

ORIGINAL RESEARCH

How to Implement Educational E-Learning Material to Enhance Clinical Skills of Undergraduate Nursing Students: A Narrative Literature Review

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Summary. The online education period with COVID-19 showed that it is crucial to develop effective and supportive e-learning practices to teach necessary clinical skills in nursing. The purpose of this narrative literature review was to describe good practices on the implementation of educational e-learning material to enhance the clinical skills of undergraduate nursing students. This review aims to identify and describe some of the various factors that might have positive influence on students' learning results.

A literature search was conducted on PubMed, CINAHL and ERIC databases. Inclusion was limited to research studies in which e-learning was the major educational / pedagogical approach and that it presented evidence of the effects of e-learning in practical or clinical subjects. Twenty-four studies were included in the review. The data were analyzed using inductive content analysis. The three main categories identified through the content analysis were pedagogical, content and usability related good practices.

The results indicated that the students' knowledge and skill requirements need to be considered, a simple-to-complex or simple-to-deep design could be preferable in e-learning. The importance of authenticity and realism of the materials was considered important. Students preferred unlimited accessibility, allowing flexibility of their study time and ease of use also with mobile devices. It was emphasized that the content should keep students behaviorally engaged through various activities and instant feedback.

As a conclusion, pedagogical, content and usability related good practices need to be implemented to keep students behaviorally engaged with e-learning material to acquire clinical skills.

Introduction

COVID-19 outbreak forced and accelerated transition from traditional classroom teaching to online, and e-learning. A recent study (1) revealed that 65% of nursing educators thought that they had been unprepared for teaching online. In addition, 59% of them considered that online education during the pandemic failed to meet the psychomotor learning needs of nursing students (1). In fact, it has been identified that newly graduated nurses had a lack of advanced clinical skills already prior to the pandemic (2). Since the pandemic, higher education institutions have applied various methods to deliver distance education to nursing students (1). These methods

utilize various possibilities of e-learning. There are different definitions for e-learning. Instead of e-learning, similar concepts such as online learning, computer-assisted instruction, or internet-based learning have been used interchangeably (3).

In this review the term e-learning is defined as educational material that utilizes Information and Communications Technology (ICT) for learning purposes and can be implemented through web-based, computer-based, digital, or online learning (4). Conventional e-learning is typically carried out on computers; however, nowadays, compatibility with mobile devices is a necessity and often preferred by students. This review considers different, novel technological solutions, such as immersive virtual reality (IVR) and mobile learning to be means of e-learning. In addition, this review especially includes the use of reusable learning objects (RLO). Learning objects are self-contained "online resources or interactive software

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used for learning” (5). The reusability of learning objects means that they can be used multiple times anytime and anywhere (6).

According to the latest meta-analysis (7), the effect of e-learning depends much on the investigated learning outcome and the learning methods which e-learning is compared with. Apparently, the effect of e-learning is influenced by many factors that vary between different learning methods, contents, and outcomes. The meta-analysis concluded that the effects of e-learning on learning results are situational when compared to traditional learning methods in nursing education (7). This review aims to identify and describe some of the various factors that might have an influence on e-learning in undergraduate nursing education.

It seems apparent that students have not been able to achieve all necessary psychomotor nursing skills during the online education period with COVID-19 (1). This is one reason why it is crucial to develop effective and supportive e-learning methods and practices to learn necessary clinical skills in nursing education. There is a need to develop concrete good practices on e-learning which would benefit both students and educators. In this review, clinical skills refer to both technical and non-technical skills meaning cognitive, affective, and psychomotor skills that nurses need in assessing, planning, and implementing nursing care.

The purpose of this narrative literature review was to describe good practices on the implementation of educational e-learning material to enhance the clinical skills of undergraduate nursing students. The literature review was conducted based on the following question: What are good practices to implement educational e-learning material to enhance clinical skills of undergraduate nursing students?

