Education and Information Technologies (2024) 29:21547–21565
https://doi.org/10.1007/s10639-024-12692-1

Using the online education planned based on anderson's theory to facilitate the practice learning experiences of nursing students: A phenomenological study

Aysun Bayram[1] · **Sule Biyik Bayram**[1] · **Aysel Özsaban**[1]

Received: 25 August 2023 / Accepted: 10 April 2024 / Published online: 2 May 2024

Abstract
This study aimed to explore nursing students' practice skills learning experiences in online education based on Anderson's Theory and to investigate and interpret these experiences among students. Besides, this study proposes to evaluate the planned online nursing education based on Anderson's theory. With a phenomenological qualitative design, the study sample included 17 nursing students using purposive sampling. In-depth semi-structured interviews were performed to collect data. The data were analysed using the interpretative phenomenological analysis method. Three major themes were identified as follows: (a)Practice skills learning experiences; (b)Coping process in practice skills learning; (c)Suggestions to improve online practice skills learning process. Students expressed both positive and negative experiences. To cope with the process, they used different learning materials as well as individual ways of coping. They also offered suggestions on the learning process, teaching content and interaction and evaluation for practice skill learning in online education. The findings demonstrated that students perceived inadequacy in these skills but also expressed that they improved their psychomotor, cognitive and affective skills. In addition, Anderson's theory created positive results in the online nursing skill training process.

Keywords Online education · Practice skill · Nursing education · Qualitative research

✉ Aysun Bayram
aysunbayram@ktu.edu.tr

[1] Fundamentals of Nursing Department, Faculty of Health Sciences, Karadeniz Technical University, Trabzon, Turkey

1 Introduction

Online education replacing one-to-one education led to significant problems and debates in nursing where applied education is fundamental (Dewart et al., 2020; Swift et al., 2020). Although the theory of teaching from a distance caused no major problems in nursing, skill acquisition and bedside learning processes were heavily affected (Agu et al., 2021; Kim et al., 2021). In such scenarios, educators are expected to plan online education processes multidimensionally and favour active learning approaches (Agu et al., 2021; Beauvais et al., 2021). According to previous studies, nursing educators agree that theoretical courses are quite manageable in online education, but clinical skills and competencies are difficult to acquire, jeopardising their teaching with online courses (Nabolsi et al., 2021).

Educators should enhance innovative and/or constructive approaches to skills training through online education (Kumar et al., 2021). As in traditional education processes, this requires theoretical guidance of educators for effective education planning in online education processes (Picciano, 2017). In fact, recent studies where educators from nursing and different disciplines structured online courses according to the theories indicated positive impacts on students' experiences (Kim et al., 2021; Nabolsi et al., 2021; Salmani et al., 2022). Online education theories will guide the education' aims, objectives, planning, implementation, and evaluation outcomes (Picciano, 2017). Additionally, the fundamental parameters of online education, including effective solid interaction, learner-centeredness, flexibility, motivation, and support for self-regulated learning, should be emphasised (Kumar et al., 2021; Tamim, 2020). In the literature, Anderson's Interaction Equivalency Theorem (AIET) stands out as a theory that provides an interactive conceptual framework (Picciano, 2017). AIET was developed to clarify the interaction mechanism in online education. This theory refers to independent-oriented or interaction-oriented learning strategies that involve effectively meeting students' different needs in the learning process (Miyazoe & Anderson, 2010). According to Anderson's AIET, an online education theory, a profound and formal teaching and learning experience is sufficiently accomplished when either an interaction among students, between students and the content or between the educator and students is specifically considered (Anderson, 2003). Anderson proposes three essential types of interaction (student–student/student-content/educator-content) and suggests that a high level of one of the interaction types is sufficient for profound and formal teaching and learning to take place. In which case, he argued, the other two interactions can be kept to a minimum or disregarded (Anderson, 2003). Although promising outcomes were obtained by applying AIET in different disciplines (Hamid et al., 2021; Ke, 2013; Nieuwoudt, 2020), a counterpart application in the context of nursing, characterised by a considerable number of skill training courses, is surprisingly lacking in the literature. Thus, this study aimed to explore nursing students' practice skills learning experiences in the online Fundamentals of Nursing-II course planned based on AIET and to investigate and interpret these experiences among students. Besides, this study also aimed to evaluate the online nursing education planned based on AIET**.**

2 Method

2.1 Study design

A qualitative study design was performed based on interpretative phenomenological analysis (IPA) (Smith et al., 2009). Online education in teaching psychomotor skills in nursing education is a new and unconventional phenomenon in the traditional education system. With this in mind, the IPA technique was considered suitable for obtaining a deep knowledge of the experiences of the students who received psychomotor skills training with online education (Smith et al., 2009). Besides, Anderson's theory was used both in the educational content of the Fundamentals of Nursing-II course and in structuring the data analysis process. AIET theory interactions (student–student/student-content/educator-content) were considered during the data analysis to provide a theoretical framework grounded in the data collected specifically for this study. While analysing all transcribed data, the codes and/or themes determined associated with AIET's interaction types and those that were thought to match were brought together and collected under the same themes. Furthermore, Consolidated Criteria for Reporting Qualitative Research (COREQ), which provided a structure for the research design itself, was followed for reporting this study (Supplementary File 1; Tong et al., 2007).

