursing I in the topic of orthopedic nursing in order to yield appropriate and useful collected data.

2. Samples agreed to participate in the study.

Exclusion criteria:

1. Being absent from lessons and/or group activities for at least two periods.

2. Being diagnosed with severe anxiety or severe physical problems that would potentially affect participating in the project.

Research instruments

The research instrument consisted of an online teaching method combined with reflective thinking, while the data collecting tool was a learning skill assessment form. The processes of online learning with reflective thinking technique were observed and discussed.

1. Experimental Tools was an online teaching activity with a reflection cycle consisting six steps, namely: describing, feeling, evaluating, analysis, conclusion, and action, Gibbs (1988).

2. Data collection tools consisted of two parts:

2.1 Demographic information including genders and age.

2.2 Questionnaires related to reflective thinking skill consisting of fifteen questions underpinned by Gibbs (1998) were used. They were a five-point scale, following the Likert scale (1932). The scales allowed participants to indicate their positive-to-negative strength of agreement or disagreement with a particular statement. That is, strongly agree equals five points, agree equals four points, moderately agree equals three points, disagree equals two points, and strongly disagree equals one point. The level of interpretation for mean value is less than 1.50 (very low), 1.51-2.50 (low), 2.51-3.50 (moderate), 3.51-4.50 (high), and 4.51-5.00 (very high).

Validation of experimental tools

The experimental tool, a combination of online teaching activities and reflective thinking, was proved for content and language validity by three experts, with an IOC value of 1.00; while the validity of the learning skills assessment was 0.67-1.00. Then, the mending experimental tool, following the experts' commendation, was tried on 30 nursing students from another nursing institute who met a similar characteristic. Cronbach's Alpha Coefficient of the trial was 0.93.

Data collection method

The data collection method in this research consists of three primary stages: pre-experimental, experimental, and post-experimental. Below is a structured breakdown of each stage, highlighting key steps in the process of implementing online learning with reflective thinking techniques for nursing students.

Pre-experimental Stage

1. Ethical Approval and Permission: After obtaining ethical approval from the Institutional Review Board (IRB), the researchers informed the department head and relevant parties in the Adult and Gerontological Nursing Department of the BCNB, Phitsanulok Province, regarding objectives and details of the study.

2. Informed consent: Participants were briefed on the study's purposes, interventions, and their rights, emphasizing that their decision to participate would not

affect their grades or academic standing. Once participants agreed to partake in the study, verbal informed consent protocols were followed.

3. Pre-test administration: Participants were asked to complete a pre-test focused on reflective thinking to assess their baseline abilities prior to the intervention.

Experimental Stage

1. Orthopedic nursing care interactive teaching (via Google Meet): Students were briefed on the lesson's objectives, activities, and evaluation criteria. Then, a two-hour interactive lecture on orthopedic nursing care was provided, where students were encouraged to ask questions and share their own experiences.

2. Introduction to Gibbs' reflective thinking model: For approximately 15 minutes, the lecturers explained Gibbs' (1988) model of reflective thinking, providing a structured approach for analyzing situations.

3. Case studies presentation: Students were provided case studies on osteomyelitis, gout, and bone cancer with video scenarios and handouts for a duration of 30 minutes.

4. Application of Gibbs' reflective thinking (Gibbs, 1988): Nursing lecturers demonstrated how to apply Gibbs' reflective thinking model to the case studies, focusing on linking reflective analysis to clinical practice for about 30 minutes.

5. Individual reflective thinking practice: The lecturers facilitated the students while they were tasked with analyzing the case studies using Gibbs' six-step reflective model (Gibbs, 1988).
5.1 Describe: What happened?

5.2 Feeling: What were your thoughts or feelings during the situation?
5.3 Evaluation: What were the positives and negatives of the situation?
5.4 Analysis: What insights or learning can be drawn from this experience?
5.5 Conclusion: What can you conclude about the incident and related circumstances?
5.6 Action: What would you do differently in the future?

6. Group reflective thinking practice and discussion: The lecturers facilitated the students while they worked in groups (6 groups of 7–8 students) discussing case studies, exploring problem-solving approaches, and applying nursing knowledge. This peer exchange was essential for fostering deeper learning.

