

Unsupervised clinical skills training in nursing education: Active student involvement in the development of a technology-based learning tool

By

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Stavanger, May 2017

Cecilie Haraldseid

Summary

This thesis describes the process of active student involvement in development of a technology-based learning tool for clinical skills training. The thesis also explores how technology-based learning tool can facilitate unsupervised learning and discusses how students can become increasingly self-directed learners.

Acquiring clinical skills is an especially demanding activity for nursing students, where they need to combine components from psychomotor, cognitive, and affective learning domains. Clinical skills are traditionally taught using a combination of real-life rehearsals during practical placements and simulation of different clinical nursing activities in clinical skills laboratories (CSL). Claims of diminished learning opportunities during practical placements has led to a growing emphasis on the importance of clinical skills training at the faculties CSLs. Accordingly, there has been increasing interest in methods that can help students obtain necessary skills in the CSL. In line with general technological advancements in society, these methods have increasingly involved different technological components.

New policy initiatives and growing literature within higher education are calling for students not only to be consulted during the development of learning strategies, but also to become actively involved in creation of their own learning experiences. Consequently, a frequent training method for clinical skills learning within nursing education and for higher education in general is unsupervised training activities where students must initiate their own learning processes.

Based on this, studies of active student involvement in development of a technology-based learning tool for unsupervised clinical skill training would be a valuable contribution to nursing education research. The aim of the thesis has been twofold: (I) To explore the process of active student involvement in the development of a technology-based learning tool, and (II) to explore how this technology-based learning tool can facilitate unsupervised clinical skills learning.

To pursue this aim, this thesis has adopted a qualitative research design with an

explorative approach. Since end users and active student involvement is a key element, the thesis follows a participatory design approach entailing four different stages (exploration of work, discovery process, prototyping and investigation of utilization). The exploration of work stage is described in Paper I, where the aim was to explore student perception of current clinical skills training. The findings describe the students' current perceptions of the physical, organizational and psychosocial learning environment. In summary, students report that they seek, lack and crave more instructions concerning what and how to learn clinical skills procedures.

The discovery process and prototyping stages are described in Paper II, here an iterative process together with the students explored how the technology-based learning tool could best fit the students' needs. The study showed that an iterative involvement of students through a development process contributes to surfacing of important learning needs, enabling the content of the technology-based learning tool to be tailored to accommodate student needs.

In the investigation of utilization stage, the aim was to investigate factors that influenced the students' utilization of the technology-based learning tool as described in Paper III. The paper describes how utilization of a learning tool depends on how well the student group is equipped to handle and manage its own learning processes. In order to utilize the technology-based learning tool, the groups must have a certain skill set prior to training that relates to how they solve learning tasks. Level of competence, motivation, role clarification and collaborative problem-solving skills will aid their ability to use the technology-based tool.

In order to add to the knowledge of unsupervised clinical skill learning in nursing education, the synthesized findings are viewed in the light of Knowles' self-directed learning theory. The results document that nursing students' perceptions of their current learning environment in a clinical skills laboratory can be characterized by a search and desire for more structure and detailed guidance during unsupervised clinical skills training. They especially demand more instruction concerning what and how to learn, indicating a teacher-dependent learning style among current nursing students. In order to decrease such dependence, the thesis suggests that nursing faculties should increasingly involve students in decision making and development of their own learning

tools. Active student involvement, such as the iterative development process, is an example of how students can provide faculty staff with necessary feedback on curricula development as well as influencing their own learning. As such, the involvement of students in the development, testing, and feedback on the contents of a technology-based learning tool contribute to the revelation of vital learning needs. The iterative process enables the technology-based learning tool to be better tailored to accommodate these needs.

However, using the technology-based learning tool depends on the student groups' possession of certain skills prior to unsupervised training. The skill set included motivation to learn, critical thinking, and collaborative problem-solving abilities. These are all necessary for students to be able to handle and manage their own learning process in unsupervised clinical skills training. More specifically, students must clarify the different roles (patient, student, instructor) in the training scenario, making sure the student learner stage matches the instructor's teaching style. Self-directed learning competencies are required for nursing students to manage their own learning processes, yet student groups, to a certain extent, seem to lack such abilities. Nursing faculties, therefore, need to facilitate the development of self-directed learning competencies prior to student engagement in unsupervised clinical skills learning.

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Part I

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1 Introduction

This thesis describes the process of active student involvement in the development of a technology-based learning tool for clinical skills training. The thesis also explores how the technology-based learning tool can facilitate unsupervised learning, and discusses how students can become increasingly self-directed learners.

Clinical skills are generally defined as all actions, behaviors, or decisions concerning patient care according to Rennie (2009). As a skilled nurse, it is important to master both the technical performance of practical procedures, such as intravenous infusions or wound care, as well as to know the underlying reasons for why, when, and how to perform such procedures. In order to do this, a nurse needs to be able to reflect and adapt knowledge of natural and human sciences, technology, and ethics into the appropriate actions concerning patient care (Benner, Sutphen, Leonard, & Day, 2010; Lin, 2013). Acquiring the clinical skills, therefore, is an especially demanding activity for students, in which they need to combine components from the psychomotor, cognitive, and affective learning domains (Ross, 2012). In addition, minor knowledge gaps or slips can cause serious adverse events to patients (Benner et al., 2002; Hsu & Hsieh, 2013). The importance and complexity of clinical skills learning has, therefore, made it a subject for debate, concern, and innovation for decades (Freeth & Fry, 2005).

Clinical skills are traditionally taught using a combination of real-life rehearsals during practical placements and the simulation of different clinical nursing activities in clinical skills laboratories (CSL). Claims of diminished learning opportunities during practical placements has led to a growing emphasis on the importance of clinical skills training at the faculties CSLs (Wellard & Heggen, 2010). Accordingly, there has been increasing interest in methods that can help students acquire the necessary skills in the CSL. In line with general technological advancements in society, these methods have increasingly involved different technological components (Kala, Isaramalai, & Pohthong, 2010). While the literature disagrees about whether or not the technology provides students with better learning experiences (River, Currie, Crawford, Betihavas, & Randall, 2016), Horton (2012) believes technology is merely a

tool we use to mediate learning, and that success, therefore, is dependent on the design and development of such tools and not on the technology itself. While the early introduction of technology set out to replace the means of content delivery, the aim of today's technology is rather to enhance students' learning (Bullock & de Jong, 2014). Technology has also been regarded as an important factor to enable strained faculty staff to actively engage high numbers of students in learning activities instead of being passive consumers of learning content. While numerous technology-based tools have already been developed and designed, nursing educators are constantly looking for optimal ways of learning clinical skills (Bloomfield, Fordham-Clarke, Pegram, & Cunningham, 2010).

Together with the increasing focus on technology-enhanced learning, new policy initiatives and a growing literature within higher education are increasingly calling for students not only to be consulted during the development of learning strategies, but also to become actively involved in the creation of their own learning experiences (Bovill & Bulley, 2011; Könings, Brand-Gruwel, & van Merriënboer, 2010). With societal trends increasingly focusing on individuals' right to influence decisions concerning their own lives, and the literature indicating that active involvement has the potential to ease implementation and create legitimacy amongst its users (Fenton, 2014), such involvement should be a natural part of developing learning activities. Despite this, student involvement is lacking within higher education, and according to McKeown and Carey (2015), the involvement taking place is often limited to the use of representatives rather than active participation.

Institutions of higher education expect their students to take responsibility for their own learning. Consequently, a frequent training method for clinical skills learning within nursing education and for higher education in general is unsupervised training activities in which students must manage their own learning processes. In this context, the students are expected to initiate, engage, and evaluate their own learning to prepare for, and ultimately pass, exams. Over recent decades, with the increase in student numbers and decreasing numbers of faculty staff, increasing emphasis has been placed on unsupervised learning and training activities (Breymer, 2012; Lin, 2013; West, Usher, & Delaney, 2012).

Based on this, studies of active student involvement in the development of a technology-based learning tool for unsupervised clinical skill training would be a valuable contribution to nursing education research.

1.1 Nursing education in Norway

Norway is one of 29 signatories to the 1999 Bologna Declaration, which means the Norwegian Government has committed itself to implementing a common qualification framework that makes academic programs standardized and comparable throughout Europe (European Ministers of Education, 1999). As a result, institutions delivering the Norwegian Bachelor of Nursing degree are subject to government control and must follow the centralized framework *National Curriculum Regulations for Nursing Programs* when developing educational programs and curricula (Norwegian Ministry of Education and Research, 2008). In Norway, there are 14 different educational institutions that offer a Bachelor's Degree in Nursing. This degree qualifies the graduate to become a Registered Nurse (RN).

The *National Curriculum Regulations for Nursing Programs* differentiates between two different forms of clinical skills training: skills training during practical placements (*praksisstudier*) and simulated skills training (*ferdighetstrening*). Together, the joint training must give 90 ECTS (European Credit Transfer and Accumulation System), of which 15 ECTS are gained through simulated skills training. Skills training could be performed in the faculties' own CSL or demonstration rooms and must give the student 'personal knowledge developed by the individual through trial and own experience' (Norwegian Ministry of Education and Research, 2008, p. 10).

In an international context, Norway operates with one of the highest amounts of practical placements in the world and has some of the strictest regulations relating to how much time spent in the CSL can count as clinical placements. Where other countries approve of training in the CSL as clinical placements, Norway only allows the 15 ECTS mentioned to replace clinical practice. Although students spend more time in the CLS performing practical training, this cannot replace the amount of time spent in allocated practical placements, according to Norwegian regulations. There is an ongoing global debate concerning what can be described as clinical practice, whether CSL training

can replace practical placements, and if so, what is the minimal amount of practical placements needed and how much can be replaced by CSL training. Irrespective of the outcome of this debate, the growing demand for nurses worldwide, which will increase the pressure on already strained clinical placements, will create a need for effective clinical skills training methods in the CSL which manages to prepare students for their future profession.

1.2 Clinical skills training in nursing education

As mentioned, nursing faculties traditionally teach clinical skills in their own CSL (Wellard & Heggen, 2010). The CSL, designed to mimic a hospital ward, is a facility located within the nursing faculty's premises, and is built for the sole purpose of actively simulating clinical nursing activities in a clinical setting (Jeffries, Rew, & Cramer, 2002). Training in the CSL removes the fear of patient harm, and is believed to be an important component in pre-registration clinical skill development (Freeth & Fry, 2005; Hilton & Pollard, 2004). Although little consensus exists on which pedagogical approaches best support students' development of nursing knowledge (Wellard & Heggen, 2010), CSL training is based on the statement 'practice makes perfect' (Dunn, 2004). Training in the CSL focuses on giving the students repetitive training consisting mainly of different forms of simulation activities in which different nursing activities are 'mocked' (Overstreet, 2008). CSL training is most commonly based on a combination of supervised (teacher-directed) and unsupervised (student-directed) learning activities (Wellard, Solvoll, & Heggen, 2009).

Supervised: Traditionally, students are given 2-4 hours of supervised skills training for each skill, depending on the topic (Lin, 2013). The design of the supervised training sessions varies, but consists mainly of teacher demonstrations followed by student repetition and practice (Wellard & Heggen, 2010). At the end of each session, teacher and student discussions concerning procedural guidelines and practices are encouraged.

Unsupervised: Students are expected to engage in different unsupervised, student-initiated learning activities both before and after the supervised training sessions. Prior to supervised training, the students are expected to prepare for the upcoming sessions through engagement in various activities such as

multiple choice testing, curriculum reading, and instructional videos. After supervised training sessions, based on the principle of practice makes perfect, the students are expected to engage in as many variable training activities as needed in order to master the different clinical skills. Depending on the faculty concerned, students have the opportunity to use the CSL for unsupervised practice in order to train in an authentic environment. Faculties also provide students with variable forms of learning resources, such as case studies, reading material, posters, tests, practice mannequins, etc. for students' use during training.

1.3 Technology introduction in clinical skills training

Due to technological advancements, the different educational institutions have increasingly embedded a technological component in both the supervised and unsupervised learning and teaching methods concerning clinical skills learning (Lahti, Hätönen, & Välimäki, 2014; River et al., 2016). Video lectures, web-based courses, high- and low-fidelity simulation, virtual patients, serious games, personal digital assistants, digital multiple-choice tests, and instructional videos and podcasts constitute just an exemplary selection of the current technology-based learning tools within skills acquisition (Gerdprasert, Pruksacheva, Panijpan, & Ruenwongsa, 2011; Guise, Chambers, & Välimäki, 2012; Lashley, 2005; Mundy, 2007; Petit dit Dariel, Raby, Ravaut, & Rothan-Tondeur, 2013; Petty, 2013). One of the arguments for introducing technology, besides increasing active student approaches, is that the students of today adapt easily to technology-based learning tools and their application and prefer pedagogy based on teamwork, familiarity with the technological process, and opportunities for realistic immersion (Skiba, 2007).

As a consequence of the massive amount of different technology-based learning tools, the field also flourishes with different concepts, used interchangeably, at the same time as the tools are evolving (Rice & McKendree, 2014). For the purpose of this thesis, the term *technology-based learning tool* will be used as it broadly covers all learning tools that provide learning material through a technological device.

1.4 Active student involvement

The goal of active user involvement is to place user needs at the center of the design process (Bate & Robert, 2007) and thus view the user as a knowledgeable and critical partner in learning (Shor, 1992). While the idea of user involvement already is an established best practice within health care services (Fenton, 2014; Tremayne, Russell, & Allman, 2014), nursing education has only partially embraced the student collaboration concept. Student experiences have, however, been deemed valuable for future educational improvement (Papathanasiou, Tsaras, & Sarafis, 2013), and student involvement has been used in the design of some curricula (Happell et al., 2014). There is also comprehensive literature on student use, benefits, barriers, and students' experiences with already developed programs and devices (Button, Harrington, & Belan, 2014; Mancuso-Murphy, 2007; Raman, 2015). On the other hand, there is a shortage of literature on active involvement of nursing students in technology-based development processes and especially a lack of descriptive studies that examine the role of the students as they are engaged in the creation of their own learning activities (Kirschner, 2015).

1.5 Aim, objectives, and research questions

This thesis will investigate how students can become active participants in the development of a technology-based learning tool and how this tool can facilitate unsupervised clinical skills learning. More specifically, the aim of the thesis is twofold:

- I. To explore the process of active student involvement in the development of a technology-based learning tool
- II. To explore how this technology-based learning tool can facilitate unsupervised clinical skills learning

Objectives

1. To explore students' perceptions of their learning environment in a clinical skills laboratory (Paper I).
2. To explore and describe the process of active student involvement when developing technology-based learning material for clinical skills

training (Paper II).

3. To investigate how groups of nursing students utilize a technology-based learning tool in clinical skills training (Paper III).

Research questions

- a) How do nursing students perceive their CSL environment? (Paper I)
- b) How can nursing faculties actively involve their nursing students in the process of developing technology-based learning material? (Paper II)
- c) How can students' roles and contributions in the development process of technological learning material be described? (Paper II)
- d) How can groups of nursing students' variability in performance when using a technology-based tool tailored for clinical skills training be mapped? (Paper III)
- e) What are the factors influencing groups of nursing students' ability to utilize a technology-based tool during clinical skills training? (Paper III)

1.6 Thesis structure

The thesis consists of two parts. Part I covers seven chapters: the introduction, theory, methodology, summary of results, discussion, conclusion, and implications. Chapter 1 has introduced the background of the thesis and given reasons for the aim of the thesis. Chapter 2 will briefly introduce the reader to different learning paradigms in order to position the thesis in a broader theoretical context, before presenting and describing the chosen theory of andragogy and self-directed learning as the theoretical framework for the thesis. The methodological approach is described in detail in Chapter 3, and includes the philosophical underpinnings, research design, thesis stages, thesis context, setting, participants and data collection, data analysis, ethical considerations, trustworthiness, and methodological reflections. Chapter 4 provides a summary of the findings within the three respective papers before briefly offering the reader a synthesis of the thesis findings, which form the basis for the discussion. Chapter 5 discusses the findings in view of the theoretical framework of self-directed learning. Chapter 6 incorporates the thesis conclusion, while Chapter 7 states the implications of the findings of the thesis and suggestions for future research. Part II consists of the three papers upon which the thesis builds.

List of Papers

Paper I

Haraldseid, C., & Aase, K. (2017). Variability among groups of nursing students' utilization of a technological learning tool for clinical skills training: An observational study. *Journal of Nursing Education and practice*, 7(7), e1-e6. doi:10.5430/jnep.v7n7p66

Paper II

Haraldseid, C., Friberg, F., & Aase, K. (2015). Nursing students' perceptions of factors influencing their learning environment in a clinical skills laboratory: A qualitative study. *Nurse Education Today*. doi:10.1016/j.nedt.2015.03.015

Paper III

Haraldseid, C., Friberg, F., & Aase, K. (2016). How can students contribute? A qualitative study of active student involvement in development of technological learning material for clinical skills training. *BMC Nursing*, 15(1), 1-10. doi:10.1186/s12912-016-0125-y

2 Theoretical framework

In order to position the thesis theoretically, the chapter will start with a brief introduction of different learning paradigms. Subsequently, the chapter will present an argument for the chosen paradigm and the choice of learning theory, before presenting the theory of self-directed learning in detail.

2.1 Learning paradigms

Within education, there are a number of learning theories, some overlapping, some clearly distinct from each other, all with possibilities of informing practice (Kaufman & Mann, 2013). The variety of learning theories is generally placed within different paradigms. Although different classification systems and labels exist, a basic overarching classification of learning paradigms often distinguishes between behaviorism, cognitivism, constructivism, humanism, and, more recently, connectivism. These different paradigms distinguish between how their theorists believe learning occurs.

In the behaviorist paradigm learners are assumed to be passive or reactive, where change in behavior or learning is achieved through positive or negative reinforcement and repetition (Skinner, 2011). The focus is on external changes exclusively, where all behavior is influenced by environmental factors and can be explained without considering internal processes such as mental state or consciousness (Watson, 2013). Within the cognitivism paradigm, the learner is viewed as an active participant and information processor whose actions are a consequence of thinking. The cognitive paradigm attends to the acquisition of knowledge and how a person gains, processes, mentally organizes, and retrieves information (Ertmer & Newby, 1993). This view is set apart from the behavioristic approach as it considers the individual to have an active mental activity prior to his/her response to stimuli from the environment (Shuell, 1986). The constructivism paradigm holds the premise that learning is an active constructive process, in which learning is equal to creating meaning from experience (Bednar, Cunningham, Duffy, & Perry, 1992). Through experience and interaction with his/her environment, the learner constructs personal interpretations of the world. Since interaction is crucial for constructing the uniqueness and complexity of the learner's context, the context is in this

paradigm seen as an integral part of the learning process (Jonassen, 1992). The humanist paradigm emphasizes the necessity to see the person as a whole. Proponents of this paradigm believe individuals act with intent, have inherent goodness, and that learning is a natural desire. With regard to learning, humanism emphasizes the importance of the process rather than the outcome (DeCarvalho, 1991). Connectivism, is a more recent paradigm. According to its founder, Siemens (2005), the process of learning within this paradigm is no longer about acquiring more knowledge from information resources, but rather to form connections between holders of information and maintaining those connections.

Choice of learning paradigm

Choosing one of these learning paradigms does not undermine the value of the others, but rather implies taking a distinct view of the phenomenon under study, clarifying for the reader what perspective the researcher has applied.

The philosophical assumptions behind both behavioral and cognitive theories are based on an objectivistic approach that there is a real world, which is external to the learner. Constructivism holds that what we know of the world depends on how we interpret our experiences. While the objectivist approach holds that knowledge is *acquired*, constructivists believe humans *create* meaning. While constructivists do not oppose the notion that a real world exists, they do not believe there is an objective reality the learner can strive to know. Humanism was developed as a contrast to the objectivistic approach of cognitivism and behaviorism, and this paradigm is more concerned with how personal development can foster learning, rather than trying to explain how knowledge acquisition occurs. As opposed to the other paradigms, connectivism, on the other hand, claims to address learning which occurs entirely outside of people.

An underlying assumption of the thesis is not to reach an objective truth, but rather to explore and describe the knowledge created during the different interactions between students and their CSL environment. Such interactions include those between participants in the development process, between students and the technology-based learning tool content, as well as interactions within a group of students practicing clinical skills, in line with constructivism.

Choice of learning theory

A range of different learning theories exist within the paradigm of constructivism. Among them is situated learning and communities of practice by Lave and Wenger (1991, 2002). Both of these are important underlying theories for nursing education, students' professional socialization, the development of professional identity, and clinical skills learning. Situated learning views development and learning as a transformation that occurs through participation in community activities where the key to learning is participation. Participation more specifically concerns interaction with community members who can show new members how activities are played out (Lave & Wenger, 1991). The most important task of the new member is to gain knowledge of the particular community and what sets it apart from other communities (Lave & Wenger, 2002). The learner learns different aspects of the community through different relationships with different groups of the community, including masters, more advanced apprentices, and peers. How these different groups collaborate, collude, and collide, and what they enjoy, dislike, respect, and admire (Lave & Wenger, 2002) gives the learner the opportunity to gain insight into the community. According to Lave and Wenger (1991) situated learning occurs in a community of practice (*CoP*). A CoP consists of groups of people who share a concern or passion for something they do, and learn how to do it better as they interact regularly (Wenger, 1998). In order to be a CoP and not just a community, the CoP must have a combination of three characteristics: there must be an identity connected to a shared domain of common interest among the members. The members of a CoP must also engage in joint activities and build relationships that enable them to learn from each other. In addition, the members are practitioners who have a shared practice; experiences, stories, and tools, not just people who like the same things.

Concerning students' clinical skills learning within an educational setting, one could argue that situated learning theory has its benefits. The CSL could be viewed as a community in which students train and learn from interacting with other members of the community such as masters (teachers), more advanced apprentices (more advanced students), and peers (students at the same level). However, the aim of this thesis is to explore not only how students learn clinical skills, but also how technology can facilitate such learning and the process of

student involvement in the development of a learning tool. A broader theory would therefore be useful. Knowles' (1975) self-directed learning theory (SDL) is relevant in this respect. Although the thesis is placed within the paradigm of constructivism, SDL and the associated andragogy stems from a humanist paradigm (Lincoln, Lynham, & Guba, 2011). However, according to Herman (1995), the constructivist and humanist paradigms are linked as they both focus on intrinsic motivation, learning processes, teacher-student relationships, and active instead of passive students. Herman further suggests that these paradigms complement each other and that constructivist-based research within teaching and learning can derive benefits by exploring ideas from the humanistic paradigm. Kaufman and Mann (2013) furthermore argue that SDL can be viewed from a constructivist perspective.

2.2 Self-directed learning

The concept of self-directed, lifelong learning springs from the work of Knowles (1973, 1975) and his work within adult learning; andragogy and self-directed learning (SDL). SDL is essentially a learning process initiated by the individuals themselves. It addresses both the teachers' role as facilitators of learning as well as the learning process, and suggests different views on how to organize and accommodate learning experiences. It can occur both within and outside formal settings, but a number of factors both within the learner and within his/her environment will affect their ability to be self-directed (Kaufman & Mann, 2013). It is an underlying assumption within this theory that the learner assumes an active participating role in the learning process, which is in line with the overarching aim of this thesis.

Within the literature of self-directed and self-regulated learning there are tangled relationships between different terms, which cause confusion and misunderstandings (Saks & Leijen, 2014). Due to subtle and inconsistent differences between similar terms such as directed self-regulated learning, learning directedness, autonomous learning, self-planned learning, self-teaching, and independent learning, these terms are often used interchangeably with the same meaning. While the terms have something in common, they spring from different underlying theoretical backgrounds and should be treated separately (Saks & Leijen, 2014). In this thesis, self-directed learning and

andragogy have been employed throughout, although I acknowledge that parallel terms such as self-regulated learning could be relevant.

In order to offer an understanding of the underlying assumptions of SDL, the following section will first briefly explain Knowles' concept of andragogy (adult learning) before elaborating on Knowles' self-directed learning theory.

2.2.1 Andragogy

An important theoretical underpinning of self-directed learning is Knowles' (1973) work of andragogy. According to Knowles (1973) *andragogy*, the study of how adults learn, is essentially different from *pedagogy* and how a child learns, in the sense that adults have assumed responsibility for managing their own lives (Merriam, Caffarella, & Baumgartner, 2012). While a phenomenon as multi-faceted as adult learning would be difficult to explain with one simple theory, Knowles (1980) offers a set of underlying characteristics of the adult learner which he sees as fundamental to the design and development of adult learning programs. According to Knowles, the six characteristics are: 1) adults' self-concept is well developed; 2) adults bring considerable experience to learning; 3) adults' readiness to learn depends on their needs; 4) adults tend to have a problem-centered focus; 5) adults are generally internally motivated, and 6) adults need to know why they need to know something. In contrast to children, the adult learner generally needs situation-specific skills to resolve problems, to be able to immediately apply knowledge to the current problems at hand, as well as to find the learning task meaningful, be self-directed, and draw on own experience (Merriam et al., 2012). An important aspect within andragogy is that the role of the teacher evolves into a facilitator of learning, where the student is involved in all phases of the learning process (Kaufman & Mann, 2013).

Knowles' andragogy has been criticized for not being a "proven theory," but rather sound principles of good practice (Merriam et al., 2012). Knowles (1980) responded to this criticism by stating that rather than providing a theory, he provides the view that learning is something occurring in a continuum, where the learner moves from being teacher-directed to becoming student-directed or self-directed when they get older. Knowles does not exhaustively clarify all aspects of the adult as a learner. However, the perspective of adulthood is

essentially important as it demands a fundamental shift in the approach to learning. To view the learner as an adult takes into account that learning is a process shaped by the context of the adult's life. The society to which the learner belongs to therefore to a greater extent evens out the skewed power balance between the student and the teacher. As the student participants in this thesis are university students aged between 21 and 44, they are characterized as adult learners, and the approach to learning should therefore reflect this fact.

2.2.2 Knowles' self-directed learning theory

Self-directed learning builds on the principle that adults become increasingly self-directed as they mature. According to Knowles (1975, p. 18) the broadest definition of self-directed learning is

'a process in which individuals take the initiative, with or without the help of others, in diagnosing their learning needs, formulating learning goals, identify human and material resources for learning, choosing and implementing appropriate learning strategies and evaluating learning outcomes.'

Knowles (1975) further states that while there are numerous other similar labels to describe this process, they often view learning in isolation, while self-directed learning, according to Knowles, includes various kinds of facilitators and helpers in the learners' surrounding environment, such as teachers or peers.

A different assumption of learner needs

Self-directed learning is the opposite of being taught, or so-called "teacher-directed learning". The two opposites are based on different sets of assumptions. Teacher-directed learning has the underlying assumption that the learner has a dependent personality and needs to be taught, suggesting that the teacher decides what and how the learner should learn. While self-direction is based on the assumption that the learner grows in capacity to be self-directed and that the teacher's job is to help adults learn by nurturing this already embedded capacity (Knowles, 1975).

Self-directed learning takes into account that the learner has some previous experience that should be combined with resources from experts in the learning

process. Underlying SDL is the assumption that individuals mature differently. This means not all individuals are ready to learn the same thing at the same time. Self-direction also assumes that learning is internally motivated, that the learner learns due to curiosity, the urge to grow, the satisfaction of accomplishment, and the desire to achieve, rather than grades or degrees. According to Knowles (1975), the distinction between being facilitated and being taught may lie primarily in the attitude of the learner. While self-direction is preferred, adults also encounter situations in which they need to be taught, for example on occasions where they have no previous experience.

The andragogical learning process

Knowles (1975) proposes that the teacher is a facilitator of learning, which, he stresses, is a rather fundamental role transformation. While the teacher previously has been concerned with deciding *what, how, and when* to learn, he/she must now function as a facilitator of a student-governed learning process. In order to facilitate students' learning process, Knowles (1975) suggests the adoption of seven elements of an andragogical process design: *climate setting, planning, diagnosing needs for learning, setting goals, designing a learning plan, engaging in learning activities, and evaluating learning outcomes*. It is the student who is in charge of deciding what, when, and how to learn, while it is the teacher's job to clarify for the students how he/she can be of assistance. In the following, an overview of what the different steps entail for both teacher and student will be presented.

Climate setting: The teacher must ask him/herself how he/she can best set the climate within the group of learners, getting them to become familiar with one another and recognize one another as mutual resources of learning. The teacher must also help them become familiar with the concept of SDL and the teacher's role as a facilitator, as well as help them figure out how to build trust between members of the group and between the learners and the teacher. The students' task in this part of the process is to clarify and describe how each person can contribute to the specific task at hand. Knowles believes this can be done in discussion groups that address underlying assumptions for SDL, why SDL should be used for this project, and what SDL in essence is.

Planning: instead of planning what content to cover and how, the teacher must

Theoretical framework

plan what different options he/she is to present to the learners. While it is the teacher's task to plan for different procedures to use in order to learn, it is the learner him/herself who decides which procedure to choose. The teacher must ask him/herself how he/she can involve the students in this decision making and help them find the best suitable approach.

Diagnosing needs for learning: the teacher should now construct a model of objectives for a specific learning experience. He/she must ask him/herself how this can be presented so that the students feel free to adjust it according to their own preferences. The objectives therefore are not a set standard, but suggestions for use. The teacher must also reflect on how he/she can help the students realize if there are discrepancies between their present level of development and the level of their objectives. The students' task at this stage entails discussing what competencies are required for the specific learning task and self-rating of the different group member's competencies, clarifying what competencies are required for this task.

Setting goals: When the needs have been diagnosed, the teacher must facilitate the students' translation of needs into learning objectives that are clear, feasible, specified, meaningful, and measurable. The teacher must take care to present the suggested changes constructively, so the students are equipped to make the necessary changes.

Designing a learning plan: the teacher must now present different models and guidelines for designing a learning plan the students can choose from. He/she must also expose the students to different learning resources they may not yet have thought about and make room for them to help each other. When designing a learning plan, the students could draft a learning contract in which they state the learning objectives, learning resources, and strategies, as well as what counts as evidence of accomplishments and criteria for how to validate the evidence. While the students can draft this individually, both group members and the teachers should comment on the draft before the students finalize it.

Engaging in learning activities: The teacher must take responsibility for engaging in some learning activities in order to meet common objectives for the group. He/she should also reflect over which suggested activities are delegated to groups of students and which should be individual tasks, as well

as how to make him/herself available as a resource and assess the quality of the performance of learning activities. The students' task is to choose which learning activities they would like to engage in and whether such activities should take place individually or in a group.

Evaluating learning outcomes: With respect for the learners' self-directedness, the teacher must communicate to the students his/her perceptions on their accomplishments regarding learning objectives. This must be done in a way that enhances the students' self-conception and thereby their self-directedness. In this step, the student is responsible for presenting the evidence he/she previously stated in the learning contract and discuss with peers and the teacher whether or not the objectives are achieved.

Knowles (1975) acknowledges that this rather unstructured layout stresses learners who are new to SDL. He therefore emphasizes that there is a structure, but it is a process structure rather than a content structure. The teacher, however, is in charge of the process and will guide the students through it and make choices for them, when they are not able to. On the other hand, this strategy demands that the students take on more responsibility for their own learning process. It focuses primarily on the acquisition of content rather than transmission of content, which demands students to be co-producers of the content they are to learn. One of the primary responsibilities of the teacher is to help students develop competences that enable them to follow the andragogical process and become increasingly self-directed learners.

2.2.3 Different views of self-directed learning

Since 1975 SDL has evolved along three somewhat overlapping pathways; to view it as personal attribute of the learner, to view it as a goal of learning, or to view it as a process or method of learning (Merriam et al., 2012).

