

E-Learning and Blended-Learning Program in Wound Care for Undergraduate Nursing Students

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ABSTRACT

Background: Due to an increasing number of undergraduate students in a Bachelor of Nursing Science program, the existing teaching modalities in wound care were shifted into blended- and e-learning units. The aim is to present the development and implementation of a blended- and e-learning wound care curriculum in an actual nursing program. **Method:** The development of the blended- and e-learning units is based on literature reviews and expert discussions. The process was guided by the learning outcomes defined by the European Wound Management Association. The implementation was planned for 3 years. **Results:** All 14 learning units were developed and implemented using 12 blended and two e-learning units. Flipped classrooms using asynchronous e-learning and workshops with clinical wound care specialists were used for blended learning. **Conclusion:** Blended and e-learning are valuable modalities to provide flexibility and deliver learning units based on the latest evidence. The effectiveness of this curriculum needs to be investigated. [*J Nurs Educ.* 2022;61(1):53-57.]

designs could increase the students' skills, knowledge, and satisfaction (Li et al., 2019; Shorey et al., 2018). Additionally, blended- or e-learning modalities improve self-directed learning (Noh & Kim, 2019) and autonomy and offer students an active role in the learning process (Hsu, 2012). This active role is important and suggests that motivation could influence learning outcomes (Gagnon et al., 2013). Overall, asynchronous online learning allows both the teacher and the student flexibility in their time management (Leidl et al., 2020). Nevertheless, Hsu (2012) argues that students following an e-learning program can experience an increased workload, as well as increased learning pressure.

One of the nursing tasks is to promote skin integrity (Beeckman et al., 2020) to prevent and manage different wounds such as pressure ulcers (European Pressure Ulcer Advisory Panel et al., 2019) or leg ulcers (Guest et al., 2018). Prevention and management of chronic or acute wounds is part of the nursing curriculum.

To combine the increased number of students and the difficulties evoked by the literature, the Chair of Wound Care at the Geneva School of Health Sciences decided to shift all face-to-face teaching to blended- and e-learning units. In doing so, we adapted the current wound care curriculum by integrating the learning outcomes defined by the European Wound Management Association (EWMA) curriculum for nurses of level 5 (Pokorná et al., 2017) and partly of level 6 (Probst et al., 2019).

This article aims to present the development and implementation of blended- and e-learning units in an existing nursing program with the example of a wound care curriculum.

Overview of the Modified Program

Each Bachelor of Nursing program in the western part of Switzerland is led by the same educational framework (HES-SO, 2012) providing guidance for minimal content such as the prevention and management of acute and chronic wounds. Face-to-face teaching modalities based on recommendations for best practice and the experiences of clinical nurse specialists in wound care were used throughout the entire program. To face the new challenges, a flipped classroom design using asynchronous e-learning modules and face-to-face workshops was implemented. The learning outcomes were adjusted, and the latest available evidence included. To ensure a smooth transition, we used the experiences de-

To respond to the nursing shortage in the canton of Geneva, the School of Health Sciences increased the yearly number of Bachelor of Nursing students from 426 in 2016 to 497 in 2019 (HES-SO, 2020; 2021). In 2020, 190 students started, representing an increase of 18% since 2016. This increase had a major effect on the current face-to-face teaching methods, not only for the availability of lecturers, but also for the logistical resources. To face this problem, different virtual learning tools such as blended and e-learning were implemented. Blended learning is a combination of online learning and the traditional face-to-face learning (Siemens et al., 2015; Singh, 2003) using different technological approaches such as podcasts, lecture captures, or virtual web-based classrooms (Leidl et al., 2020), whereas e-learning is an online education method (Moore et al., 2011).

The effectiveness of these teaching and learning methods on students' outcomes is unclear (Gagnon et al., 2013; Liu et al., 2016; Voutilainen et al., 2017). Evidence demonstrates that online learning for teaching clinical skills, for example, is not less effective than traditional teaching (McCutcheon et al., 2015). McDonald et al. (2018), on the other hand, highlight that blended-learning approaches could sometimes show superiority to e-learning designs. However, both

scribed by Posey and Pintz (2017). Therefore, we started to implement the changes progressively over a 3-year period. Due to the coronavirus disease 2019 pandemic, this transition was accelerated.