7. Group presentation of the case studies: Each group presented their reflective analysis of the assigned case study, with discussions fostering peer interaction and collaboration.

8. Group reflective Discussion: After the group presentations, a reflective discussion session allowed students to identify limitations in their learning process and propose solutions. Then, each group was assigned to submit the final report of reflective thinking following the commendations of lecturers.

9. Learning Summary: The session concluded with a 10-minute summary of key learning outcomes by the lecturers.

Post-experimental Stage

Post-Test Questionnaire: Students completed a post-test questionnaire via Google Forms, assessing their reflective thinking skill after participating in the intervention.
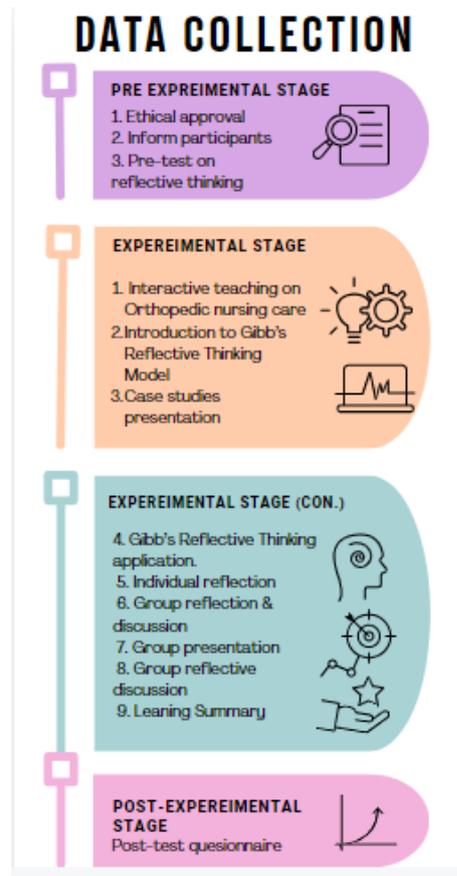
Figure II: Data collection of effects of online learning with reflective thinking technique to promote learning skills among nursing students

Data analysis

1. Demographic data were analyzed in percentage, mean, and standard deviation.

2. The pre-post scales of reflective thinking skill assessment were compared, contrasted, and analyzed using paired t-tests. The cumulative distributions of the two data sets were assumption approved by Kolmogorov–Smirnov test before applying paired t-test. All data showed normally distributed (sig=.200).

3. Learning skills were observed, noted and content analyzed.

Research ethics

This research study confirmed the appropriate ethical approval from the human research ethics review committee of Sirindhorn College of Public, Phitsanulok; certificate number 2/2564.1.3 proved on August 9th, 2021. In this research, participants were protected for their ethical rights and were informed as follows: 1) names, institutes, and contact details of researchers; 2) purposes and benefits of the research; 3) the methods used to collect the data; 4) the privacy and confidential participant information were kept confidential. The collected data were planned to destroy one year after publication. In this article, the anonymized participant information would be published; and 5) participants gained full right to accept, reject participation, or withdraw from the research at any time without impacting their study. Once the participants agreed to participate in this research, the verbal informed protocols have been followed.

Research results

Research findings were as follow:

1. Most participants were females (97.60%) with the age range of 20-21 90%

(90%) and an average age of 20.73 years old.

2. The average level of reflective thinking learning skill after intervention (Mean = 4.11; S.D. = 0.509) showed significant differences greater than that before (Mean = 3.84; S.D. = 0.528) at 0.001 (Table 1).

Table 1 Pre-post intervention average level of reflective thinking learning of nursing students using a combination of online teaching and reflective thinking (n=125)

Learning skill scores	Mean	SD	t	p
Pre-test	3.84	0.528	4.025	<0.001*
Post-test	4.11	0.509		

* p-value < 0.05

3. The following statements show how online learning with reflective thinking technique were developed through online platforms using reflective thinking technique. The effects were described framed by Gibb's reflective thinking model (Gibb, 1988) and semi-structured questions were asked in each stage.