To view SDL as a personal attribute of the learners stems from Knowles' (1975) assumptions about some underlying requirements for the self-directed learner. These assumptions again build on the work of Tough (1971), which Knowles refers to throughout his work. The requirements are concerned mainly with the learner's ability to view him/herself as a non-dependent and self-directed person, who can collaborate with peers, is able to realistically set learning goals

for him/herself, is able to locate and make use of learning resources, and relate to teachers as facilitators. To what degree these requirements are found can differ between the learners and within the learner depending on the task the learner will address. A large research field has examined this particular view of seeing self-directed learning as a personal attribute of the learner. Researchers in this field have directed their attention especially towards the characteristics of self-directed learners. Researchers such as Candy (1991), Garrison (1997), and Oddi (1986) are all especially concerned with who the best self-directed learner is and what it is that makes him/her self-directed.

A different view of SDL, to see it as a goal, also stems from the work of Knowles (1980) and Tough (1979), who believe the goal of SDL is to enhance the learner's ability to be self-directed. Other researchers, such as Mezirow (1985), Brookfield (1986, 1993), and Collins (1996) have followed their work, but have claimed that the goal is somewhat different. They suggest it is either to foster transformational learning, which entails changing the learner's consciousness concerning own learning, or to promote emancipatory learning in which the learner him/herself holds the power of making all the educational decisions. While all of these overlapping pathways complement different parts of the same theory, the most suitable view for this thesis is to see self-directed learning as a process or method of learning.

SDL as a process or method of learning

Merriam et al. (2012) state that most models of SDL reflect the aim of enhancing the learner's ability to be self-directed. Within a wide array of models, there is a difference in nature, from being linear to interactive or instructional.

The early work on SDL by Tough (1971) and Knowles (1975) outlined SDL as a linear process in order to choose what, where, and when to learn. The two authors developed somewhat similar steps following the andragogical process. Later models have claimed SDL to be a more interactive process, which is less planned and more dependent on opportunities, personal characteristics, cognitive processes, and context, which results in episodes of SDL. A known interactive model is from the work of Brockett and Hiemstra (1991) and their model of Personal Responsibility Orientation (PRO). Then again, other models

have an instructional focus describing how the facilitator of learning or instructor can integrate self-directed learning methods in educational programs (Merriam et al., 2012). In the following, an instructional model deemed relevant for the technological-based learning tool developed through this thesis is presented.

Staged self-directed learning model

Grow's (1991) model of staged self-directed learning (SSDL) describes how teachers can help students become more self-directed. He believes students move through different levels of self-direction, and that teachers or facilitators can help or hinder this advancement towards greater self-direction. In order to help advancement through the stages, the teacher must be able to match the learner's stage with the teacher's style. Grow's work builds on Hersey and Blanchard's (1988) work within management theory and extends it to education. The model is outlined as a grid where there are four different learner or student stages (S1-S4). These stages are placed upwards on the vertical axis; S1 dependent learner, S2 interested learner, S3 involved learner, and S4 self-directed learner. For every learner stage the model suggests possible roles for the teacher (T1-T4), which are placed on the horizontal axis: T1 authority/expert, T2 salesperson/motivator, T3 facilitator, T4 delegator. See Figure 1.

Theoretical framework

Stage 4: Self-directed learner	<i>Severe mismatch student resents authoritarian teacher</i>	<i>Mismatch</i>	Near match	Match
Stage 3: Involved learner	<i>Mismatch</i>	Near match	Match	Near match
Stage 2: Interested learner	Near match	Match	Near match	<i>Mismatch</i>
Stage 1: Dependent learner	Match	Near match	<i>Mismatch</i>	<i>Severe mismatch student resents freedom they are not ready for</i>
↑ Learner stage	T 1: Authority, expert	T 2: Salesperson, motivator	T 3: Facilitator	T 4: Delegator
→ Teacher style				

Figure 1: Grow's (1991) model of mismatch between learner stages and teacher styles

According to Grow (1991) the different stages entail the following:

Stage one: Learners of low self-direction. Students at this stage are ‘dependent learners,’ who should be coached by an ‘authority/expert.’ The students need to be told what to do, when and how to do it, and be given concrete learning tasks, and immediate feedback that is task oriented and frequent. This type of learning could be seen in parallel with the transfer of knowledge, where teachers ‘pour’ knowledge into students. At this stage, the students are in the phase of getting the basic mechanical skills right.

Stage two: Learners of moderate self-direction. At this stage, the learners are described as ‘interested.’ They can be motivated by a ‘salesperson/motivator’ who uses motivational strategies. These students are willing to perform key assignments as long as they see the purpose. The teacher’s role, therefore, is to motivate and reinforce, using enthusiasm and supportive approaches. The

teacher must clearly explain why something is important and how learning will help the students. If the students become motivated, they will continue to learn on their own. Since the teacher, at this stage, is to help the students become more self-directed he/she should encourage the students to set their own goals.

Stage three: Learners of intermediate self-direction. Learners at this stage see themselves as participants in their own education. They are labelled ‘involved learners.’ With a good guide or ‘facilitator’ they are ready to explore subjects. Students at this stage will develop critical thinking and individual initiative and acknowledge that they are co-creators of the culture that shapes them. The teacher at this stage is a participant who joins the students in the learning experience. Students and teacher share decision making, while the students increasingly have the power to decide, and the teacher provides different tools to use. Written criteria and checklists will help learners monitor their own progress.

Stage four: Learners of high self-direction. The learners are equipped to set their own goals and standards, and to choose how to reach them. They are ‘self-directed learners.’ These learners use learning tools, teachers, and educational institutions as they see fit, and ‘shop’ between different learning resources to pursue their goals, with or without a teacher present. At stage four, learners can learn from any type of teacher, but thrive best with full autonomy. The teacher at this stage is not absent, but focuses rather on cultivating the students’ ability to learn by being a ‘delegator.’

In his model, Grow (1991) proposes matches and mismatches between student and teacher stages. While there are 16 different combinations, only four are presented as matches, while two are severe mismatches (see Figure 1). Grow states that there are different ways of filling the teacher roles and that matching must be guided primarily by the student’s level of ability to participate.

3 Methodology

This chapter presents the underlying methodology for conducting the PhD project. The chapter starts with a brief introduction of philosophical underpinnings, then presents research design, thesis stages, context, setting, participants, and data collection, before describing methods for data analysis, ethical considerations, addressing issues of trustworthiness and account for methodological reflections.

3.1 *Philosophical underpinnings*

The fundamental philosophy of knowledge has implications for how the area of interest can be studied. As mentioned earlier, this thesis is placed within the paradigm of constructivism. However, there are different forms of constructivism. The flavors range from the radical belief that objective reality is nonexistent because each individual constructs his/her own meaning, to the more pragmatic view where knowledge is the product of many learner-centered processes (Rovai, 2004). The essence of constructivism is that knowledge is built by the learner, with a primary focus on the individual mind's construction of meaning (Crotty, 1998). When we "stretch" this concept to include that what is learnt is learnt through something external and sharable, like a computer, constructivism becomes constructionism (Papert, 1990). By adding culture to the equation, and emphasizing that culture shapes the way we see things, constructivism has gone via constructionism to becoming social constructionism (Crotty, 1998). Since the focus of this thesis concerns interaction between different participants and external artifacts (technology-based learning tool, talk, text), within a specific culture (CSL/nursing education), social constructionism constitutes the philosophy of knowledge underpinning this thesis.

This placement in the constructivist paradigm makes the researcher believe we construct our own personal reality (ontology) (Guba, 1996), that people construct their own understanding of reality, and that we construct meaning based on our interactions with our surroundings (epistemology) (Lincoln & Guba, 1985). We can, therefore, discover what we believe to be known through such interpretive approaches as interviews and observations (methodology)

(Angen, 2000).

3.2 Research design

To pursue the overall aim, this thesis has adopted a qualitative research design with an explorative approach. While qualitative methodology in general enables the researcher to explore social phenomenon and human experiences (Polit & Beck, 2008), an explorative approach gives the researcher the opportunity to investigate and describe problems to get a better idea of what is going on (Blaikie, 2000). The explorative approach serves the purpose of the thesis due to the novelty of the area of interest.

3.2.1 Participatory design

Participatory design (PD) is an approach which builds on the line of reasoning that the key to finding the knowledge gaps that matter lies in involving end users in the development and design of services (Sanoff, 2008). The process entails actively involving a group of people and bringing them to consensus on what they want to do and how best to do it. To meet the actual needs of the users, PD aims at describing users' knowledge by designing partnerships with participants in order to use such partnerships to design artifacts, workflow, or work environments. Since end users and active student involvement is a key element of this research, the thesis has adopted and followed a participatory design approach throughout.

It is argued that a PD process must have an iterative conduction to give the researchers and participants the opportunity to redefine and adapt their previous understanding of needs (Spinuzzi, 2005). Participation can be effectively addressed by asking simple questions such as who, what, where, how, and when (Sanoff, 2008). Through this process, PD can facilitate the implementation and creation of the benefits of credibility and legitimacy, while ensuring that the final design truly meets the precise needs of its users (Fenton, 2014). PD has increasingly become an important approach for human-computer interaction and related fields (Spinuzzi, 2005), and has been suggested for use especially within educational settings due to its ability to consider student perspectives (Könings, Brand-Gruwel, & Merriënboer, 2010). While PD does not entail a specific description of how to involve end users in the development process,

Spinuzzi (2005) argues that research with a participatory design often entails three basic stages: 1) exploration of work, 2) discovery processes, and 3) prototyping. The initial stage involves meeting the participants and allowing them to familiarize themselves with the way they work together. In stage two, researchers and participants agree upon and clarify the users' goals, values, and desired outcomes, while stage three usually entails an iterative process in which the designers and users shape technological artifacts to fit the users' needs.

Theoretically, participatory design is grounded in the constructivist paradigm, and knowledge is, as such, situated in a complexity of artifacts, practice, and interactions. Much knowledge is therefore tacit and implicit rather than explicit and articulated, demanding observation as well as conversation (Spinuzzi, 2005).

3.3 Thesis stages

Inspired by the three most common stages of participatory design – ‘exploration of work,’ ‘discovery process,’ and ‘prototyping’ (Spinuzzi, 2005), the thesis progressed following four stages, adding a fourth stage to explore the utility of the developed tool. The four stages again resulted in the three different articles of the thesis. Stage one resulted in Paper I, where the aim was to explore the students' perceptions of current clinical skills training. Stages 2 and 3 resulted in Paper II, where an iterative process together with the students explored how the technology-based learning tool could best fit the students' needs. This resulted in a prototype of the technology-based learning tool content. In addition to the three common stages of the participatory design, this thesis also entailed a fourth stage, which resulted in Paper III, in which the aim was to investigate factors influencing the student groups' ability to utilize the technology-based learning tool.

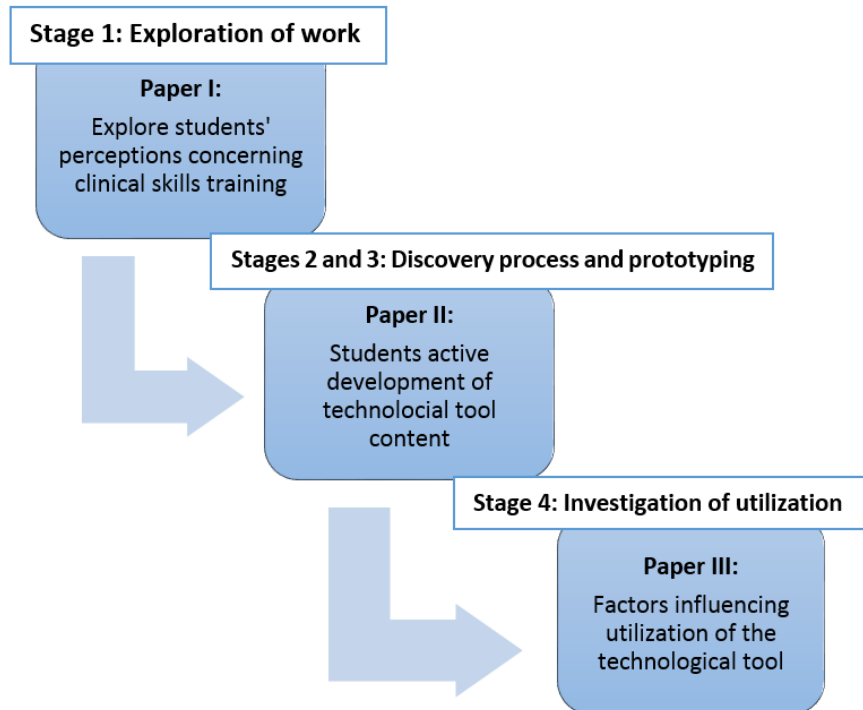


Figure 2: Overview of thesis stages

3.4 Thesis context

The thesis context revolves around the teaching and learning of clinical skills at a Norwegian nursing faculty. The faculty is located at a small university with approximately 12,500 students. The university is responsible for a relatively large part of the country's output of Bachelor of Nursing degrees, with close to 900 students enrolled for the degree, divided between the three different years. More precisely, the research activities in this thesis are concerned with the students, the staff, and the activities connected to a clinical skills course in the 2nd year of the nursing degree.

3.4.1 Clinical skills course

The clinical skills course and most of its activities are located in the faculty's

CSL. The course is held for second-year nursing students, and has the learning objective of mastering 13 different clinical skills (see Haraldseid, Friberg, and Aase (2015) for an overview). It is made up of a combination of supervised and un-supervised training sessions. The students are given a total of nine three-hour supervised training sessions wherein a teacher-led group of 10-12 students practice the 13 different scenarios. Every session revolves around a case study concerning specific skills (e.g., intramuscular injection, nasogastric tube insertion, wound care), each of which has its own specific learning objectives designed to strengthen the students' ability to deliver comprehensive care by applying critical thinking, reasoning, and decision-making skills. The supervised training usually consists of a three-step routine: the teacher demonstrates the procedure, the students' practice the procedure, and teachers and students reflect over the different performances of the procedure. During student practice, groups of two or three are assigned a bed in the CSL where the groups are expected to train based on the case study and its associated learning objectives. Usually, the students take turns practicing the skill, observe or act as patient. The teacher is present for questions and discussions. In addition, the students are expected to train as much as needed in order to practically and theoretically master all of the 13 different skills through their unlimited access to the CSL. Throughout the course, and in preparation for each session, the students are encouraged to use all of the available didactic tools: multiple-choice tests, instructional videos, assigned reading and an internet-based discussion forum. To pass the course, the students must take a practical-oral exam in which two of the faculty teachers assess their abilities in any one of the 13 different skills, which skill they are tested in is chosen randomly. In order to pass the exam the skill performance must be accomplished with regards to safe practice, hygiene, practical performance, and utilization of available resources in order to pass the course. All of the learning material developed through this thesis is based on the case studies concerning the 13 different skills the students are tested in, in this practical oral exam.

3.4.2 CSL environment

The CSL is designed to resemble a hospital ward to optimize the simulation of clinical learning situations. It holds 16 beds, all of which are equipped with privacy screens and located in four different patient rooms. Besides the ordinary

interior and layout of the patient rooms, there are toilets, a medical supply room, nurses' office, a decontamination and cleaning room, etc. There is also an auditorium in the CSL that seats up to 50 students for demonstration and reflection. The CSL is equipped with all the necessary reusable and stationary medical equipment. Single supplies such as nasal cannulas, wound dressings, and syringes are handed out to each student in a free equipment kit at the beginning of the course. These supplies are for one-time use only, but must be reused by the students during training if they do not wish to replace them with their own funds. If medical supplies are lost or broken, a few replacements are available upon request. Every patient room is equipped with a computer where the students can access different online-based didactic tools. All nursing students must meet uniform requirements at all times in the CSL. Students are encouraged to practice on peer students when advisable; for other procedures, basic mannequins are provided.

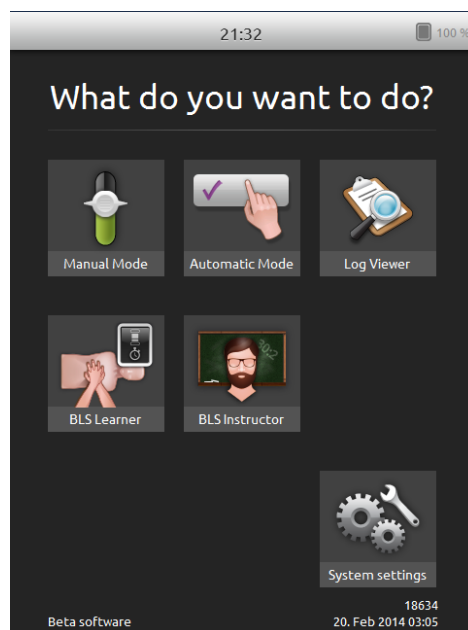
3.4.3 Technology-based learning tool

The technology-based learning tool used in this thesis was chosen due to its availability as it was already in the faculty's possession. The tool is a SimPad®, a handheld, wireless, portable tool developed by Laerdal Medical, and designed to be able to make high-fidelity simulation scenarios portable, through connection between the tool and an advanced simulator (SimMan 3G). SimPad has a touchscreen interface that gives the user different alternatives for running a simulated scenario in *manual* or *automatic* mode (see Picture 1).

The manual mode is for operating an advanced simulator (SimMan 3G). When using this mode, the scenario is dependent on an educated instructor driving the scenario, as the instructor must give orders to the simulator on how it is to react to the unfolding events. This mode is therefore a resource-demanding model of a scenario-based simulation; the students depend on faculty staff to facilitate the training, which dramatically reduces the possibility of repetitive training.

The automatic mode offers the opportunity to preprogram scenarios through the associated computer program 'SimDesigner'®. The software is a coding program that gives the programmer the ability to link actions to responses. This allows students to tailor the content of the SimPad® to meet their specific needs. The programmer can, for example, structure which actions is to be taken

(see Picture 2) create ‘pop-up screens’ with information (see Picture 3), give feedback on actions taken/not taken, provide a log of actions at the end of each scenario, add log comments, set time limits for when actions need to take place. This mode depends entirely on what is pre-programmed, as the tool cannot be overruled or manipulated once it is in use in this mode. In theory, a pre-programmed scenario could be run by an ‘uneducated’ instructor, as long as the scenario is pre-programmed. It is the possibilities this mode offers that makes the tool useful for active student involvement, since this mode needs demands the content to be designed. Since the SimPad® lacks a common name, which implies for others what it entails, and since it looks like a tablet, and has some of the capabilities of a tablet, although it cannot be connected to the internet, it is referred to as ‘*the tablet*’ throughout the thesis and in the papers.



Picture 1: Start screen on SimPad



Picture 2: Example of a preprogrammed scenario structure on the SimPad.



Picture 3: Example of a 'pop-up screen' with information.

3.5 Setting, participants, and data collection

All phases of the thesis were carried out on the premises of the same faculty, in offices, meeting rooms, classrooms, and CSL. The faculty was chosen for conducting all phases of the thesis because it offered a natural meeting point

Methodology

for all participants, a place where both researchers and students would most likely feel comfortable (Morgan, 1997). All student participants in the PhD project were recruited from the same nursing faculty between autumn 2013 and autumn 2014. None of the participants withdrew at any point of the study. In the following section setting, participants and data collection methods for each of the three papers will be described in detail. For an overview of the three papers, the different participants, and the data material, see Table 1.

Table 1: Overview of participants, material, and analytical approach

Paper	Participatory Design Stage	Aim	Participants	Data collection methods	Data material	Data analysis
I	1: Exploration of work	Explore students' perceptions of their learning environment in a clinical skills laboratory	19 nursing students (16 females and 3 males from academic year 2012/2013)	2 focus group Interviews	42 transcribed pages	Content analysis
II	2&3: Discovery process and prototyping	Explore and describe the process of active student involvement when developing technological learning material for clinical skills training	19 nursing students (16 females and 3 males from academic year 2012/2013) 1 clinical nurse specialist 2 faculty teachers 1 senior interaction designer	4 focus group interviews and 2 test sessions with field notes	42* + 14 transcribed pages 47 pages of field notes	Content analysis
III	4: Investigation of utilization	To investigate how groups of nursing students utilize a technology-based learning tool in clinical skill training	17 nursing students (15 females 2 males from academic year 2013/2014)	Video recordings	7 video recordings 221 min	Thematic analysis

*same as paper I

3.5.1 Paper I

Stage 1 of the participatory design process, ‘exploration of work,’ involves meeting the participants and getting to know the way they work together (see Figure 2). This stage was conducted at the beginning of the thesis and resulted in Paper I, whose aim is to map the students’ perceptions of clinical skills training in the CSL. An exploratory qualitative methodology using focus group interviews and content analysis was used to establish a knowledge base for understanding the CSL learning environment from the students’ perspective.

Setting and participants

The focus group interviews were conducted in January 2014 in a meeting room at the faculty between six and nine weeks after the students had completed the clinical skills course in the Bachelor of Nursing program. All students were recruited through purposive sampling in collaboration with the lecturers at the nursing school, using an open invitation in class in which I provided information about the aim of the thesis, what participation entailed, possible advantages and disadvantages, how the data material would be collected and handled, as well as the participants’ right to withdraw at any point (see Appendix III). All students wanting to participate were encouraged to approach me after class. Sixteen females and three males volunteered. Eight of the females were part-time students enrolled in the long-distance bachelor program and had a mean age of 41 (named group A). The remaining 11 students (three males and eight females) were full-time on-campus students with a mean age of 24 (named group B). The full- and part-time students were divided into two groups. This was done to ensure that the participants would be comfortable discussing the topic with each other and that their different, shared experiences with the CSL would generate meaningful discussions (Morgan, 1997). The split was also based on the hypothesis that their enrollment in different study programs (long-distance vs. on-campus) and the age and gender compositions would yield different student perceptions, which could provide a range of descriptions of the CSL learning environment (Krueger & Casey, 2009).

Data collection

Focus group interviews are carefully planned discussions designed to obtain perceptions of a special area of interest (Krueger & Casey, 2009). I moderated all the focus group interviews, while one of my co-authors functioned as assistant moderator, observed, and took notes. The two focus group interviews followed the same interviewing guide (see Appendix IV). The meeting room was set up with an oval table, gathering the students in a u-shaped form in front of the moderator, making it easy for the moderator to assess the level of participation (Morgan, 1997). The focus group interviews commenced with general questions to the students about their training and what they did in the CSL. After the students were comfortable with the moderators, questions gradually turned to the theme of the interview (Krueger & Casey, 2009). Questions pertained to issues the students enjoyed or found difficult in the CSL environment, their needs, and how training could be improved. Interaction among the students was encouraged, with the moderator asking prompting, and clarifying questions. Focus group interviews were audio recorded while both moderator and assistant moderator wrote field notes to complement the audio tape. The interviews lasted from 60-80 minutes.

3.5.2 Paper II

In Stage 2 of the participatory design process (see Figure 2), the researcher and participants' tries to agree upon and clarify the users' goals, values, and desired outcome. Stage 3 usually entails an iterative process where the designer and users shape technological artifacts to fit the users' needs. These two stages of the participatory design process resulted in Paper II, which aims to explore and describe the process of student involvement when developing technological learning material for clinical skills training. To engage students actively in the development process, an explorative qualitative approach was used to gather data from focus group interviews, field notes, and student notes.

Settings and participants

Paper II describes an iterative process with five different phases in which the students are involved in different activities in order to develop the content of the technology-based learning tool. The phases stretch over a period of time

prior to the data collection of Paper I and right upon the onset of Paper III. The process entails five phases: the initial, investigation, revision, exploratory test, and finalization phase (see Table 2).

Table 2: Overview of phases in paper II

Phase	When	Where	Activity	Data Material	Participants
Initial Phase	Autumn 2013	CSL on campus	Tablets borrowed 134 times for unsupervised training sessions	Field notes	165 students
Investigation Phase	Spring 2014	Meeting room on campus	Two focus group interviews	Transcription of interviews and field notes	Group A: 11 students Group B: 8 students
Revision Phase	Spring 2014	Office on campus	Four revision meetings E-mail exchanges	Field notes from meetings	Thesis author, clinical nurse specialist, faculty teacher, senior interaction designer
Exploratory test Phase	Spring 2014	CSL on campus	Two practical test sessions	Student notes during practical test	Group C: 5 Students Group D: 6 Students
		Meeting room on campus	Two focus group interviews	Transcription of interviews and field notes	Group C: 5 Students Group D: 6 students
Finalization Phase	Spring 2014	Office on campus	One revision meeting	Field notes	Thesis author, faculty teachers

All phases took place at different faculty campus locations. Prior to actively involving the students in the development process, a teacher team and I developed four prototype scenarios to exemplify for the students how the tablet's features could be used. The prototype scenarios were based on the same scenarios practiced in the supervised clinical skills training sessions. These were the same scenarios the students would encounter during the exam. In the initial phase all students of the 2012/2013 academic year who enrolled in the clinical skills course (165 in total) were informed of the ongoing project in a compulsory class. All students were then given a one-hour introductory lecture on how to operate the tablets, and offered the opportunity to test the device in groups. The prototype scenarios were also made available for use during two compulsory supervised training sessions, and were available for use during unsupervised training sessions. If wanting to use the tablets for unsupervised training the students could borrow the tablets in my office.

During the initial phase, the 165 students borrowed the tablets 134 times for use during unsupervised training sessions. The students participating in the investigation and exploratory test phase were recruited during the initial phase through purposive sampling among these 165 students. This recruitment was done after the students had completed their clinical skills course. The recruitment process was the same as that described in Paper I, as the same students were used to inform both Papers I and II. During the investigation phase, 19 students were divided into two groups, with eight students in Group A and 11 in Group B. The participants and the two focus group interviews during the investigation phase were identical to those in Paper I. In the exploratory test phase, 11 of the 19 students who participated in the investigation phase volunteered to contribute further with additional focus group interviews and training sessions to develop the contents of one of the prototype scenarios, the "wound care and dressing" scenario. The decision to participate further was based on availability, with 5 from Group A and 6 from Group B. These 11 students were then divided into Groups C and D (see Table 2).

During the revision and finalization phases, I organized meetings and facilitated the process of making changes to the learning tool material. Two faculty

teachers were involved, both of whom were in charge of the supervised training in the clinical skills course concerning the “wound care and dressing” scenario. A clinical nurse specialist from the hospital contributed as a direct result of the students’ feedback concerning the need for standardized procedures and minimal discrepancies between faculty and clinical placements. She was purposely recruited from the hospital’s wound care ward by the faculty teachers involved in the research. In addition, a senior interaction designer from the producer of the technology-based learning tool contributed as a voluntary resource. He became a consultant on how to integrate the students’ feedback with the technological choices available in the tablet’s software.

Data collection

As shown in Table 2, there were collected different forms of data at different times throughout the iterative process. Field notes were collected through informal meetings between me and the students, for example, during the delivery and return of the tablets to my office, or if any students approached me with comments about tablet use during the initial phase. In addition, notes were taken at all revision meetings, and the students wrote their own notes during the practical test session in the exploratory test phase.

Focus group interviews (2 x 2) were completed during spring 2014. The exploratory test phase consisted of practical training sessions followed by focus group interviews. The training session was conducted in the CSL with all the necessary equipment for the wound care and dressing procedure. Each session lasted 45-60 minutes. During the session, the students received a revised version of the technological learning material, based on the needs and feedback gathered during the investigation phase. The students were divided into groups of two or three and instructed to test the device as it suited them, but they had to complete the entire scenario. They were encouraged to take breaks in the scenario and discuss the process with each other, while taking notes of what they had experienced, felt, and thought. Immediately after the practical training session, the groups were gathered for joint discussion in focus group interviews. The focus group lasted approximately 30 minutes. It attended to different aspects of the learning material, in particular, the layout, contents, and areas that needed improvement and suggestions for ways to undertake such improvement (see Appendix VI). In addition, the students handed in their

personal notes from the practical test session for use as supplementary data material. For more details see Haraldseid, Friberg, and Aase (2016).

3.5.3 Paper III

In addition to the three stages of the participatory design process, the thesis entailed a fourth stage, which required investigating the use of the developed technological learning material. This stage resulted in paper III of the thesis. The aim of paper III is to describe how groups of nursing students use the technology-based learning tool programmed with the learning material developed in paper II. This paper had an exploratory design where video recordings were used as a subject for thematic analysis.

Setting and participants

The students participating in this study were from the cohort of the 2013/2014 academic year, the year subsequent to the cohort included in Papers I and II. The students, therefore, had no previous engagement in the development phases of the learning tool. The students were recruited during their enrolment in the ongoing clinical skills course.

At the onset of the clinical skills course, all students were given information about the tablets, which were programmed with seven of the 13 different scenarios relevant to preparation for the clinical skills exam. The students were then given a one-hour training session with me on how to operate the tablets. After that, the tablets were freely available for the students in the CSL every day from 06.00 to 23.00. In order to be able to describe how students utilized the technology-based learning tool, students were recruited to make video recordings during clinical skills training in the CSL. Video recordings were chosen to capture extensive data on students' actions and practices; such recordings give researchers unique access to the details of social actions and interactions. In addition, video material gives several researchers the opportunity to conduct multiple analytical steps without being present during the data collection process (Heath, Hindmarsh, & Luff, 2010). All data were collected over a four-day period in 2014, when all 158 students in the cohort participated in the supervised training session concerning the 'wound care and dressing' scenario. This was the same scenario which had been subjected for

revisions during the iterative process in paper II.

During the four days, one of the rooms in the CSL was set up for video recording. All students were orally informed by their teachers about the ongoing study during the introductory section of the supervised training session, before the training commenced. Participants wanting to participate were invited to contact me in the video recording room, after they had participated in the first hour of the training session. A total of 17 students (15 females and 2 males) agreed to participate in the study. Participation in the video recording were not dependent on previous experience with the tablet.

The wound care and dressing scenario programmed in the technological learning material developed in Paper II was outlined as a checklist of the different practical steps (e.g., inform patient, irrigate wound, dispose of gloves) the students were to perform, thereby ensuring that students practiced the steps in a consecutive sequence, and were asked questions and given remarks about their actions throughout (see Haraldseid and Aase (2017) for details). Each scenario was designed to be used in groups of three, with one student in the role of instructor, one as the patient, and one as the student practicing the skill. The instructor would hold the tablet and guide student practicing the skill throughout the scenario, registering the actions made and following any instructions given to him/her by the tablet. The instructions on the tablet aimed at helping the students practicing the scenario by preventing them from playing out wrong moves through the use of information on the tablet. Every action registered by the instructor was linked to a reaction. For example, the tablet could point out that the action registered was wrong and urge instructor to ask the student to reconsider; it could ask the instructor to make the student give reasons for his/her action; or it could give additional information and ask for contraindications or what the next action should be. The learning material consisted exclusively of text. The patient's role was important to make the experience more authentic, while the practicing student was responsible for performing the skill, guided by the instructor. All students were informed of the intended use of the tablet during the introduction session.

Data collection

For practical reasons not all groups had three participants; three groups had

three students, and four groups had two students. The groups with two students used a mannequin as a patient, while the groups with three students had all three roles (instructor, patient, and student). All groups divided the different roles among themselves. They were handed the tablet with instructions to train as preferred, as long as they finished all sections of the scenario. I was located outside the room in case the students had any questions. To save time, reduce unnecessary movement in the scenario, and thereby increase the quality of the video, all necessary equipment was located on a trolley within the room instead of in the supply room, as normal. Both necessary and unnecessary equipment was supplied so the students had to choose what to use. Prior to commencing the data collection I sought help from experienced technicians to assess what type of camera, sound equipment, and camera positions were optimal for this use. I chose to use two camera positions, both fixed, with only two fixed microphones at the side of each camera as opposed to personal, hand-held microphones (see picture 4). The two fixed camera frames captured: 1) an overview of the situation, and 2) a close-up of the tablet screen to see the instructor's actions. Since the participants were positioned in the same place throughout the video recording, (see picture 5) it was deemed that these two frames would provide me with all the relevant data. Fixed cameras and microphones were chosen to limit the video equipment's impact on the participants (Heath et al., 2010).