Methods

Narrative literature review was chosen as the research method. This type of review aims to summarize, explain, and interpret evidence on a particular topic or question (8), and to describe the phenomenon (9). In addition, it may include studies that apply different methodologies in the field of one research topic (10). The descriptive narrative method is divided into four stages, which are 1) the research question formation, 2) selection of material, 3) construction of description, and 4) observation of the produced result (9). The review was conducted following these stages.

After forming the research question, a literature search was conducted using the following databases:

PubMed, CINAHL and ERIC. Search terms were developed by two review authors (SML, TSMP), and two information specialists were consulted. The search was limited to English language studies published between October 1st, 2016, and October 31st, 2021, for which an abstract was available. The full search strategies and limitations are presented in Table 1. Database searches yielded a total of 761 references.

Two review authors (SML, TSMP) independently examined the references using the inclusion and exclusion criteria presented in Table 2. The original studies were selected based on the titles, abstracts, and full texts. The reviewers' consensus on the selection of the studies was achieved through discussions and justification with inclusion and exclusion criteria.

The search process and the selection of articles are described in more detail in Figure 1.

The results were analyzed by three reviewers (SML, TSMP, TSP) using inductive content analysis. The analysis process was carried out according to the stages of the inductive content analysis process described by Elo and Kyngäs (11). The analysis was started by reading the research articles several times, and at the same time underlining the sentences relevant to the research question. The original expressions extracted from the text were compiled in a table, after which simplified statements were formed. Simplified statements were grouped into subcategories ($n = 13$), and the conceptualization was continued by merging the subcategories with the same content into categories ($n = 3$). An example of the content analysis process can be found in Table 3.

The review data consisted of 24 research articles conducted in Australia ($n = 3$), Canada ($n = 1$), Hong Kong ($n = 2$), Iran ($n = 1$), Israel ($n = 1$), Italy ($n = 1$), Scotland ($n = 1$), South Korea ($n = 2$), Taiwan ($n = 2$), Turkey ($n = 6$) and USA ($n = 4$). The articles were published between 2016 and 2022. Most of the studies were quantitative ($n = 14$) including pre- and post-tests, experimental and quasi-experimental pre- and post-tests. Seven of the included studies were conducted with mixed methods. There were 3 completely qualitative studies: focus group and individual interviews and a literature review. The sample size varied from 19 to 305, and the samples consisted of nursing students in various phases of their studies. Sampling methods used were convenience sampling ($n = 15$) and random assignment ($n = 8$). One of the studies was a literature review with a sample of 21 articles.

Table 1. Search strategies, limitations, and search results

Database and Date of Search	Search Strategy	Limitations	Results	Title	Abstract	Whole Text
PubMed 11/11/2021	(e-learning OR "electronic learning" OR "online learning" OR "online education" OR "web-based learning" OR "web-based education" OR "Internet-based learning" OR "remote learning" OR "remote education" OR "distance learning" OR "distance education" OR "Education, Distance" [Mesh]) AND ("nurse educator*" OR "nurse teacher*" OR "nursing facult*" OR "nursing student*" OR "nursing education" OR "Faculty, Nursing"[Mesh] OR "Students, Nursing"[Mesh] OR "Education, Nursing"[Mesh]) AND (effect* OR impact* OR outcome* OR efficac* OR influenc* OR affect* OR evidenc* OR "best practic*")	English language, Last 5 years, Abstract available	450	129	38	10
CINAHL 24/11/2021	(e-learning OR "electronic learning" OR "online learning" OR "online education" OR "web-based learning" OR "internet-based learning" OR "remote learning" OR "distance learning" OR "distance education" OR "web-based education" OR MM "online Education") AND ("nurse educator*" OR "nurse teacher*" OR "nursing facult*" OR "nursing student*" OR "nursing education" OR MM "Faculty, Nursing" OR MM "Students, Nursing" OR MM "Education, Nursing") AND (effect* OR impact* OR outcome* OR efficac* OR influenc* OR affect* OR evidenc* OR "best practice")	English language, Publishing Date: 01/10/2016–31/10/2021 Source type: Abstract available	267	78	30	11
ERIC 10/11/2021	(e-learning OR "electronic learning" OR "online learning" OR "online education" OR "web-based learning" OR "web-based education" OR "Internet-based learning" OR "remote learning" OR "remote education" OR "distance learning" OR "distance education" OR DE "Electronic Learning" OR DE "Distance Education") AND ("nurse educator*" OR "nurse teacher*" OR "nursing facult*" OR "nursing student*" OR "nursing education" OR DE "Nursing Students" OR DE "Nursing Education") AND (effect* OR impact* OR outcome* OR efficac* OR influenc* OR affect* OR evidenc* OR "best practice")	English language, Date Published: 01/10/2016–03/11/2021	44	21	9	3
Total			761	228	77	24