2.2 Course procedure based on anderson's theory

The Fundamentals of Nursing-II is a theoretical and laboratory practice course in the nursing program. The course content was created based on the Model for Nursing Based on Activities of Living by Roper-Logan-Tierney. This course is given with the online education method and was carried out synchronously and asynchronously between February and May 2021 for a total of 14 weeks, four hours of theory, three hours of laboratory and 10 h of clinical practice. The course was designed under the guidance of Anderson's AEIT. The content of this course focuses mainly on skill practice, and the educator aims to teach, develop and apply basic professional skills. The purpose of the student is to know, apply and use nursing skills in professional practices. In the first stage of the skill training process, course materials, including course presentations, skill videos shot using mannequin/low- and high-fidelity simulators and procedural steps, were uploaded to the online system of the university before the course, and the students were expected to prepare before the course. In the second stage, the skills were demonstrated by the instructors with the support of live lectures and skill video recordings, with first theoretical and then practical lessons in synchronous lessons. All students had free access to all these contents through the online system. Thus, a consistent access opportunity independent of time and location was maintained. In the third stage, students were expected to take skill videos (6 pieces) following the procedural steps and upload them to the university's online system to encourage students to practice on their own in online education and to support their skill

development. During the homework, the students created the needed materials using their creativity or obtained them from medical stores/hospitals. The basic rule for the skill videos created was to apply the skills following the procedural steps. However, particular attention was paid to the student-content type of interaction because 50 students per educator were assigned to the course. Thus, based on Anderson's theory, the student-content interaction type was emphasised, but other types of interaction were tried to be kept at a high level for deep and formal education to take place in this course. Consequently, the online teaching process of the Fundamentals of Nursing-II course, aimed at helping nursing students acquire different skills, was carried out based on AIET (Fig. 1).

2.3 Participants

This study was conducted with 187 first-year students in nursing education. Following the IPA approach, a homogeneous sample was determined by the purposive sampling method (Smith et al., 2009). The inclusion criteria were as follows: (i) native language being Turkish, (ii) taking the Fundamentals of Nursing-II course for the first time, (iii) following the online courses, and (iv) fulfilling course requirements. First, 30 students who met the inclusion criteria were invited to the study by e-mail, and 25 of them accepted. Data collection was stopped with 17 interviews, held in the order received to the mail, after reaching data saturation (Smith et al., 2009). To control the effect of students' previous experiences on study findings, those repeating the course who had clinical practice experience and who previously studied a health-related department were excluded.

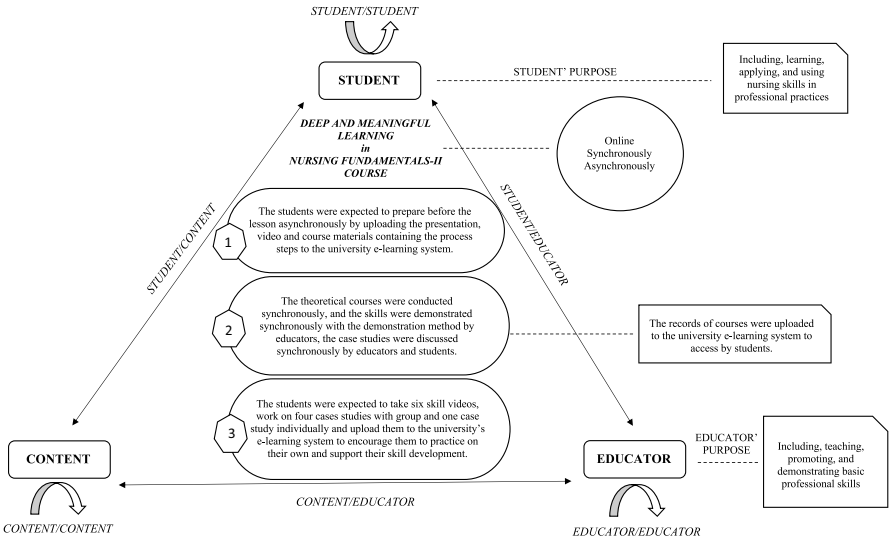

Fig. 1 The E-Learning Process of Nursing Fundamentals-II Course based on Anderson's Theory

2.4 Data collection

Data were collected using a semi-structured interview form specifically designed by the authors based on the literature and some concepts from AIET. It includes six questions on specific topics related to skill-learning experiences in online education (Table 1). To confirm its validity, the form was sent by e-mail to three experts with experience in qualitative studies and online nursing practices education and Doctor of Philosophy degrees in fundamentals of nursing. The experts rated each item as suitable, unsuitable or suggestions. The three authors discussed the feedback and finalised the interview form. Although it was initially intended to seek another expert's opinion in the event of a disagreement between the authors, no such disagreement occurred.

The semi-structured interview technique that provides the opportunity to ask open-ended questions was used during the data collection method (Smith et al., 2009). The researchers provided the participants with preparatory information on the goal of the study and the research questions two days before the planned interview date, allowing them to think about their own experiences on the subject. At the beginning of the interview, several flexible questions were directed, and as the interview progressed, questions based on in-depth discussion emerged. Besides, during the interviews, researchers tried to set aside personal prejudices, judgments, and assumptions, maintaining awareness of their own potential biases. The authors took field notes and self-criticism notes, which were used during the data analysis, regarding each interview to ensure transparency and strengthen the overall methodological rigor of the study. If the interviews deviated from their intended scope, the researchers reiterated the questions from the interview to refocus on the topic. Data were collected by one-to-one interviews, lasting approximately 40–60 min, in a private room between October and November 2021. The interviews were recorded using a voice recorder.

Table 1 The questions of semi structured interview form

No	Questions
1	How do you evaluate the effect of the psychomotor skill training you receive remotely on conceptual and skill knowledge levels?
2	How does distance education affect psychomotor skill development?
3	How is your self-learning experience during the psychomotor skill training process? What difficulties do you experience?
4	How do you cope with methods in distance practice skills training?
5	Do you feel ready for clinical practice/laboratory practices with the psychomotor skills training you received during the distance education process?
6	What are your recommendations regarding psychomotor skills training in the distance education process?