Methodology



Picture 4: Camera locations



Picture 5: Positioning of students throughout the scenario

3.6 Data Analysis

Analysis of qualitative data is foremost a systematic organization and synthesis of research data so it can be interpreted and communicated (Polit & Beck, 2008). The process of analysis is continuous and challenging since there are no universal rules for how it is to be performed. Focus group interviews in papers I and II were analyzed using content analysis. While video recordings in paper III were analyzed using thematic analysis. Content analysis was used in the first two papers as it is well suited for cutting across large amounts of data, finding recurrent themes, and measuring their frequency (Vaismoradi, Turunen, & Bondas, 2013). Content analysis was used since finding frequently recurrent themes seemed suitable for identifying which aspects the students deemed important in their clinical skills learning, and using it to develop the technology-based learning tool content. Thematic analysis was used for analysis of the video material as it aims to identify themes describing what happens rather than analyzing the underlying meaning (Vaismoradi et al., 2013). This approach is used in Paper III, as it is regarded as suitable for describing how the students utilized the technology-based learning tool.

Field notes and student notes were taken during the data collection for Paper II. These were used as supplementary data to better understand the students' verbal statements and to validate the findings. I therefore read them parallel to performing the analytic steps to see if they supported or contradicted the themes I had identified. The field notes were not subject to systematic analysis.

3.6.1 Qualitative content analysis

Qualitative content analysis by Graneheim and Lundman (2004) was chosen as the method to analyze and categorize data from focus group interviews. Two analyses were performed separately in two analytical processes, with different themes and subthemes for Papers I and II, but entailed the same analytical steps as followed.

All of the focus group interviews were transcribed by myself, one or two days after the interviews. I then analyzed and coded the transcripts to structure the collected data. In the first step, the interviews were read as openly as possible, in an attempt to get an impression of both the parts and the whole. Segments of

text units that were found interesting in relation to the aim of the respective papers were then marked in color to highlight that they represented something interesting. In the second step, all text segments were organized in a table and a new column was added where the number of words was condensed, while preserving the contents of the text unit. The condensed meaning units were then given a code that was linked to the contents of the original meaning unit. The codes were color coded to further organize the material. At first, the colors were not linked to a specific theme; they just indicated my impression that they belonged together, and essentially carried the same meaning. The different codes were then compared and labeled with preliminary themes. In step three, the themes were sorted and resorted into different themes several times, in an attempt to find the essence of what was being said, all the time going back and forth between the parts and the whole of the material to check that the original statement matched the current label on the text unit (Graneheim & Lundman, 2004). The process also entailed discussions with an additional researcher who formulated critical questions to expand understanding of the data (Denzin & Lincoln, 2011; Graneheim & Lundman, 2004). In both papers, the third step entailed a merging of themes as my co-authors and I discovered different overlaps, which called for adjustment to merge the themes at a more abstract level. Step four consisted of creating the final main themes and subthemes, making sure each theme displayed its content as accurately as possible.

Paper I

Focus group interviews in Paper I were quite open, and pertained to how the students experienced their current clinical skills training. During the short debriefing sessions between the assistant moderator of the interviews and I, in between and after both interviews had finished, we noted how the students seemed quite problem focused. The initial reading of the transcribed interviews further confirmed this impression, but I also recognized that the material revealed quite a few notions about what they preferred and what they believed helped them learn. The initially marked meaning units were therefore divided into the sections ‘inhibits’ and ‘promotes.’ This initial division was not particularly descriptive of the students’ experiences, which called for further analysis of the different sections’ content. This next phase proved challenging, and lasted several weeks, during which time I tried to label the sections differently, although every time the content of the sections seemed to overlap

considerably. Through an analysis session with my co-authors, the themes were discussed and re-labeled. It became clear that the analytical challenge was related to the classification of ‘inhibits’ and ‘promotes,’ which called for a new revision. The new themes therefore cut across the ‘inhibits’ and ‘promotes’ since what the students talked about was more about what surrounded them than about themselves. During a final revision the last themes and sub-themes concerning the learning environment, as they appear in the article, were formed.

Paper II

The early goal of Paper II was to focus on describing the process of student involvement and to identify how I could practically revise the content of the technological-based tool. Due to the challenges associated with the analysis of Paper I, I refrained from starting out by using labels in this analysis and rather color-coded different text segments to indicate which segments had something in common. Through analysis sessions with my co-authors I addressed the issue that this data material was richer than our initial interest which only concerned feedback on how the students wanted the technological learning material to be revised. The discussions identified that the students rather addressed their needs throughout the learning process, which altered the discourse of the analysis process. While this analysis process pertained to verbatim transcriptions of the data material gathered through the different focus group interviews, the actual analysis had most likely been initiated already at the time of the data collection for Paper I. The findings in this article evolved over time through the iterative process and, as such, became the stated result of a prolonged process. In particular, my interpretation of the data material was influenced by my prolonged engagement with the students throughout the different phases of the thesis. Due to my considerable involvement in all of the iterative stages it is difficult to explicitly account for where, how, and when each learning need became manifested. However, throughout the process, the students repeatedly confirmed the results and descriptions of their learning needs.

3.6.2 Thematic analysis

The data material of Paper III consisted of video recordings to capture interactions among the students and their use of the technology-based learning tool. The analysis tool ATLAS.ti was chosen to practically handle analysis of

the data material as it provides the researcher with an opportunity to link text-to-video segments as well as enabling the analysis to organize video segments into different themes and sub themes. The thematic analysis approach was performed according to Braun and Clarke (2006) and their six phases of thematic analysis. Braun and Clarke put forward such analysis as a method of identifying, analyzing, and reporting patterns within data that are suitable for a range of theoretical and epistemological approaches. Paper III had an inductive approach to the collection of data as it was guided by a research question without associated theory, but had a more deductive approach to coding of data as the coding was guided by the research question. The six phases were performed through a collaborative process between me and my co-author as seen in Table 3 (Haraldseid & Aase, 2017).

Table 3: Thematic analysis process

Phase	Description	Participants
1. Familiarizing yourself with your data	-Familiarizing yourself with the data by watching the entire video material several times -Mapping initial ideas and thoughts	Thesis author
2. Generating initial codes	-Initial coding, marking of the segments of interest using ATLAS.ti -Suggestions for initial themes -Verbal transcriptions of all coded segments to be able to sort through the data set (thesis author)	Thesis author and co-author separately
3. Searching for themes	-Author discussions, comparing and revising themes. The thesis author identified four themes, and the co-author identified five themes. Four out of five themes matched with regard to content. All themes were revised to arrive at four common themes.	Thesis author and co-author
4. Reviewing themes	-Reorganizing video segments; linking video segments to the four themes	Thesis author
	-Collaboratively watching a randomly chosen selection of the video segments the thesis author had connected to each theme, making sure both authors had a similar understanding of the content of the themes to ensure validity	Thesis author and co-author
5. Defining and naming	Theme names were refined and revised, making sure they reflected the content	Thesis author and co-author
6. Producing narratives	Video narratives from segments of the data material were produced to exemplify the contents of each theme	Thesis author and co-author

Descriptions of analysis process

During the data collection of the video material subjected for analysis for Paper III, I had a broad approach to what I expected to find. There was an agreement between the two co-authors that we would first view the recordings and see what stood out, prior to agreeing on the paper's focus. The first views of the video material gave the initial impression that there was great variability in how well the groups performed in the scenario programmed at the learning tool. The reason behind this variability was, however, difficult to assess and did not seem to have a direct link to the design of the tool content as expected. Since video recordings provide a rich display of actions and impressions, we chose to view the videos separately prior to embarking upon an analysis session to discuss our impressions. This session revealed a quite common perception of which groups performed good or poor, in addition to a series of broad themes concerning the reasons for this variability. However, this impression needed to be more rigorously founded. In order to organize the material further and more systematically, we therefore chose to score the groups' performance according to the procedural guidelines outlined within the learning tool material. This made it easier to assess the same type of groups together, cutting across them and assessing what they had in common and what differed between them. I also made verbal transcriptions of all my marked video segments within every video. This was done to be able to 'view' the dataset altogether, making it easier to organize and reorganize the different video segments and link them to the initial themes. New discussions between the co-authors generated new labels on the themes which all attended to characteristics of the groups who influenced their variability in performance. These themes were again validated with my co-author, as we collaboratively watched a selection of randomly chosen video segments connected to each theme, making sure we had a similar understanding of the content of each theme.

3.7 Ethical considerations

Throughout this research process, all participants in the thesis have been informed of the research's progress, as well as its aim and purpose. It has been emphasized to the students that their participation (or non-participation) in the research would under no circumstances affect their grades in the clinical skills

course. With regard to the video material, it was stressed to the participants that the aim of the video recording was to study their interactions with the technology and their group process, not as an evaluation of their individual performance. All participants were reminded about their right to withdraw at any time, especially after filming had taken place if they did not feel comfortable. Written informed consent was obtained from all participants prior to the collection of the data material. Approval of the thesis was obtained from the Norwegian Social Science Data Service (NSD ref number: 36260) and from the head of the nursing faculty (see Appendix I & II).

3.8 Trustworthiness

In qualitative research trustworthiness refers to the extent to which the results of the research represent reality (Polit & Beck, 2010). Evaluation of trustworthiness follows the criteria of credibility, transferability, dependability, and confirmability, and is established if the audience is persuaded that the findings are worth paying attention to according to Lincoln and Guba (1985).

3.8.1 Credibility

In order to achieve credibility the researcher must create confidence in the truth and the interpretation of the data (Polit & Beck, 2010). The data's truthfulness or credibility, according to Lincoln and Guba (1985), can be shown through the following features; prolonged engagement in the field, persistent observation, knowledge of the culture and the context, trust building, self-awareness in the researcher, minimization of distortion, triangulation, and member checks.

The research persisted over a period of several years during which I was part of the field both before and after data collection. I am a RN who has previously been working in the Bachelor of Nursing education program, which has given me the knowledge of both the nursing profession and the CSL context and culture. My previous engagement in the clinical skills course through an earlier employment, together with my presence in the CSL through research activities has created a prolonged engagement in the field. This presence gave me the opportunity for persistent observation to identify characteristics and elements that were relevant to the issue at hand, and enabled me to focus on them in detail (Lincoln & Guba, 1985). To build trust is a developmental process between the

researcher and the participants according to Lincoln and Guba (1985). During the research, therefore, I made a point of being present in the CSL at different times, at both scheduled and unscheduled training sessions throughout the research period having informal conversations with various student groups. The research also intentionally involved two faculty teachers the students knew, who were responsible for the supervised training in the CSL in order to create legitimacy with the students. Member checking was part of the design in Paper II where the students participated in an iterative process to make sure the audience recognized the interpretations and conclusions the researchers made (Lincoln & Guba, 1985). Member checking was also obtained throughout the research as I made myself available for questions and feedback through informal meeting points and regular visits in the CSL.

Self-awareness has been in focus throughout the thesis through field notes and collegial discussions as grounds for valuable reflection concerning the thesis topic, methods, and aim. While my prolonged engagement in the field gave me insight, it could also make me ‘blind’ to certain spots. My insight was therefore balanced through triangulation with co-researchers of different backgrounds (organizational studies and pedagogy), providing critical questions throughout (Denzin & Lincoln, 2011). This balance was obtained both during data collection and analysis as the co-researchers contributed to all parts. To minimize distortion, the analysis process has been conducted over time to attain both distance from and proximity to the data. During the process, I have invested considerable time, going back and forth between the parts and the whole, checking the original manifested data against the interpretations (Kvale & Brinkmann, 2009).

3.8.2 Dependability

Dependability refers to the consistency and repeatability of the evidence, should the investigation be replicated under similar conditions (Lincoln & Guba, 1985). Although the thesis aims to provide a comprehensive and thorough explanation of the research process to help the reader understand how and why I have found what I claim to have found, trying to duplicate the thesis results would still be difficult. Repeatability depends on something tangible and unchanging to exist in order for it to be used as a benchmark for measurement.

Due to the ever-changing nature of the elements in qualitative research, repeatability is difficult to obtain. Instead, dependability rests upon the credibility criteria with regard to consistency during the research process (Lincoln & Guba, 1985). Consistency in this thesis is provided mainly through my presence in all phases. Throughout the entire research I have been the main driver of, and involved in, all parts of the process, from research design, data collection and transcriptions to meetings and analysis. I have been the face of the project at the faculty, causing a wide array of the attention, its problems, challenges, concerns, and student contact to be brought to me. The stability of the researcher throughout the duration of the thesis has enabled me to establish trust with the students as well as provide a detailed description of the process. However, when the results are assessed, the influence on the data material of one researcher must be taken into consideration.

3.8.3 Confirmability

Confirmability concerns the degree to which research results are objective and determined by the participants and the research context, and not by the inquiry itself or the inquirer (Lincoln & Guba, 1985). According to Lincoln and Guba (1985) a criterion for objectivity is if multiple observers can agree on a phenomenon. Confirmability, therefore, was set as a goal through the involvement of different researchers in the analysis of the data material. Themes and sub themes were discussed until agreement was reached during the different analysis processes by two or three researchers. I have also been in close collaboration with the students through the nature of the research design. In order to establish confirmability, the research results were also presented to the faculty staff during the process, to receive feedback and reflections concerning the findings.

3.8.4 Transferability

The last aspect of trustworthiness refers to the extent to which qualitative findings can be transferred to other settings, contexts, or groups (Lincoln & Guba, 1985). In qualitative research, the researcher can only provide the reader with thick descriptions of the road of inquiry to enable anyone interested in transferring the results to reach a conclusion (Lincoln & Guba, 1985). During

this thesis, therefore, I attempted to provide a detailed account of the execution of the research, describing the overall context, the CSL, the clinical skills course training, as well as the technology-based learning tool, the participants, and the data analysis approaches, to provide the reader with as much information as possible. This would enable the reader to understand the progress and setting of the thesis. It is reasonable to assume that the setting in other Norwegian CSLs are so similar that the findings and technology-based learning tool content would easily be transferable. On the other hand, nursing faculties have interpreted the *National Curriculum Regulations for Nursing Programs* (Norwegian Ministry of Education and Research, 2008) differently, and their education, clinical skills course, and training scenarios could vary in style and content as a result. However, it has been an important aim of this thesis to try to describe the different steps of student involvement closely, so that different, higher levels of education could draw benefits from those findings.

3.9 Methodological reflections

In the next section I will provide an overview of the most important methodological reflections relevant for the thesis.

3.9.1 Evolvement of the thesis aim

The thesis aim started with an interest in focusing on the technology-based learning tool itself. This interest mostly concerned the interface of the technology-based learning tool, the layout of its technological components, and the possibilities such an interactive technology-based learning tool offered. While planning the different studies, it became evident from researching the literature that it would be of considerable value to involve the end users – the students – in the development and testing of the technology. Foremost because the students would be able to give feedback on what they preferred, and because of the paucity of studies on how to involve students in such processes. During analysis of the actual involvement, however, it became clear that the students generally were more concerned about different aspects of learning than with the layout of the technology-based learning tool itself. In retrospect, these findings could have been influenced by the formulation of the interview guide or the interests of the moderator of the focus group interviews, subconsciously

steering the interviews in one direction. Either way, it has been the empirical evidence – the students’ involvement, thoughts, opinions, and feedback that has influenced and changed the overall research aim from focusing on the tools interface to focusing on utility and learning. I believe this is evidence of how this thesis has been true to its data.

3.9.2 Analysis of focus group interviews

An analysis issue concerning focus group interviews is that what individuals do in a group is influenced by the context and the other members of the group. The researcher must therefore acknowledge the interplay between the parts and the whole when analyzing focus group material (Morgan, 1997). To address this issue, the agreement or disagreement, the nodding and ‘hmming’ of other participants, was noted by the assistant moderator, when different topics were discussed. These notes were then used to complement the analysis process when trying to decipher whether different statements were agreed upon by the group or individual. This, however, cannot exclude the fact that some areas the thesis emphasized as important could be based on a discourse in the group coming from one or a few strong group members.

Another analysis issue with focus group interviews is that although something is often talked about this is not equal to it being important. This is especially a concern for qualitative researchers using content analysis, as there is a tendency to use this analysis method for quantifying data rather than interpreting it (Vaismoradi et al., 2013). This issue was addressed by noting down the different groups’ energy when different topics came up, in an attempt to use group-to-group validation by recognizing similar energy around the same topics. However, the main focus of the analysis has been on the manifested content of the group discussions, which opens for quantification of data rather than its interpretation.

During the focus group interviews, although interaction was encouraged, a take-turn mentality took place among the participants. While more interaction and group discussions could have been created through what Morgan (1997) refers to as ‘discussion creation questions,’ the research aim was aided more by finding out what the group itself wanted to communicate, which was validated through unprovoked mentioning of the same themes in several groups.

3.9.3 Video recordings and analysis

During video recordings it is important to reflect on the equipment's impact on the participants' conduct (Heath et al., 2010). While one student uttered a comment along the lines of '*I wish the camera was not here right now...*' the students in general quickly seemed to forget the presence of the video equipment. Several of the videos include comments of the students being hungry, what they planned to do in the afternoon, and what they did or were supposed to do during the weekend, which might indicate they were ignorant of the camera's presence. This behavior is supported by Heath et al. (2010), who claim that the impact of fixed cameras is often exaggerated, and that while participants generally seem to forget the equipment, they can detect comments 'designed for the camera' in their research. While the cameras can create a form of 'show off' from the participant's side, the findings in this thesis should also take into consideration that the participants may have felt anxious and tense, causing them to underachieve as well (Patton, 1999).

With regards to analysis, a challenge with observation is that perception is highly selective and can be influenced by different backgrounds, biases, and interests, causing different researchers to focus on different aspects (Patton, 1999). The rich amount of data provided through the video recordings makes room for a wider range of interpretation by the researchers. Difficulties reaching a consensus between the researchers, therefore, can easily become a pitfall within video analysis. On the other hand, as opposed to observations in real time, video recordings give researchers the opportunity to return to the original corpus on multiple occasions to review the data material together to discuss and evaluate interpretations (Heath et al., 2010). Patton (1999) also stresses that observational methods require disciplined training and rigorous preparation in order to learn how to separate details from trivia, using rigorous methods to validate observations. Despite the fact that the two researchers involved in the analysis process have different backgrounds (nursing and organizational studies), the individual review of the data material resulted in similar preliminary themes, although in different wording. Nonetheless, my co-researcher and I practiced both individual and collaborative viewing of the data material to ensure agreement on the content and interpretation of the different video segments. I also prepared for the observation of the video recordings by reading research articles about video analysis and discussions, online and at

international conferences, with experienced researchers using video recordings in their research. I also participated in an online course on how to use the video analysis tool ATLAS.ti, as well as discussing methodological and technical challenges with other researchers and technicians in various online discussion forums throughout the analysis process, in order to get inspiration, help, and input from these researchers in similar and different fields.

3.9.4 Researcher's role

The researcher herself is an instrument influencing the process of gathering data within qualitative research. A qualitative report, therefore, should always include information about the researcher and important aspects that could influence her/him (Patton, 1999). I am in my early 30s, hold a Bachelor degree in Nursing from Edith Cowan University in Western Australia and a Master's degree in Health Science (with a focus on user perspective) from the University of Stavanger (UiS) where I am also currently a PhD student. I worked as a nurse both within primary and secondary care for five years before entering the educational sector as a teacher in the Bachelor of Science in nursing degree. I have previously been a colleague of some of the faculty staff participating in the research. The project's introduction to faculty staff at the university where the research took place received a variety of responses, both positive and negative. I have, however, not felt obliged to steer the research project in a specific direction or had any restrictions or constraints imposed on me by university leaders or staff in general. Some of the findings were presented to the faculty staff throughout the research period, and elicited a variety of responses. I have also encountered some of the participating students due to previous engagements as a teacher. Since these students knew me before the project started, they may have been somewhat more talkative during the focus group interviews. However, the students expressed both positive and negative experiences during the research process, indicating that they did not feel overly obliged to display only the positive aspects.

3.9.5 Technology-based learning tool

In retrospect, the pre-determined technology (SimPad) imposed some limitations on the PhD-project. The technology in question did not have the

ability to display pictures/video material or provide functions as synchronous or asynchronous communication, nor was it able to connect to the internet, giving students access to secondary learning material. The rapid technological advancements during the past few years have also dramatically changed the availability and form of technology-based learning tools available. Although the technology at the time represented something fresh and innovative, the technology itself has become “old fashioned” in just a few years.

In retrospect, the learning material should be developed without being platform dependent, meaning it could have been used on all devices, removing the issues of loan and delivery of the tool itself. If the technology had not been predetermined, the students would also have been able to impose a higher level of influence on the development and design of the learning material. However, the students did not address this issue, but rather expressed joy and enthusiasm in order to be included as a genuine part of the developmental process. The decision to use a pre-determined technology-based learning tool, however, was made because of limited time and resources as well as the limited scope of this thesis. I am not an educated technologist and the interest of the thesis was to develop the contents of the technology rather than the technology itself.

3.9.6 Participants

During the recruitment process, more students than anticipated joined the focus group interviews, although faculty staff had warned about difficulties recruiting students to participate in other similar studies. I viewed this as a sign of interest from the students, which seemed to be a strong motivator for the research. Giving the students the possibility to influence their current learning situation could, however, attract students who, either were very satisfied or students who were very unsatisfied. This could have skewed the results either way, reducing the chance of the student group participating in the research to represent the whole cohort. On the other hand, the participants represented two very different student groups coming from both long-distance and on-campus study programs, which suggests the probability that the students represented a broader variation of the student cohort. In addition, although separated in two different focus group interviews, the results from both groups complemented each other, showing saturation in the data (Denzin & Lincoln, 2011).

4 Summary of results

The thesis constitutes three papers, and this chapter will provide an overview of the main findings in each of the papers. For details, see the different papers in part two of the thesis.

4.1 Paper I

Haraldseid, C., & Aase, K. (2017). Variability among groups of nursing students' utilization of a technological learning tool for clinical skills training: An observational study. *Journal of Nursing Education and practice*, 7(7), 66-76. doi:[10.5430/jnep.v7n7p66](https://doi.org/10.5430/jnep.v7n7p66)

The aim of the paper is to explore students' perceptions of their learning environment in a clinical skills laboratory. The analysis identified three main factors that influenced the students' learning environment: physical environment, psychosocial environment, and organizational environment. Each environmental factor had sub-factors as shown in Figure 3 (Haraldseid et al., 2015).

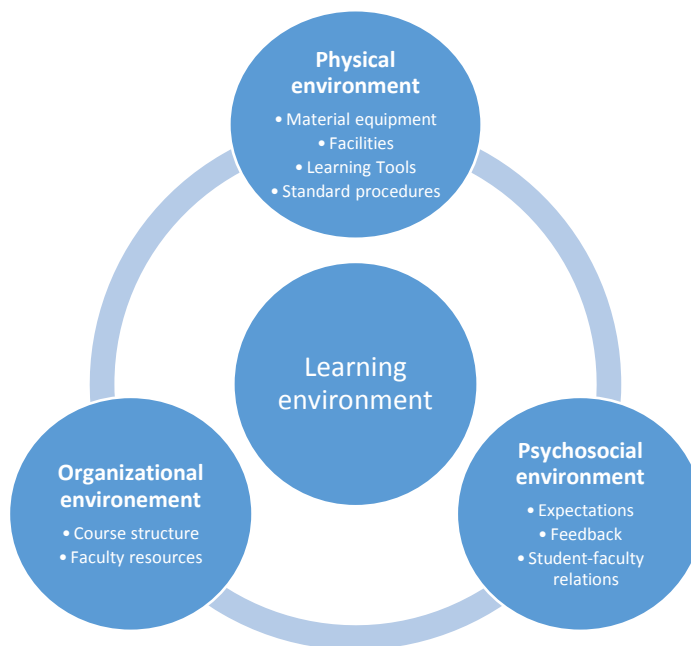


Figure 3: Framework for the clinical skills learning environment

Summary of results

The physical environment refers to sub-factors such as material equipment, facilities, learning tools, and standardized procedures. In order for the students to train properly, they need access to all the right equipment and facilities, as well as easy access to different learning tools and standardized procedures to prevent discrepancies during the performance of clinical skill procedures.

The psychosocial environment includes sub-factors such as expectations, feedback, and student-faculty relations. The students reported difficulty understanding what was expected of them, and that they needed clearly stated expectations. Feedback refers to the students' "hunger" for confirmation that they were on the "right track," while student-faculty relations refer to the group environment in the CSL where the students appreciated feeling close to their teachers.

Organizational environment consists of the sub-factors course structure and faculty resources. The students' main concern with the course structure was the lack of consistency among faculty members, the difference in contents, and delivery of the supervised training sessions and difficulties accessing faculty members for questions and answers. Students desire more time to practice and believe this will make them better at performing clinical skills.

CSL The paper explored nursing students' perceptions of the current CSL environment in order to improve conditions for learning. The paper suggests that students should be involved in future improvement efforts to facilitate motivation and create authentic learning environments.

4.2 Paper II

Haraldseid, C., Friberg, F., & Aase, K. (2015). Nursing students' perceptions of factors influencing their learning environment in a clinical skills laboratory: A qualitative study. *Nurse Education Today*. doi:10.1016/j.nedt.2015.03.015

The aim of the paper is to explore and describe the process of student involvement when developing technological learning material for clinical skills training. The results are twofold, focusing on both the process of involvement and how students can be involved, as well as clarification of the learning needs necessary for tailoring learning material accordingly.

With regards to student involvement, the paper describes an iterative process

Summary of results

with five different phases: the initial phase, investigation phase, revision phase, exploratory test phase, and finalization phase. The initial phase involves testing out a prototype of the learning material on the technology-based learning tool during unsupervised training sessions, and invites students to influence further development through iterative involvement. The investigation phase maps the students' experiences through two focus group interviews. The project then enters a revision phase that involves a clinical nurse specialist, faculty teachers, an interaction designer and me, in order to accommodate the feedback from the investigation phase. An exploratory test phase is then initiated. This phase entails a training session where the students test the revised technology-based learning material before joining a new focus group interview to comment on the revised scenario. In the finalization phase, the scenario is revised again based on the findings from the exploratory test phase.

Five themes evolved through the process of developing the learning material, and represent the students' different learning needs:

Clarification of learning expectations refers to the students' uncertainty about what is expected of them, which makes them worry more about what the faculty wants them to know than about how they could learn better and understand the different aspects of the actual clinical skills procedure. When addressing this issue by integrating learning goals into the learning material, the students found it easier to grasp what was expected from them with regards to learning objectives.

Help to recognize the bigger picture addresses the students' challenges regarding how to differentiate between different answers to the same question. The students reported a high level of stress related to the fact that a question could have several answers to it, anyone of them right. The questions embedded in the learning material, therefore, were complemented with answers and arguments. This helped the students to better understand the clinical skills scenario, and enabled them to better see connections between principles, actions, and arguments.

Stimulation of interaction refers to the fact that students often seek and value every possibility for interaction with peers, learning material, and teachers. They want to challenge their own knowledge, test it, and rate their knowledge

according to the knowledge of others and thus progress. The technology-based learning tool, therefore, was adjusted to ask stimulating questions and give feedback that could trigger more interaction between both the students and the technology-based learning tool and between the students and themselves.

Creation of structure implies students' desire for simplicity, overview, and structure. The clinical skills scenarios were therefore structured chronologically, dividing the different tasks into separate sections to create a natural progression in the scenario. While this structuring could be seen as fragmenting the bigger picture, it accommodates the students' need for a "recipe" to follow due to the novelty of their professional status.

Context-specific content is concerned with what kind of information the students need. What made them favor the learning material on the technology-based learning tool, however, is that the content could be specified to each context and situation. Disputes and frustration seem to be more related to questions concerning context. By providing and explaining context-specific information, more tailored to the clinical skills scenarios, the technology-based learning material helped settle disputes rather than create them.

The paper indicates that faculties can actively involve nursing students in the development of technological learning material through an iterative process as well as describes how. The students' role and contribution in this process is foremost to identify and describe important learning needs.

4.3 Paper III

Haraldseid, C., Friberg, F., & Aase, K. (2016). How can students contribute? A qualitative study of active student involvement in development of technological learning material for clinical skills training. *BMC Nursing*, 15(1), 1-10. doi:10.1186/s12912-016-0125-y

The aim of the paper is to investigate how groups of nursing students utilize a technology-based learning tool in practice by focusing on the variability in clinical skills performance and the factors that explain this variability. The groups' performance is scored according to the procedural guidelines embedded in the technology-based learning material. Out of a total of 30 steps, to conduct a flawless procedure the groups score varied between 14 to 24 out of 30. While all the groups managed to inform the patient about the procedure,

they differed widely in their ability to select the right equipment and adhere to hygiene principles. This variation is linked to several influencing factors:

Level of competence, which suggested that students groups with less knowledge of basic principles lacked the ability to see their own flaws, causing them to misinterpret the instructions from the tablet, deviate from the instructions, and mistrust the sequence of the procedural steps. With the tablet at their side, the students do not need to be fluent in the procedural steps; on the other hand, they need the ability to detect errors by combining their own knowledge with the information provided by the technology-based learning tool.

Motivation to learn involved that student groups with a high level of motivation appeared to have a higher interest in finding the right actions, and wanting to understand and learn as much as possible. On the other hand, a low level of motivation in the group resulted in low interest in the actions taking place and few attempts to check the quality of their performance.

Role clarification meant the instructors in the low- and middle-performing groups seemed to interpret their role as strict observers, in which their task was one-sidedly to register what the peer students performed. Within the high-performing groups, there seemed to be an understanding that everyone's role was to contribute where they could, with what they could, helping and guiding each other, advancing the best options for handling the situation.

Collaborative problem-solving skills included the high-performing groups often using the tablet to find answers and combining this information with their prior knowledge, resulting in a higher score on the skill performance assessment. Low-performing groups lacked the ability to detect a problem in the first place; they were less critical and often moved forward without detecting their own errors.

Nursing students' variability in performance when using a technology-based learning tool tailored for clinical skills training can be mapped by scoring performance with regards to the embedded procedure in the technology-based learning tool. Factors explaining the variability in clinical skill performance are linked to the above-mentioned factors. Attention to these factors by faculties would improve the utilization of technology-based learning tools, thereby increasing the effectiveness of such tools.

4.4 Synthesis of findings

Considering the individual papers' findings in the light of the thesis objectives and synthesizing the findings into a broader picture, the thesis has identified three main findings:

- The students' perceptions of their current learning environment in the clinical skills laboratory is that they seek, lack, and crave more structure and detailed guidance. They demand more instruction concerning what to learn and how to learn the clinical skill procedures.
- Active student involvement in an iterative process in which the students test and give feedback on the technology-based learning material, contributes to the surfacing of important learning needs, which enables the content to be adjusted accordingly.
- Utilization of a technology-based learning tool depends on how well the student group is equipped to handle and manage its own learning process. In order to utilize the technology-based learning tool, the groups must have a certain skill set prior to training that relates to how they solve learning tasks. Motivation, critical thinking, and collaborative problem-solving skills will aid the ability to use the tool.

5 Discussion

The overarching aim of this thesis has been to explore the process of active student involvement in the development of a technology-based learning tool and to explore how this tool can facilitate unsupervised learning. In order to add to the knowledge of unsupervised clinical skill learning in nursing education I have chosen to view the synthesized findings in the light of Knowles' self-directed learning theory.

5.1 Reducing students' teacher dependence

The findings in Papers I and II indicate that students seek reassurance, detailed guidance, structure, and instruction about what clinical skills to learn and how to learn them. The students in Paper I explicitly expressed frustration regarding the lack of teacher contact, which they perceived as the most important resource for confirmation that what they learned was correct (Haraldseid et al., 2015). Paper II also addresses students' issues regarding the creation of a structure within learning scenarios and clarifying learning expectations, as well as helping to recognize the bigger picture and receiving context-specific content for the scenarios (Haraldseid et al., 2016). Viewing these findings with a self-directed learning perspective indicates that these learners are what Knowles (1975) refers to as dependent learners with a teacher-centered orientation. This means the students depend on the teacher to direct where, when, and especially what to learn, as the results of this thesis indicate.