3.1 Describe: What happened?
- Describe the brief facts of situation provided in case studies such as what occurred, who presented?
- Outline the key details of the situation, including the specific incident that occurred such as when and where did it happen?
- Explain the actions taken by you, other individuals or groups, if applicable, in response to the situation.

- Describe the outcomes of the situation as well as what did you want to happen?

Students generally agreed on their descriptions of the case study. Most groups divided tasks among subgroups to improve efficiency and develop a research focus. On this stage, the students significantly developed learning skills which include 1) the 4C's (Ministry of Education, Government of India, 2020; Kamany, 2014), fostered the following: 1.1) collaboration, and 1.2) communication. The students practiced verbal and written pattern to convey appropriate language and structure related to the case study. Initially, the groups lacked a standardized reporting format struggled to combine individual work, requiring rewriting and highlighting the importance of collaboration, and communication. And 2) the 3R * 8C (Panich, 2017) including 2.1) collaboration teamwork and leadership, 2.2) communication, information and media literary, and 2.3) computing and IT literacy which needed to apply across many disciplines and was fundamental to convey the report or presentation in the 21st-century.

3.2 Feeling: What were your thoughts or feeling about the situation or case study?
- How were you thinking or feeling before, during and after the situation or case study and now?
- What do you think other people were feeling about the situation or case study at that time and now?
- Were there any external factors that influenced the actions of others?
- Did you encounter any challenges related to the activity, timing, location, information, or resources?

The learning skill students developed at this stage related to 1) the 4C's: 1.1) communication, together with 2) the 3R * 8C: 2.1) communication, information and media literary. Most students described their

thoughts and feelings related to Covid-19 and the case study in the rather negative way. That the case study was too hard for them to understand clearly and the pandemic forced them to learn new technology besides new knowledge. Moreover, the expenses were added up to technology and electricity. The lecturers motivated them to think positively, try to find positive in negative events. promotes self-awareness and emotional intelligence, a key component of emotional regulation and effective interpersonal interaction. The most important thing was to motivate the students that there was the first step for every experience including knowledge. Finally, the lecturer facilitated nursing concept related to the case studies.

3.3 Evaluation: What was positive or negative about this situation?
- What went well and what didn't?
- What did you and others contribute to the advantages and disadvantages situation?
- How did the facts or feelings (from steps 1 and 2) affect your actions and behaviors?
- Were there any other circumstances that may have influenced your actions or thoughts?
- How might these issues have related to the activities or practices?

This stage enhanced 1) the 4C's: critical thinking, and 2) the 3R * 8C: 2.1) critical thinking and problem solving, and 2.2) career and learning skills. Most students analyzed the positive and negative aspects of the experiences and case studies, weighing evidences and forming reasoned judgments. This directly linked to critical thinking and problem-solving skill (Facione, 2015)

3.4 Analysis: What insights can you draw from the situation?
- Why did things go well and why didn't it go well?
- What sense can you and others make of the situation?
- How did you descript the patient's illness situations and comparing them to the existing knowledge?
- How is it consistent or different from the existing knowledge?
- What is the primary area of concern or focus or the future?

The same as the evaluation stage, this stage built analytical and problem-solving skills and career and learning skills. Students dissected the experiences, identifying causal relationships and underlying factors contributing to the outcome, and describing the patient's illness situations and comparing them to their existing knowledge.

3.5 Conclusion: What did you learn from the situation?
- What have you discovered about yourself?
- What lessons have you learned from this incident and the surrounding circumstances?
- What are the solutions or appropriate treatments and nursing care for the case studies?
- What skills do you and others need to develop to handle a situation like this better?
- What questions remain unanswered?

This stage developed 1) the 4C's: 1.1) critical thinking, and 1.2) communication, and 2) the 3R * 8C: 2.1) critical thinking and problem solving, 2.2) collaboration teamwork and leadership, 2.3) communication, information and media literary, 2.4) computing and IT literacy career, and 2.5) career and learning skills. At this stage, students summarized their learning, integrating insights from previous stages into a coherent conclusion.

3.6 Action: How would you deal with similar situations in the future? And what would you do or need differently for better solution?
- What will you do differently from now on if similar or related situation arises?