2.5 Data analysis

Data were analysed using the inductive IPA approach to interpret the meaning from the content of students' learning experiences (Smith et al., 2009). The inductive procedure in IPA aims to enable the researcher to develop an insider's view of the subject. This permits researchers to think creatively and find unexpected themes throughout the analysis (Reid et al., 2005). Before the analysis, the audio-recorded interviews were divided between the authors and transformed into written texts independently and without comment. The written interviews and audio recordings were randomly re-divided among the authors and double-checked carefully. The last version of written texts was shared with participants for them to verify (participant control).

Starting with a standard thematic analysis but extending beyond it, IPA appears to be a text-focused approach, yet it is more interpretative in nature. As such, it provides researchers with the opportunity to compare participants' similar and diverse experiences related to the phenomenon. In the analysis process of this study, researchers initially adopted a descriptive approach when analysing participants' expressions and subsequently interpreted these identified statements. In the descriptive stage, the authors performed the first note-taking process describing the codes to obtain descriptive interpretations by transcribing them verbatim. The similarities and differences between the transcripts were then identified (Smith & Eatough, 2006). In this process, written records were read repeatedly by each author, important parts of the participants' statements were captured as short notes and appropriate codes (concepts) were determined. The relationship and agreement between the codes created were examined by all researchers by performing focus group discussions to increase the consistency of the data, codes thought to be matched were brought together and pooled under the same category. Furthermore, proceeding to the next step at the end of each analysis step, researchers made focus group discussions to increase the consistency of the data (Tong et al., 2007).

In the interpretive stage, the aim is to try to find deep meaning in the data to allow the development of themes. In this analysis process, researchers sought answers to questions such as "What is the person trying to convey here?", "Could there be something different from the intended purpose behind this expression?" and "Could there be something here that participants themselves are not aware of?" to discover the interpretative component in participants' expressions (Smith & Osborn, 2008). The researcher then developed a framework illustrating the relationship between the initially identified codes and themes from an interpretative perspective (Smith, 2004). According to Smith (2011), logical coherence among identified themes increases consistency. In this study, to strengthen consistency, researchers attempted to create a logical framework based on matches between the identified codes and themes, drawing on Anderson's interaction types. The authors noted minor themes related to interpreting the codes they obtained in the descriptive phase and the participants' expressions of experience. In developing the main themes, the relationship and agreement between the codes created were examined by all authors; codes thought to be matched were brought together and pooled under

the same themes by examining the relationship between the minor themes and by associating the interaction types of AIET (Table 2). Following the last step, in order to strengthen the consistency of the themes, the final version of the themes was shared with the students to ensure their accuracy (participant control).

2.6 Rigour

The participants were the authors' students during the Fundamentals of Nursing-II course. The interviews were conducted by the last two authors responsible for the aforementioned class. In the preparation phase of this study, research questions were prepared by taking into account both the authors' experiences and the feedback given by the students at the time of learning and the literature. In this way, authors were able to be even more transparent by basing the study questions on the literature, independently of authors, aligned with the type of qualitative research. The interviews were completed at the end of the course to address the credibility by reducing any impact of the present study on the students and to avoid a dependent relationship between students and authors. Besides, there was no dependent relationship between the participants and the authors. Authors also considered their thoughts and beliefs that may have the potential to influence data analysis (reflexivity), constantly assessed potential biases they might have due to their background, and wrote down and discussed their self-criticisms at each interview to promote transparency in their approach and

Table 2 An overview of major and minor themes

Major Themes		Minor Themes
(a) Practice Skills Learning Experiences	***Pros***	Acquisition of psychomotor and cognitive skills
		Acquisition of affective skills
		Motivational
	Cons	Perception of deficiency in acquisition of psychomotor and cognitive skills
		Perception of deficiency in acquisition of affective skills
		Demotivation
		Inappropriate learning environment
		Dissatisfaction the interaction and evaluation
		Anxiety to the preparedness for the clinic experience
(b) Coping Process in Practice Skills Learning		Using other learning resources
		Self-effort to learn
		Getting environmental support
		Having a new style of learning
(c) Suggestions to Improve Online Practice Skills Learning Process		Improving the online learning process
		Improving the teaching content
		Improving the interaction and evaluation

increase the credibility of the analysis. These notes included the authors' feelings and thoughts about the interview. The notes they took after each interview were discussed among themselves, taking into account the interactions in Anderson's theory. This aimed to eliminate the effect of emotions and thoughts when moving from one student to another. In this way, the effect of both interviews and analysis was controlled. Furthermore, to avoid bias in data analysis, authors made focus group discussions to finalise the code, category, sub- and main themes. Thus, the consistency of the data was increased (Creswell and Poth, 2016; Tong et al., 2007).

3 Results

Of the 17 participants, 82.35% were female, and their mean age was 19.82. Participants' experiences were collected in sixteen minor themes under three major theme categories: (a) Practice Skills Learning Experiences, (b) Coping Process in Practice Skills Learning, (c) Suggestions to Improve Online Practice Skills Learning Process (Table 2, Fig. 2, Supplementary File 2).

3.1 (a). Practice skills learning experiences

This major theme was discussed under two separate headings, pros and cons, with 3 and 6 minor themes, respectively, under each.