The primary goal of many educational institutions has increasingly been to find ways that will enable students to become self-directed learners (Merriam et al., 2012). In association with self-directed learning, 'taking responsibility for own learning,' as a concept, has flourished in Norway, both within higher and lower educational settings as a result of central white paper (Meland, 2011). The goal is to teach learners from an early age to become responsible for their own learning, increase motivation, and make the learning environment more attractive and inclusive for a broader spectrum of students (Lone, 2013; Norwegian Ministry of Education and Research, 2012). The question, therefore, is why these learners express such high levels of dependence, despite their educational system's efforts towards educating them to increasingly take

responsibility for their own learning.

One reason for such dependence could stem from a lack of relevant knowledge and the novelty of the students' professional status. Knowles' (1975) suggestions also confirm this type of dependence as he claims that even self-directed learners will find themselves in need of being taught if they have no previous experience. While this could be true for some of the students, they were all in their second year of nursing education, which means they were exposed to learning situations involving different clinical skills both at the faculty and at several practical placements. Comments throughout the different data collection phases also confirm that many of the students occupy part-time jobs in healthcare institutions, in addition to some of them having extensive experience as part- or full-time workers within healthcare.

Knowles (1975) also questions whether this teacher centeredness could be a result of being taught through primary, secondary, and high school, where the students' most important skill is to listen and follow the teachers' advice. While it might be historically true that attentive listening and the ability to take careful notes have been virtues within educational institutions (Brookfield, 1993), there has been a shift in opinions concerning what counts as important skills. Now, the educational setting focuses increasingly on skill development, which involves the ability to collaborate, solve problems, and communicate (Voogt & Roblin, 2012). This shift in primary education towards focusing on skills other than attentive listening might make Knowles' argument somewhat outdated. On the other hand, Knowles' argument also indicates that it is in the teachers' power to decide what is important, which is still true for today's education. In the context of this thesis, the teacher is in charge of passing or failing students during the practical oral exams, which could make the teacher centeredness a result of the fear of failing, rather than novelty. However, this skewed power relation is difficult to adjust since the teacher inevitably is placed in a double role; on one side he/she is supposed to help the student become an independent learner, and on the other hand, he/she is in charge of finding out whether the students' competencies are adequate to withstand the authorization standards.

Some believe that introducing SDL is equal to placing all decisions concerning learning in the hands of the student. Such a claim has led researchers such as Timmins (2008) and Walsh (2004) to report that teachers believe SDL is

inappropriate for nursing education and that following an SDL approach could lead to educational institutions being held responsible for not delivering course content. Interpreting SDL in this strict manner, such as Brookfield (1993) did, where all decisions are in the hands of the individual, is therefore probably neither wanted nor accommodated within the formal regulation of nursing education. However, Knowles claims that while the learning process should be governed by the student, all parts of the andragogical process, from setting the goals to evaluating the outcome, are a shared decision negotiated between the student and teacher. While self-directed learning is often confused with self-teaching or self-assessment, it is not the same. The student is never completely detached from the teacher with regard to process evaluation or assessment of competencies, according to Knowles (1975). Following an SDL approach does, therefore, not contradict the ability to adhere to formal educational goals set by official regulations, but rather sets implications for how these goals can be reached through sharing the power of decision making with the students.

According to Silén and Uhlin (2008), following an SDL approach to learning is a demanding process that requires ongoing attention from faculty, but which in the long run could yield more independent students. Weimer (2003) points out that learners become dependent if faculties operate with directive learning processes, deciding and instructing students on what to do, which again potentially reduces the students' own motivation. In order to reduce student dependence and improve their motivation Allen (2010) claims that faculties must learn to share their power with students through increased freedom, which results in greater responsibility and empowerment of the student. Although the students in this thesis expressed a teacher-centered attitude, the findings also indicate that actively involving them facilitated the students' autonomy by acknowledging and integrating their thoughts and feeling, as reported in Paper III. This involvement could, therefore, be an important step towards decreased teacher dependence as shared decision making empowers students and urges them to become more engaged, subsequently taking more responsibility for own learning. This supports Knowles' (1975) notion that partnership between the teacher and student is a fundamental part of helping the student to become increasingly self-directed.

5.2 Matching learner stage with teacher style

The findings in Paper III displayed a high variability in clinical skills performance across student groups. While some of the groups scored as high as 24 out of 30 practical steps in the clinical skills procedure, other groups scored only 14 out of 30. Although there could be several reasons for this outcome, it is in an SDL perspective, so it is interesting to view the findings with regard to Grow's (1991) model of mismatch between learner stages and teacher styles. According to Grow (1991) one of the most important areas to address when facilitating students to become increasingly self-directed is to match teacher style with learner stage. Grow claims that a mismatch between the two can result in a series of challenges and can, in severe cases, have serious consequences.

The findings in Paper I and II indicated a lack of teacher contact and the need to receive guidance and support. The content of the technology-based learning tool was, therefore, designed to resemble what the students wanted from the teacher: enable the student instructor to guide the student throughout a training scenario with a checklist of the practical procedural steps, and give critical questions and feedback along the way (Haraldseid & Aase, 2017). As supported by the findings in Paper II, the students viewed the technology-based tool and the instructor handling it as a guide to the correct answers and some sort of an expert, similar to the role of a teacher (Haraldseid et al., 2016). If the instructor handling the technology-based learning tool is interpreted as performing the role of the teacher, and the student as the learner, the degree of match or mismatch between the two could be a reason for the high variability in performance across the groups.

In the lower performing groups in Paper III, the student often lacked basic knowledge of equipment names, which led to consequential flaws without the student instructor correcting the student. The scenario was also characterized by low interaction, few discussions, insecurity, hesitation, and unanswered questions. The groups also had a tendency to blame the technology if something did not go as they had anticipated. The practicing students in these cases, therefore, could resemble students at learner stage 1 'dependent learners,' who possess low self-direction competencies according to Grow's (1991) model (see figure 4). The instructor of these groups often kept interference to a

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minimum and gave minimal instructions to the students, equal to Grow's teacher style 4– 'delegator.' Lack of guidance and feedback from the instructor caused the students to become uncertain and uncomfortable during the scenario. As supported by Grow, students at learner stage 1 'dependent learners' need to get explicit directions on what, how, and when to learn something. They respond well to instructions but do not like to be given choices. The students in the lower performing groups in learning stage 1 'dependent learners,' would require a teacher style 1 – 'authority, expert' in order to match (see pink color in Figure 4). But since the instructor in these cases rather adopted teacher style 4 'delegator', the result instead became a severe mismatch between the 'dependent' learner and the teacher 'delegator' (see dark red color in Figure 4).

Stage 4: Self-directed Learner	<i>Severe Mismatch Student resents authoritarian teacher</i>	<i>Mismatch</i>	Near match	Match
Stage 3: Involved Learner	<i>Mismatch</i>	Near match	Match	Near match
Stage 2: Interested Learner	Near Match	Match	Near match	<i>Mismatch</i>
Stage 1: Dependent Learner	Match	Near match	<i>Mismatch</i>	<i>Severe Mismatch Students resents freedom they are not ready for</i>
↑ Learner stage				
Teacher style →	T 1: Authority, Expert	T 2: Salesperson, Motivator	T 3: Facilitator	T 4: Delegator

Figure 4: Overview of student stages and teacher/instructor styles based on Grow's (1991) model

In the higher performing groups, however, the students critically used the information the instructor gave to them to ensure appropriate performance. They generally had a higher level of activity, reflection, and discussion in trying

to find the best answers and solutions. They seemed to agree upon their roles as mutual contributors where everyone contributed what they could at any given time in the scenario. The instructor in these groups clearly took the role in line with Grow's teacher style 3 'facilitator,' trying to help the students perform and answer questions in the best possible way. The students, on the other hand, matched the learner stage 3 – 'involved learner' of intermediate self-direction (Grow, 1991). They saw themselves as participants in their own education. They had an ability to work with others, but could have some issues learning entirely on their own, which made them thrive with guidance and help from the facilitator. Since stage 3 'involved learners' are best matched with a teacher style that involves empowering learners by helping and guiding them, they are best matched with the teacher style 3 'facilitator,' (see green color in Figure 4). The good match between learner stage and teacher style could thereby be some of the reasons for these groups' high level of performance.

While Gow's facilitator role holds that he/she should not instruct the learner, which the learning material developed through this thesis does, it is the student instructor involved in the training scenario who decided how to use the information on the technology-based learning tool. In the higher performing groups the instructor chose to use it only as a guide to help the students or check facts, as a teacher style 3 'facilitator. The technological learning material could also be used in a strict instructor sense, in line with teacher style 1 'authority/expert,' which would be suitable for the learner stage 1 'dependent' (see pink color in Figure 4). This shows that the technology-based learning tool could suit learners at different stages, but that the teacher/instructor style needs to match the learner stage. To accomplish this, both roles need to be clearly defined in advance. The importance of role clarification is stated throughout the literature within different settings as this is essential for clarifying and accommodating learning expectations (Harder, Ross, & Paul, 2013; Levett-Jones, 2005).

Grow's (1991) staged self-directed learning model has received a critique from Tennant (1992), who claims that a mismatch between teacher style and learner stage can be highly effective in some cases. Grow (1994) answers this critique by adding that the model does not apply in all situations. While Tennant's comment might be valuable in the educational setting, where some learners could be driven forward with a teacher on a "mismatched" level, the findings

in this thesis support that matching learner stage with teacher style is favorable for the utilization of the technology-based learning tool for clinical skills training. Such matchmaking, therefore, should be taken into consideration when developing and using technology-based learning tools, especially for unsupervised use.

5.3 Enabling students to utilize the technology-based learning tool

Paper III's findings show a difference between the student groups in how they used the technology-based learning tool. Those using the tool with high performance seemed to possess certain competences. Among these competences were the ability to collaboratively solve problems and clearly define the group members' roles (Haraldseid & Aase, 2017). According to Knowles (1975), the students' ability to acknowledge each other and collaborate as valuable partners in learning is fundamental to self-directed learning. So too is the ability to locate learning resources, identify who possesses different skills, and clarify which competencies are needed for a particular task (Knowles, 1975). The higher performing groups collaborated well as they saw each other as mutual resources for learning that each contributed when they could. They also used the tool as an information resource that contributed to reflection and discussion in order to reach agreement and learn. The characteristics of the groups that best utilized the technology-based learning tool seem to match some of the characteristics of a self-directed learner. It is reasonable to assume that these high-performing groups, therefore, were better equipped to utilize the technology-based learning tool in the first place, since it requires a set of predeveloped SDL competencies which they possessed.

One of the reasons for the increased use of technology within education has been technology's ability to change the learners' role from a passive state to an active process in which the learner has to take responsibility for his or her own learning (Phillips, 2005). It has also been an important aspect that technology has the ability to structure and guide students through learning activities in which they can engage in a more self-directed manner with less involvement from the teacher (Dennison, 2011; Schneiderman, Corbridge, & Zerwic, 2009).

Accordingly, the interest in SDL within higher education has grown alongside the increased use of different technology-based learning tools (Petty, 2013). In light of the above, while self-directed learning once started as a term within adult education, it has now become an increasingly important term within technological advancements and education (Saks & Leijen, 2014). The thesis findings support that SDL competencies are important for using technology-based learning tools. However, the fact that not all groups possessed these competences naturally is not uncommon, according to Walsh (2004). He states further that students in higher education generally need to be supported by creating awareness among students' own learning styles, developing critique and discussion competencies, as well as making them able to locate and retrieve information from different sources. How nursing faculties can nurture such SDL competencies development is debatable.

While SDL is both a desired, valued, and frequently used educational approach within nursing education, this process of developing SDL competencies, however, is not something that just occurs if the learners are given time to study on their own. The literature claims that students can be helped to become more self-directed learners if faculties equip them with the skills to take responsibility for their own learning (Cadorin et al., 2015; Kim & Park, 2011; Levett-Jones, 2005). Timmins (2008) claims there are no consistent guidelines of how to operationalize the educational principles within SDL, but agrees with Knowles (1975) that students depend on the faculty to create the right conditions for learning. Knowles (1975) further claims that the teachers' most important job is to help the students through the andragogical process by giving them specific directions on how to become self-directed learners.

Within the andragogical process, it is the teacher's first aim to establish a fruitful climate. According to Knowles (1975), setting the climate is about establishing warmth, dialogue, mutual respect, and trust in order for the teacher to join the student in co-created learning. In this thesis, involving the students in the development of the technology-based learning tool content described in Paper II was an attempt to establish the kind of relationship Knowles talks about. As supported by Sze-yeng and Hussain (2010), being taken seriously and having the power balance transferred from being solely in the hands of the teacher to becoming shared between the teacher and student is an important catalyst for students' motivation when engaging in learning activities. Active

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student involvement can therefore strengthen students' motivation, as it is an important aspect of climate setting. On the other hand, active involvement is not easy to achieve in all cases. Nursing education serves a large group of students, which makes it time and resource consuming to include all students in active involvement. Furthermore, not all students necessarily want to be actively engaged, and, as Paper III's findings indicate, designing technology-based tools for interactive learning does not naturally create engagement. In this context, some of the groups displayed low levels of motivation, were non-responsive to the instructor, and showed little interest in the learning material, even though the learning tool was designed for an interactive learning experience. Active engagement is not real engagement if the students just feel instructed on how to become active (Allen, 2010). Setting the right climate and building trust and respect between teachers and students, therefore, is not just about shifting from a passive, teacher-centered style to student-centered learning; faculties still need to become learning centered, focusing on how students can learn to learn, rather than being concerned just about how to teach (Weimer, 2003).

Setting the right climate is also about establishing the underlying assumptions of what the teachers' and students' roles and responsibilities are. Knowles (1975) claims that SDL is a process of co-creation that demands students and teachers to be present. However, the teacher must have the underlying assumption that his/her job is to nurture the students' capacity to become increasingly self-directed, and the students must have the underlying assumption that the teacher is a facilitator and not a transmitter of learning content (Knowles 1975). The students in this thesis seem to assume that the teacher's role is that of an expert providing them with all the answers. As the findings in Paper I show, the students want more information and guidance from the teachers at the same time as they experience that this guidance is hard to get. A reason for this could be a mismatch between the different expectations each party has of the other, which indicates that there is a need for a clarification of the role expectations between teacher and students at the faculty. Levett-Jones (2005) supports this notion by stating that it is paramount for the success of the SDL learning process that mutual role expectations between students and teachers are negotiated and agreed upon. If faculties want the students to take responsibility for their own learning, they must also hold the perspective that

the teacher is a facilitator. Knowles (1975) suggests that separate sessions must be held where the different role expectations are described and discussed between the students and teachers to prepare the students for SDL. At the sessions, the difference between transmitting learning and self-directed learning, as well as the requirements for SDL, must be addressed and discussed between the students and teacher to ensure all parties are familiar with their roles.

The andragogical process also entails the competency to locate and use appropriate learning resources. Students in the study of Fumin and Li (2012) report that one of the most important roles of faculty teachers in promoting student autonomy in learning and SDL processes was their ability to guide them in the learning process and helping them sort different learning resources. This implies that faculty teachers must be able to advise which learning resources, such as the technology-based learning tool developed throughout this thesis, are appropriate to use, for what, and for whom. Such guidance demands an increasing knowledge, attention, and awareness from nursing faculty staff regarding how students learn, which methodology is suitable for what type of learning goals, and how to assess student progression. Facilitating an andragogical process, therefore, requires nursing faculties to focus just as much on *how* to learn, as their traditional focus on *what* to learn, according to Lin (2013).

While technology-based learning tools often require SDL competencies for utilization, these competencies can also be developed through technology use. Sze-yeng and Hussain (2010) argue that different digital tools that engage students in student-student dialogue, minimize mediation from a teacher, and facilitate structured learning processes can also stimulate the development of cooperation, negotiation, interaction, and reflection skills useful for SDL. The development of technology-based learning tools that facilitate the enhancement of such skills can therefore be important in the process of teaching learners to become increasingly self-directed. Şenyuva and Kaya (2014) support this notion by referring to a web-based course that positively affected students' readiness for SDL.

5.4 Self-directed learning competencies – a prerequisite for nurses?

While different studies have documented the importance of developing SDL competencies within the nursing education (Avdal, 2013), nursing faculties have also reported staff members' rejecting SDL because they perceive it as unsuitable for the nursing educational setting (Townsend, 1990; Turunen, Taskinen, Voutilainen, Tossavainen, & Sinkkonen, 1997). Government control over learning objectives and difficulties of evening out the skewed power balance between students and teachers can make SDL a challenge for educational institutions (Timmins, 2008). Studies have reported that attitudes towards SDL include the perception that it is an easy way out for teachers with restrictions on space and resources (Hewitt-Taylor, 2002), or that it is a do-it-yourself approach that only demands time slots in the students' schedules (Hamill, 1995). SDL is also claimed to conflict with higher education's didactical teaching methods, which consist mainly of instructional lectures (Walsh, 2004). Others hold that there is limited empirical evidence to support the use of SDL in undergraduate education and that some nurse educators struggle to come to terms with the SDL concept, its meaning, and its relevance to nursing education (Timmins, 2008).

The students in this thesis could seem to oppose SDL due to their general desire for guidance and more structure. Allen (2010), however, states that it is natural for nursing students to become unwilling to assume responsibility for their own learning since their comfort level is to depend on faculty to guide them. Becoming autonomous learners, which SDL demands, with shared responsibility for the learning process, therefore, feels uncomfortable and contradictory to students. It is not uncommon for faculty to feel insecure engaging in an SDL process as the concept can appear blurry, undefined, and particularly distant and foreign to 'regular' higher educational practices (Hewitt-Taylor, 2002).

On the other hand, the nursing profession is in an evolving situation, which demands professionals capable of rapid adjustment and the acquisition of new knowledge (Jarvis, 2005). Nurses are experiencing the rapid development of new technological equipment, medical advancements within treatment, and streamlined procedures and medication renewal along with an aging population

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with more advanced requests with regard to treatment, care options, and patient participation in decision making (Norwegian Ministry of Education and Research, 2012). This evolution represents a challenge to the nursing education system in which teaching strategies must aim to educate autonomous graduates with highly developed critical thinking and reflection skills equipped for lifelong learning (Allen, 2010). Nursing students are particularly dependent on becoming lifelong learners to improve our future practices in line with technological and medical advancements and the general community's needs (Clapper, 2010). Accordingly, faculty commitment to develop students' self-directed lifelong learning skills is crucial (Sze-yeng & Hussain, 2010). In order to equip students for lifelong learning, faculty must take the students' contributions seriously.

In line with other educational institutions, nursing education has been criticized for not equipping students for their future profession (Norwegian Ministry of Education and Research, 2012). This debate on how nurses are best prepared for their profession, whether it is through higher education or within the hospital, has been ongoing since the 1960s (Malka, 2007). In order to educate nursing students to become critical thinkers, able to adapt to the changing environment, and provide patients with safe, effective nursing care based on the individual patient's needs and situation, nursing education must focus first on promoting learning so the nurses can adapt to changes throughout their profession. If nursing education focuses initially on teaching the students how to learn, nursing education will assist in the development of future nurses by helping them to become lifelong learners in one of the most demanding, rewarding, and important professions in the world.

6 Conclusion

In this PhD project the aim has been to generate knowledge about nursing students' learning of clinical skills in general, and more specifically on their active involvement in the development of a technology-based learning tool for unsupervised clinical skills training.

The results document that nursing students' perceptions of their current learning environment in a clinical skills laboratory can be characterized by a search and desire for more structure and detailed guidance during unsupervised clinical skills training. They especially demand more instruction concerning what and how to learn, indicating a teacher-dependent learning style among current nursing students. In order to decrease such dependence the thesis suggests that nursing faculties should increasingly involve students in decision making and the development of their own learning tools. Active student involvement, such as the iterative development process in which the nursing students participated in this PhD project, is an example of how students can provide faculty staff with necessary feedback on curricula development as well as influencing their own learning. As such, the involvement of students in the development, testing, and feedback on the contents of a technology-based learning tool contributed to the surfacing of vital learning needs. The iterative process enabled the technology-based learning tool to be better tailored to accommodate the students' needs.

However, using the technology-based learning tool depended on the student groups' possession of certain skills prior to unsupervised training. The skill set includes motivation to learn, critical thinking, and collaborative problem-solving abilities, all necessary for students to be able to handle and manage their own learning process in unsupervised clinical skills training. More specifically, students must clarify the different roles (patient, student, instructor) in the training scenario, making sure the student's learner stage matches the instructor's teacher style. Self-directed learning competencies are required for nursing students to manage their own learning processes, yet student groups, to a certain extent, seem to lack such abilities. Nursing faculties, therefore, need to facilitate the development of such competencies prior to students' engagement in unsupervised clinical skills learning.

Conclusion

7 Implications

7.1 Education and practice

Students and faculty staff

Faculty staff should value students' opinions and actively involve them in shared decision making in as many aspects of their education as possible. While it is the faculty staff's task to see that rules and regulations are adhered to, student groups should contribute to everything from choosing the curriculum to developing learning activities and setting learning goals.

Integrating student feedback and experiences should be a natural part of all learning processes in order for these approaches to be evaluated and adjusted. Adjustment and changes can also be integrated in the students' learning activities, since such experience provides both students and faculty staff with insights into how development processes progress, what can be changed according to the rules and regulations, and how.

Role clarification between students and faculty staff is important from the first entrance into higher education. What can students expect from faculty, and what can faculty staff expect from students? This initial training should contain specific learning activities aimed at developing the students' SDL competencies, such as diagnosing their own learning needs, setting learning goals, designing learning plans, and evaluating learning outcomes. Training must also include tips and hints that could facilitate students management of own learning process, such as how to collaborate in a group, where and how to locate different learning resources, and how to set specific goals that are achievable and assessable at different levels.

Both faculty staff and students should organize and engage themselves in smaller groups in which they can collaborate, discuss, present, plan, and give each other feedback on different educational activities. The focus of these groups should be on learning how to learn, prior to focusing on what to learn. The groups should have a non-judgmental tone and make room for discussing success as well as mistakes concerning how previous learning activities worked and why or why they did not. The groups for faculty staff should also make

room for the staff to discuss their underlying assumptions about their role as educators and what they believe to be good educational approaches and methodological choices, and why.

Faculty management

Faculty management should provide faculty staff with instructions concerning how and when students should be actively involved and in what. The instructions must set a minimum requirement for involvement to ensure that faculty staff comply, but should just imply how students are to be involved, as this decision should be taken based on the particular faculty staff's requirements.

The SDL approach must be anchored in the faculty management in order to ensure a common educational approach throughout nursing education, which creates a unifying base, with room for professional differences. Increasing students' SDL competencies does entail close facilitation from the faculty staff. Changing the staff's educational approach also demands time and resources. Faculty management, therefore, must provide time and resources in order to boost faculty staffs' competences within adult learning and SDL.

As faculty management has the overarching responsibility for students developing skills for lifelong learning, they must ensure that learning strategies and learning environments are developed that foster critical thinking skills, collaboration skills, and self-assessment skills. Faculty management should take care to provide students with different educational tools that are capable of fostering such competencies.

Policy

The national curriculum regulations for nursing programs should include a set of competencies nursing students must achieve regarding their ability to structure, manage, and assess the progression of their own learning process. These regulations should be on a national level since all professional nurses must continue their learning throughout their career, and therefore should have the ability to become lifelong learners.

As user involvement is integrated in policy initiatives and white papers in health

care, student involvement within higher education should likewise be government recommended. Policy initiatives, particularly, should recommend active student involvement in order to increasingly make use of the students' experiences and signal that their involvement is important, as opposed to the current student representative approaches.

Nursing institutions should acknowledge the synergy effects of including professionals with a pedagogical/andragogical background, and what they can contribute, in addition to the specific professional background of faculty staff. Higher education's own pedagogical programs educating faculty staff on pedagogy should also consider including the andragogical perspective into their curriculum,

7.2 Research

Since how to specifically develop student SDL competencies is still a somewhat undescribed area that is difficult to operationalize, future descriptive research regarding how such competencies are to be developed is needed. Due to the importance of students' and teachers' underlying assumptions of each other's roles, further research is needed concerning what these underlying assumptions currently entail and what should be investigated from both the students' and teachers' perspectives. The manner in which faculty management styles of the educating institutions influences such assumptions is also important.

Since the nursing profession is complex, some educational activities are better suited to SDL than others. While clinical skills can be a suitable educational activity for clinical skills learning, research must continue to explore which activities are suitable for SDL strategies and why other pedagogical approaches are needed. Research should explore the degree to which the students could take responsibility for their own learning through an SDL approach, and which tasks would require stricter guidance.

One of the aims of developing SDL competencies is to enable students to further develop and learn outside the educational setting. It is important to understand which competencies the students bring with them into their profession and how they transfer and use these competencies throughout their

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lifelong learning process. Such research could be used to determine the usefulness and potential improvement of the development of SDL competencies.

8 References

- Allen, S. (2010). The revolution of nursing pedagogy: a transformational process. *Teaching and Learning in Nursing, 5*(1), 33-38.
doi:10.1016/j.teln.2009.07.001
- Angen, M. J. (2000). Evaluating interpretive inquiry: Reviewing the validity debate and opening the dialogue. *Qualitative Health Research, 10*(3), 378-395. doi: 10.1177/104973200129118516
- Avdal, E. Ü. (2013). The effect of self-directed learning abilities of student nurses on success in Turkey. *Nurse Education Today, 33*(8), 838-841.
doi:10.1016/j.nedt.2012.02.006
- Bate, P., & Robert, G. (2007). *Bringing User Experience to Healthcare Improvement: The Concepts, Methods and Practices of Experience-based Design*. Abingdon, UK: Radcliffe Publishing.
- Bednar, A. K., Cunningham, D., Duffy, T. M., & Perry, J. D. (1992). Theory into practice: How do we link. In T. M. Duffy & D.H Jonassen (Ed.) *Constructivism and the technology of instruction: A conversation*, 17-34. New Jersey: Lawrence Earlbaum Associates Publishers.
- Benner, P., Sheets, V., Uris, P., Malloch, K., Schwed, K., & Jamison, D. (2002). Individual, practice, and system causes of errors in nursing: a taxonomy. *The Journal of Nursing Administration, 32*(10), 509-523.
doi:10.1097/00005110-200210000-00006
- Benner, P., Sutphen, M., Leonard, V., & Day, L. (2010). *Educating nurses: A call for radical transformation*. California: San Francisco: Jossey-Bass.
- Blaikie, N. (2000). *Designing social research*. Cambridge: Polity.
- Bloomfield, J., Fordham-Clarke, C., Pegram, A., & Cunningham, B. (2010). The development and evaluation of a computer-based resource to

References

- assist pre-registration nursing students with their preparation for objective structured clinical examinations (OSCEs). *Nurse Education Today*, 30(2), 113-117. doi: 10.1016/j.nedt.2009.06.004
- Bovill, C., & Bulley, C. J. (2011). A model of active student participation in curriculum design: Exploring Desirability and Possibility. In C. Rust (Ed.), *Improving Student Learning (ISL) 18: Global theories and Local Practices: Institutional, Disciplinary and Cultural Variations*. Oxford Brookes University: Oxford Centre for staff and Learning development.
- Braun, V., & Clarke, V. (2006). Using thematic analysis in psychology. *Qualitative Research in Psychology*, 3(2), 77-101. doi:10.1191/1478088706qp063oa
- Breymier, T. L. (2012). *Clinical learning needs: Student nurse perceptions of the traditional clinical environment and the simulation environment*. (Ph.D.), Capella University. Retrieved from <http://search.ebscohost.com>
- Brockett, R. G., & Hiemstra, R. (1991). *Self-Direction in Adult Learning: Perspectives on Theory, Research, and Practice*. New York: Routledge.
- Brookfield, S. (1986). *Understanding and facilitating adult learning*. San Francisco: Josey-Bass.
- Brookfield, S. (1993). Self-Directed Learning, Political Clarity, and the Critical Practice of Adult Education. *Adult Education Quarterly*, 43(4), 227-242. doi:10.1177/0741713693043004002
- Bullock, A., & de Jong, P. G. (2014). Technology-enhanced learning. In T. Swanwick (Ed.), *Understanding medical education: evidence, theory and practice* (2 ed., pp. 149-160). Oxford: Wiley Blackwell.
- Button, D., Harrington, A., & Belan, I. (2014). E-learning & information

References

- communication technology (ICT) in nursing education: A review of the literature. *Nurse Education Today*, 34(10), 1311-1323.
doi:/10.1016/j.nedt.2013.05.002
- Cadorin, L., Rei, A., Dante, A., Bulfone, T., Viera, G., & Palese, A. (2015). Enhancing self-directed learning among Italian nursing students: A pre- and post-intervention study. *Nurse Education Today*, 35(6), 746-753. doi: 10.1016/j.nedt.2015.02.004
- Candy, P. C. (1991). *Self-Direction for Lifelong Learning. A Comprehensive Guide to Theory and Practice*. San Fransisco: Jossey-Bass.
- Clapper, T. C. (2010). Beyond Knowles: What Those Conducting Simulation Need to Know About Adult Learning Theory. *Clinical Simulation in Nursing*, 6(1), e7-e14. doi: 10.1016/j.ecns.2009.07.003
- Collins, M. (1996). On contemporary practice and research: Self-directed learning to critical theory. In R. Edwards, A. Hanson, & R. Ragatt (Eds.), *Boundaries of adult learning: Adult learners, education and training* (pp. 109-127). New York: Routledge.
- Crotty, M. (1998). *The foundations of social research: Meaning and perspective in the research process*. Thousand Oakes, California: Sage.
- DeCarvalho, R. J. (1991). The humanistic paradigm in education. *The Humanistic Psychologist*, 19(1), 88.
doi:10.1080/08873267.1991.9986754
- Dennison, H. A. (2011). Creating a computer-assisted learning module for the non-expert nephrology nurse. *Nephrology Nursing Journal*, 38(1), 41.
- Denzin, N. K., & Lincoln, Y. S. (2011). *The SAGE handbook of qualitative research*. Los Angeles: Sage.
- Dunn, W. (2004). Educational theory: does simulation really fit? In W. Dunn (Ed.), *Simulators in critical care and beyond* (pp. 15-19). Des Plaines:

References

- Society of Critical Care Medicine.
- Ertmer, P. A., & Newby, T. J. (1993). Behaviorism, cognitivism, constructivism: Comparing critical features from an instructional design perspective. *Performance improvement quarterly*, 6(4), 50-72. doi: 10.1111/j.1937-8327.1993.tb00605.x
- European Ministers of Education. (1999). *The Bologna Declaration of 19 June 1999. Joint declaration of the European Ministers of Education*. Brussels: European Union
- Fenton, G. (2014). Involving a young person in the development of a digital resource in nurse education. *Nurse Education in Practice*, 14(1), 49-54. doi: 10.1016/j.nepr.2013.04.014
- Freeth, D., & Fry, H. (2005). Nursing students' and tutors' perceptions of learning and teaching in a clinical skills centre. *Nurse Education Today*, 25(4), 272-282. doi:10.1016/j.nedt.2005.01.007
- Fumin, F., & Li, Z. (2012). Teachers' roles in promoting students' learner autonomy in China. *English language teaching*, 5(4), 51. doi:10.5539/elt.v5n4p51
- Garrison, D. R. (1997). Self-directed learning: Toward a comprehensive model. *Adult Education Quarterly*, 48(1), 18. doi:10.1177/074171369704800103
- Gerdprasert, S., Pruksacheva, T., Panijpan, B., & Ruenwongsa, P. (2011). An interactive web-based learning unit to facilitate and improve intrapartum nursing care of nursing students. *Nurse Education Today*, 31(5), 531-535. doi: 10.1016/j.nedt.2010.10.008
- Graneheim, U. H., & Lundman, B. (2004). Qualitative content analysis in nursing research: Concepts, Procedures and Measures to achieve trustworthiness. *Nurse Education Today*, 24(2), 105-112. doi:10.1016/j.nedt.2003.10.001

References

- Grow, G. (1991). Teaching learners to be self-directed. *Adult Education Quarterly*, 41(3), 125-149. doi:10.1177/0001848191041003001
- Grow, G. (1994). In defense of the staged self-directed learning model. *Adult Education Quarterly*, 44(2), 109-114. doi:10.1177/074171369404400206
- Guba, E. G. (1996). What happened to me on the road to Damascus In L. Heshusius & K. Ballard (Eds.), *from positivism to interpretivism and beyond: Tales of transformation in educational and social research* (pp. 43-49). New York: Teachers College Press.
- Guise, V., Chambers, M., & Välimäki, M. (2012). What can virtual patient simulation offer mental health nursing education? *Journal of Psychiatric & Mental Health Nursing*, 19(5), 410-418. doi:10.1111/j.1365-2850.2011.01797.x
- Hamill, C. (1995). The phenomenon of stress as perceived by Project 2000 student nurses: a case study. *Journal of Advanced Nursing*, 21(3), 528-536. doi: 10.1111/j.1365-2648.1995.tb02737.x
- Happell, B., Byrne, L., McAllister, M., Lampshire, D., Roper, C., Gaskin, C. J., Hamer, H. (2014). Consumer involvement in the tertiary-level education of mental health professionals: A systematic review. *International Journal of Mental Health Nursing*, 23(1), 3-16. doi:10.1111/inm.12021
- Haraldseid, C., & Aase, K. (2017). Variability among groups of nursing students' utilization of a technological learning tool for clinical skills training: An observational study. *Journal of Nursing Education and Practice*, 7(7), e1-e6. doi: 10.5430/jnep.v7n7p66
- Haraldseid, C., Friberg, F., & Aase, K. (2015). Nursing students' perceptions of factors influencing their learning environment in a clinical skills laboratory: A qualitative study. *Nurse Education Today*.