Table 2. Inclusion and exclusion criteria

Inclusion Criteria	Exclusion Criteria
Preregistration or undergraduate Bachelor of Nursing students	Licensed practical nursing students, advanced practice nursing (APN) students, nurse practitioner (NP) students, registered or graduated nurses, Master students, Doctoral students
Combination of nursing students and professional nurses or medical students so that the nursing student's outcomes or results have been reported separately	Combination of nursing students and professional nurses or medical students so that the nursing student's outcomes or results have not been reported separately
Nurse educators provide the teaching	Other professionals, such as nurse preceptors, provide the teaching
The content of teaching/learning is practical or clinical	The content of teaching/learning is only theoretical
E-learning is the major educational/pedagogical approach	E-learning is not the major educational/pedagogical approach
There is evidence of the effect of e-learning	There is no documented evidence of the effect of e-learning separately
Research study	Not a research study, pilot test
Re-usable learning object (RLO)	Not re-usable learning object (RLO)
Learning outcomes have been measured	Learning outcomes have not been measured

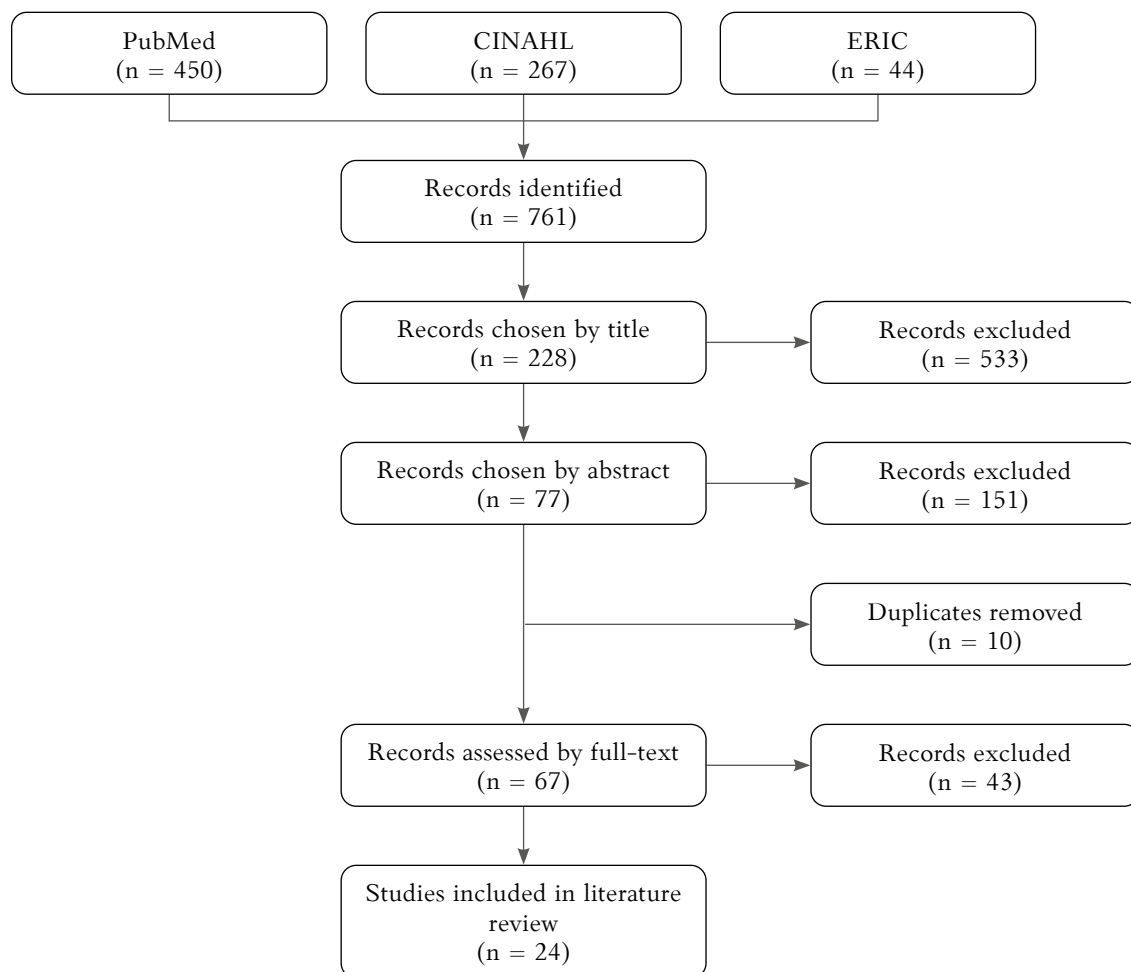


Fig. 1. Search process and the selection of study articles (modified from Moher et al., 2009)

Table 3. Example of the content analysis

Unit of Analysis: Sentences	Simplified Statement	Subcategory	Category
<i>It included positive modeling of nursing practices in video clips to capture seeing, hearing and observing positive nursing practices with older people experiencing cognitive impairment (27).</i>	Video clips included positive modeling of nursing.	Include videos	Content related practices
<i>Students enjoyed the videos with clear examples (27).</i>	Students enjoyed videos providing clear examples.	Include videos	
<i>Some participants felt the learning activity was too long and contained too many videos that seemed to have a similar message (27).</i>	Avoid too many videos that present the same message.	Include videos	
<i>Based on gamification and social learning theory, this asynchronous e-learning module offered a novel, effective and enjoyable educational experience for students that helped them learn (27).</i>	Gamification helped students to learn.	Active involvement	Pedagogical practices