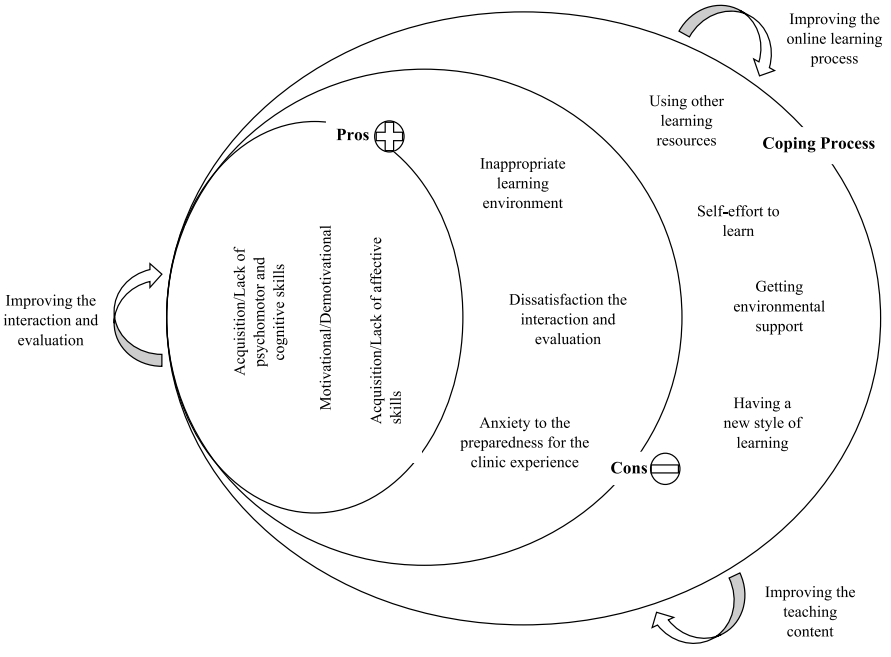

Fig. 2 Data display of minor and major themes

3.1.1 Pros

1. ***Acquisition of psychomotor and cognitive skills:*** Interestingly, a few participants emphasised an unexpected surge in psychomotor and cognitive skills from the skill training they received through online training.

   P6: "…I totally remember the videos I shot… they are all in my mind."

2. ***Acquisition of affective skills:*** Participants expressed that they felt they were role-modelled and felt fondness and professional belonging through skill training.

   P5: "In the end, I'll do exactly what I have seen…I will repeat the same procedure steps. We mimic our educators' moves…we familiarised ourselves with the videos as we have watched them over and over."
   P1: "In that video (referring to the video she prepared as homework), I appeared as a nurse in uniform. I put on a stethoscope; I saw myself as a real nurse."

Some participants indicated that skill learning in online education builds empathy skills.

P5: "…I empathise when I do it to someone. I wonder if it causes them pain as well. With consistent practice, I believe I can make progress."

3. ***Motivational:*** Participants who expressed motivation in the skill learning process demonstrated a correlation with their willingness to learn, satisfaction with the course modality, independence of learning from time and place, and autonomy in the learning experience.

   P11: "We saved time not going to school. Instead, I could study more at home… it is more comfortable at home…"

3.1.2 Cons

1. ***Perception of deficiency in acquisition of psychomotor and cognitive skills:*** Students mentioned they perceived inadequacy in their psychomotor and cognitive skills development in online education.

   P9: "…knowing is not enough, we need to see and try."

As expected, some participants described that they perceived the skill learning process as difficult because they could not remember the procedure steps while applying the skill in skill video assignments during the Fundamentals of Nursing-II course.

P13: "…I felt I didn't get it; I watched it a lot…it was very difficult…I shot about 50 videos…I was frustrated…"

Most of the participants expressed their perceptions that reflective thinking in online education was ineffective in learning skills by describing negative aspects associated with knowledge comprehension, knowledge transformation into a skill, or skill comparison to real-life situations.

> *P4: "…it doesn't matter how much you do it on the plush bear; humans will respond with emotions. That's why it contradicts real life…"*

Two participants stated that they only practised results-oriented exercises, ignoring other aspects of care in the skills they practised.

> *P8: "…I proceeded directly to the video, I didn't do them (communication, gathering information, etc.). I've missed out on many things; I just did the skill step…"*

2. ***Perception of deficiency in acquisition of affective skills:*** Most of the participants said that they felt unconfident in their emotional skill development.

> *P9: "…according to what is in the book, I believe that I did it right, but I wouldn't do it to a person, I'd freak out, I'd think I could make a mistake…"*

One participant reported that the online education process is inadequate for developing empathy skills, and three participants reported that they could not feel a sense of professional belonging.

> *P1: "Touching a person and touching a doll are very different… it may hurt but you won't know it at that moment, it misses this."*
>
> *P15: "…it gets a little strange when you are at home, you cannot feel that you are going to be a nurse…"*

One participant had difficulty in creative thinking while practising skills at home.

> *P13: "…there is no emotion, I did it because it had to be done. I don't like to design things, so I had a hard time…"*

3. ***Demotivational:*** The participants stated that they felt inadequate in their preparation for learning skills, were unwilling to learn, could not feel like students, and described online education as a pointless learning process.

> *P3: "…I'd like the hands-on parts to be one-to-one, so in my eyes it was a lost year…"*

4. ***Inappropriate learning environment:*** For most participants, the home environment was unsuitable for learning during online education.

> *P11: "… I was studying inefficiently at home… It was difficult communicating with people online…"*

Particularly, the participants who lived in rural areas reported technical problems related to computers and the Internet and problems supplying materials for skill applications.

> *P12: "… there was no internet connection. I'd visit my neighbour, trying to attend classes that way."*

5. ***Dissatisfaction with interaction and evaluation:*** Some participants reported that they received insufficient feedback on the skills they performed during online

training and that they were not aware of their own mistakes or deficiencies in the skills.

> *P9: "If it was face-to-face, if I had done it in front of you, you could intervene instantly if I made a mistake. It would be better to be with someone who knows and guides me."*

6. ***Anxiety about not being prepared for clinical experience:*** When asked about the skills training they received through online training and their readiness for clinical practice, most of the participants felt that they experienced fear and anxiety because they did not know what to expect in the hospital environment, and because they practised alone and felt inadequate.