References

- doi:10.1016/j.nedt.2015.03.015
- Haraldseid, C., Friberg, F., & Aase, K. (2016). How can students contribute? A qualitative study of active student involvement in development of technological learning material for clinical skills training. *BMC Nursing, 15*(1),1-10. doi: 10.1186/s12912-016-0125-y
- Harder, N., Ross, C. J. M., & Paul, P. (2013). Student Perspective of Roles Assignment in High-Fidelity Simulation: An Ethnographic Study. *Clinical Simulation in Nursing, 9*(9), e329-e334.
doi:10.1016/j.ecns.2012.09.003
- Heath, C., Hindmarsh, J., & Luff, P. (2010). *Video in qualitative research*. London: Sage Publications.
- Herman, W. E. (1995). *Humanistic Influences on a Constructivist Approach to Teaching and Learning*. Paper presented at the Annual Meeting of the American Educational Research Association: San Francisco, CA.
- Hersey, P., & Blanchard, K. H. (1988). *Management of organizational behavior: Utilizing human resources* (5th ed.). Engelwood Cliffs: Prentice-Hall, Inc.
- Hewitt-Taylor, J. (2002). Teachers' and students' views on self-directed learning. *Nursing Standard, 17*(1), 33-38.
doi:10.7748/ns2002.09.17.1.33.c3267
- Hilton, P., & Pollard, C. (2004). Supporting clinical skills developments. *Nursing Standard, 18*(35), 31-36.
doi:10.7748/ns2004.05.18.35.31.c3608
- Horton, W. (2012). *E-learning by design*. San Francisco, California: Pfeiffer.
- Hsu, L.-L., & Hsieh, S.-I. (2013). Development and psychometric evaluation of the competency inventory for nursing students: A learning outcome perspective. *Nurse Education Today, 33*(5), 492-497.
doi:10.1016/j.nedt.2012.05.028

References

- Jarvis, P. (2005). Lifelong education and its relevance to nursing. *Nurse Education Today*, 25(8), 655-660. doi:10.1016/j.nedt.2005.09.005
- Jeffries, P. R., Rew, S., & Cramer, J. M. (2002). A comparison of student-centered versus traditional methods of teaching basic nursing skills in a learning laboratory. *Nursing education perspectives*, 23(1), 14. Retrieved from <http://search.proquest.com>
- Jonassen, D. H. (1992). Evaluating constructivistic learning. In T.M Duff & D.H Jonassen (Ed.) *Constructivism and the technology of instruction: A conversation*, 137-148. New Jersey: Lawrence Earlbaum Associates Publishers.
- Kala, S., Isaramalai, S.-A., & Pohthong, A. (2010). Electronic learning and constructivism: A model for nursing education. *Nurse Education Today*, 30(1), 61-66. doi: 10.1016/j.nedt.2009.06.002
- Kaufman, D. M., & Mann, K. V. (2013). Teaching and learning in medical education: how theory can inform practice. In T. Swanwick (Ed.), *Understanding medical education: evidence, theory and practice* (pp. 7-29). ProQuest ebrary: Wiley-Blackwell.
- Kim, M., & Park, S.-Y. (2011). Factors Affecting the Self-directed Learning of Students at Clinical Practice Course for Advanced Practice Nurse. *Asian Nursing Research*, 5(1), 48-59. doi:10.1016/S1976-1317(11)60013-3
- Kirschner, P. A. (2015). Do we need teachers as designers of technology enhanced learning? *Instructional Science*, 43(2), 309-322. doi:10.1007/s11251-015-9346-9
- Knowles, M. (1973). *The adult learner: a neglected species*. Houston: Gulf Pub. Co.
- Knowles, M. (1975). *Self-directed learning*. New York: Association Press
- Knowles, M. (1980). *The modern practice of adult education: from pedagogy*

References

- to andragogy (2nd ed.). New York: Cambridge books.
- Krueger, R. A., & Casey, M. A. (2009). *Focus groups: a practical guide for applied research*. Los Angeles, California: Sage.
- Kvale, S., & Brinkmann, S. (2009). *Interviews: learning the craft of qualitative research interviewing*. Los Angeles, California: Sage.
- Könings, K. D., Brand-Gruwel, S., & Merriënboer, J. J. G. (2010). An approach to participatory instructional design in secondary education: an exploratory study. *Educational Research*, 52.
doi:10.1080/00131881003588204
- Könings, K. D., Brand-Gruwel, S., & van Merriënboer, J. J. G. (2010). An approach to participatory instructional design in secondary education: an exploratory study. *Educational Research*, 52(1), 45-59.
doi:10.1080/00131881003588204
- Lahti, M., Hätönen, H., & Välimäki, M. (2014). Impact of e-learning on nurses' and student nurses' knowledge, skills, and satisfaction: A systematic review and meta-analysis. *International Journal of Nursing Studies*, 51(1), 136-149. doi: 10.1016/j.ijnurstu.2012.12.017
- Lashley, M. (2005). Faculty forum. Teaching health assessment in the virtual classroom. *Journal of Nursing Education*, 44(8), 348-350. Retrieved from <http://search.proquest.com>.
- Lave, J., & Wenger, E. (1991). *Situated learning: legitimate peripheral participation*. Cambridge: Cambridge University Press.
- Lave, J., & Wenger, E. (2002). Legitimate peripheral participation in communities of practice. In R. Harrison, F. Reeve, A. Hanson, & J. Clarke (Eds.), *Supporting Lifelong Learning. Perspectives on Learning* (pp. 1111-1126). London: Routledge Farmer.
- Levett-Jones, T. L. (2005). Self-directed learning: Implications and limitations for undergraduate nursing education. *Nurse Education Today*, 25(5),

References

- 363-368. doi: 10.1016/j.nedt.2005.03.003
- Lin, Z.-C. (2013). Comparison of technology-based cooperative learning with technology-based individual learning in enhancing fundamental nursing proficiency. *Nurse Education Today*, 33(5), 546-551. doi:10.1016/j.nedt.2011.12.006
- Lincoln, Y. S., & Guba, E. G. (1985). *Naturalistic inquiry*. California: Sage publications.
- Lincoln, Y. S., Lynham, S. A., & Guba, E. G. (2011). Paradigmatic controversies, contradictions, and emerging confluences, revisited. In N. K. Denzin & Y. S. Lincoln (Eds.), *The SAGE handbook of qualitative research*. Los Angeles: Sage.
- Lone, N. C. (2013). *Motivasjon og Læring (Motivation and learning)*. University of Oslo M.Sc Thesis
- Malka, S. G. (2007). *Daring to care: American nursing and second-wave feminism*. Chicago: University of Illinois Press.
- Mancuso-Murphy, J. (2007). Distance education in nursing: an integrated review of online nursing students' experiences with technology-delivered instruction. *Journal of Nursing Education*, 46(6), 252-260. Retrieved from: <http://www.healio.com/journals/jne>
- McKeown, M., & Carey, L. (2015). Editorial: Democratic leadership: a charming solution for nursing's legitimacy crisis. *Journal of Clinical Nursing*, 24(3-4), 315-317. doi:10.1111/jocn.12752
- Meland, A. T. (2011). *Ansvar for egen læring. Intensjoner og realiteter i en norsk videregående skole (Responsibility for own learning. Intentions and reality in a Norwegian Vocational school)* (PhD thesis, Gothenburg Studies in Educational Sciences) Göteborg: Acta Universitatis Gothoburgensis
- Merriam, S. B., Caffarella, R. S., & Baumgartner, L. M. (2012). *Learning in*

References

- adulthood: A comprehensive guide*. ProQuest ebrary: John Wiley & Sons.
- Mezirow, J. (1985). A critical theory of self-directed learning. *New Directions for Adult and Continuing Education*, no. 25, 17-30.
doi:10.1002/ace.36719852504
- Morgan, D. L. (1997). *Focus groups as qualitative research* (2nd ed. ed. Vol. vol. 16). Thousand Oaks, California: Sage Publications.
- Mundy, C. A. (2007). Innovative Teaching Strategies: Educating Student Nurses on Vascular Access Management. *Journal of the Association for Vascular Access*, 12(4), 232-236. doi: 10.2309/java.12-4-11
- Norwegian Ministry of Education and Research. (2008). *Rammeplan for sykepleierutdanning (National curriculum Regulations for Nursing programs)*. Oslo: Norwegian Ministry of Education and Research
- Norwegian Ministry of Education and Research. (2012). *Utdanning for velferd. Samspill i Praksis (Education for Welfare. Cooperation in Practice) (St.meld. nr. 13, 2011-2012)*. Oslo: Norwegian Ministry of Education and Research
- Oddi, L. F. (1986). Development and validation of an instrument to identify self-directed continuing learners. *Adult Education Quarterly*, 36(2), 97-107. doi:http://dx.doi.org/10.1177/0001848186036002004
- Overstreet, M. (2008). The use of simulation technology in the education of nursing students. *Nursing Clinics of North America*, 43(4), 593-603, vii. doi:10.1016/j.cnur.2008.06.009
- Papathanasiou, I. V., Tsaras, K., & Sarafis, P. (2013). Views and perceptions of nursing students on their clinical learning environment: Teaching and learning. *Nurse Education Today*, 34(1), 57-60.
doi:10.1016/j.nedt.2013.02.007
- Papert, S. (1990). Introduction. In I. Harel (Ed.), *Constructionist learning*.

References

- Boston: MIT.
- Patton, M. Q. (1999). Enhancing the quality and credibility of qualitative analysis. *Health services research*, 34(5 Part II), 1189-1208. Retrived from <https://www.ncbi.nlm.nih.gov>
- Petit dit Dariel, O. J., Raby, T., Ravaut, F., & Rothan-Tondeur, M. (2013). Developing the Serious Games potential in nursing education. *Nurse Education Today*, 33(12), 1569-1575. doi:10.1016/j.nedt.2012.12.014
- Petty, J. (2013). Interactive, technology-enhanced self-regulated learning tools in healthcare education: A literature review. *Nurse Education Today*, 33(1), 53-59. doi: 10.1016/j.nedt.2012.06.008
- Phillips, J. M. (2005). Strategies for active learning in online continuing education. *Journal of Continuing Education in Nursing*, 36(2), 77-83. doi: 10.3928/0022-0124-20050301-08
- Polit, D. F., & Beck, C. T. (2008). *Nursing research: Generating and Assessing Evidence for Nursing Practice* (8th ed.). Philadelphia: Wolters Kluwer/Lippincott Williams & Wilkins.
- Polit, D. F., & Beck, C. T. (2010). *Essentials of nursing research : appraising evidence for nursing practice*. Philadelphia: Wolters Kluwer/Lippincott Williams & Wilkins.
- Raman, J. (2015). Mobile technology in nursing education: where do we go from here? A review of the literature. *Nurse Education Today*, 35(5), 663-672. doi:10.1016/j.nedt.2015.01.018
- Rennie, I. (2009). Exploring approaches to clinical skills development in nursing education. *Nursing Times*, 105(3), 20-22. Retrived from <http://europepmc.org>
- Rice, S., & McKendree, J. (2014). e-Learning. In T. Swanwick (Ed.), *Understanding Medical Education: Evidence, Theory and Practice* (pp. 161-173). Oxford: Wiley Blackwell

References

- River, J., Currie, J., Crawford, T., Betihavas, V., & Randall, S. (2016). A systematic review examining the effectiveness of blending technology with team-based learning. *Nurse Education Today*, *45*, 185-192. doi:10.1016/j.nedt.2016.08.012
- Ross, J. G. (2012). Simulation and Psychomotor Skill Acquisition: A Review of the Literature. *Clinical Simulation in Nursing*, *8*(9), e429-e435. doi:10.1016/j.ecns.2011.04.004
- Rovai, A. P. (2004). A constructivist approach to online college learning. *The Internet and Higher Education*, *7*(2), 79-93. doi:10.1016/j.iheduc.2003.10.002
- Saks, K., & Leijen, Ä. (2014). Distinguishing Self-directed and Self-regulated Learning and Measuring them in the E-learning Context. *Procedia - Social and Behavioral Sciences*, *112*, 190-198. doi:10.1016/j.sbspro.2014.01.1155
- Sanoff, H. (2008). Multiple Views on Participatory Design. *International Journal of Architectural Research*, *2*(1), 57-69. doi:10.15368/focus.2011v8n1.1
- Schneiderman, J., Corbridge, S., & Zerwic, J. J. (2009). Demonstrating the effectiveness of an online, computer-based learning module for arterial blood gas analysis. *Clinical Nurse Specialist*, *23*(3), 151-155. doi:10.1097/NUR.0b013e3181a075bc
- Şenyuva, E., & Kaya, H. (2014). Effect Self Directed Learning Readiness of Nursing Students of the Web Based Learning. *Procedia - Social and Behavioral Sciences*, *152*, 386-392. doi:10.1016/j.sbspro.2014.09.217
- Shor, I. (1992). *Empowering education. Critical teaching for social change*. London: University of Chicago Press.
- Shuell, T. J. (1986). Cognitive conceptions of learning. *Review of educational research*, *56*(4), 411-436. doi: 10.3102/00346543056004411

References

- Siemens, G. (2005). Connectivism – A learning theory for the digital age. *International Journal of Instructional Technology and Distance Learning*, 2(1), 3-10.
- Silén, C., & Uhlin, L. (2008). Self-directed learning – a learning issue for students and faculty! *Teaching in Higher Education*, 13(4), 461-475. doi:10.1080/13562510802169756
- Skiba, D. J. (2007). Nursing education 2.0: Are mashups useful for nursing education? *Nursing education perspectives*, 28(5), 286-288. Retrived from <http://journals.lww.com/neonline>
- Skinner, B. F. (2011). *About behaviorism*. New York: Vintage Books.
- Spinuzzi, C. (2005). The methodology of participatory design. *Technical communication*, 52(2), 163-174. Retrived from <http://www.ingentaconnect.com>
- Sze-yeng, F., & Hussain, R. M. R. (2010). Self-directed learning in a socioconstructivist learning environment. *Procedia – Social and Behavioral Sciences*, 9, 1913-1917. doi:10.1016/j.sbspro.2010.12.423
- Tennant, M. (1992). The staged self-directed learning model. *Adult Education Quarterly*, 42(3), 164-166. doi: 10.1177/074171369204200304
- Timmins, F. (2008). Take time to facilitate self-directed learning. *Nurse Education in Practice*, 8(5), 302-305. doi:10.1016/j.nepr.2008.02.004
- Tough, A. M. (1971). *Adults' learning projects: A fresh approach to theory and practice in adult education*. Toronto: Ontario Institute for Studies in Education.
- Tough, A. M. (1979). *The Adult's Learning Projects. A Fresh Approach to Theory and Practice in Adult Learning* (2nd ed.). Toronto: Ontario Institute for Studies in Education.
- Townsend, J. (1990). Teaching/learning strategies. *Nursing Times*, 86(23), 66. Retrived from <https://www.ncbi.nlm.nih.gov/pubmed>.

References

- Tremayne, P., Russell, P., & Allman, H. (2014). Service user involvement in nurse education. *Nursing Standard*, 28(22), 37-41.
doi:10.7748/ns2014.01.28.22.37.e7951
- Turunen, H., Taskinen, H., Voutilainen, U., Tossavainen, K., & Sinkkonen, S. (1997). Nursing and social work students' initial orientation towards their studies. *Nurse Education Today*, 17(1), 67-71.
doi:10.1016/S0260-6917(97)80082-2
- Vaismoradi, M., Turunen, H., & Bondas, T. (2013). Content analysis and thematic analysis: Implications for conducting a qualitative descriptive study. *Nurse Health Science*, 15(3), 398-405.
doi:10.1111/nhs.12048
- Voogt, J., & Roblin, N. P. (2012). A comparative analysis of international frameworks for 21st century competences: Implications for national curriculum policies. *Journal of Curriculum Studies*, 44(3), 299-321.
doi:10.1080/00220272.2012.668938
- Walsh, M. (2004). Lecturers understanding and experiences' of self-directed learning and its relevance to undergraduate nursing education. *Univerity College Dublin M.Sc. Thesis*.
- Watson, J. B. (2013). *Behaviorism*. New York: Read Books Ltd.
- Weimer, M. (2003). Focus on learning, transform teaching. *Change: The Magazine of Higher Learning*, 35(5), 48-54.
doi:10.1080/00091380309604119
- Wellard, S. J., & Heggen, K. M. (2010). Are laboratories useful fiction? A comparison of Norwegian and Australian undergraduate nursing skills laboratories. *Nurs Health Sci*, 12(1), 39-44. doi:10.1111/j.1442-2018.2009.00481.x
- Wellard, S. J., Solvoll, B.-A., & Heggen, K. M. (2009). Picture of Norwegian clinical learning laboratories for undergraduate nursing students.

References

- Nurse Education in Practice*, 9(4), 228-235. doi:
10.1016/j.nepr.2008.06.005
- Wenger, E. (1998). *Communities of practice: learning, meaning, and identity*.
Cambridge: Cambridge University Press.
- West, C., Usher, K., & Delaney, L. J. (2012). Unfolding case studies in pre-
registration nursing education: Lessons learned. *Nurse Education
Today*, 32(5), 576-580. doi:10.1016/j.nedt.2011.07.002

References

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Part II

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List of Papers

Paper I

Haraldseid, C., & Aase, K. (2017). Variability among groups of nursing students' utilization of a technological learning tool for clinical skills training: An observational study. *Journal of Nursing Education and practice*, 7(7), e1-e6. doi:10.5430/jnep.v7n7p66

Paper II

Haraldseid, C., Friberg, F., & Aase, K. (2015). Nursing students' perceptions of factors influencing their learning environment in a clinical skills laboratory: A qualitative study. *Nurse Educ Today*. doi:10.1016/j.nedt.2015.03.015

Paper III

Haraldseid, C., Friberg, F., & Aase, K. (2016). How can students contribute? A qualitative study of active student involvement in development of technological learning material for clinical skills training. *BMC Nursing*, 15(1), 1-10. doi:10.1186/s12912-016-0125-y

List of Papers

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Paper I

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Nursing students' perceptions of factors influencing their learning environment in a clinical skills laboratory: A qualitative study



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SUMMARY

Background: The mastery of clinical skills learning is required to become a trained nurse. Due to limited opportunities for clinical skills training in clinical practice, undergraduate training at clinical skills laboratories (CSLs) is an essential part of nursing education. In a sociocultural learning perspective learning is situated in an environment. Growing student cohorts, rapid introduction of technology-based teaching methods and a shift from a teaching- to a learning-centered education all influence the environment of the students. These changes also affect CSLs and therefore compel nursing faculties to adapt to the changing learning environment. **Objectives:** This study aimed to explore students' perceptions of their learning environment in a clinical skills laboratory, and to increase the knowledge base for improving CSL learning conditions identifying the most important environmental factors according to the students.

Design: An exploratory qualitative methodology was used.

Participants: Nineteen second-year students enrolled in an undergraduate nursing program in Norway participated in the study. They took the same clinical skills course. Eight were part-time students (group A) and 11 were full-time students (group B).

Methods: Focus group interviews and content analysis were conducted to capture the students' perception of the CSL learning environment.

Results: The study documents students' experience of the physical (facilities, material equipment, learning tools, standard procedures), psychosocial (expectations, feedback, relations) and organizational (faculty resources, course structure) factors that affect the CSL learning environment.

Conclusion: Creating an authentic environment, facilitating motivation, and providing resources for multiple methods and repetitions within clinical skills training are all important for improving CSL learning environments from the student perspective.

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Introduction

Clinical skills are difficult for students to acquire since they do not exist independently, but are rather composed of components from the psychomotor, cognitive and affective learning domains (Ross, 2012). Skills acquisition is therefore a complex process in which the students have to incorporate practical performance with knowledge and critical thinking. In addition to practice in hospitals and in home care facilities, one of the most common places for nursing students to learn clinical skills is in the clinical skills laboratory (CSL) (Houghton et al., 2012). CSLs are located at nursing schools and the literature documents that both students and teachers find them useful and important for the development of clinical skills (Freeth and Fry, 2005; Houghton et al., 2012; Moule et al., 2008; Wellard and Heggen, 2010). While Benner

et al. (2010) argue that different educational strategies and repetitions are needed to accomplish learning within psychomotor skills acquisition, Johansson (2012), points out that since learning is always situational, where the learning takes place is just as important as how. From a socio-cultural learning perspective, the CSL environment is therefore vital since it constitutes the context in which learning occurs. Growing student cohorts (Lin, 2013), rapid introduction of technology-based teaching methods and a shift from a teaching- to a learning-centered education (Breymer, 2012) have transformed nursing education (West et al., 2012). These changes that affect CSLs have compelled nursing faculties to adapt to the changing learning environment.

Educational theories now center education on student learning instead of teaching, placing students in a key position within the educational system (Katinka et al., 1998; West et al., 2012). With this increased focus on the importance of student involvement, the expectation of including students' perceptions in evaluating educational programs also arises. Despite the argument that students themselves know best how to learn, we argue that including students' experiences and

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perceptions about educational programs will complement the knowledge base used to improve educational programs (Papathanasiou et al., 2013).

More specifically, nursing faculties should pay attention to the environment in which the learning takes place (Johansson, 2012; Säljö, 2001), and include students' perceptions of their learning environment.

The environment in the CSL is designed to simulate the real clinical learning environment and is as such defined similarly as a practicum environment where students apply theory to practice, acquire critical thinking skills, participate in clinical decision-making, and practice psychomotor and affective skills (Stokes and Kost, 2009, p. 283). Within the nursing literature, numerous studies have explored students' perceptions of learning environments during clinical placements (Bjørk et al., 2014) while less focus is on the learning environment of the CSL. Existing studies often target students' perceptions of influencing factors such as positive attitude, time, affiliation to the ward and personalization of learning experiences (Henderson et al., 2011; Loo Chuan and Barnett, 2012; Papathanasiou et al., 2013). Several studies of simulation-based learning discuss learning environment and themes such as fidelity, authenticity and bridging-the-gap (e.g. Bland et al., 2014; Dieckmann et al., 2012; Rettedal, 2009). In addition the literature contains studies of the importance of relationships between students and teachers and the qualities of a good teacher (Heydari et al., 2013; Raheim, 2013; Robb, 2012; Yung et al., 2013). However, there are few studies focusing on the environment of the CSL as a research topic in itself (Freeth and Fry, 2005; Khan et al., 2011) and of students' perceptions of the learning environment in such settings. The aim of the study is therefore to explore the students' perceptions of their learning environment in the CSL. The rationale for this aim is to expand the knowledge base for improving CSL learning conditions and to identify what students consider the most important environmental factors.

CSL Environment

The study context is a Norwegian CSL environment used for conducting a clinical skills course for second-year students in Bachelor of Science in Nursing. The learning objective for the course is the mastery of 13 clinical skills (see Table 1). All the skills must be done in regard to safe practice, hygiene, practical performance and utilization of available resources in order to pass the course. In addition each skill has its own specific learning objectives designed to strengthen the students' ability to deliver comprehensive care by applying critical thinking, reasoning and decision-making skills in a non-threatening environment. The Norwegian government provides a framework of competencies that guides the schools in skills selection.

The CSL is designed to resemble a hospital ward to optimize the simulation of clinical learning situations. Besides the ordinary interior and layout of patient rooms, toilets, medical supply room, etc. an auditorium in the CSL seats up to 50 students for demonstration and reflection. The

CSL is equipped with all necessary reusable and stationary medical equipment. Single supplies such as nasal cannulas, wound dressings, and syringes are handed out to each student in a free equipment kit at the beginning of the course. If medical supplies are lost or broken, a few replacements are available upon request. Every training room also has a computer. All nursing students must meet uniform requirements at all times when in the CSL. Students are encouraged to practice on peer students when advisable; for other procedures, basic mannequins are provided.

During the course, the students have 9 three-hour supervised training sessions. Every session revolves around one or two case studies concerning specific skills and consists of a three-step routine: the teacher demonstrates the procedure, the student practices the procedure, and reflection after performance. Throughout the course, and in preparation for each session, the students are encouraged to use all the available didactic tools: multiple-choice tests, instructional videos, assigned reading and an internet-based discussion forum. Besides the scheduled sessions, the students can book the CSL for unsupervised training every day of the week. At the end of each course the students take a practical-oral exam where they are tested in any one of the 13 skills by two of the faculty teachers.

Methodology

Design

An exploratory qualitative methodology using focus group interviews and content analysis was used to establish a knowledge base for understanding the CSL learning environment from a student perspective.

Settings and Participants

The interviews were conducted in January 2014 in a meeting room in the campus of a Norwegian nursing school between six and nine weeks after the end of the course. All students were recruited through purposive sampling in collaboration with the lecturers at the nursing school, using an open invitation in class in which the first author was present. The participants were all second-year nursing students who had completed the same clinical skills training course in the same Bachelor of Science in Nursing program. All students wanting to participate were encouraged to approach the first author after class. Sixteen females and three males volunteered. Eight of the females were part-time students enrolled in the long-distance bachelor program and had a mean age of 41 (group A). The remaining eleven students, three males and eight females, were full-time, on-campus students with a mean age of 24 (group B). The full- and part-time students were divided into two groups. This was done to ensure that the participants would be comfortable discussing the topic with each other and that their different, shared experiences with the CSL would generate meaningful discussions (Morgan, 1997). The split was also based on the hypothesis that their difference in study program (long-distance vs. on-campus), age and gender compositions would yield different student perceptions that could provide a range of descriptions or influencing factors of the CSL learning environment (Krueger and Casey, 2009). The participants had previously met the first author at an introduction session. None of the students dropped out of the study.

Ethical Consideration

The students received both written information and oral information on the background and aim of the study, including information about the right to withdraw from the study at any point. Written informed consent was collected prior to the data collection. Approval of the study was obtained from the Norwegian Social Science Data Services (reference number 36260) and from the head of the nursing school.

Table 1
Overview of clinical skills.

Skill	Mannequin	Peer student
Cleaning sutured wounds and applying sterile dressing		x
Administering oxygen		x
Assessing and changing stoma	x	
Blood glucose measurement and insulin administration	x	
Administering intravenous fluids and medications	x	
Peripheral venous catheter insertion	x	
Nasal and oral tracheal suction including tracheostomy care	x	
Nasogastric tube insertion	x	
Intramuscular injection	x	
Mobilization of patient with apoplexia cerebri		x
Post-operative mobilization		x
Irrigating wounds/applying hydrocolloid dressing		x
Communication with next of kin		x

Data Collection

Each focus group interview lasted for 60–80 min. Both groups followed the same interview guide. Interviews were moderated by the first author and assisted by the third author. The interviews commenced with general questions to the students about their training and what they did in the CSL. After the students were comfortable with the interviewers, questions gradually turned to the theme of the study (Krueger and Casey, 2009). Questions pertained to issues that the students enjoyed or found difficult in the CSL environment, their needs, and how training could be improved. Interaction among the students was encouraged with the moderator asking prompting and clarifying questions. Interviews were audio recorded while both the moderator and assistant moderator wrote field notes to complement the audio tape. A third focus group was found to be unnecessary as there was a natural saturation in the data material after the first two group interviews (Denzin and Lincoln, 2011).

Data Analysis

The interviews were transcribed by the first author one or two days after the interviews. The transcripts were then analyzed and coded by the first author using qualitative content analysis in order to structure the collected data (Graneheim and Lundman, 2004). In the first step the interviews were read as openly as possible, trying to get an impression of both the parts and the whole. In the second step, after reducing the number of words while preserving the content, the meaning units were shortened and coded. This step compared the units and sorted the text into themes (Graneheim and Lundman, 2004). In step three the themes were sorted into subthemes. As the authors reviewed and discussed the themes, it became clear that several themes overlapped so some of the themes and subthemes were merged at a more abstract level. Step four consisted of the creation of three main themes and nine subthemes.

To establish trustworthiness throughout the study (Denzin and Lincoln, 2011; Graneheim and Lundman, 2004), the first and third authors conducted the interviews, while the second author formulated critical questions to expand understanding of the data. Different interpretations in the analysis steps were repeatedly discussed and reinterpreted. When presenting the findings, each theme and subtheme from analysis are described as factors and sub-factors.

Findings

Although some differences in students' perceptions between groups A (mean age: 41) and B (mean age: 24) were found, there was a general agreement both within and between the two groups. The main differences pertained to group dynamics. Group A members were talkative and interruptive and had a personal tone; group B members had a more formal tone, waited politely for their turn to speak and gave the impression of less familiarity among the group members. Overall the factors that students mentioned as most important for their learning environment in the CSL did not differ between the two student groups and were grouped as physical environment, psychosocial environment and organizational environment. A description of each is presented below. The framework of the main factors with their respective sub-factors is presented in Fig. 1.

Physical Environment

The sub-factors of the physical environment are material equipment, facilities, learning tools and standardized procedures. The students' most pressing issue was to be able to access the material equipment that they needed in order to practice their clinical skills. Lack of equipment, the need to reuse equipment and unfamiliar, old and outdated equipment forced them to improvise, resulting in a false and inadequate

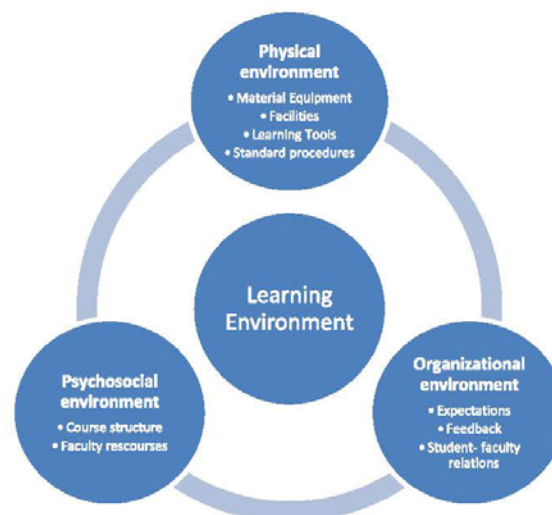


Fig. 1. Framework for clinical skills learning environment.

training situation: 'it's like you are not able to learn it correctly, because you become so unsure when things are not available or you miss this and you miss that' (B5).