<i>Students enjoyed ... the questions posed throughout the learning activity and the scenarios at the end (27).</i>	Students enjoyed the interactive e-learning activities, (games) and scenarios.	Active involvement	
<i>They also liked the ability to self-pace, found it engaging and felt like they learned the material (27).</i>	Students liked self-paced learning.	Freedom from time restraints	Usability practices
<i>The e-learning activity was developed by gerontological experts. Students get to learn indirectly from experts in the field and the educators did not need to possess gerontological expertise (27).</i>	Students were able to learn indirectly from experts that developed the e-learning activity.	Content needs to be up to date	Content related practices

Results

The three categories identified through the content analysis were pedagogical, content and usability related good practices.

Pedagogical Practices

From a pedagogical perspective, the studies clearly recommended that the learners should be considered from many viewpoints during the planning and implementation of e-learning. The students should be actively engaged with the material, and this can be accomplished by increasing interactivity. Students need feedback from their learning and look for interaction with peers and the teacher. In conclusion, e-learning was considered as an effective additional or supplemental learning method.

Learner Consideration. E-learning modules and content should be student-centered, concentrating on students' knowledge and skills requirements (12, 13). Thus, it is important to take the students' level of knowledge and competencies into consideration in designing activities (14). Educators could plan more strategically when to introduce e-learning packages across curriculum (4). Research results

showed that simple-to-complex instructional design produced better learning gains than productive failure (15). One of the main pedagogical starting points identified was the step-by-step, simple-to-deep learning strategy especially when learning nursing procedures (14, 16). Subject content should be based on the baseline knowledge of students, not to import too advanced content for early undergraduate level students (4). The information should then gradually progress from basic care to more complex cases (4, 12, 13). In addition to the learning content, the learning method's level of difficulty should gradually progress (4, 16). E-learning solutions should be tested by the target learners before they are finalized (16).