- What resources/help will you need?
- What skills do you need and how will you develop those particular skills?

This stage promotes 1) the 4C's: 1.1) critical thinking, 1.2) creativity, 1.3) collaboration, and 1.4) communication. And 2) the 3R * 8C: 2.1) critical thinking and problem solving, 2.2) collaboration teamwork and leadership, 2.3) communication, information and media literary, and 2.4) career and learning skills. Students created a plan to improve future performance based on their reflections. This requires foresight, strategic thinking, and the ability to adapt to changing circumstances, all vital 21st-century skills.

Discussion

Online learning has rapidly gained momentum as a preferred educational modality, especially in the wake of global challenges like the COVID-19 pandemic (Gupta, 2021; Mathuros, 2021). In nursing education, integrating online learning with reflective thinking techniques has proven to be a potent approach to enhance learning skills (Jensen & Joy, 2020). Reflective thinking, rooted in the theory of experiential learning by Kolb (1984), encourages students to actively reflect on their experiences, leading to deeper comprehension and better skill acquisition. This mode of learning has provided flexibility and accessibility but also posed unique challenges in promoting the development of critical learning skills among students (Rueangsawat & Phuaksawat, 2021). One effective andragogical approach is the incorporation of reflective thinking techniques, which can significantly enhance students' learning experiences and outcomes (Donkin & Francis, 2019; Jensen & Joy, 2020).

The study findings revealed effects of online learning on nursing students who enrolled in the Adult Nursing I Course at BCNB, Phitsanulok Province, Thailand. The results revealed an enhanced of reflective thinking skill and learning skills as follows:

1. Reflective thinking skill

The findings showed a statistically significant improvement in the students' reflective thinking skill after participating (Mean=4.11, SD=0.51) compared to before participating (Mean=3.84, SD=0.53; $p < 0.001$). The findings agreed with the study of Suworawatanakul, Natchamnong and Leaungsomnapa (2015) that the improvement of skill and levels of reflection were reported after implementing the reflective thinking learning program (before participation: $t = 9.290$, $p < .001$ and after participation: $t = 7.750$, $p < .001$, respectively). Reflective thinking practices within online learning environments can significantly enhance this ability among participants. By reflecting on case studies, clinical scenarios, and group discussions, students can improve their clinical reasoning. For example, incorporating reflective discussions after online clinical simulations allows students to analyze their decision-making processes, identify errors, and reinforce correct clinical reasoning (Menezes, 2020). This reflective feedback loop enhances both theoretical understanding and practical application, making students more competent in clinical settings (Verkuyl et al., 2017). By reflecting on these scenarios, they developed stronger clinical reasoning and decision-making abilities. Reflective thinking aids in bridging the gap between theory and practice, helping students apply classroom knowledge in clinical settings effectively.

2. Learning skills

Besides the improvement of reflective thinking skill, the effects of online learning also promoted learning skills of 1) the 4C's (Ministry of Education, Government of India, 2020; Kamany, 2014): 1.1) critical thinking, 1.2) creativity, 1.3) collaboration, and 1.4) communication. And some of the 3R * 8C (Panich, 2017): 2.1) critical thinking and problem solving, 2.2)

collaboration teamwork and leadership, 2.3) communication, information and media literary, 2.4) computing and IT literacy, and 2.5) career and learning skills, as follows:

2.1 Critical thinking and problem-solving skills (The 4C's: critical thinking; And the 3R * 8C: critical thinking and problem solving)

In this study, by reflective journal, the participants were able to critically evaluate patient data, consider various treatment options, and make informed clinical decisions based on evidence and reasoning. Participating in reflective processes, an active learning environment, could foster critical thinking by encouraging students to actively engage with course material (Wangruangsatid & Kaewsasri, 2023; Wichainate, 2014).