> *P7: "…we used to be on the patient side until now, but now, how can I be on the staff side? …what can I do with the patient and their relatives…it is scary to think about…" P10: "I'm not really ready, because we didn't even try it on a model, we tried it on a rag doll or a pillow… I don't know how I can try it on humans."*

3.2 (b) Coping process in practice skills learning

1. ***Using other learning resources****:* Most of the participants stated that they resorted to social media resources, supporting resources, and peer and expert counselling to cope with the skill learning process in online education.

> *P14: "I asked others who had knowledge in the field of health." P4: "…I went to a healthcare centre, the nurses were very friendly there…a patient came, and she (referring to the nurse) showed me the patient and asked for blood pressure measurement, and she said, you will do this and that…it was adorable, I was very happy."*

2. ***Individual effort to learn:*** Some participants indicated that they tried to analyse their cons experiences in skill teaching with their individual efforts.

> *P6: "…I said to myself that I was wrong, then I could not figure out where my mistake was… I found it out by watching and reading…"*

One participant explained that she chose not to practice at all because learning was left to her own choice.

> *P7: "…if we were there now…we would have to do it, but when it is up to my choice, I mostly…prefer not to…"*

Some participants stated that they went to healthcare institutions to fix the material problems they experienced.

> *P4: "…I did not have a blood pressure monitor at home; I went to a healthcare centre…"*

3. ***Environmental support to cope with learning:*** Most participants explained that they received support from family members, educators or friends in coping with cons experiences during the online education process.

   P1: "There was a sphygmomanometer at home… but since I had never seen the urinary catheter materials, I thought I would buy them and at least have one at hand… my father brought my medical supplies… my sister is a nurse, she helped."

4. ***Improving/Having a new style of learning:*** Some participants said that they coped with their negative experiences in learning skills by developing new learning methods.

   P2: "…I got used to learning by myself, I find the truth through trial and error, this is more permanent for me…"

3.3 (c) Suggestions to improve online practice skills learning process

1. ***Improving the online learning process:*** Participants who were demotivated during the online education suggested using hybrid education, synchronised lessons, and motivation-enhancing games and competitions to improve the online learning process.

   P3: "…I would like it to be a hybrid model. In particular, I would like the clinical laboratory application parts to be one-to-one and the theoretical parts to be remote."

2. ***Improving the teaching content:*** Some participants suggested that giving each skill as a video assignment would positively affect skill development in online education.

   P11: "…my only suggestion: … we could have more homework…"

3. ***Improving the interaction and evaluation:*** A few participants said it would be helpful to receive feedback from educators on skill practices and shoot skill videos in a hospital setting.

   P16: "…we watch ourselves, but having someone in charge and the confidence it would give us is something else…they can tell you the mistakes directly…they'd provide assurance…"

Participants' detailed comments are documented in Supplementary File 2.

4 Discussion

The data obtained from this study were discussed in three major themes (Fig. 2).

1). **Practice skills learning experiences:** Online skills training provides students with time management opportunities, ease of access to information and flexibility in learning (Wu et al., 2018). In the examined course based on Anderson's student-content interaction, it was expected that leaving learning to students and allowing autonomy in self-schedule would provide an advantage in learning skills (Anderson, 2003). Nursing students in this study reported that they were motivated by the online process and acquired psychomotor, cognitive and emotional skills. Besides, some of them acquired empathy skills and felt a sense of belonging to nursing by taking the educators as role models. In studies on nursing students' experiences in online education, students described the opportunity to plan their own learning programs as an advantage of online education (Kim et al., 2021; Salmani et al., 2022), similar to our findings. Also, the positive results from this study were consistent with the results of another study based on AIET, though it was designed to deliver theoretical knowledge in different disciplines (Hamid et al., 2021; Ke, 2013; Nieuwoudt, 2020). Based on the results of this study, it can be concluded that this theory is valuable when used in nursing and teaching practice skills through online learning. For the course under examination, it also seems that students' self-planned studies support their individual learning processes and reinforce their practice skills through the opportunity to try more than once. Besides, the assignments given as part of the course allowed the students to practice, furthering their creative and critical thinking skills. Similar conclusions were drawn by Fitriyana et al. (2021), reporting that students learning with self-schedule focus better, and by Lu and Lien (2020), indicating that students' personal involvement in learning increases their proficiency.

However, some nursing students receiving their skills training online for the first time had negative experiences along with positive ones. Students expressed feeling demotivated and inadequate in psychomotor, cognitive and affective skills, thought the learning environment was inappropriate, were dissatisfied with interaction and evaluation, and were concerned about clinical readiness. They also reported that they felt inadequate in reflective thinking skills and practised results-oriented skills only. Their negative experiences were caused by the inappropriate atmosphere for education and training, the inability to maintain the student role and the lack of self-control in learning and time management. Previous studies have also described that nursing students' roles at home and school intermingled in online education, they attended classes with their family members around and had difficulties in attending classes (Dost et al., 2020; Ramos-Morcillo et al., 2020; Salmani et al., 2022). This was a result of the physical difficulties due to prolonged and tiring class hours and the lack of classroom climate when attending classes at home. In the study by Olum et al. (2020), about half of the students found that online education process was inefficient. On the other hand, Kumar et al. (2021) reported that students experienced fatigue problems (eye, etc.) during online education, supporting our study. This was also caused by the students having different learning styles and preferring different learning settings such as classroom, bedside, and online (Olum et al., 2020; Zolotov et al., 2022). Another negative student experience was dissatisfaction with the interaction and evaluation. This might be caused by the unbalanced number of students and educators, students and educators not knowing each other, students not being able to spend time with each other, their hesitance/shyness about turning on

the camera or the sound, and their inability to adopt to online education. All these findings emphasise that the multi-faceted interaction process proposed in AIET can be affected by external barriers and that individualised and holistic learning are needed in online learning.