Even when the CSL provided the facilities that the students needed to practice their skills, some of them were unable to use the lab: 'I have also experienced that we have booked the lab, and when we get there it's occupied' (B4). At the same time, the facilities were so valuable to them that students were thankful that the lab was open beyond ordinary school hours: 'Saturdays and Sundays we'll be here until 5 pm or 9 pm, to be as effective as we can while we are here. There have been many late nights' (A1). During training, the students appreciated easy access to learning tools such as multiple-choice tests or videotapes and guidelines, while others preferred discussion with fellow students and teachers.

The majority of students described discrepancies in how to perform some procedures: 'It's not exactly coherence between the reality of what goes on in the nursing lab, and what goes on when I work at the hospital' (B1). These discrepancies made it difficult for them: 'right now I have so many ways of doing it [the skill]' (A7). Their lack of confidence and knowledge made it difficult for students to assess which practices were the best and they therefore called for standard best practice procedures: 'Then you got a procedure that was "the right one", this is how you do it, this is the recipe!' (A6).

Psychosocial Environment

The psychosocial environment consists of the psychological and social factors that could affect satisfaction, health and ability to perform within the CSL, as stated by UNESCO (2014). Expectations, feedback and student–faculty relations were characteristic.

The majority of students pointed out the difficulty of understanding what was expected of them: 'last year I had no clue what was expected from me, and I came to the exam believing I knew, but I had no idea what the examiners expected' (B7). Another student explained: 'For instance, I had no idea that so much knowledge on anatomy was required' (B8). This also proved to be a problem when it came to interpreting the case studies that were given as assignments. The students were often frustrated: 'what do they mean? What do they think? How do you interpret it?' (B1). They believed that some of their frustrations could have been avoided had their instructors clearly stated their expectations and provided more thorough information during the skills training sessions.

Feedback referred to the students' "hunger" for confirmation that they were on the "right track" in regard to both (psychomotor) performance and their critical thinking skills. They used multiple methods to receive this confirmation, for instance testing each other with questions from textbooks, taking online tests or emailing their questions to faculty. The most urgent issue was: 'you need something that can give you something in return, that you receive feedback on the spot' (A1). Some of the students complained that their lack of knowledge made it difficult for them to judge the quality of feedback given by peers, so they therefore wanted feedback from the faculty: 'Then you know that what you learn is correct' (B6). They also pointed out that the faculty had limited time to give them the feedback that they wanted: 'maybe they [the teachers] could prioritize some days throughout the autumn semester where a couple of them are available for questions' (B3).

The groups of 8–12 students in the CSL created an intimacy in the skills training that did not exist in lectures in an auditorium with 240 students. This intimacy seemed to change the relationship between students and faculty: 'it has been really positive to experience that teachers are humans, (...) That they did not take themselves too seriously' (B3). The students also stressed how these relations improved their learning environment in the CSL: 'if you get like a smile and a nod and 'come on' and everything is ok, then it is.... It's fun!' (A6) or made it uncomfortable: 'when you feel like you get attacked for asking questions. It could happen, not everyone is like that, but, then we were so unhappy when we finished' (B5).

Organizational Environment

Organizational environment consisted of the sub-factors course structure and faculty resources. Organizational environment is here defined as the faculty's facilitation, allocation and management of work.

The main concern with course structure was the lack of consistency among faculty members. A variety of answers in response to students' questions led to frustration and uncertainty over what was correct. In addition, the content and delivery of the different classes varied extensively among faculty members, making the students request a common approach: 'the teachers should coordinate amongst themselves so they tell the same things and are updated, so different groups don't learn different things' (B9). 'I often experience that the teachers says something different from the film or the PPS [Practical Procedures for Nurses] guidelines' (B11). Some of the students perceived that the differences in the information that they were receiving gave the impression that the faculty was unprepared.

Access to faculty was difficult: 'when people [teachers] where there [in the lab], we grabbed hold of them, because everyone is so busy, so we grab hold of everyone that comes by' (A6). In addition many students reported that they did not receive responses from their instructors on the online discussion forum that was intended to be a resource for answers and discussions between teachers and students: 'there are still questions that are unanswered and then you kind of give up, when they [the questions] have been there for several months' (A5). Students also desired more time to practice: 'we should have had more [practice], we should have practiced and practiced, so that we were able to see the entire picture in a way' (A6). Others clearly were unhappy not hearing back from the faculty: 'you know you get uncertain, because we are not professionals any of us, so it would be great to have a teacher present once in a while' (A7).

Although some students accepted that the nursing school was under-resourced, several were dissatisfied: 'often a teacher was sick, and then we were maybe 10–14 students with one teacher, I think that was a bit too much' (B11). Students also complained about time constraints: 'there is no time for questions because we have 20 min on that procedure and 20 min on that procedure and it is like "please do not ask any questions" because they have to show us how the procedures are done' (A3). Some students reported that faculty members cut the

training sessions short: 'many of the teachers are in a hurry, 'are you done soon?' and then we leave after a short time, and we have only used one and a half hour when we could have been there for three' (B4). Many students believed that they would have done better if they had had more time: 'the days when we have been there for the entire time frame we have learned much more, because then we have discussed and there has been time for questions' (B9).

Fig. 1 shows a framework for clinical skills learning environment and the influencing factors. The framework can be used for future CSL improvement efforts.

Discussion

In this paper, we have studied undergraduate students' perceptions of their learning environment in a clinical skills laboratory (CSL). We have identified the physical, psychosocial, and organizational factors of importance for their learning environment. The results from group A and group B showed consensus both within and across the two study groups, despite the expectation that group composition and dynamics would yield differences in their members' perceptions of the CSL environment (Krueger and Casey, 2009). Although the reasons for the consensus are unclear, it might indicate that students' perceptions of being a student are perceived uniformly, smoothing out the differences in age and study program. At the same time, we cannot rule out the possibility that the familiarity among the students in group A created invisible boundaries that prevented certain subjects or collective tacit knowledge from being raised (Morgan, 1997). To prevent this, the researchers made efforts to allow time for all students in the group to present their views. In the following, we will discuss three major issues that cut across several of the identified factors and that are vital components of a CSL learning environment.

Authenticity

Authenticity seems to be especially important to the students, who valued the ability to train in surroundings that resembled the environment of their future workplace. Not being able to train in such surroundings often led to frustration and diminished satisfaction among the students. Wellard et al. (2009) echo these findings, pointing out that students and staff emphasize the importance of creating an environment that resembles the practical nursing setting. According to Johnson (2009), the reason that students need authenticity might be the need to create an environment in which students perceive the realism of the situation and understand its relevance for clinical practice.

The students clearly stated that they felt uncertain in the CSL when equipment was old, reused or unavailable. Rettedal (2009) argues that the professional nurse is aided in a simulation training setting by mental images that he or she has gained through real-life practice. Since the nursing students are undergraduates with minimal practical experience, lack of such mental images could explain why they find it difficult to improvise in a simulated setting. Their need for circumstantial factors that mimic a real environment and up-weigh their lack of mental images would explain the necessity of authenticity as a vital component of their learning environment. On the one hand, authentic facilities and equipment should therefore be integrated into realistic training settings. On the other hand, Wellard et al. (2009) note that there is little empirical support for the relationship between CSL training and nurses' preparedness for clinical reality, indicating a need for further research.

Motivation

Training in a CSL is an important element of preparing students for the professional nursing practice, according to Wellard and Heggen (2010). It is often the students' first experience with hands-on clinical practice. This novelty might explain the fact that students enjoy CSL training, as supported by Freeth and Fry (2005). Deci and Ryan (1985)

use the term *intrinsic motivation* to describe activities that give a positive experience to the performer and that are beneficial for learning. Situations characterized by intrinsic motivation are performed for the fun, challenge or positive experience that they entail, rather than the instrumental benefits to the student. The positive experience that the students expressed could imply that they have a natural motivation to train and work in the CSL. However, most activities are extrinsically motivated, according to Ryan and Deci (2000). Performance in the CSL is therefore not solely motivated by the joy of training but also externally motivated by the fear of failing the exam or the reward for passing it.

Motivation to learn is an important factor for learning outcome (Deci and Ryan, 2004), and is therefore an essential component to address in educational settings. Intrinsic motivation can be facilitated through communication, relations and feedback from others in the learning environment, according to Ryan and Deci (2000). Feedback is pivotal because it encourages students to improve by changing their future actions (Giles et al., 2014). Relations are important because of their influence on intrinsic motivation through positive relational enforcement in student groups (Ryan and Deci, 2000). In order to increase students' motivation, faculty should value support, respect, and care about their students while giving them the challenges and expectations that they need (Raaheim, 2013). These values were confirmed by the students in this study.

Resources

Our results clearly indicated that time constraints and limited faculty resources interfered with students' acquisition of clinical skills. Benner et al. (2010) argue that the complexity of psychomotor skills acquisition demands a variety of educational approaches. Johansson (2012) emphasizes the importance of the environment in successful learning. Despite this, the teaching of traditional clinical skills in most nursing schools has been based on the perspective that clinical practice makes perfect (Dunn, 2004). After spending 2 to 4 h a week on skills training (depending on the skill), students can use the CSL to perfect their clinical skills on their own schedule (Lin, 2013). However, the idea that practical skills develop naturally without feedback and guidance has been challenged (Bjork, 1999; Kardong-Edgren et al., 2010).

In an era of mass education, emphasis on best practice, pressured clinical placements and staff with reduced learning opportunities there is reason to suspect that educational institutions concentrate too heavily on what is being taught, rather than how it is taught (Barnett et al., 2010; Lin, 2013; Reierson et al., 2013) and where. This might place the students in a trap between faculty obligations and educational faculties that need to change.

Limitations

The study is based on a single nursing school, so there is a question of whether or not the findings can be applied to other nursing schools and contexts (Graneheim and Lundman, 2004). Studies comparing CSLs in Australia and Norway have identified several similarities between the two countries (Wellard and Heggen, 2010), implying that there is some transferability of our study results. While agreement between the groups indicates that their members were free to speak up, we cannot rule out the possibility that students disagreeing with the group consensus hesitated to express themselves. Although transcripts were not returned to the participants for validation, main trends in our results were presented and validated by faculty members at the nursing school.

Conclusion

In order to improve conditions for learning in the CSL, this study explored factors of vital importance for students during their CSL training. The study explored several physical, psychosocial and organizational

factors. These factors should be improved through enlisting student involvement in future improvement efforts to facilitate motivation and to create authentic learning situations.

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References

- Barnett, T., Cross, M., Shahwan-Akl, L., Jacob, E., 2010. The evaluation of a successful collaborative education model to expand student clinical placements. *Nurse Educ. Pract.* 10 (1), 17–21. <http://dx.doi.org/10.1016/j.nepr.2009.01.018>.
- Benner, P., Sutphen, M., Leonard, V., Day, L., 2010. *Educating Nurses: A Call for Radical Transformation*. Jossey-Bass, California: San Francisco.
- Bjork, I.T., 1999. Practical skill development in new nurses. *Nurs. Inq.* 6 (1), 34–47.
- Bjork, I.T., Bentsen, K., Brynildsen, G., Hestetun, M., 2014. Nursing students' perceptions of their clinical learning environment in placements outside traditional hospital settings. *J. Clin. Nurs.* 23 (19/20), 2958–2967. <http://dx.doi.org/10.1111/jocn.12532>.
- Bland, A.J., Topping, A., Tobbell, J., 2014. Time to unravel the conceptual confusion of authenticity and fidelity and their contribution to learning within simulation-based nurse education. A discussion paper. *Nurse Educ. Today* 34 (7), 1112–1118. <http://dx.doi.org/10.1016/j.nedt.2014.03.009>.
- Breymer, T.L., 2012. *Clinical Learning Needs: Student Nurse Perceptions of the Traditional Clinical Environment and the Simulation Environment* (Ph.D., Capella University. Retrieved from EBSCOhost database).
- Deci, E.L., Ryan, R.M., 1985. *Intrinsic Motivation and Self-determination in Human Behavior*. Plenum, New York.
- Deci, E.L., Ryan, R.M., 2004. *Handbook of Self-determination Research*. University of Rochester Press, New York.
- Denzin, N.K., Lincoln, Y.S., 2011. *The SAGE Handbook of Qualitative Research*. Sage, Los Angeles.
- Dieckmann, P., Friis, S.M., Lippert, A., Ostergaard, D., 2012. Goals, success factors, and barriers for simulation-based learning: a qualitative interview study in health care. *Simulat. Gaming* 43 (5), 627–647.
- Dunn, W., 2004. Educational theory: does simulation really fit? In: Dunn, W. (Ed.), *Simulators in Critical Care and Beyond*. Society of Critical Care Medicine, Des Plaines, pp. 15–19.
- Freeth, D., Fry, H., 2005. Nursing students' and tutors' perceptions of learning and teaching in a clinical skills centre. *Nurse Educ. Today* 25 (4), 272–282. <http://dx.doi.org/10.1016/j.nedt.2005.01.007>.
- Giles, T.M., Gilbert, S., McNeill, L., 2014. Nursing students' perceptions regarding the amount and type of written feedback required to enhance their learning. *J. Nurs. Educ.* 53 (1), 23–30. <http://dx.doi.org/10.3928/01484834-20131209-02>.
- Graneheim, U.H., Lundman, B., 2004. Qualitative content analysis in nursing research: concepts, procedures and measures to achieve trustworthiness. *Nurse Educ. Today* 24 (2), 105–112. <http://dx.doi.org/10.1016/j.nedt.2003.10.001>.
- Henderson, A., Cooke, M., Creedy, D.K., Walker, R., 2011. Nursing students' perceptions of learning in practice environments: a review. *Nurse Educ. Today* 32 (3), 299–302. <http://dx.doi.org/10.1016/j.nedt.2011.03.010>.
- Heydari, A., Yaghoobinia, F., Roudsari, R.L., 2013. Supportive relationship: experiences of Iranian students and teachers concerning student–teacher relationship in clinical nursing education. *Iran. J. Nurs. Midwifery Res.* 18 (6), 466–474.
- Houghton, C.E., Casey, D., Shaw, D., Murphy, K., 2012. Staff and students' perceptions and experiences of teaching and assessment in clinical skills laboratories: interview findings from a multiple case study. *Nurse Educ. Today* 32 (6), e29–e34. <http://dx.doi.org/10.1016/j.nedt.2011.10.005>.
- Johansson, T., 2012. *The Learning Human Being: Development Learning Socialization*. (In Swedish). Liber, Malmö.
- Johnson, E., 2009. Extending the simulator: good practice for instructors using medical simulators. In: Dieckmann, P. (Ed.), *Using Simulations for Education, Training and Research*. Pabst, Lengerich, pp. 180–201.
- Kardong-Edgren, S., Adamson, K.A., Fitzgerald, C., 2010. A review of currently published evaluation instruments for human patient simulation. *Clin. Simulat. Nurs.* 6 (1), e25–e35. <http://dx.doi.org/10.1016/j.ecns.2009.08.004>.
- Katinka, K.V., Albert, J.A.H.P., Cees, J.J.A.S., Vleuten, P.M.V.D., Verwijnen, G.M.M., 1998. Student participation in educational management and organization. *Med. Teach.* 20 (5), 451–454. <http://dx.doi.org/10.1080/01421599880562>.
- Khan, B.A., Ali, F., Vazir, N., Barolia, R., Rehan, S., 2011. Students' perceptions of clinical teaching and learning strategies: a Pakistani perspective. *Nurse Educ. Today* 32 (1), 85–90. <http://dx.doi.org/10.1016/j.nedt.2011.01.016>.
- Krueger, R.A., Casey, M.A., 2009. *Focus Groups: A Practical Guide for Applied Research*. Sage, Los Angeles, California.
- Lin, Z.-C., 2013. Comparison of technology-based cooperative learning with technology-based individual learning in enhancing fundamental nursing proficiency. *Nurse Educ. Today* 33 (5), 546–551. <http://dx.doi.org/10.1016/j.nedt.2011.12.006>.
- Loo Chuan, O., Barnett, T., 2012. Student, tutor and staff nurse perceptions of the clinical learning environment. *Nurse Educ. Pract.* 12 (4), 192–197. <http://dx.doi.org/10.1016/j.nepr.2012.01.003>.
- Morgan, D.L., 1997. *Focus Groups as Qualitative Research*. 2nd ed. vol. 16. Sage Publications, Thousand Oaks, Calif.

- Moule, P., Willford, A., Sales, R., Lockyer, L., 2008. Student experiences and mentor views of the use of simulation for learning. *Nurse Educ. Today* 28 (7), 790–797. <http://dx.doi.org/10.1016/j.nedt.2008.03.007>.
- Papathanasiou, I.V., Tsaras, K., Sarafis, P., 2013. Views and perceptions of nursing students on their clinical learning environment: teaching and learning. *Nurse Educ. Today* 34 (1), 57–60. <http://dx.doi.org/10.1016/j.nedt.2013.02.007>.
- Raaheim, A., 2013. *Advice and Tips for You That Teach* (In Norwegian). Gyldendal akademisk, Oslo.
- Reierson, I.A., Eivindsen, A., Wighus, M., Brangot, S., Bjørk, I.T., 2013. Key issues and challenges in developing a pedagogical intervention in the simulation skills center – an action research study. *Nurse Educ. Pract.* 13 (4), 294–300. <http://dx.doi.org/10.1016/j.nepr.2013.04.004>.
- Rertedal, A., 2009. Illusions and technology in medical simulation: if you cannot build it, make them believe. In: Dieckmann, P. (Ed.), *Using Simulation for Education, Training and Research*. Pabst, Lengerich.
- Robb, M.K., 2012. Managing a large class environment: simple strategies for new nurse educators. *Teach. Learn. Nurs.* 7 (2), 47–50. <http://dx.doi.org/10.1016/j.teln.2011.08.006>.
- Ross, J.G., 2012. Simulation and psychomotor skill acquisition: a review of the literature. *Clin. Simul. Nurs.* 8 (9), e429–e435. <http://dx.doi.org/10.1016/j.ecns.2011.04.004>.
- Ryan, R.M., Deci, E.L., 2000. Intrinsic and extrinsic motivations: classic definitions and new directions. *Contemp. Educ. Psychol.* 25 (1), 54–67. <http://dx.doi.org/10.1006/ceps.1999.1020>.
- Säljö, R., 2001. *Learning in Practice: A Sociocultural Perspective* (In Norwegian). Cappelen akademisk, Oslo.
- Stokes, L.G., Kost, G.C., 2009. Teaching in the clinical setting. In: Billing's, D., Halstead's, J. (Eds.), *Teaching in Nursing: A Guide for Faculty*. Saunders, St. Louis, MO.
- UNESCO, 2014. The psychosocial environment. Available at: <http://www.unesco.org>.
- Wellard, S.J., Heggen, K.M., 2010. Are laboratories useful fiction? A comparison of Norwegian and Australian undergraduate nursing skills laboratories. *Nurs. Health Sci.* 12 (1), 39–44. <http://dx.doi.org/10.1111/j.1442-2018.2009.00481.x>.
- Wellard, S.J., Solvoll, B.-A., Heggen, K.M., 2009. Picture of Norwegian clinical learning laboratories for undergraduate nursing students. *Nurse Educ. Pract.* 9 (4), 228–235. <http://dx.doi.org/10.1016/j.nepr.2008.06.005>.
- West, C., Usher, K., Delaney, I.J., 2012. Unfolding case studies in pre-registration nursing education: lessons learned. *Nurse Educ. Today* 32 (5), 576–580. <http://dx.doi.org/10.1016/j.nedt.2011.07.002>.
- Yung, B.H.W., Zhu, Y., Wong, S.L., Cheng, M.W., Lo, F.Y., 2013. Teachers' and students' conceptions of good science teaching. *Int. J. Sci. Educ.* 35 (14), 2435–2461. <http://dx.doi.org/10.1080/09500693.2011.629375>.

Paper II

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RESEARCH ARTICLE

Open Access



How can students contribute? A qualitative study of active student involvement in development of technological learning material for clinical skills training

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Abstract

Background: Policy initiatives and an increasing amount of the literature within higher education both call for students to become more involved in creating their own learning. However, there is a lack of studies in undergraduate nursing education that actively involve students in developing such learning material with descriptions of the students' roles in these interactive processes.

Method: Explorative qualitative study, using data from focus group interviews, field notes and student notes. The data has been subjected to qualitative content analysis.

Results: Active student involvement through an iterative process identified five different learning needs that are especially important to the students: clarification of learning expectations, help to recognize the bigger picture, stimulation of interaction, creation of structure, and receiving context-specific content.

Conclusion: The iterative process involvement of students during the development of new technological learning material will enhance the identification of important learning needs for students. The use of student and teacher knowledge through an adapted co-design process is the most optimal level of that involvement.

Keywords: Clinical skills, Nursing education, Technology, User involvement, Student involvement

Background

Clinical skills training is a fundamental part of nursing education wherein students combine sensory, motor and cognitive learning processes and learn how to perceive and act in any situation presented to them [1]. This complexity of clinical skills acquisition demands a range of different learning approaches for nursing students to learn what they need to know [2]. A shift toward more learner active teaching strategies in higher education [3] and an expanding knowledge of information technology [4] has produced many changes in clinical skills training over the last few years. This change has produced multiple new learning strategies, such as simulation, serious games, online learning material, and personal digital

assistants, which have emerged and become part of nursing student clinical skills training [5–9]. Nevertheless, the quest to determine the most optimal learning method within clinical skills is still being sought by many nurse educators [10].

Further, new policy initiatives and an increasing amount of the literature within higher education call for students, not only to be consulted during the development of learning strategies, but also become actually involved as co-designers, co-producers, and co-creators of their own learning [11, 12]. The goal is to place student needs at the center of the design process [13] and thus view the student as a knowledgeable and critical partner in learning [14]. While the idea of user involvement already is an established best practice within health care services [15–17] nursing education has only to some extent actually embraced this student collaboration concept [18, 19]. Student experiences have, however,

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been deemed valuable for future educational improvement [20] and student involvement has been used in some curriculum design [21, 22]. There is also some comprehensive literature on student use, benefits, barriers, and their experiences with already developed programs and devices [23–25]. On the other hand, there is a shortage of literature on active involvement of nursing students in the actual development processes and especially a lack of descriptive studies that examine the actual personal role of the students when they are engaged in the creation of their own learning activities [26]. In Norway, undergraduate nursing education follows the Bologna requirements with 3 years of full-time study resulting in a bachelor degree [27]. Student involvement is ensured through law [28] where the minimum requirement is yearly student evaluation of the educational programme provided by the institution. The Ministry of Education also requires the educational institutions to gear their educational approach to the ‘*active, participating student*’, through a White Paper submitted to the Norwegian Parliament [29]. While these official documents have ensured some participation, the room for individual interpretation of its execution often results in the use of representatives rather than participatory or prefigurative forms [30].

Aim of the study

The aim of this study was to explore and describe the actual process of student involvement when developing technological learning material for clinical skills training in a Norwegian nursing faculty. Two research questions were developed for this purpose:

- How can nursing faculties actively involve their nursing students in the process of developing technological learning material?
- How can both students’ roles and contributions in the development process of such technological learning material be best described?

Methods

Design

The study was grounded in the idea of user involvement and the methodology of participatory design (PD). PD builds on the line of reasoning that key to finding the gaps that matters lies in involving the end users in development and design of services [31]. The process entails actively involving a group of people and bringing them to a consensus on what they want to do and how best to do it. In order to meet the actual needs of the users, their involvement must be incorporated into both design and development [31]. Through this process, PD has the potential of increasing the ease of implementation and of creating the benefits of credibility and legitimacy,

while ensuring that the final design truly meets the precise needs of its users [19]. The approach has been specially suggested for use within educational settings due to its ability to take student perspectives into account [11]. While similar approaches such as experience-based co-design (EBCD) offers a series of stages to follow [32, 33] PD does not entail a specific description of how to involve the end users in the development process, but rather focuses on the involvement itself. In this study, the methods of data collection therefore needed to both actively and creatively engage the students in the developmental process, while giving the researchers the opportunity to grasp the students’ perspectives throughout the developmental process. An explorative qualitative approach was chosen as appropriate for arriving at an in-depth understanding of human behavior, by giving the participants room and opportunity to describe and explain their own experiences [34]. The development process was elaborated by the authors of the paper and divided into five phases; (1) initial phase, (2) Investigation phase, (3) revision phase, (4) exploratory test phase, and (5) finalization phase. The students contributed to different activities and to the collection of different data throughout the development process. An overview of activities and data collection is found in Table 1.

Contextual setting

The technological learning material was applied to the clinical skills course at a Norwegian nursing faculty to teach undergraduate nursing students the 13 clinical skills required to pass that course. The course the technological learning material was applied to was based on a combination of supervised and unsupervised practice sessions. There were nine different supervised training sessions wherein a teacher-led group of 10–12 students practiced the 13 different scenarios. In addition, the students were given unlimited access to the Clinical Skills Laboratory (CSL) at the campus where they were expected to administer their own unsupervised training sessions. At the end of the course, all students were tested in one of the 13, randomly chosen skills in practical oral examination. For details of the course and the CSL environment, see C Haraldseid, F Friberg and K Aase [35]. Portable Sim-Pad® tablets were used as technological mediators of the offered learning material. The main features of the tablet was; preprogramming correct actions that could be taken, feedback on actions taken, and to linking actions to responses. The user was thereby guided through a scenario, which could develop in multiple ways, as different actions might result in different outcomes. The software also gave the user a log of their actions at the end of each scenario and the programmer had the opportunity to add log comments, give the instructor instant messages, or set time limits for when actions needed to take place. By

Table 1 Overview of research activities and collection of data material for study

Phase	When	Where	Activity	Data material	Participants
Initial Phase	Autumn 2013	CSL on campus	Tablets borrowed 134 times for unsupervised training sessions	Field notes	165 students
Investigative Phase	Spring 2014	Meeting room on campus	Two focus group Interviews	Transcription of interviews and field notes	Group A: 11 students Group B: 8 students
Revision Phase	Spring 2014	First author's office at campus	Four revision meetings E-mail exchanges	Field notes from the meetings, taken by first author	First author, clinical nurse specialist, faculty teacher, and Senior interaction designer
Exploratory test Phase	Spring 2014	CSL on campus	Two practical test sessions	Student notes during practical test	Group C: 5 Students Group D: 6 Students
		Meeting room on campus	Two focus group Interviews	Transcription of interviews and field notes	Group C: 5 Students Group D: 6 students
Finalization Phase	Spring 2014	First author's office	One revision meeting	Field notes	First author, faculty teachers

pre-programming the tablets, the students were able to run the required scenarios on their own.

Prior to involving the student in the developmental process actively, four prototype scenarios were developed by a teacher team to exemplify for the students how the features of the tablet could be used. To demonstrate to the students what they were asked to do, all students (165) enrolled in the clinical skills course were given a 1-hour introductory instruction lecture on how to operate their tablets, including the possibility of testing the device in groups. The prototype scenarios were also made available for use during two compulsory, supervised training sessions where the students had the opportunity to access their tablets during unsupervised training sessions to test the scenarios and become comfortable with their use. After the introduction, the students were involved in different phases and in different activities as shown in Table 1.

Study participants

The study was undertaken at a Norwegian nursing faculty during Fall 2013 and Spring 2014 terms. In the Initial phase, all students enrolled in the clinical skills course were informed of the ongoing project and had the opportunity to familiarize themselves with the tablets and use of them as desired and when and how they wanted. The students participating in the Investigation and Exploratory Test phase were recruited during the initial phase through purposive sampling among all 165 students. This recruitment was done after the students completed their clinical skills course. Due to their participation in the course these students would have important experiences of their needs and the challenges that would present during clinical skills acquisition, together with first-hand user information on how the prototype of the learning material used in the course could be improved. The students were recruited by the

first author through an open invitation in one of the faculty lecture classes. All students wishing to participate were encouraged to approach the first author personally or via an e-mail after class. There were no prerequisite for how much the students used the prototype of the learning material during the course, as those without excessive experience with the tablets could also contribute with important experiences leading to improvements. In total, 19 students contributed to four focus group interviews and two practical training sessions. In their own reporting, five of these 19 students stated they had used the tablet 'a little', six had used it 'some', and eight reported they had used it 'a lot'. During the focus groups in the Investigation Phase the 19 students were divided into two groups with eight students in Group A and 11 in Group B. The division into the groups were based on the students' schedules and their convenience. In the Exploratory Test Phase, 11 out of the original 19 students who participated did so based on availability with five from Group A and six from Group B. These 11 students were then divided into Groups C and D (see Table 1).

During the Revision and the Finalization phases, the first author organized meetings and conducted the process of making changes to the learning material. A clinical nurse specialist from the hospital contributed as a direct result of the students' feedback, and two faculty teachers were consulted to make sure the current alterations matched best practice guidelines and required course content. A senior interaction designer was consulted on how to integrate the students' feedback to the technological choices available on the tablet set-up.

Ethical considerations

During the Initial phase of the study the students were given oral information about the ongoing project, confirming that participation was voluntary, which is in line with the principles outlined in the Declaration of

Helsinki (World Medical Association Declaration of Helsinki, 2005). The students who proceeded to participate in the Investigation Phase and the Exploratory Test Phase received both written and oral information on the background and goal of the study, including information about their right to withdraw from the study at any point during it. Written informed consent was collected prior to data collection in both the Investigation Phase and the Exploratory Test Phase. Since the current research study involved no medical interventions or collection of health related information, the approval authority is the Norwegian Social Science Data Services (NSD) who also assess the ethical aspects of recruitment and informed consent. Approval for the study was therefore obtained from the NSD (Reference Number. 36260) and from the head of the nursing faculty.

Data collection

The data in the study was collected through field notes and focus group interviews. Field notes were collected through informal meetings between the first author and the students, for example, during the delivery and return of the tablets or if any students approached the first author with comments about tablet use. In addition, notes were taken at all revision meetings, and the students took their own notes during the practical test session.

All focus group interviews were conducted in a meeting room on campus. Interviews with Groups A and B were conducted 6 weeks after these students completed the clinical skills course, while the interviews with Groups C and D were conducted 9 weeks after their completion of the course. All interviews were moderated by the first author and assisted by the third author. Interaction between the students was encouraged with the moderator asking, prompting, and clarifying questions. Interviews were audio recorded while both the moderator and assistant moderator wrote field notes to complement the audio-taping. The Investigation Phase and the Finalization Phase had their own separate aims and interview guidelines, respectively.

In the Investigation Phase, the focus group interviews [36] lasted for 60–80 min. The goal was to explore the students' requirements during unsupervised training and how the technological learning material could contribute to fulfilling their learning needs. The interviews commenced with general questions about the students experiences in CSL training. Once the students seemed comfortable with the interviewers, the questions gradually turned to the theme of the study [36]. Those questions pertained to the issues the students enjoyed or found difficult in the CSL environment, their needs, and how their training could be improved.

The Exploratory Test Phase consisted of both practical training sessions and focus group interviews. The training

session lasted for 45–60 min. In that session the students received a revised version of the technological learning material, based on the needs and feedback gathered during the Investigation Phase. They were given all the necessary equipment to complete the training session. The students were divided in groups of two or three and instructed to test the device as it suited them, but they had to complete the entire scenario. They were encouraged to take breaks in the scenario and discuss the process with each other, while taking notes of what they had experienced, felt and thought. Immediately after the practical training session, the groups were gathered for joint discussion in focus group interviews. The focus group lasted for approximately 30 min. It attended to different aspects of the learning material, in particular; the layout, the content, and areas that needed improvement and ways to undertake such improvement. In addition, the students handed in their personal notes from the practical test session for use as supplementary data material.