Organizing, highlighting key points, and chunking learning content into small units can promote learning (17, 18). One article (19) pointed out that the students' culture affects their learning behavior and should be taken into consideration, for example, being accustomed to teacher-centered approach. Another article (20) advised motivating students with the factors that students valued, like academic success and interest in the course. Participants were more motivated to learn if they

could self-select the online course (17).

Active Involvement. Activating solutions that keep students involved engaged them in the learning process (16–18, 21–23). E-learning applications engaged students individually, hence less motivated students could not stand back or be overcompensated by active students (23). E-learning required and facilitated self-directiveness (19, 21, 24, 25) and taking responsibility for one's own learning (4). E-learning encouraged students to reflect and self-correct their actions (4). Self-directed approach increased students' motivation to learn (25).

Students' behavioral engagement with the e-learning content is important because the more students devoted time to learning the higher their learning gains were (15). The studies presented several different ways to keep the students engaged with the learning content. Immersive virtual reality strongly promoted students' involvement in learning activities; they were not just passively watching videos but actively doing and practicing skills (16, 23). Gamification with interactive games, quizzes and knowledge-check questions reinforced students' learning (12, 17, 18, 26, 27). Games and competition with rewards can improve motivation to learn (14). Students interacted longer with the content when the simple-to-complex approach was applied compared with productive failure design (15). Students could also be activated with mobile phone notifications (12) or online reminders (28) and supportive messages encouraging them to apply the content in clinical practice (29).

Providing Feedback from Learning. The studies identified feedback to students being likewise important as interactive features in e-learning, an integrated part of the activating solutions. Feedback allowed the students to evaluate themselves (4), correct their thinking (18), understand what went wrong and not to repeat it (14, 30) and identify gaps in their knowledge (4, 23). Constant evaluation of progress could improve the motivation of students (20). The studies recognized different methods of getting feedback: from their peers (4), teacher or instructor (19, 31, 32) and automatically through games and quizzes (18, 23, 26, 32). Students received and appreciated immediate feedback (18–20, 23, 26, 32).

Student-Teacher, Learner-Learner Interaction. Student-teacher interaction was perceived as an important aspect in e-learning (12–14, 19, 20, 30). Many channels for interaction were utilized, like real-time e-discussions (19), asynchronous discussions on a platform (26), anonymous Q&A function via mobile devices (20), virtual classroom application (12), virtual chat rooms and mobile text messages (13). These channels were also used to enable students to contact each other (12, 13, 26) to

allow peer discussion (14) and to share information (13).

Additional and Supplemental Learning Method. Many of the studies concluded that web-based learning served as a useful additional learning method to increase the clinical knowledge and skill acquisition of students (4, 15, 16, 18, 22, 30). E-learning was recommended to be used to supplement but not to replace the traditional face-to-face teaching of clinical skills (4, 20, 23, 24, 30). For instance, it was recognized that the online-only group performed worse than the on-campus and combined groups in skills that require dexterity and coordination, which are typically mastered with hands-on practice (24). Another example showed that a VR game could complement, but not replace, a conventional clinical simulation (23). On the other hand, nursing students require supportive e-learning tools to reinforce their theoretical knowledge and practical skills due to a lack of insufficient internship opportunities and lectures (16). A multitude of the studies recommended the use of traditional teaching methods combined or blended with web-based methods (4, 21, 24, 25, 30, 31, 33).

Content-related Practices

According to the studies, it is recommended that the e-learning content needs to be up-to-date, authentic and include cases and videos.

Content Needs to be up to Date. The produced e-learning material included high quality (30, 31) and comprehensive (13, 31) content that was based on latest (21, 30) scientific evidence and evidence-based guidelines (29, 30). It was also mentioned that the material was developed with experts (16, 27) or revised based on expert opinions (13).