Almost all the students who received skills training for the first time with the online method explained that they felt uncertain about the clinical setting, perceived they were inadequate to practice alone, and had anxiety about how prepared they were for the clinic. We believe the facts that the online learning setting does not adequately reflect the actual clinical practice, the students have not met a patient before and practiced on them, and that the thought of receiving negative reactions from patients affect their anxiety. According to Salmani et al. (2022), having only online courses isolated from the clinical context and staying away from clinical settings for long cause lack of self-confidence and anxiety about professional skills and patient communication in nursing students. A study evaluating nursing students' clinical practice readiness after online education concluded that this education system created anxiety about preparedness for the clinic and that all theoretical lessons, but not clinical lessons, can be learned with this method, supporting our study (Suliman et al., 2021). Clinical practice areas depend on nursing students' ability to demonstrate their learnings (Nweke et al., 2021). It can, therefore, be said that ensuring the orientation of the students to the clinic under the supervision of a mentor/teaching staff so that they can perform their skills in the clinical setting and using hybrid education in skill teaching can reduce or help control students' anxiety about their clinical readiness.

2). **Coping process in practice skills learning:** Some of the students received support from other digital sources (e.g., YouTube, Google) in learning, developed individual solutions (e.g., listening to the lectures more than once), consulted those around them (e.g., family members, educators, peers) and developed new learning strategies (e.g., taking and coding notes) fit for them. In this study, we believe that students used these coping methods for skill learning to only manage the current situation rather than for permanence. According to the literature, nursing students do not see the online system as an alternative in skills training and looked forward to one-to-one training (Chakraborty et al., 2021; Ramos-Morcillo et al., 2020). Also, Salmani et al. (2022) stated that nursing students experienced confusion at the beginning of the online education process, coped by adapting to this process over time, and used individual learning efforts such as watching lecture and video recordings more than once, taking notes of the records, and comparing source books and course contents to maintain learning, consistent with our study findings.

3). Suggestions to improve online practice skills learning process: Adopting a hybrid education approach and synchronisation of skills, increasing in-class socialisation, assigning homework including all skill practices, shooting skill videos in clinical settings and giving feedback on assignments by educators to boost learning, content and interaction were provided as suggestions in improving online education systems for skill teaching. A direct positive interaction is known to exist between course evaluation and students' homework performance and the course content (Murray et al., 2013). Anderson argues that emphasising one type of interaction in online education is sufficient for deep and meaningful learning. The

fact that the students offered suggestions about the course process and content of the education to improve the online education system as part of this course, which is based on AIET, is similar to Anderson's idea of achieving learning. This study has also demonstrated that the suggestions offered by nursing students covered all types of interaction (student-content, educator-content, student–student). According to the literature, online education has disadvantages, such as changing the way the educator interacts with the student, weakening student–student interactions, and being away from clinical settings (Salmani et al., 2022; Sindiani et al., 2020). In online courses, there is also little direct student interaction to encourage active student learning (Edwards & Lane, 2021). Besides, students' lack of social interaction seems to be a barrier to learning (Kumar et al., 2021), and nursing students' lack of active communication and interaction with educators negatively affects learning success (Penrod et al., 2022). It can, therefore, be recommended to commit in-class acquaintance time before starting the lessons in online education, shoot skill videos with actual patients instead of simulator models, give assignments so that students can try all the applications on their own, and offer feedback for each student.

4.1 Limitations

First, the semi-structured interviews with students were performed by educators responsible for the course. Therefore, participants were likely to answer positively to educators. Students' course ratings following the education may have impacted their perceptions of their experiences, influencing their expressions. Although precautions are taken to prevent data bias, student interaction with educators in the school setting may pose a risk of bias. Secondly, the educator/student ratio may have affected the students' experiences. Thirdly, the environment in which the students attended the classes and the family structure could also be a limitation. Furthermore, many individual factors, such as students' motivation, satisfaction, professional perceptions, learning styles, learning environments, difficulties/facilitators in participating in the course (materials for shooting videos, conditions of access to equipment, etc.), and the overall online education process might have affected the findings presented here. This demonstrates that student experiences can be impacted by variables other than the teaching strategies and methods used. In this context, the findings should be interpreted within these constraints. Lastly, the study was conducted only at a faculty, so the findings cannot be generalised to all nursing students.

5 Conclusion

In conclusion, nursing students thought the online training method had advantages and disadvantages in the practice skills training they received. They described gains in their psychomotor, cognitive and affective skills but also mentioned their perception of inadequacy in these skills. Although some students stated that this education method was motivating, most students said that it caused low

motivation. In addition, students also noted the disadvantages of online education in skill learning due to the inappropriate learning environment, inadequacy in educator-student interaction and anxiety in their clinical readiness. To cope with these difficulties, the students stated that they used different learning resources, discovered individual ways of learning, and sought the opinions of those around them. In the face of these results, the students suggested using hybrid education, producing skill videos with actual patients in clinical environments, synchronising the classes, and using methods that enable more interaction and communication with the educator and their peers to present the skill practices face-to-face in online nursing education. On the other hand, AIET was used for the first time for psychomotor skill training in nursing education with online education and had positive outcomes. This training program planned based on AEIT by considering three interactions (student–student/student-content/educator-content) of Anderson, with particular emphasis on the student-content component, demonstrated that this program increased the psychomotor, cognitive and affective skills, motivation, self-confidence levels of the students in learning psychomotor skills.