Data analysis

The main topic for analysis was the focus group interviews, while the field notes and student notes were used as supplementary data material. Qualitative content analysis was chosen as the method to analyze and categorize data [37]. All interviews were transcribed by the first author 1 or 2 days after the interviews. The transcripts and field notes were also analyzed and coded by the first author. In the first step, the data was read as openly as possible, trying to get an impression of both parts and the whole. In the second step, after reducing the number of words while still preserving the content, the meaning units were shortened and coded. This step compared the units and sorted the text into relevant themes [37]. As the authors reviewed and discussed these themes, it became clear that several themes were overlapping, so some themes were merged at a more abstract level in Step 3. Step 4 consisted of reading the field notes and interview transcriptions again, making sure the final themes covered the whole picture. During this step it became clear that the themes represented five different learning needs that were especially important for the students: clarification of learning expectations, help to recognize the bigger picture, stimulation of interaction, creation of structure, and receiving context-specific content. To establish trustworthiness throughout the entire study, the first and third authors conducted the interviews and took all the field notes, while the second author formulated the critical questions needed to expand the understanding of the gathered data [37, 38]. Different interpretations found during the analytical steps were repeatedly discussed and reinterpreted by all authors together.

Results

Through a process of actively involving nursing students in the development of technological learning material, their role evolved into being advocates for learning needs that are necessary for tailoring their learning material accordingly. While the nursing faculty staff may hold the key to what students should learn, the students described how their learning could be most constructively achieved. These learning needs were not initially explicitly described, but rather evolved over time as a result of the iterative involvement. By systematically collecting the students' experiences and using different data sources, their learning needs became both explicit and concise. These learning needs were subsequently used as the basis for identifying the practical implications and changes to be made to the technological learning material. The five themes evolved through the process of the material development and represent the students' different learning needs.

Clarification of learning expectations

The students undertook a range of different actions to prepare themselves for the final exam, among these were multiple choice questions, video films, assigned reading and correspondence with teachers through e-mails, on-line discussions forums, and personal meetings. While these different actions did serve different needs, the students' main goal was to understand what the faculty teachers actually expected of them in terms of learning. Their time and energy were often used to decipher the real or hidden meaning behind the information and questions they received from faculty teachers. This often led to uncertainty: *'If you don't have the answer, then we go back and forth. What do they mean? What do they think? How do you interpret it? Then you are left with three different answers...then this uncertainty appears (Interviews, Group B).* These were all typical questions from the students. Their biggest fear was a failure to grasp what they needed to learn, which would result in their failing the exam. This fear left them uncertain and insecure, indeed more worried about what the faculty wanted them to know than about how they could learn better and understand the different aspects of the actual procedure. *'The students ask a lot of questions over and over again, and need detailed conformation and information about what to learn (Field notes).* The students, therefore, needed better preparation and more information about their teachers' expectations. By clarifying expectations, important time and energy could be diverted toward achieving specific learning goals, instead of searching for them. When addressing this issue by integrating learning goals into the learning material, the students found it easier to grasp what was expected of them, as *'it stood there, in black and white: what is*

expected of you and what is the answer' (Interview, Group C).

Help to recognize the bigger picture

Another issue that claimed much of the students' attention was the variety of answers they could find for what they saw as being the same type of questions. In their struggle to find the 'right' answers, they often consulted different sources of information, resulting in them finding more discrepancies than clarification. For example, *'...we ask the same question to different teachers and get different answers' (Interview, Group B).* It seemed that the novelty of their profession led to an extreme attention to details, focusing more on the pieces of the puzzle than the big picture. They seemed to be self-aware of their own deficiency in recognizing the bigger picture while lacking the tools to do something about it *'...there is probably many ways to Rome, and they are all right, but we cannot see all the possibilities. For us there is so much we need to keep in mind; it is this procedure and this procedure, we cannot see all the possibilities, we need it to be more specific; that's how it is. Maybe it sounds kind of square, but that's how it is!' (Interview, Group B).* While all these small variations were a source of frustration, their biggest issue was the differences between actual practice and what was taught at the faculty: *'I have practiced (on the procedures) the way I think the sensors would like me to solve the task at the exam, in order to pass. You need to know how it's supposed to be done when you come in there (to the school exam) because the reality in the CSL is not exactly the same as the reality we meet when we are on prac' (Interview, Group A).*

The students therefore wanted answers that 'belonged' to every question and a recipe for how things were done and why. While the students searched for ways to simplify their quest for what they saw as 'right answers' the field notes also speculated that the real issue was understanding the bigger picture and indeed, *'recipes with belonging arguments of 'why' could help students think picture instead of pieces? (Field Notes).* The original questions embedded in the learning material were therefore complemented with answers and arguments. This aimed to help the students better understand the whole scenario, seeing better connections between principles, actions and arguments: *'(...) I think more now, I pay attention if the doctor (when in prac) does it correctly (...) Before I never had the knowledge to do that' (Interview, Group B).*

Stimulation of interaction

Besides helping to recognize the whole picture and clarifying expectations, the students appeared to seek, and value every possibility for more interaction. Types of

interactions varied between students and those between students and teachers. What all of the activities had in common, however, was that they gave the students' the ability to challenge their own knowledge, test their knowledge, and rate their knowledge to the knowledge of others and thus progress. While all forms of feedback were sought, teacher feedback was especially valued. The students saw this feedback as the safest source of information and information of the highest level to test their knowledge against, although it was often the least available option. The most used alternative was to practice, discuss, and receive precise feedback through group interaction with other students. The problem with this process, however, was uncertainty about the quality of the feedback coming from their peers: *'it is okay to ask each other, I might ask Mary, and then she answers and I think "hm...yes I'm satisfied with that answer", but sometimes I think "is Mary right?...is that the right answer?" And then you get hesitant, because we are not professionals any of us! So sometimes it would be great to have a teacher here!' (Interview, Group D).*

The tablet, however, could be used to ask stimulating questions and give feedback that would trigger more interaction both between the students and the tablet and between the students who were practicing together. Critical questions created enthusiasm and engagement with the procedure, while also eliminating the uncertainty that could be raised between peers as in *'you know that what you learn is correct', 'it's a quality assurance' (Interview, Group B).*

While the prototype scenarios entailed a limited number of questions, one of the later versions integrated questions into almost every answer to test how the student responded. As noted in the Field Notes, there was *'a surprising enthusiasm about all the questions in scenario 4 (Field Notes)'*. This mood seemed to be explained by the fact that the students saw the questions as a chance to be challenged about aspects of the procedure that they had not thought of, to *'get some aha-experiences for ourselves (Interview, Group A)'* and also to receive tips for possible questions for the exam. All these characteristics, taken together, made the tablet interesting as a potential element for creating highly valued interactions among the students that helped them both prepare and learn.

Creation of structure

Training for the practical oral exam was seen by the students as a stressful event. While they valued all sorts of tools that could help them during training, it was important that these tools simplified, instead of complicating, their preparations. Simplicity, overview, and structure were thus keywords found in the students' feedback created through the layout and design of the content on the tablet. It was

important that *'for someone that is doing this for the first time it should not feel so overwhelming', (Interview, Group C).* Student feedback, therefore, led to scenarios that were structured chronologically, dividing the different tasks into separate sections to create a natural progression in the scenario. While this dissection could be seen as fragmenting the bigger picture, it accommodated the students' previous statements about needing a recipe to follow due to the novelty of their profession: *'in nursing there is so much (to know)... But now it gets taken down a notch, and it gets easier to act accordingly' (Interview, Group B).* Using the same basic structure in all scenarios created a sense of familiarity and predictability for the students, while giving them the structure they needed. Another important aspect for creating such a structure was enabling the students to follow it. The initial lack of attention to details often caused a gap between what teachers believed was communicated and what the students perceived as having been communicated. *'People are more amateurs than you think (...) I remember when we first started here (in the CSL) some of us had never measured a blood pressure before, and then you are presented with a film, and you see how they measure, but there is no sound. Yes, you blow up this and you put these in your ears, but you don't know how it is supposed to sound. It's like if I was to teach you how to bake a cake I could say: "then you take the flour..." but you would want to know how much flour to take wouldn't you?! (Interview, Group B).*

This attention to detail often made the scenarios information rich and long, something that also claimed an opportunity to navigate back and forth in the scenarios and check information they were unsure of, while also to making it easier for them to repeat specific sections of the scenario while creating the structure. The students also pointed out where information needed to be elaborated on, what information could be misjudged or misunderstood, and how information should be phrased, thus keeping them truly on track to know what was important and avoid potential confusion.

Receive context-specific content

While creating a structure revolved around how information was given, the students' contributions were also concerned with what kind of information they needed. Multiple learning tools competed for their attention, and the trouble of their not knowing the best way to learn caused them to jump from one remedy to another. What made them favor the learning material on the tablet, however, was that the content could be specified to each context and situation. Disputes and frustration seemed to be more related to questions concerning context. Discrepancies in answers and information often were rooted in the fact that they were given for different contexts. By giving and explaining context specific information, more

tailored to the scenarios, the process helped settle disputes rather than create more of them.

That the learning material was produced in collaboration with teachers and a clinical nurse specialist created a new coherence between what happened during practice, was written in the referenced literature, lectured about in class and the information stored on the tablet. Taken together, this process clarified several factors that had previously been seen as discrepancies by the students, and it helped them see that instruction could be done differently, depending on the context: (Student 1) *'then we actually get an answer...'* (Student2) *Instead of just us students discussing, because then we never get answers...'*(Interview, Group B)'. Training using the tablet also created an unexpected positive aspect that helped them prepare for the more psychological aspect of the exam: *This is a very good way to work. You get kind of nervous, get some performance anxiety, because you know that she has something that resembles the exam (the tablet). You get to practice the exam situation in a systematic way* (Interview, Group C)'. Making the instruction context specific also meant challenging students to think about the context. Asking for explanations and reasons for their actions in each specific setting, but also asking what would have changed if something in the context was changed: *'By using the Simpad, I got quite a few extra tips about the questions that might come, what the sensors could ask, it made me become more aware of the reasons behind things* (Interview, Group A) ...'.

Practical implications

In order to operationalize the findings for future development of technological learning material, the five different learning needs that evolved through the iterative student involvement process were linked to a set of practical implications. These practical implications can be seen as a checklist of important aspects to consider for future development of technological learning material. The implications are structured in a figure indicating the relationship between the iterative student involvement, the evolved student learning needs, and the practical implications (Fig. 1).

As Fig. 1 displays, each of the five identified learning needs can be operationalized through a set of different implications. It is important to remember that the iterative student involvement process entailed student validation of all implications in this study, and the findings may vary by context. In addition, several aspects related to students' involvement need to be considered, some of which are discussed in the following.

Discussion

This paper documents how nursing students can be actively involved in the development of their own learning

materials and how their role indeed contributed to the identification of five different and important learning needs. In the following discussion we look at the involvement when using an iterative process and the level of student involvement for the best learning outcomes.

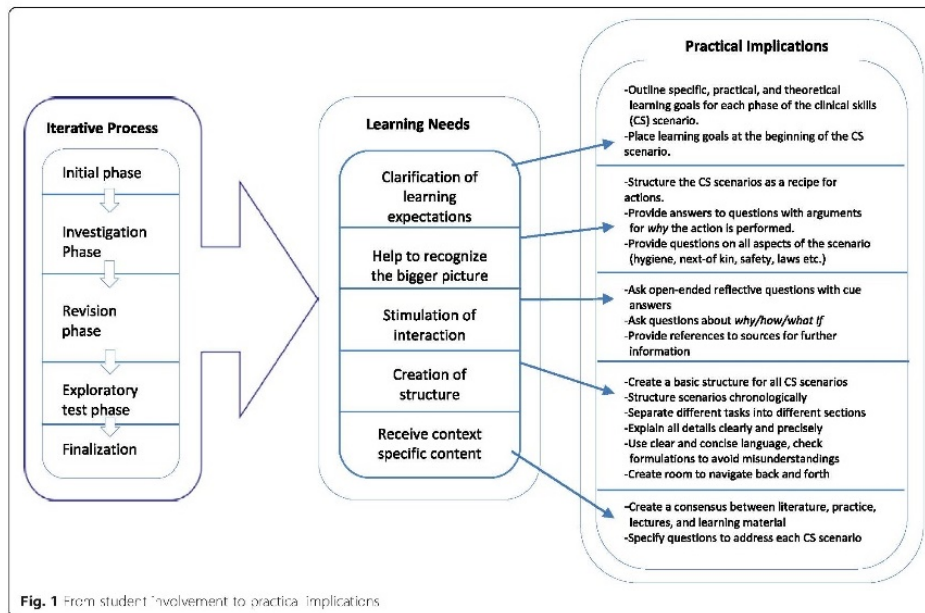
Using an iterative process for involvement

The students in this study were actively involved in several phases throughout the development process. The process was iterative and entailed identifying student needs and trying to meet them, before adjusting both the needs and the solutions. Without this repetitive process, the unveiling of the specific learning needs would have been more difficult. One of the most important catalysts that enables human beings to become proactive and engaged in activities according to RM Ryan and EL Deci [39] are the catalyzing factors in their environment. Among these are autonomy, which plays a vital role in human motivation [40]. Facilitating autonomy demands decreases external control, provision of individual choices, and acknowledgement of feelings [41]. We believe that the iterative process in contrast to a single mapping of students' experiences facilitates autonomy through acknowledging and integrating students' thoughts and feeling over time. Parallels can be drawn to Freire's [42] deliberative pedagogy where creativity and participation are taken into account. This choice again made the students in this study engaged and interested in the possibility of being able to influence their own learning material.

The process of iterative student involvement can be difficult to achieve due to limited time and resources. Teachers also often experience anxiety over reduced authority when they open up to students for feedback on their performance [43]. Further, students may feel insufficiently equipped to participate in the process [44]. On the other hand, engagement and student involvement, once undertaken, makes students more aware of their faculty's commitment to their own learning [45], thus enhancing knowledge of their own learning process [46], playing an important role in quality improvement [44] and increasing student satisfaction with the material provided them. While satisfaction should not be equated with quality [47], dissatisfaction with teaching has negative effects on both motivation and engagement [48]. The results from this study indicate that iterative processes that do identify students' needs assumable can foster more motivation and engagement and have the possibility of ensuring the development of learning design that satisfies students' needs.

Level of student involvement

Although user involvement is deemed to be beneficial, there is ongoing debate concerning the extent of that involvement. C Bovill and CJ Bulley [12] adapted



Arnstein's ladder of citizen participation [49] to revolve more around student involvement, and specifically distinguish between 'tutors in control' and 'students in control'. The highest level of participation is when students themselves control decision-making and have substantial influence, while the lowest level of participation is when there is no student participation [12]. The highest level of involvement removes the teacher from the equation, leaving the students absent from the influence of the tutor. While this active participation can bring to bear a high level of autonomy, as supported by EL Deci and RM Ryan [41], the removal of the tutor is still challenging in the higher education context due to quality assurance systems [12]. It could also be directly unwise sometimes, as the qualities of good teachers are still vital for the facilitation of learning according to J Hattie [50]. Striving for student participation at the highest rung also was contradicted by some of our findings. Our students clearly stated that the role of the teacher was important, as they needed clarification of learning expectations, along with questions, clues, and answers to help them see details they were not able to see for themselves. The teacher is, therefore, important when designing technological learning material and is supported by PA Kirschner [26]. Shared involvement in the overall process makes both students and teachers valuable, where the aim is not necessarily

simply to strive to reach the highest rung of the ladder. Within other professions, user involvement and participatory approaches have gradually shifted toward similar approaches such as 'co-creation', 'co-design' or 'experience-based co-design' [51–54]. These methods reflect a more democratized approach where the different stakeholders are united in a partnership agreement that fosters a bottom-up approach [33]. The idea is to involve all parties in an ongoing creative process, giving end-users a larger role and the power to make decisions [51]. Education, as advocated by Paulo Freire should in itself be an empowering, participatory process [42]. Involving students through co-creation and co-design could therefore seem suitable for the educational setting since participation and empowerment are the direct consequences of this process. Although the literature on co-creation and co-design within education is somewhat scarce, the method has proven fruitful in areas like health care and service improvement [55–57]. Collaboration through combining experience, creativity, and engagement of both students and teachers in a co-design of technological learning material could therefore be beneficial for in many respects.

Although different learning styles are believed to suit different students, the focus of this study was not to match a specific style to a particular type of students but

rather to add to the body of learning materials in order to increase the chance that all students will find a type of learning material that suits their needs. An analysis of the effects of the learning material described here was beyond the scope of the reported study. Further research is needed to investigate how this learning material impacts students' learning processes. The active student involvement was limited to a group of student representatives. Their opinions might not correspond with other students in the faculty or other nursing faculties, and those differences should also be taken into consideration [58].

Conclusion

This study indicates that iterative involvement of students in the process of developing new technological learning material enhances student identification of important learning needs. Further, the use of students' and teachers' knowledge in an adapted co-design process appears to be the most optimal level of involvement for both students and instructors. Further studies are needed to optimize the approach for student involvement and adjust it to various settings and professions.

Competing interests

The authors declare that they have no competing interests.

Authors' contributions

CH had the main responsibility for conception, design, data collection, analysis, interpretation and writing of the article. FF has contributed to the conception and design of the study, analysis and interpretation of data and revising the manuscript. KA has contributed to the conception and design of the study, data collection, analysis and interpretation of data, drafting and revising the manuscript. All authors have approved the final submitted version of the manuscript.

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References

- Johannesson E, Silen C, Kvist J, Hult H. Students' experiences of learning manual clinical skills through simulation. *Adv Health Sci Educ*. 2013;18(1):99–114.
- Benner P, Sutphen M, Leonard V, Day L. *Educating nurses: A call for radical transformation*. San Francisco: Jossey-Bass; 2010.
- West C, Usher K, Delaney LJ. Unfolding case studies in pre-registration nursing education: Lessons learned. *Nurse Educ Today*. 2012;32(5):576–80.
- Kala S, Isaramalai S-A, Pohthong A. Electronic learning and constructivism: A model for nursing education. *Nurse Educ Today*. 2010;30(1):61–6.
- McNitt S. Teaching Nursing Psychomotor Skills in a Fundamentals Laboratory: A Literature Review. *Nurs Educ Perspect*. 2012;33(5):328–33.
- dit. Daniel Petit OJ, Raby T, Ravaut F, Rothan-Tondeur M. Developing the Serious Games potential in nursing education. *Nurse Educ Today*. 2013;33(12):1569–75.
- Grierson LE, Barry M, Kapralos B, Carnahan H, Dubrowski A. The role of collaborative interactivity in the observational practice of clinical skills. *Med Educ*. 2012;46(4):409–16.
- Walker S, Thrasher AB. Use of Simulation to Develop Clinical Skills: Part 1, Low-Fidelity Simulators. *Int J Athl Ther Train*. 2013;18(2):20–3.
- Elliott L, DeCristofaro C, Carpenter A. Blending technology in teaching advanced health assessment in a family nurse practitioner program: Using personal digital assistants in a simulation laboratory. *J Am Acad Nurse Pract*. 2012;24(9):536–43.
- Bloomfield J, Fordham-Clarke C, Pegram A, Cunningham B. The development and evaluation of a computer-based resource to assist pre-registration nursing students with their preparation for objective structured clinical examinations (OSCEs). *Nurse Educ Today*. 2010;30(2):113–7.
- Könings KD, Brand-Gruwel S, van Merriënboer JGG. An approach to participatory instructional design in secondary education: an exploratory study. *Educ Res*. 2010;52(1):45–59.
- Bovill C, Bulley CJ. A model of active student participation in curriculum design: Exploring Desirability and Possibility. In: Rust C, editor. *Improving Student Learning (ISL) 18: Global theories and Local Practices: Institutional, Disciplinary and Cultural Variations*. Oxford: Oxford Brookes University; 2011.
- Bate P, Robert G. *Bringing User Experience to Healthcare Improvement: The Concepts, Methods and Practices of Experience-based Design*. Abingdon: Radcliffe Publishing; 2007.
- Shor I. *Empowering education. Critical teaching for social change*. London: University of Chicago Press; 1992.
- Dudley L, Gamble C, Preston J, Buck D, Hanley B, Williamson P, et al. What Difference Does Patient and Public Involvement Make and What Are Its Pathways to Impact? Qualitative Study of Patients and Researchers from a Cohort of Randomised Clinical Trials. *PLoS one*. 2015; 10(6).
- Renedo A, Marston CA, Spyridonidis D, Barlow J. Patient and Public Involvement in Healthcare Quality Improvement: How organizations can help patients and professionals to collaborate. *Public Manage Rev*. 2015;17(1):17–34.
- Happell B, Byrne L, McAllister M, Lamphire D, Roper C, Gaskin CJ, et al. Consumer involvement in the tertiary-level education of mental health professionals: A systematic review. *Int J Ment Health Nurs*. 2014;23(1):3–16.
- Tremayne P, Russell P, Allman H. Service user involvement in nurse education. *Nurs Stand*. 2014;28(22):37–41.
- Fenton G. Involving a young person in the development of a digital resource in nurse education. *Nurse Educ Pract*. 2014;14(1):49–54.
- Papathanasiou M, Tsaras K, Sarafis P. Views and perceptions of nursing students on their clinical learning environment: Teaching and learning. *Nurse Educ Today*. 2013;34(1):57–60.
- Happell B, Roper C. Promoting consumer participation through the implementation of a consumer academic position. *Nurse Educ Pract*. 2002;2(2):73–9.
- Khoo R, McVicar A, Brandon D. Service user involvement in postgraduate mental health education. Does it benefit practice? *J Ment Health*. 2004;13(5):481–92.
- Button D, Harrington A, Belan I. E-learning and information communication technology (ICT) in nursing education: A review of the literature. *Nurse Educ Today*. 2014;34(10):1311–23.
- Raman J. Mobile technology in nursing education: where do we go from here? A review of the literature. *Nurse Educ Today*. 2015;35(5):663–72.
- Mancuso-Murphy J. Distance education in nursing: an integrated review of online nursing students' experiences with technology-delivered instruction. *J Nurs Educ*. 2007;46(6):252–60.
- Kirschner PA. Do we need teachers as designers of technology enhanced learning? *Instr Sci*. 2015;43(2):309–22.
- European Ministers of Education: The Bologna Declaration of 19 June 1999. Joint declaration of the European Ministers of Education. Brussels, 1999. <http://www.magna-charta.org/resources/files/text-of-the-bologna-declaration>. Accessed 03 Nov 2015.
- The Norwegian Government. *Universitets og høyskoleloven (Law for Universities and Colleges) LOV-2005-04-01-15*. Oslo: The Norwegian Government; 2005.
- Norwegian Ministry of Education and Research. *St.meld. nr. 13: Utdanning for velferd. Samspill i praksis (Education for Welfare. Cooperation in Practice)*. Oslo: Governmental White Paper; 2013.
- McKeown M, Carey L. Editorial: Democratic leadership: a charming solution for nursing's legitimacy crisis. *J Clin Nurs*. 2015;24(3–4):315–7.
- Sanoff H. Multiple Views on Participatory Design. *Int J Arch Res*. 2008;2(1):57–69.
- Robert G, Cornwell J, Lockett L, Purushotham A, Sturme G, Gager M. Patients and staff as codesigners of healthcare services. *BMJ*. 2015;350:g7714.

33. Donetto S, Tsiannikas V, Robert G. Using Experience-based Co-design to Improve the quality of healthcare: mapping where we are now and establishing future directions. London: King's College London; 2014.
34. Polit DF, Beck CT. Nursing research: Generating and Assessing Evidence for Nursing Practice. Philadelphia: Lippincott: Williams & Wilkins; 2008.
35. Haraldseid C, Friberg F, Aase K. Nursing students' perceptions of factors influencing their learning environment in a clinical skills laboratory: A qualitative study. *Nurse Educ Today*. 2015;35:e1–6.
36. Krueger RA, Casey MA. Focus groups: a practical guide for applied research. Los Angeles: Sage; 2009.
37. Graneheim UH, Lundman B. Qualitative content analysis in nursing research: Concepts, Procedures and Measures to achieve trustworthiness. *Nurse Educ Today*. 2004;24(2):105–12.
38. Denzin NK, Lincoln YS. The SAGE handbook of qualitative research. Los Angeles: Sage; 2011.
39. Ryan RM, Deci EL. Self-determination theory and the facilitation of intrinsic motivation, social development, and well-being. *Am Psychol*. 2000;55(1):68.
40. Deci EL, Ryan RM. Intrinsic motivation and self-determination in human behavior. New York: Plenum; 1985.
41. Deci EL, Ryan RM. The "what" and "why" of goal pursuits: Human needs and the self-determination of behavior. *Psychol Inq*. 2000;11(4):227–68.
42. Freire P. Pedagogy of freedom: ethics, democracy and civil courage. Maryland: Rowman & Littlefield; 1998.
43. Rudduck J, McIntyre D. Improving learning through consulting pupils. Abingdon: Routledge; 2007.
44. Elassy N. A model of student involvement in the quality assurance system at institutional level. *Qual Assur Educ*. 2013;21(2):162–98.
45. McKinney K, Jarvis P, Creasey G, Herrmann D. A range of students voices in the scholarship of teaching and learning. In: Engaging student voices in the study of teaching and learning. 1st ed. edn. Edited by Werder C, Otis MM. Sterling, Va: Stylus; 2010.
46. Delpish A, Darby A, Holmes A, Knight-McKenna M, Mihans R, King C, et al. Equalizing voices: student faculty partnership in course design. In: Engaging student voices in the study of teaching and learning. 1st ed. edn. Edited by Werder C, Otis MM. Sterling, Va: Stylus; 2010.
47. Diaz-Méndez M, Gunnarsson E. Value co-creation and university teaching quality: Consequences for the European Higher Education Area (EHEA). *J Serv Manage*. 2012;23(4):571–92.
48. Eccles JS, Wigfield A, Midgley C, Reuman D, Iver DM, Feldlaufer H. Negative effects of traditional middle schools on students' motivation. *Elem Sch J*. 1993;93:553–74.
49. Arnstein SR. A ladder of citizen participation. *J Am Inst Plann*. 1969;35(4):216–24.
50. Hattie J. Visible learning and the science of how we learn. Oxford: Taylor & Francis; 2013.
51. Sanders EBN, Stappers PJ. Co-creation and the new landscapes of design. *CoDesign*. 2008;4(1):5–18.
52. Carey P. Student as co-producer in a marketised higher education system: a case study of students' experience of participation in curriculum design. *Innov Educ Teach Int*. 2013;50(3):250–60.
53. Ho K-H, Lee YC. The quality of design participation: Intersubjectivity in design practice. *Int J Des*. 2012;6:71.
54. Donetto S, Pierri P, Tsiannikas V, Robert G. Experience-based Co-design and Healthcare Improvement: Realizing Participatory Design in the Public Sector. *Des J*. 2015;18(2):227–48.
55. Warda G, Holliday N, Awang D, Hanson D. Creative approaches to service design: Using co-creation to develop a consumer-focused assistive technology service. *Technol Disabil*. 2015;27(1/2):5–15.
56. van Hoof J, Blom MM, Post HNA, Bastein WL. Designing a "Think-Along Dwelling" for people with dementia: A co-creation project between health care and the building services sector. *J Hous Elder*. 2013;27(3):299–332.
57. Bergdahl E, Benzein E, Ternstedt B-M, Elmberger E, Andershed B. Co-creating possibilities for patients in palliative care to reach vital goals - a multiple case study of home-care nursing encounters. *Nurs Inq*. 2013;20(4):341–51.
58. Könings KD, Brand-Gruwel S, van Merriënboer JGG. Participatory instructional redesign by students and teachers in secondary education: effects on perceptions of instruction. *Instr Sci*. 2010;39(5):737–62.

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Paper III

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ORIGINAL RESEARCH

Variability among groups of nursing students' utilization of a technological learning tool for clinical skills training: An observational study

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ABSTRACT

Background and objective: The use of technology has become the norm in nursing education. While technology has opened up for more flexible, active, student-focused teaching methods, its introduction has also brought challenges regarding its use and implementation. Recent literature has concentrated on how to best implement technology, but little attention has focused on observing student practices during technology use. Therefore, it is unknown how to optimize technology use within clinical skills training. The objective of this study was to investigate how groups of nursing students utilize a technology-based learning tool.

Methods: An observational study with an exploratory design was implemented using video recordings as the data material.

Results: The results indicated a high level of variability in nursing students' performance and ability to utilize a technological tool while working in groups. The variability during clinical skills training was associated with four factors: level of competence, motivation to learn, role clarification, and collaborative problem-solving skills.

Conclusions: The results of the study indicated variability in groups of nursing students' ability to employ a technological tool during a selected procedure—namely, wound care and dressing. These findings suggest that a set of implications for faculty members should be developed. Specifically, staff and students should be prepared prior to using technology by focusing on group dynamics, group composition, development of collaborative problem-solving skills, and role modeling.

Key Words: Nursing education, Educational technology, Clinical skills, Non-participant observation

1. INTRODUCTION

Faculty members are constantly attempting to find new ways to motivate and engage students in learning.^[1,2] In the field of nursing, the complexity of clinical skill learning^[3] and the shift towards student active learning methods has created a need to change the methods of teaching clinical skills.^[4-6] Embedding technological components in courses has become the norm in the development and implementation of new teaching methods;^[7,8] this is because there have been technological advances in the field. Technology-based learn-

ing tools include, but are not limited to, the following: video lectures, web-based courses, high and low fidelity simulation, virtual patients, serious games, personal digital assistants, and podcasts.^[9-14] While active participation has increased, the use and implementation of technology has presented challenges to faculty members.

A considerable amount of research has addressed the challenges associated with technology implementation. The majority of the literature has focused on barriers to technology

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use by faculty members and students. Several studies have indicated that the provision of technology-based training, sufficient IT support, adequate accessibility, computer skills, and allocated time and resources are related to technology implementation.^[15] Additional obstacles include unreliable technology, which leads to frustration and wasted time in addition, faculty members reporting that it is challenging to keep up-to-date on available technologies.^[2] Research has examined attitudes toward technology; for instance, Petit dit Dariel and Wharrad^[16] found pedagogical beliefs, social networks, and academic culture influenced staff attitudes. They argued that skepticism and indifference toward technology are associated with a lack of use among nurse educators. The successful introduction of technology is also dependent on the motivation for its use.^[17] Studies have also compared the relations between perceived self-efficacy, technology-based methodology, and traditional methods.^[9,18] In addition, research indicates that faculty members should provide sound instructional design and usability testing to ensure positive user experiences.^[19]

A common feature of the current research is the focus on participants' experience and beliefs regarding different beliefs concerning different technology-based tools, often limited to the implementation phase. Thus far, little attention has been paid to observing student practices when using technology. As most nursing faculty members have already integrated technology-based learning tools within their clinical skills training, the question now is how to optimize the use based on observations of groups of students employing the technology.

Aim

The aim of this study was to investigate how groups of nursing students utilized a technology-based learning tool in clinical skill training. Thus, two research questions were developed:

- (1) How can nursing students' variability in performance when using a technological tool tailored for clinical skills training be mapped?
- (2) Which factors influence groups of nursing students' ability to utilize a technological tool during clinical skills training?

2. METHODS

2.1 Design

An exploratory^[20] was conducted using video recordings to capture students' actions and practices, which provided researchers with access to the details of their social actions. In addition, video recordings allow researchers to conduct

multiple analytical steps without being present during data collection.^[21]

2.2 Setting

The study was conducted with students in their second year of a Bachelors in Nursing degree at a Norwegian faculty. More specifically, the study was conducted during the compulsory clinical skills course. This course is taken during students' fourth semester and teaches 13 clinical skills (e.g., intramuscular injection, nasogastric tube insertion, wound care; for a more detailed account^[22]). All skills are taught in a clinical skills laboratory (CSL) via nine, 3-hour, scenario-based training sessions. During each session, teachers lead a group of students through different scenarios. Students practice in small groups while the teacher supervises, asks questions, and answers questions. In addition, students have unlimited access to the CSL and are expected to engage in unsupervised training to master skills before the final exam. All students take a practical oral exam at the end of the course where they are tested on one of the 13 randomly chosen skills.