Effective problem-solving in nursing requires not only knowledge but also the ability to apply knowledge creatively and critically in complex situations (Jones & Smith, 2019). Online case studies, combined with reflective prompts, can provide a safe space for students to practice problem-solving in simulated scenarios before encountering real-world challenges. The asynchronous nature of online learning could also allow for more time for in-depth reflection on complex problems. Furthermore, structured feedback and peer interaction within the online learning environment can expose students to various approaches to problem-solving, enhancing their adaptability and resilience. That is, interactive class was essential such as facilitating the students, reflective journaling, self-assessment, and peer feedback. These approaches prompted students to analyze their learning processes, identify knowledge gaps, and evaluate the effectiveness of their strategies (Akpur, 2020).

2.2 Collaboration and communication skills (The 4C's: Collaboration and communication; And the 3R * 8C: collaboration teamwork and leadership; and communication, information and media literary,)

Online learning, when paired with reflective practices, can also foster collaboration and communication, which are critical skills for nursing professionals. Group reflections in online platforms such as discussion boards or peer review activities enable students to exchange diverse perspectives, fostering critical discourse. This collaborative reflection not only enhances communication skills but also builds a supportive learning community, which is often challenging to develop in online education (Jensen & Joy, 2020).

2.3 Career and learning skills (The 3R * 8C: Career and learning skills)

Most participants were satisfied with online learning environments as they allow the nursing students to absorb and process information at their own pace, promoting independent learning and cognitive development. However, nursing career and learning engagement can be superficial if not complemented by reflective thinking practices. Reflective thinking encourages deeper processing of content by prompting students to critically evaluate what they have learned and apply it to real-world scenarios (O'Flaherty & Phillips, 2015). The study findings matched with Buchanan, Cooney and Lynaug (2019) in the way that reflective journaling, reflective journal could enhance understanding by allowing students to articulate and question their knowledge, leading to better retention and career skill acquisition. The questions could be asked by lecturers or peers and should be multiple questions rather than one, or asking from lower level to higher level questions.

2.4 Computing and IT literacy skills (The 3R * 8C: Computing and IT literacy skills)

The use of digital devices like smartphones and laptops is prevalent among nursing students particular in the 21st century. For instance, smartphones were frequently used with a mean of 3.89 (SD = $\pm$0.42), followed by laptops at 3.54 (SD =

±0.72) (Harerimana & Mtshali, 2022). The study found a positive correlation between computer skills and internet skills, indicating that students' ability to use digital devices is linked to their internet skills ($r = 0.278$, $p = .012$) (Harerimana & Mtshali, 2022). Moreover, a study on computer literacy in traditional nursing programs found that students' literacy levels increased over time, with those owning computers being more literate (Celeste & Osias, 2024). However, there are still challenges related to hardware and software issues, connectivity, security, and face-to-face interaction, (Celeste & Osias, 2024, Li, 2022).) and self-regulated learning (Kozisnik, 2018).

Conclusion

The findings agreed with Menezes (2020) study that the integration of online learning with reflective thinking techniques is a powerful approach in nursing education. It improved reflective thinking skill and fostered learning skills, namely: cognitive skills development, collaboration and communication skills, career and learning skills, and computing and IT literacy skills, which are crucial for nursing students. They were developed through the processes of online learning with reflective thinking technique. When carefully implemented, these reflective practices promote deeper engagement with learning materials and equip students with the necessary skills for clinical reasoning and decision-making.

However, this approach needed guided support from instructors to maximize its effectiveness.

Limitations/ implications

The integration of reflective thinking within online nursing education offers a promising approach to developing reflective thinking skill and learning skills related to the 21st century skills. The effectiveness of reflective thinking techniques may be influenced by factors such as the quality of the online learning design, the instructor's facilitation style, and the students' prior learning experiences and digital literacy skills. However, online learning has limitations when it comes to practical, hands-on training, a cornerstone of nursing education. That, this approach may not fully replace the hands-on learning necessary for nursing skills acquisition. Also, time-consuming on reflective thinking processes was noted among the students in this study. Further research is needed to optimize the design and implementation of reflective learning experiences within online nursing curricula, considering the unique challenges and opportunities presented by this learning environment.

Acknowledgments

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International Journal of Public Health and Health Sciences; IJPHS
ISSN 2673-0200 (print) ISSN 2673-0251 (online)
IJPHS Vol.6 No.2 May-August 2024
www.tci-thaijo.org/index.php/ijphs

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