In line with the results of this study, Anderson's theory, which was previously used in the literature to structure educational processes in different fields, was integrated into the field of nursing education for the first time and student experiences were analysed. Considering that online education will continue in future crisis situations such as pandemics and as a part of face-to-face education, it can be said that Anderson's theory has the potential to be a guide in nursing education. Moreover, based on this study's findings, the following can be suggested for incorporating online education in skill teaching in nursing: to base the course content on theory, to improve the student-educator and student–student interaction, and to use practical programs in appropriate formats to manage feedback. Along with these suggestions, this study offers a few suggestions for future studies. First of all, future research may consider enhancing participant diversity to provide a more thorough representation of nursing students from a range of backgrounds, experiences, and perspectives. Secondly, to provide significant information on the long-term effects of online education on the acquisition and maintenance of practical skills and to monitor and report nursing students' progress and experiences over time, a longitudinal study methodology and follow-up interviews may be recommended. Finally, to assess the effectiveness of online education, a comparative analysis for the future quantitative studies may be suggested with inclusion of a control group of nursing students who are participating in traditional, face-to-face practice skills learning.

Supplementary Information The online version contains supplementary material available at https://doi.org/10.1007/s10639-024-12692-1.

Acknowledgements The authors thank the nursing students who participated in the study.

Authors contribution Conceived and designed the study; Aysun Bayram, Sule Biyik Bayram, Aysel Özsaban.

Collected of the data; Sule Biyik Bayram, Aysel Özsaban.

Contributed data or analysis tools; Aysun Bayram, Sule Biyik Bayram, Aysel Özsaban.

Performed the analysis; Aysun Bayram, Aysel Özsaban.
Wrote the paper; Aysun Bayram, Sule Biyik Bayram, Aysel Özsaban.
Critical review; Aysun Bayram, Sule Biyik Bayram, Aysel Özsaban.
Other contribution; Aysun Bayram, Aysel Özsaban.

Funding Open access funding provided by the Scientific and Technological Research Council of Türkiye (TÜBİTAK).

Data availability This paper [and its tables, figures and supplementary files] contain all data produced or analysed during this study.

Declarations

Ethical approval Institutional permission (Date:06.11.2021, number: E-63582098–299-1432) and ethics committee approval (Date:29.09.2021, number:24237859–726) were obtained to conduct the study. Participants provided written consents. The Declaration of Helsinki principles were complied with throughout the study.

Conflicts of interest The authors declare no conflict of interest.

References

Agu, C. F., Stewart, J., Mcfarlane-Stewart, N., & Rae, T. (2021). Covid-19 pandemic effects on nursing education: Looking through the lens of a developing country. *International Nursing Review, 68*(2), 153–158. https://doi.org/10.1111/inr.12663

Anderson, T. (2003). Getting the mix right again: An updated and theoretical rationale for interaction. *International Review of Research in Open and Distance Learning, 4*(2), 1–14. https://doi.org/10.19173/irrodl.v4i2.149

Beauvais, A., Kazer, M., Rebeschi, L. M., Baker, R., & Lupinacci, J. H. (2021). Educating nursing students through the pandemic: The essentials of collaboration. *SAGE Open Nursing, 7*, 1–6. https://doi.org/10.1177/23779608211062678

Chakraborty, P., Mittal, P., Gupta, M. S., Yadav, S., & Arora, A. (2021). Opinion of students on online education during the COVID-19 pandemic. *Human Behaviour and Emerging Technology, 3*(3), 357–365. https://doi.org/10.1002/hbe2.240

Creswell, J.W., & Poth, C.N. (2016). *Qualitative Inquiry and Research Design: Choosing Among Five Approaches.* Sage publications.

Dewart, G., Corcoran, L., Thirsk, L., & Petrovic, K. (2020). Nursing education in a pandemic: Academic challenges in response to COVID-19. *Nurse Education Today, 92*, 104471. https://doi.org/10.1016/j.nedt.2020.104471

Dost, S., Hossain, A., Shehab, M., Abdelwahed, A., & Al-Nusair, L. (2020). Perceptions of medical students towards online teaching during the COVID-19 pandemic: A national cross-sectional survey of 2721 UK medical students. *British Medical Journal Open, 10*(11), e042378. https://doi.org/10.1136/bmjopen-2020-042378

Edwards, C. R., & Lane, P. N. (2021). Facilitating student interaction: The role of Flipgrid in blended language classrooms. *Computer Assisted Language Learning Electronic Journal, 22*(2), 26–39.

Fitriyana, N., Wiyarsi, A., Sugiyarto, K. H., & Ikhsan, J. (2021). The influences of hybrid learning with video conference and" chemondro-game" on students' self-efficacy, self-regulated learning, and achievement toward chemistry. *Journal of Turkish Science Education, 18*(2), 233–248. https://doi.org/10.36681/tused.2021.62

Hamid, S. N. M., Lee, T. T., Taha, H., Rahim, N. A., & Sharif, A. M. (2021). E-content module for Chemistry Massive Open Online Course (MOOC): Development and students' perceptions. *JOTSE: Journal of Technology and Science Education, 11*(1), 67–92. https://doi.org/10.3926/jotse.1074

Ke, F. (2013). Online interaction arrangements on quality of online interactions performed by diverse learners across disciplines. *Internet and Higher Education, 16*, 14–22. https://doi.org/10.1016/j.iheduc.2012.07.003

Kim, S. Y., Kim, S. J., & Lee, S. H. (2021). Effects of online learning on nursing students in south korea during COVID-19. *International Journal of Environmental Research and Public Health, 18*(16), 8506. https://doi.org/10.3390/ijerph18168506

Kumar, A., Kalal, N., Rana, N., Vyas, H., Choudhary, V., & Rani, R. (2021). Online learning in nursing students: Satisfaction and barriers. *Journal of Education and Health Promotion, 10*, 411. https://doi.org/10.4103/jehp.jehp_1221_20

Lu, Y. L., & Lien, C. J. (2020). Are they learning or playing? Students' perception traits and their learning self-efficacy in a game-based learning environment. *Journal of Educational Computing Research, 57*(8), 1879–1909. https://doi.org/10.1177/0735633118820684

Miyazoe, T., & Anderson, T. (2010). The interaction equivalency theorem. *Journal of Interactive Online Learning, 9*(2), 94–104.