The Outline of the Modified Courses Using the Wound Care Content as an Example

The wound care program of the Bachelor of Nursing studies starts with a face-to-face lecture providing all students an overview of their courses in wound care to ensure that everybody can access the e-learning units. As most students are already familiar with everyday use of informatic technology devices, they may need support in operating their tablet or computer as a learning tool (Kirschner & De Bruyckere, 2017).

The introductory session contains an online self-evaluation assessing basic skin and wound care knowledge, followed by an e-learning module to ensure all students have the same knowledge level. The first learning unit covers the skin assessment, the prevention and management of pressure ulcers, and incontinence-associated dermatitis, as well as the management of surgical wounds. Other wound-aetiologies such as leg or diabetic foot ulcers are progressively introduced throughout the program and are in alignment with other units. **Table 1** outlines the topics and distribution of the 14 units during the 3-year Bachelor of Nursing studies.

To consolidate the educational content, 12 of 14 wound care e-learning units use a flipped classroom design combining e-learning, followed by face-to-face workshops. During these workshops, the students discuss case studies with wound care clinical specialists. Additionally, they learn the characteristics and application of the different categories of wound dressings. For example, students have the opportunity to touch and test different absorption capacities from wound dressings using water. The defined learning outcomes are mainly in reference to Bloom's revised taxonomy (Anderson & Krathwohl, 2001). This means our e-learning units use "knowledge/cognitive" and "awareness/behavior" categories, whereas workshops mobilize "pragmatic/psychomotor" skills. However, these categories

are frequently interrelated (Berthiaume & Daele, 2013). The EWMA curriculum level 5 (Pokorná et al., 2017) and level 6 (Probst et al., 2019) provide guidance for their development. Box 1 provides examples of learning outcomes of the year two Bachelor of Nursing program.

All workshops are carried out simultaneously in 10 small groups of a maximum of 12 students in different clinical skill rooms. For consistency, all teachers use the same pedagogical scenario. This setting enables all students to be guided when implementing the theory into clinical practice. Clinical nurse specialists with a Certificate of Advanced Studies in wound care teach these workshops. This allows addressing specific needs and questions from the groups such as support of implementing current sources of evidence into practice. Due to the implementation of a flipped classroom program, it was difficult to ensure that students carefully prepare the face-to-face workshops. This could have an influence on the mobilization of knowledge and skills development during these teaching units. To improve student preparation and identify students' understanding and misunderstanding of the content, a facultative quiz assessing knowledge was provided and reviewed by a lecturer prior to each workshop. Depending on the results, global feedback was provided to students through an online forum or to each clinical nurse specialist before starting the workshop.

All wound care learning units are, if possible, linked to units taught in the general curriculum and defined by the educational framework of the University of Applied Sciences and Arts (HES-SO, 2012). For example, the prevention and management of skin tears is integrated into the unit of the "care of older adults," or the prevention and management of diabetic foot ulcers is included in the unit of diabetes care. During the last year of training, the students have the possibility to further develop their skills and knowledge in wound care by completing a high-fidelity simulation training and/or writing their Bachelor thesis focusing on a specific subject in wound care. All learning units correspond to the different learning levels of the students and provide a basic framework for registered nurses in the prevention and management of patients with acute or chronic wounds.