Authenticity. Authenticity and realism were found to be important aspects in e-learning materials (13, 17, 22–25, 32). This encompassed the realistic nature of the features (24), using real patients (22) and devices similar to the real ones (24). This realism gave an experience of acting in a real-life situation (23, 24). For example, an online iv pump emulator was realistically designed and replicated well the visual appearance, functions and sounds of the actual pump (24). In addition, it was recognized that the real-life scenarios added authenticity (13, 17). It was mentioned that video accounts of real-life experiences enhanced remembering the information (17) and playing a realistic IVR game created a feeling of being on the ward and treating a real patient (23).

Include Cases. Case-based scenarios or case studies were widely used in e-learning materials (13, 17–19, 23, 24, 26). Cases were applied for example to promote critical thinking (19), to summarize key aspects (18), to solve clinical problems (26), to

practice severe and rare cases (13, 23) and to help students prepare before practicum training (17). It was highlighted that in case-based web-learning students require precise clinical case information and guidelines on how to complete the assignments (19).

Include Videos. Most of the e-learning materials included videos (4, 13–15, 18, 21, 22, 26, 28, 29, 30, 32). Videos were used for example to educate how to perform technical clinical skills (14, 21, 28, 30, 32), to highlight communicational aspects related to complicated situations (30) and to emphasize certain content (29). For instance, videos were used to give clear examples on how to work with older people with cognitive impairment and models of positive nursing practice (27). Videos promoted cognitive learning and retention of knowledge (20, 30). Videos helped to review nursing skills (20, 30) and in clinical decision-making during practicum (12). In addition, watching the videos helped to make fewer mistakes (30) and to integrate prior knowledge with applied knowledge (15). Videos allowed relating to patients instead of only seeing them as cases (4). It was also mentioned that a relatable main character (26) and providing checklists (30) in the video might have a positive influence on learning and that too many videos presenting the same message should be avoided (27).

Usability Practices

Good accessibility and ease of use were aspects recommended across the studies to enhance the usability of e-learning materials. Currently, students rely to an increasing extent on mobile devices in learning; thus, many studies reported utilizing mobile technology. Students appreciated the possibility to use e-learning material anytime and anywhere without time restraints. In addition, efficient orientation to e-learning modules and technical support were considered a necessity.

Accessibility and Ease of Use. Accessibility is one of the basic requirements to enable e-learning and it was a highly appreciated feature by the students (12, 13, 16, 17, 21, 22, 24, 25, 28, 30). E-learning material being easily accessible at a time and place convenient for the learner might be particularly important when learning sensitive topics (29). Students considered the possibility to use e-learning material at home with unlimited accessibility important (24). In further detail, this was described as a requirement for quick access (12, 13) to the material from anywhere (13, 14, 21, 22, 32, 34). To overcome network restrictions, it was mentioned that the possibility to download files was useful (17, 21). One barrier to accessibility that was identified was the high cost of an e-book, which the students could not afford without

financial support (31).

Ease of use of web-based learning effectively supported learning (30). Studies concluded that ease of use and practice were essential (24, 25) and materials should be easy to find (12, 30). User-friendliness was increased by a helpful resources page and image gallery, well reproduced dials and easy to follow prompts (24).

Possibility to Use with Mobile Devices. Online education cannot be restricted to desktop and laptop because students rely even more on mobile devices (24). Many studies mentioned utilizing e-learning apps or materials that could be accessed also through mobile devices (12, 13, 20, 21, 28, 30). Use of digital technology and mobile phones contribute positively to learning during clinical practicums (4). From a teacher's point of view, the use of mobile devices enabled more variety in teaching methods and promoted student-teacher interaction (20). From a students' perspective, mobile devices enabled watching videos on practical skills even during clinical placements (20, 30).