Murray, M., Pérez, J., Geist, D., & Hedrick, A. (2013). Student interaction with content in online and hybrid courses: Leading horses to the proverbial water. *Informing Science, 16*(1), 99–115.

Nabolsi, M., Abu-Moghli, F., Khalaf, I., Zumot, A., & Suliman, W. (2021). Nursing faculty experience with online distance education during COVID-19 crisis: A qualitative study. *Journal of Professional Nursing : Official Journal of the American Association of Colleges of Nursing, 37*(5), 828–835. https://doi.org/10.1016/j.profnurs.2021.06.002

Nieuwoudt, J. E. (2020). Investigating synchronous and asynchronous class attendance as predictors of academic success in online education. *Australasian Journal of Educational Technology, 36*(3), 15–25. https://doi.org/10.14742/ajet.5137

Nweke, C. I., Abazie, O. H., Adetunji, A. J., & Okwuikpo, M. I. (2021). Readiness for clinical practice amidst coronavirus among nursing students in southwest Nigeria. *International Journal of Africa Nursing Sciences, 15*, 100328. https://doi.org/10.1016/j.ijans.2021.100328

Olum, R., Atulinda, L., Kigozi, E., Nassozi, D. R., Mulekwa, A., Bongomin, F., & Kiguli, S. (2020). Medical education and e-learning during COVID-19 pandemic: Awareness, attitudes, preferences, and barriers among undergraduate medicine and nursing students at makerere university, uganda. *Journal of Medical Education and Curricular Development, 7*, 2382120520973212. https://doi.org/10.1177/2382120520973212

Penrod, D., Shaw, T., Nash, J., Dierkes, M., & Collins, S. (2022). Community college students' perspectives on online learning during COVID-19 and factors related to success. *Teaching and Learning in Nursing: Official Journal of the National Organization for Assciate Degree Nursing, 17*(3), 267–271. https://doi.org/10.1016/j.teln.2022.01.012

Picciano, A. G. (2017). Theories and frameworks for online education: Seeking an integrated model. *Online Learning, 21*(3), 166–190. https://doi.org/10.24059/olj.v21i3.1225

Ramos-Morcillo, A. J., Leal-Costa, C., Moral-García, J. E., & Ruzafa-Martínez, M. (2020). Experiences of nursing students during the abrupt change from face-to-face to e-learning education during the first month of confinement due to covıd-19 in spain. *International Journal of Environmental Research and Public Health, 17*(15), 5519. https://doi.org/10.3390/ijerph17155519

Reid, K., Flowers, P., & Larkin, M. (2005). Exploring lived experience. *The Psychologist, 18*(1), 20–23.

Salmani, N., Bagheri, I., & Dadgari, A. (2022). Iranian nursing students experiences regarding the status of e-learning during COVID-19 pandemic. *PLoS ONE, 17*(2), e0263388. https://doi.org/10.1371/journal.pone.0263388

Sindiani, A. M., Obeidat, N., Alshdaifat, E., Elsalem, L., Alwani, M. M., Rawashdeh, H., Fares, A. S., Alalawne, T., & Tawalbeh, L. I. (2020). Distance education during the COVID-19 outbreak: A cross-sectional study among medical students in North of Jordan. *Annals of Medicine and Surgery, 59*, 186–194. https://doi.org/10.1016/j.amsu.2020.09.036

Smith, J. A. (2004). Reflecting on the development of interpretative phenomenological analysis and its contribution to qualitative research in psychology. *Qualitative Research in Psychology, 1*(1), 39–54.
Smith, J. A. (2011). Evaluating the contribution of interpretative phenomenological analysis. *Health Psychology Review, 5*(1), 9–27.
Smith, J. A., Flowers, P., & Larkin, M. (2009). *Interpretive phenomenological analysis: Theory, method, and research*. Sage.
Smith, J. A., & Eatough, V. (2006). *Interpretative phenomenological analysis*. Sage Publications.
Smith, J.A., & Osborn, M. (2008). Interpretative Phenomenological Analysis. In J. A. Smith (Eds.), *Qualitative psychology: A practical guide to research methods*. Sage Publications.
Suliman, W. A., Abu-Moghli, F. A., Khalaf, I., Zumot, A. F., & Nabolsi, M. (2021). Experiences of nursing students under the unprecedented abrupt online learning format forced by the national curfew due to COVID-19: A qualitative research study. *Nurse Education Today, 100*, 104829. https://doi.org/10.1016/j.nedt.2021.104829
Swift, A., Banks, L., Baleswaran, A., Cooke, N., Little, C., McGrath, L., Meechan-Rogers, R., Neve, A., Rees, H., Tomlinson, A., & Williams, G. (2020). COVID-19 and student nurses: A view from England. *Journal of Clinical Nursing, 29*(17–18), 3111–3114. https://doi.org/10.1111/jocn.15298
Tamim, S. R. (2020). Analyzing the complexities of online education systems: A systems thinking perspective. *TechTrends, 64*, 740–750. https://doi.org/10.1007/s11528-020-00538-9
Tong, A., Sainsbury, P., & Craig, J. (2007). Consolidated criteria for reporting qualitative research (COREQ): A 32-item checklist for interviews and focus groups. *International Journal for Quality Health Care, 19*(6), 349–357.
Wu, X. V., Chan, Y. S., Tan, K. H. S., & Wang, W. (2018). A systematic review of online learning programs for nurse preceptors. *Nurse Education Today, 60*, 11–22. https://doi.org/10.1016/j.nedt.2017.09.010
Zolotov, Y., Reznik, A., Bender, S., & Isralowitz, R. (2022). COVID-19 fear, mental health, and substance use among israeli university students. *International Journal of Mental Health and Addiction, 20*(1), 230–236. https://doi.org/10.1007/s11469-020-00351-8