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Implementation of Recent Wound Care Research into the Learning Units

Using courses based on current research and on international recommendations is of utmost importance to promote good clinical practice (Polit & Beck, 2020). Therefore, we conducted a literature review using MEDLINE via PubMed, CINAHL, Joanna Briggs Institute, and Cochrane Library. With qualitative research articles, we illustrated, for example, the experiences of living with a chronic wound. Quantitative research articles were used to show quality of life scores or risk factors. According to the scope of our e-learning, evidence is mostly published by nurses (Gethin et al., 2020). We additionally included clinical guidelines developed by the World Union of Wound Healing Societies, EWMA, or wound specific associations such as the European Pressure Ulcer Advisory Panel or International Skin Tear Advisory Panel. To illustrate the local context, local hospitals provide their care guidelines or protocols. The main messages of the sources of evidence are translated into French, ensuring that all students can follow the units. Our e-learning use the APA style for references to provide students examples of using evidence. This could improve their academic literacy (Jefferies et al., 2018), and it is a requirement for the bachelor thesis.

Building of the Blended- and E-Learning Units

To build the new learning units, we initially used a free software license. However, this software showed a lack of interactivity and did not support interactive illustrations or easy access to key references. A newly obtained license for Articulate Storyline 360® improves interactivity and answers some wound care specificities such as wound delimitations, hidden pictures, and others. Combining Articulate Storyline 360® with our online resource Cyberlearn Moodle® allows us to provide quizzes, videos, and a place for a discussion forum. All of our accesses are password protected to ensure the respect of copyright in our Swiss context.

All units are self-explanatory and therefore may improve the learner's attention to important data. For example, we highlighted important facts in text, like contraindication for wound debridement, or repeated learning objectives a second time to focus students' attention on important data. Moreover, we took into consideration different results from research and promoted

TABLE 1
Structure of the Units of the Bachelor of Nursing Curriculum

Year	Semester	Unit/Content	E-Learning (hours)	Workshop (hours)
Bachelor 1	1	Clinical assessment and wound healing Surgical wounds Wound bed evaluation Pressure ulcers Incontinence associated dermatitis	6	12
	2	Wound infection Skin tears	4	0
Bachelor 2	3	Malignant fungating wounds Diabetic foot ulcers	4	4
	4	Leg ulcers Wound bed preparation (debridement)	4	8
Bachelor 3	5	Burns Negative pressure wound therapy Cavity irrigation Wound care in complex situations	4	4
Total			22	28

the importance of interaction to enhance learning (Leidl et al., 2020; Regmi & Jones, 2020), gave the learner control of their learning process using a control board, and provided the ability to stop the videos. These modalities seem to be useful tools to increase students' skills and knowledge (Coyne et al., 2018) and could enhance the learning experience. The e-learning units are designed to prevent cognitive overload due to an excess of animations (Mayer & Moreno, 2003) and decrease distractions (Cantoni et al., 2004). To prevent technological barriers, e-learning offer access across various informatics devices (Jowsey et al., 2020). According to our experience, we suppose that our e-learning designs allow students more interactivity and the ability to choose their own useful resources.

Student Assessment and Satisfaction

To assess student knowledge and to further develop the units, students can take an online feedback quiz. The first part contains questions examining the knowledge associated with the units, and the second part gives the student an opportunity to provide feedback about the content of the different learning units and modalities. The results of our "knowledge" quizzes could suggest a good level of student knowledge. Yet, we did not, as with most of the educational projects (McCutcheon et al., 2015), evaluate them using a robust methodology and validated tools. For this reason, we plan to use the Pressure Ulcer Knowledge Assessment Tool 2.0 (Manderlier et al., 2017) for the pressure ulcer assessment. For other units, specific tools need to be developed.