Freedom from Time Restraints. In many of the studies, students appreciated the ability to use e-learning material anytime (12–14, 17, 21, 24, 25, 32, 34). Continual availability of educational materials can increase students' motivation, satisfaction, and pleasure (21). Students liked self-paced learning (19, 20, 24, 25, 27). For instance, students appreciated the start-stop functionality that allowed them to return and continue the course at another sitting (17). Either a possibility for enough learning sessions (16) or an ability to practice or watch repeatedly was considered an advantage (4, 22, 24, 25, 32). One article pointed out that the students were, in the first sessions, more interested in the functionality of the IVR and only later did the interest shift to the learning content (16).

Availability of Orientation and Technical Support. Studies described that they included an introduction or an instructional session to orient the students to the e-learning material (12, 13, 23, 24, 30, 33). Instructions needed to be detailed and easy to follow (24). Both staff and students require training and preparation for an e-based program. Students should feel they have the required IT skills to engage with the program (4). Enough time should be allocated to acquaint e-learners with the technology so that they can focus on the learning content (16, 23). Students appreciated technical assistance and reliable network connection (20).

Discussion

The reliability of the review was enhanced by carefully conducted literature search and selection of articles by two reviewers. In addition, the analysis process made by three reviewers increased reliability.

The following factors limit the reliability of this review: the literature search was conducted only in databases, and the search was not supplemented by a manual search; the language of the original research articles was limited to English; and the quality of the original studies was not assessed with critical appraisal tools.

The aim of this review was to identify and describe some of the various factors that might have an influence on e-learning. As an answer to the review question “what are good practices to implement educational e-learning material to enhance clinical skills of undergraduate nursing students?”, three clear categories of good practices were formulated: pedagogical, content related and usability.

From the pedagogical practices, this review identified *learner consideration* to be one of the important aspects in the design of e-learning objects. The studies used different pedagogical approaches as a basis for the development of e-learning modules. However, there were study results only in the favor of the simple-to-complex instructional design (15). A simple-to-deep learning strategy was applied by several studies to promote students’ learning (14, 16). Simple-to-complex instructional design could be applied in the construction of e-learning material, in the application of learning methods and in curriculum development. In the context of learning clinical psychomotor skills, it is recommended that e-learning materials should be utilized as an additional and supplemental learning method.

Active involvement of students and enabling *interaction* were used to keep students engaged with the e-learning material. Several diverse ways were presented in the studies on how to get students actively involved. Even more important than what the activating tools are is the fact that the students are kept behaviorally engaged. This is worth implementing because the more students spent time and effort with the material the higher their learning gains were (15). Students need feedback from their learning, and they prefer immediate feedback (18–20, 23, 26, 32). The preference for instant feedback might be related to millennials being accustomed to fast-paced digital environments and the possibility for constant interaction.

A self-evident *content related* good practice was

to create e-learning material that is based on up-to-date, evidence-based information. Especially in nursing education, the importance of *authenticity* and realism of the used learning objects are emphasized. Authenticity was a widely reported feature in the review studies (13, 17, 22–25, 32). This was a particularly important aspect in videos and case-based learning which were often included in the e-learning materials. The significance of authenticity is likely to be explained by the practical nature of nursing work and students’ desire to learn practical skills.

The importance of *usability* is recognized at least when there are deficiencies. Students appreciated unlimited accessibility allowing flexibility of their study time, self-paced learning, and the possibility to use e-learning material anywhere. The use of mobile devices facilitated the realization of these preferences. Students considered specific orientation to e-learning modules and technical support highly recommendable.

Conclusion

The results of this review can be applied in undergraduate nursing education when planning e-learning material on clinical skills. These results can be integrated with teaching strategies such as the ASSURE model developed by Heinich, Molenda, Russell and Smaldino in 1999. The ASSURE model involves 6 stages: 1) analyzing learners, 2) setting objectives, 3) selecting method, media, and materials, 4) utilizing media and materials, 5) requiring learner participation, and 6) evaluating and revising (35). Our review gives suggestions on how to utilize materials with different e-learning solutions. These pedagogical, content and usability related good practices can be applied in creating e-learning content. The application of these good practices may help in keeping nursing students behaviorally engaged with e-learning material. This in turn can facilitate future nurses to acquire professional clinical skills.

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