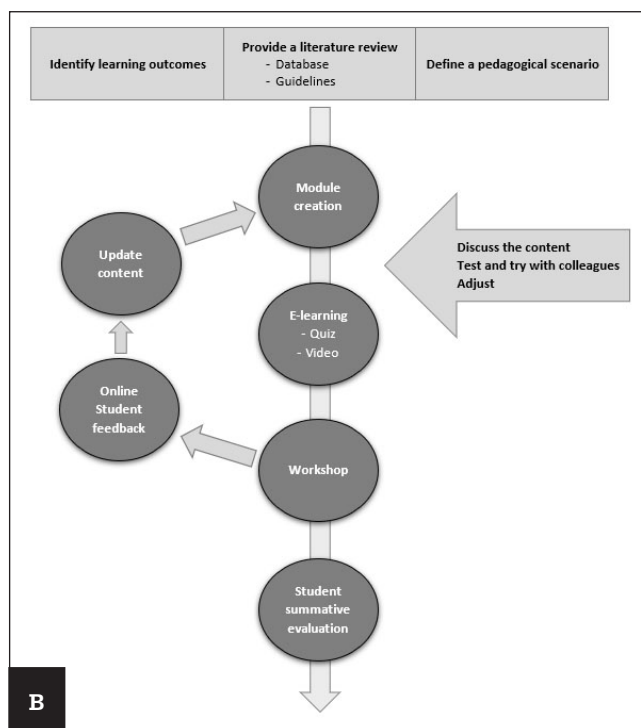
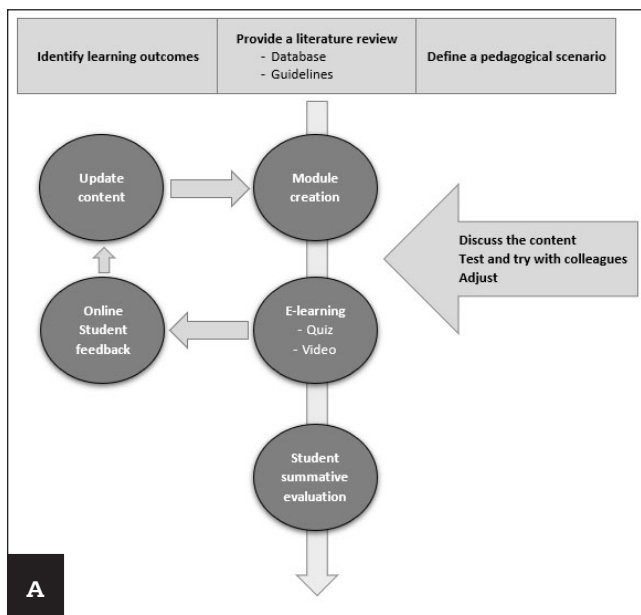


Figure 1. (A) Process of e-learning units development. (B) Process of blended learning units development.

Students' satisfaction preliminary results were positive, highlighting interactivity, using evidence, and workshops with experts in the field. Workshops were well appreciated and helped students implement their skills and knowledge. On the other side, student feedback illustrated the difficulty of taking into consideration the “real” out of the classroom learning time, as it presents high variability. Evidence shows that it is challenging for students to engage in e-learning activities, as it can create stress

and tensions (Jowsey et al., 2020). Summative evaluations based on learning outcomes are conducted periodically during the curriculum. **Figure 1A** and **Figure 1B** provide an outline of the different steps.

Experiences and Further Perspectives

We suggest that such a development needs a team with different skills, such as clinical wound care practice, teaching, research, and informatics. Working in a team with various experts on this project allows constructive feedback and improves the curriculum. Moreover, it allows lecturers to stay up to date and to face an underestimated workload.

This newly developed and adapted curriculum was endorsed by EWMA in 2020 and provides students the opportunity to develop critical thinking skills. This curriculum decreases room and teacher shortages. In the future, this project could evolve to adaptive e-learning designs, as they show superiority in learning outcomes with less cognitive load (Fontaine et al., 2019).

The transition of the Bachelor of Nursing curricula improved our information technology skills and allowed us to proceed to a rapid adaptation to online learning of our planned courses. For example, we designed our teaching modalities in the midwifery curricula or postgraduate courses during the pandemic lockdown in April 2020. Due to the flexibility offered by blended learning designs and the need for flexibility for health care providers in pandemic situations, we reflect adapting these pedagogical modalities to our postgraduate course.

Conclusion

The development of a wound care curriculum using a blended-learning methodology is work-intensive but allows flexibility and includes the newest findings and recommendations. Student feedback allows for rich improvement in our teaching program and the designs of our online learning activities. More research is needed to better understand the experiences of students in following such a curriculum, to evaluate their newly gained knowledge with specific tools, and to monitor how they implement their skills into clinical practice.

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