A set of interactive, technologically mediated, learning scenarios was developed to help the students prepare for the practical oral exam during their unsupervised training; these scenarios were based on the exam scenarios. The scenarios were mediated through a handheld portable tablet from Laerdal Medical called SimPad[®]. The faculty already owned this technology, thereby making it accessible during students' unsupervised training. All second-semester students were offered a one-hour training session on the operation of the tablets at the beginning of the course. Then, the tablets were programmed with eight of the 13 exam scenarios; they were available in the CSL daily from 06:00 to 23:00. The technological learning material was presented as a checklist that outlined the different practical steps, thereby ensuring that the steps were practiced in a consecutive sequence. Students were asked questions and given feedback throughout the process. Each scenario required a group of three students: one student was the instructor, one was the patient, and one was the student practicing the skill. The instructor-student held the tablet, registered the actions on the tablet, followed the instructions on the tablet, and guided the other students through the scenario. The instructor-student helped the student practicing the scenario and prevented him/her from poor practice via the information on the tablet. Every action registered by the instructor-student was linked to a reaction (e.g., point out that an action is wrong and urge reconsideration; ask students to explain his/her action; provide additional information and ask for contraindications or for subsequent actions). The learning material consisted exclusively of text.

2.3 Ethical considerations

The head of the nursing faculty and the Norwegian Social Science Data Service (ref. number: 36260) approved the study. All participants were given both written and oral information about the study, including the right to withdraw from the study at any point before, during, or after the video recording had taken place. Written informed consent was obtained from all participants prior to data collection. All data were stored in a secure location on a password-protected computer. Participants were informed that the aim of the video recording was to study their interactions with the technology and their group process, not an evaluation of their individual performance. All presented data are anonymized.

2.4 Data material

The data were derived from one of the 13 clinical skills scenarios—namely, wound care and dressing. There were practical reasons for choosing this scenario since it was developed using active student involvement in a previous study.^[23] The data included seven videos, from seven different groups (ranging from 20 to 33 minutes), totaling 221 minutes.

2.5 Participants and data collection

Data were collected in 2014 over a four-day period during the fourth week of the clinical skills course. This is when all

158 students took part in a training session on wound care and dressings. During this time, one of the rooms in the CSL was set up for video recording. The teachers informed all students about the ongoing study. After they participated in the first hour of the training session, participants were invited to contact the first author in the video recording room. Seven groups agreed to be video recorded, totaling 17 students (15 female and 2 male) who were all in their fourth semester. Groups consisted of two or three participants: three groups had three students and four groups had two students. The groups with two students used a mannequin as the patient and groups of three students used a student as the patient. The groups divided the roles among themselves. They were then handed the tablet with instructions to use as they saw fit; they only had to finish all sections of the scenario. The first author was located outside the room in case the students had any questions. All necessary equipment was located on a trolley within the room instead of the supply room; this was done to increase efficiency and reduce unnecessary movement during the scenario. Students were supplied with both necessary and unnecessary equipment, and they could choose what to use. Two stationary cameras were set up: one to capture an overview of the situation and one to capture the screen of the tablet to see the actions of the instructor (see Figure 1).



Figure 1. Overview of the video recording location

2.6 Data analysis

To address the research questions, the data analysis followed a two-step process: (1) map the group performance by scoring the scenarios, and (2) describe the factors influencing the groups' ability to utilize the technological tool. The recordings from the overview camera were analyzed, and the recordings from the second camera were used to clarify

actions within certain video segments.

2.6.1 Variability in group performance

To map variability in the groups' performance, the first author watched the recordings several times and discussed the recordings with the second author. Afterwards, it became evident that there was a need to systematically document the variability among the nursing groups. Therefore, the groups'

performance was scored according to the procedural guidelines outlined within the technological tool. Specifically, the procedural guidelines included 30 steps and were outlined in accordance with the Norwegian Practical Procedures in Nursing^[24] (see Table 1). The groups were scored for whether or not they implemented a step, and if the steps were performed in the correct order, with the correct execution. The scoring was conducted by the first author.

Table 1. Overview of group scores on wound care and dressing scenario

Overview of group score on wound care and dressing scenario							
Procedural steps	Gr1	Gr2	Gr3	Gr4	Gr5	Gr6	Gr7
1. Inform patient	x	x	x	x	x	x	x
2. Prepare all necessary equipment	x		x		x		
3. Ensure comfortable position for patient				x	x	x	x
4. Hand disinfection		x		x	x	x	x
5. Clean gloves, disposable apron		x	x	x	x	x	x
6. Remove old zink cream				x			x
7. Change gloves		x	x			x	x
8. Irrigate wound	x	x	x	x		x	x
9. Wash, rinse and dry the foot/leg	x	x	x		x	x	x
10. Bring the wound irrigation solution to room temperature					x	x	x
11. Soak gauze pads with irrigation solution and apply to the wound	x	x	x	x	x	x	x
12. Cover the soaked gauze pads with a clean towel and wait 15 min	x	x	x		x	x	x
13. Remove unwanted debris with scalpel	x			x	x	x	
14. Gently dry off wound edges with gauze			x	x	x	x	
15. Apply zink cream to wound edges			x	x	x	x	x
16. Apply wound gel to the wound bed	x	x	x	x	x	x	x
17. Apply moisturizer to leg/foot			x	x	x	x	
18. Apply correct bandage (Polyurethane foam)		x	x	x	x	x	
19. Fixate foam with wide mesh cotton gauze	x	x	x		x	x	x
20. Dispose of gloves			x			x	
21. Hand disinfection			x			x	
22. Ensure normal position of the foot; lightly bend nee, 90° ankle			x				
23. Cover skin from toes to knee with tubular bandage	x	x	x				
24. Apply padding from toes to knee	x	x	x	x			
25. Select correct type of elastic bandage		x					
26. Apply elastic bandage	x	x	x	x			
27. Even pressure/uniform tension	x	x	x	x			
28. Ensure there are no folds and creases	x	x		x			
29. Discuss observations (minimum 6)			x		x	x	
30. Discuss further/new actions (minimum 3)			x		x	x	
31. Total score	14	17	24	17	18	21	14

2.6.2 Influencing factors

The first and second authors conducted a thematic analysis of the data material inspired by Braun and Clarke^[25] to describe factors influencing the groups' use of the tool. The thematic analysis follows Braun and Clark's six phases described in Table 2.

The purpose of the narratives in the sixth step was to give an

impression of the relevant aspects, not to present an absolute presentation of all activities.^[26] The narratives are verbatim transcriptions of conversations and are accompanied by behavioral and context-specific descriptions; this was done to illustrate the complexity of the interaction.^[21] Although all transcriptions were kept verbatim, some of the narratives were shortened for clarity.

Table 2. Description of the thematic analysis process

Phase	Description	Participants
1. Familiarizing yourself with your data	-Familiarization yourself with the data by watching the entire video material several times - Mapping initial ideas and thoughts through the process	First author
2. Generating initial codes	-Initial coding, marking of the segments of interest using Atlas.ti -Suggestions for initial themes -Verbal transcriptions of all coded segments to be able to sort through the data set (author 1)	First and second author separately
3. Searching for themes	Author discussions, comparing and revising themes. The first author identified four themes, and the second authors identified five themes. Four out of five themes matched with regard to content. All themes were revised to arrive at four common themes.	First and second author
4. Reviewing themes	-Reorganizing video segments linking video segments to the four themes -Collaboratively watching a randomly chosen selection of the video segments the first author had connected to each theme, making sure both authors had a similar understanding of the content of the themes to ensure validity	First author First and second author
5. Defining and naming	Theme names were refined and revised, making sure they reflected the content	First and second author
6. Producing narratives	Video narratives from segments of the data material were produced to exemplify the contents of each theme	First and second author

3. RESULTS

First, variability in group performance while using the technological tool is presented via the presentation of the groups' scores with associated descriptions of the findings. Second, descriptions of four factors influencing the groups' ability to utilize the technological tool are presented; these were: level of competence, motivation to learn, role clarification, and collaborative problem solving.

3.1 Variability in nursing groups' performance

Variability in the groups' performance was mapped by scoring their performance according to the 30 steps (see Table 1).

Only three of the 30 steps were performed by all of the groups: inform patient (step 1); soak gauze pads with irrigation solution and apply to wound (step 11); and apply wound gel to the wound bed (step 16). Five of the steps were performed by six of the groups: clean gloves, disposable apron (step 5); irrigate wound (step 8); wash rinse and dry foot/leg (step 9); cover the soaked gauze pads with a clean towel (step 12); and fixate foam with wide mesh cotton gauze (step 19). Select the correct type of elastic bandage (step 25) and ensure normal position of the foot before applying the bandage (step 22) were performed by one of the groups; this suggests that these steps were the most challenging for the students. Difficult steps also included: remove old zinc cream (step 6), hygiene concerning disposal of gloves (step

21), and hand disinfection (step 22) after cleaning the wound. Although it is difficult to rank the importance of the steps in the wound care and dressing procedure, the general importance of following hygienic guidelines was a challenge for most students throughout the scenario. As shown in Table 1, substantial variation occurred in the groups' performance, which was linked to several group factors; these are outlined below.

3.2 Factors influencing nursing groups' ability to utilize the technological tool

The groups' variability in performance was linked to four influencing factors. These were dominant in the high-performing groups and were lacking or highly variable in the lower-performing groups.

3.2.1 Level of competence

Students' level of competence influenced their ability to make use of the information they received through the tablet. Descriptions on the tablet regarding what equipment the students should use and when they should use it were of no use if students were unable to link the specific technical nursing terms to correct actions or the generic names of the correct equipment.

Narrative 1: The instructor sits next to the bed holding the tablet, reading what is listed as the next step of the procedure: '... and now... tubular bandage, (...) do you have that?' The

student picks up the tubular bandage, turns toward the instructor: 'Like this?' Instructor: 'No...!' the instructor looks over toward the equipment trolley, while the student quickly picks up a gauze bandage roll: 'This?' Instructor: 'Yes, that's the one!' (Group 2, 02.49).

Insufficient knowledge, where one student misleads another, often caused mistakes and consequential flaws later in the scenario. Students with less knowledge of basic principles lacked the ability to see their own flaws, which caused them to misinterpret the instructions from the tablet, deviate from the instructions, and question the sequence of the procedural steps:

Narrative 2: The student starts unpacking the polyurethane foam bandage when the instructor interrupts her: 'Hmm... now it (the tablet) says "perform hand disinfection." She blows her nose and makes a snorting sound together with a fake laughter. 'But you did that earlier!' The student rolls her eyes, raising her eyebrows but continues unpacking the dressing. The instructor continues watching the tablet, using her index finger to scroll back and forth on the screen. 'Eh...No! Now something came...eh...' Her voice fades away, the instructor sighs, the student stops unpacking the dressing and drops her hands down by her side (Group 1, 08.22).

With the tablet at their side, the students did not need to be fluent in the procedural steps; however, they needed to be able to detect errors by integrating their own knowledge with the information from the tablet. As depicted in the next narrative, the tablet could confirm the next correct step, while the instructor's knowledge prevented using the wrong equipment.

Narrative 3: Student: 'Then I'll apply some zinc.' Turns to the equipment trolley to find the cream. While she reaches her hand out, the instructor, who has been reading on the tablet, interrupts her: 'Wasn't it the irrigation solution next...? You know inside the...' She pretends to be holding a bottle in her hand, turning it upside down and squeezing something out of it; she squints her eyes a little bit and looks at the student with raised eyebrows and a question in her eyes. 'That's maybe what you meant, wasn't it?' The student stops with her right hand in the air, pointing at the wound with her left hand and asks: 'Before applying the zinc around it...?'

Instructor: 'Yeah! Mm!' (...) She smiles and nods, looks down at the tablet for reassurance, and nods again. When the student picks up the wound gel, the instructor looks back up at the student and sees what she is holding: 'Eh... no! The... you know (looks down at the tablet) the irrigation solution with the gauze and ...' The student puts down the wound gel, rolls her eyes, and sighs: 'Oh! Yes! Yes of course!' She picks up the irrigation solution and starts soaking the gauze; the instructor registers her action in the tablet (Group 6, 10.44).

The student demonstrated that her knowledge of the equipment, knowledge of how to use the irrigation solution, and the reassurance from the tablet came together to ensure the right performance. Therefore, for the groups to utilize the technological tool, they need to possess a minimum level of technical nursing competence and of the clinical skills when training with a technological tool.

3.2.2 Motivation to learn

Group motivation for use of the technology-based learning tool influenced students' ability to use the technology. Motivation was displayed through a combination of verbal and nonverbal expressions that were interpreted as the groups' motivation to learn. There was a positive atmosphere in the motivated groups, which was shown both through nonverbal and verbal excitement when interacting with the tablet.

Narrative 4: Student: 'Okay, then I'll just put the irrigation solution on the gauze...' Instructor: 'Mm, yes.' The instructor nods before looking down at the tablet, then quickly looks up again saying: 'Aha! Okay! It actually says here that you are to heat the solution to room temperature!' The instructor points at the tablet while looking at the student with surprise. Student: 'Okay, yeah that must be the same principle as not cooling down the wound, right?' Instructor: 'Yes! Yeah, right! That must be it. Okay good then we figured that one out' (Group 6, 6.38).

The groups with a high level of motivation displayed more interest in finding the correct action; they appeared to want to understand and learn as much as possible. They often expressed comments like 'hmm... that's interesting' and 'good for us to know' with excitement and wonder. This gave the impression that the training was valuable and that students perceived the tablet as a resource for accelerating their learning. The groups' level of motivation was often

detected within the first couple of minutes of the video and remained the same throughout the entire scenario.

Groups with high levels of motivation generally had high levels of activity, discussions, and questions; however, groups with low levels of motivation demonstrated low interest in the activity and made few gestures indicating interest in the quality of their performance.

Narrative 5: While applying the elastic bandage, the student says in a monotone voice: 'When applying the elastic bandage it is important to overlap by approximately 50% and make it smooth, preventing folds and creases.' The instructor nods, 'mmm-hmm', while avoiding looking at the student's actions. The student continues applying the elastic bandage without overlapping and with several folds and creases present on the bandaged leg (Group 2, 20.33).

These groups also expressed low levels of problem solving, had a low frequency of critical questions, and appeared to be low or non-responsive toward questions from the instructor.

Narrative 6: The instructor reads from the tablet while the patient lies in bed, arms crossed over her chest, slightly biting her lower lip, and stirring at the bedcover. The student leans on to the bed with her left hip and arm, looking at the instructor with an empty stare. Instructor: 'What is the difference between infection and inflammation?' The student looks over to the patient and raises her eyebrows. The patient furrows her eyebrows, still staring at the bedcovers while asking: 'What?' Instructor: 'The difference between infection and inflammation.' Silence for six seconds. Instructor: 'C'mon, you know this, guys!' The student stares up toward the ceiling. After four seconds, the patient says 'eh... hmm. I don't believe I have heard that word before? Inflammation...?' while looking over at the student who stares out the window (Group 4, 21.41).

Higher levels of motivation generally caused a higher level of activity within the group; this lead the groups to seek more answers, engage in more discussions, and become more interested in finding the right action. Therefore, high levels of motivation increased the groups' ability to utilize the technological tool.

3.2.3 Role clarification

Students' use of technology was also influenced by the way they interpreted their roles. The students were not given

any strict guidance about how to perform the task; they interpreted their roles differently. This diversity seemed to affect group performance. The instructors in the lower- and middle-performing groups interpreted their role as strict observers, where their task was to simply register what the student performed.

Video narrative 7: The student puts a new glove on her right hand, picks up the zinc cream, throws a quick glance at the instructor, and says, 'Maybe I should apply some moisturizer first... I'm not really sure...?' The instructor looks at her while the question is asked, blinks once, and then looks down at the tablet again without answering the question. The student lingers for a couple of seconds, looks at the instructor and down at her foot; when nothing happens, she continues with the zinc cream (Group 2, 15.41).

The lack of confirmation from the instructor often caused student uncertainty and hesitation, which lead to fewer questions and interactions. Instructors in the lower-performing groups also had a tendency to focus on the tablet, rather than following the pace and progress of the student. This often threw the student off balance, creating disturbance and confusion during the training session.

Video narrative 8: While beginning to remove debris with a scalpel, the student glances at the patient and explains, 'This is a sharp knife that I use to remove some dead cells and debris. Let me know if it hurts, okay?' Patient: 'Okay, that's fine (...). Does the wound look better than last time?' Student: 'Hmm? Yes, it looks better than yesterday.' Student and patient exchange looks and smile. The instructor during this sequence is occupied with the tablet, scrolling back and forth, reading. She now interrupts the other two with a high-pitched voice: 'Here there is a question about washing (reads the question aloud). Have you washed the wound yet? Should you wash it now?' The student answers with a calm voice while continuing what she is doing: 'I'm removing debris with the scalpel.' Turning to the patient, she continues: 'I'm now going to irrigate the wound.' She picks up a jug of water. The instructor flickers and glances back and forth from the tablet to the student: 'How warm is that fluid?' Both the patient and student answer: 'Body temperature'. (...) Instructor, still flickering her eyes: 'What?! Do you use water? That's not what it says here.'

Is this thing wrong? Are they using irrigation solution while we use water...? (...) I don't understand.' (Group 4, 04.54).

In the high-performing groups, there was an understanding that everyone's role was to contribute when they could, with what they could; this resulted in the students helping and guiding each other, which allowed for the best option for handling the situation. Although they all had different roles (i.e., student, patient, instructor), they all contributed. The role of guiding and helping was for all members of the group. This role alternated between the participants, and depended on who possessed the most knowledge at any given time during the scenario.

Video narrative 9: Instructor: 'Padding?' Student, turning toward the equipment trolley, gazing over the entire table: '...padding...? Padding...?' Patient: 'Yes, (points to the right side of the table) it's the one you know... you wrap around the leg.' Student looks over to the right side and picks up the elastic bandage: 'Oh, yes! This?' The instructor looks up at the student and firmly nods his head. The patient who has had his back to the student all this time now turns toward the student and says: 'No, no it's the other one underneath the elastic bandage.' Student, holding up the padding: 'Okay, this?' The patient nods and then looks at the instructor: 'Agree?' Instructor: 'Yes, that's the one.' (Group 5, 03.52).

Therefore, role clarification entailed that every participant understood that their role was to contribute with what they knew, as long as it was for the benefit of the group. The participants in the lower-performing groups saw their role as controlling or strictly observing; however, the higher-performing groups perceived that everyone had a contributing role.

3.2.4 Collaborative problem solving

Group utilization of the technological tool also affected their ability to detect and solve problems during the scenario. The groups asked critical questions, problematized, and discussed issues prior to coming to a consensus about what to do; this allowed them to often detect and solve problems before they arose. These groups often consulted the tablet and used their own prior knowledge to find answers, which resulted in higher scores on the skill performance assessment. In addition, the instructor or the patient tried to help the student find appropriate answers more frequently; this was done by offering tips and hints; preventing incorrect steps; and encouraging the student to find her own answers.

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Video narrative 10: The student picks up the tube of zinc cream, scrutinizes it, and starts applying it to the wound while she asks: 'This is the zinc thing, isn't it?' The instructor looks up from the tablet, nods her head, smiles, and says: 'Yes, that's the zinc cream'. The student, while deeply concentrating on applying the cream, says: '... zinc cream... why do we apply that...? It is to...?' Her voice fades away. The instructor is silent at first, looks down at the tablet, seems occupied with reading, but looks up at the student, leans back in the chair, and smiles: 'Yeah, the zinc—what was that supposed to do...? With the edge of the wound...?' Student: 'What?... eh... is to preserve... eh... I don't know...?' Instructor: 'Actually, it is to preserve the edge of the wound, so it doesn't get wet, because... eh... yes...?' The student interrupts: 'Yes! Don't get it wet! That was it!' The instructor looks down at the tablet again and presses a button on the screen to register the fact that the student is applying the zinc cream when a question pops up on the screen: 'It actually says here to ask you where we apply the zinc cream and why. There is also some additional information. Let me see...?' (Group 3, 10.58).

Lower-performing groups lacked the ability to detect a problem; they were less critical and moved forward without detecting their own errors. These groups seldom questioned anything connected to the instructions or their own performance. If a problem was detected, they tended to skip the section where the problem occurred entirely, moving forward to the next section of the scenario. When answers were provided on the tablet, the answer was read aloud without reflection or discussion. Reflective questions, where the tablet did not provide any answers, were completely skipped. If a discrepancy occurred between their own beliefs and the information or instructions on the tablet, the students in the lower-performing groups often trusted their own instincts rather than the information on the tablet.

Video narrative 11: Student: 'Okay, then we put on the moisturizer. Does the tablet say anything about that?' Instructor: 'Hmm... It says, "Bring the wound irrigation solution to room temperature"...' Patient: 'Eh... but this is what we have learned so...?' Instructor: 'Yes, put on some moisturizer.' After applying the cream, the student asks: 'So, now I change gloves? No?' Instructor: 'Well, it said earlier that you were to change gloves (...), but

that's not what we are doing now, so that doesn't count.' Both the student and patient nods, moving forward with the same gloves (Group 1, 5.09).

Collaborative problem solving included being critical of one's own understanding, reaching a consensus based on all members' opinions, and discussing ways to find an answer in collaboration with the group. Although the combination of these actions did not guarantee finding the right answers, it helped the groups detect their own flaws, and kept them from misinterpreting the information that could result in a poor performance.

4. DISCUSSION

In the current study, nursing students' use of a technology-based learning tool was examined. The variability of the groups' clinical skill performance was mapped; this resulted in a description of factors that influenced the groups' ability to use the technological tool. In the following subsections, we discuss issues that cut across the identified factors.

4.1 Interconnectivity

During the analysis, it was difficult to isolate the different factors affecting the students performance. In almost every selected segment of the recordings, at least two of the factors occurred simultaneously. Competence was connected to student motivation to learn and develop problem-solving skills. Moreover, the ability to connect previous knowledge with new knowledge and solve the problems fueled additional student motivation. In addition, role fulfillment was closely intertwined with students' level of knowledge. This was linked to their problem-solving skills. The instructors had trouble making use of the information on the tablet if they did not have previous knowledge; this made it difficult for them to guide and help the students. However, knowledgeable instructors combined their knowledge with the information on the tablet to help guide the student through the scenario. This created discussions, engagement, and opportunities to problem solve collaboratively as a group. The interconnectivity between the factors seemed to be closely related to the members of the group and their interactions. Although many groups gave the impression of task mastery, some groups worked together better than others. Role clarification, motivation to learn, and use of one's own competence to collaboratively solve problems was apparent in the high-performing groups. However, the low-performing groups struggled with all of these aspects. Given the natural diversity in group members' personality, preferred learning styles, and experiences, it is reasonable to believe that diversity influences the group dynamic and subsequent performance.^[27]

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4.2 Group dynamics

Since group dynamics influence group performance, the findings presented herein are likely related to group dynamics. Several studies have pointed out that nursing faculty fail to attend to group dynamics.^[27,28] According to Jaques,^[29] a key attribute of a group is the possession of shared aims, agreed rules, and determined power relations. As shown in our study, some of the lower-performing groups struggled to solve problems collaboratively when one member was dominant but had a low level of competence. This seemed to steer the group in the wrong direction. This could be seen as a consequence of poor group dynamics where the lack of a shared aim and a skewed power structure affected the group's motivation.^[30] Relatedly, the high-performing groups displayed a positive dynamic between the group members; specifically, one of the members' enthusiasm rubbed off on the other participants. The literature demonstrates that group work is a powerful arena for peers to motivate their less motivated students.^[27] Therefore, groups should ideally be composed of both students who are more and less motivated. This would allow for the more motivated individuals to positively influence the other students. Although group members' attributes can positively affect the group dynamics, they can also negatively affect outcomes. The lack of role clarification may be a reason why some of the groups developed poor group dynamics. Role clarification within a simulation is an essential part of pre-briefing, and is crucial for maximizing benefits to students from the learning situation. However, a lack of clarified roles causes confusion and frustration among students.^[31] In the current study, participants were not provided with clearly defined roles because the goal was to see how they solved the problem themselves. This was not problematic in the high-performing groups, but in the lower-performing group, the group dynamics could have been improved through clarifying individual roles during pre-briefing. Group work is used extensively in nursing education. It fosters active, deep collaborative learning. However, positive group processes are dependent on recognition an accommodation of group dynamics.^[27,30] Therefore, nursing education programs that use group work must facilitate positive group processes.

4.3 Technology confidence

In the lower-performing groups, a lack of motivation was evident through low interaction, disengagement during the situation, and participants' nonverbal expressions indicating disinterest (e.g., looking away and rolling their eyes). This lack of motivation was accompanied by a general distrust toward the technology. These participants often muttered comments that something was wrong with the technology, or that they believed the content on the technological tool was

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wrong. Several studies have reported that faculty members modelling behaviors during technology adoption is important for student use of technology. Specifically, studies indicate that distrust in technology is linked to a lack of role modeling.^[15] At the end of the clinical skills course, the teachers examined students' clinical skills. Teachers' attitudes toward the technology may mirror the students' beliefs and trust in the technology. Since faculty members have different exposure and awareness of the technological learning tool, it is reasonable to believe that they hold different perspectives about the technology and model its use differently. During the clinical skills course, the groups were in contact with different faculty members, which could explain the group differences in expressed confidence. Some students expressed clear confidence in the answers and information provided by the tablet; however, other students appeared to distrust the technology and blamed it if something went wrong. Therefore, role modeling from faculty may have contributed to increased technology confidence among students, which has been found in previous research.^[32, 33]

4.4 Limitations

The results of this study were based on data from student groups from one nursing school and examined a particular technology-based tool which limits the transferability to other technology-based learning tools. Douglas^[34] asserted that all groups have some inherent similarities. Thus, the results presented herein are valuable for understanding other group-based, technology-based learning tools. During the first part of the analysis, the first author scored the groups' performance according to the practical procedure guidelines; however, it could be argued that different scorers could result in different results. Nevertheless, the same author scored all of the scenarios, which contributed to consistency.

4.5 Implications

Faculty must facilitate both students' and staffs' technology use. Students must possess collaborative problem-solving skills early in their education to enable them to integrate different sources of information. Students must also be prepared to use technological tools. This can be accomplished by preparation via learning experiences, possessing a mini-

mal level of competence, having a common group aim, and the clarification of roles. Faculty who introduce group-based learning methods must be aware of how group dynamics can affect group outcomes, and must strive to facilitate positive group processes via teacher preparation. This should be done by ensuring faculty's knowledge of group dynamics and group composition. While it is difficult to implement, a mixture of more and less motivated students it is advisable as motivated students positively influence others in their group.

5. CONCLUSION

Previous studies have addressed issues regarding the challenges with technology implementation. This study investigated how groups of nursing students utilize a previously implemented technology-based learning tool. The results indicated that there was a large variability in students' performance in a selected procedure (i.e., wound care and dressing; scores ranged from 14 to 24 out of 30) and their ability to utilize the technological tool. These differences were associated with the four group factors: level of competence, motivation to learn, role clarification, and collaborative problem-solving skills. While these factors cannot provide an exhaustive explanation of variability in performance, they help explain the group differences in the ability to use the tool. Faculty must continue to actively seek knowledge about what inhibits effective technology use. In addition, they should facilitate technology use to ensure positive outcomes associated with technology-based learning methods. Currently, there is inconsistency in the literature regarding whether technology-based learning is superior to traditional learning; however, the results of this study outline factors that may better prepare students to utilize technology and, as a result, benefit from its effectiveness.

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CONFLICTS OF INTEREST DISCLOSURE

The authors declare that there is no conflict of interest.

REFERENCES

- [1] Seckman CA. Perceived sense of community, cognitive engagement, and learning outcomes among undergraduate nursing students enrolled in an internet-based learning course. *Comput Inform Nurs*. 2014; 32(10): 482-9. <http://dx.doi.org/10.1097/cin.000000000000076>
- [2] Button D, Harrington A, Belan I. E-learning & information communication technology (ICT) in nursing education: A review of the literature. *Nurse Education Today*. 2014; 34(10): 1311-23. <http://dx.doi.org/10.1016/j.nedt.2013.05.002>
- [3] Ross JG. Simulation and psychomotor skill acquisition: A review of the literature. *Clinical Simulation in Nursing*. 2012; 8(9): e429-e35.

- <http://dx.doi.org/10.1016/j.necns.2011.04.004>
- [4] Black A, Gen Y: Who they are and how they learn. *Educational Horizons*. 2010; 88(2): 92-101.
- [5] Montenery SM, Walker M, Sorensen E, et al. Millennial generation student nurses' perceptions of the impact of multiple technologies on learning. *Nursing Education Perspectives*. 2013; 34(6): 405-9. <http://dx.doi.org/10.5480/10-451>
- [6] McCurry MK, Martins DC. Teaching undergraduate nursing research: A comparison of traditional and innovative approaches for success with millennial learners. *Journal of Nursing Education*. 2010; 49(5): 276-9. <http://dx.doi.org/10.3928/01484834-20091217-02>
- [7] Lahti M, Hätönen H, Välimäki M. Impact of e-learning on nurses' and student nurses knowledge, skills, and satisfaction: A systematic review and meta-analysis. *International Journal of Nursing Studies*. 2014; 51(1): 136-49. <http://dx.doi.org/10.1016/j.ijnurstu.2012.12.017>
- [8] River J, Currie J, Crawford T, et al. A systematic review examining the effectiveness of blending technology with team-based learning. *Nurse Education Today*. 2016; 45: 185-92. <http://dx.doi.org/10.1016/j.nedt.2016.08.012>
- [9] Petty J. Interactive, technology-enhanced self-regulated learning tools in healthcare education: A literature review. *Nurse Education Today*. 2013; 33(1): 53-9. <http://dx.doi.org/10.1016/j.nedt.2012.06.008>
- [10] Lashley M. Faculty forum. Teaching health assessment in the virtual classroom. *Journal of Nursing Education*. 2005; 44(8): 348-50. PMID:16130340
- [11] Mundy CA. Innovative teaching strategies: Educating student nurses on vascular access management. *Journal of the Association for Vascular Access*. 2007; 12(4): 232-6. <http://dx.doi.org/10.2309/java.12-4-11>
- [12] Guise V, Chambers M, Välimäki M. What can virtual patient simulation offer mental health nursing education? *Journal of Psychiatric & Mental Health Nursing*. 2012; 19(5): 410-8. <http://dx.doi.org/10.1111/j.1365-2850.2011.01797.x>
- [13] Gerprasert S, Pnuksacheva T, Panijpan B, et al. An interactive web-based learning unit to facilitate and improve intrapartum nursing care of nursing students. *Nurse Education Today*. 2011; 31(5): 531-5. <http://dx.doi.org/10.1016/j.nedt.2010.10.008>
- [14] Petit dit Dariel OJ, Raby T, Ravaut F, et al. Developing the serious games potential in nursing education. *Nurse Education Today*. 2013; 33(12): 1569-75. <http://dx.doi.org/10.1016/j.nedt.2012.12.014>
- [15] Raman J. Mobile technology in nursing education: where do we go from here? A review of the literature. *Nurse Education Today*. 2015; 35(5): 663-72. <http://dx.doi.org/10.1016/j.nedt.2015.01.018>
- [16] Petit dit Dariel O, Wharrad H, Windle R. Exploring the underlying factors influencing e-learning adoption in nurse education. *Journal of Advanced Nursing*. 2013; 69(6): 1289-300. <http://dx.doi.org/10.1111/j.1365-2648.2012.06120.x>
- [17] Petit dit Dariel O, Wharrad H, Windle R. Using Bourdieu's theory of practice to understand ICT use amongst nurse educators. *Nurse Education Today*. 2014; 34(11): 1368-74. <http://dx.doi.org/10.1016/j.nedt.2014.02.005>
- [18] Warren JN, Luctkar-Flude M, Godfrey C, et al. A systematic review of the effectiveness of simulation-based education on satisfaction and learning outcomes in nurse practitioner programs. *Nurse Education Today*. 2016; 46: 99-108. <http://dx.doi.org/10.1016/j.nedt.2016.08.023>
- [19] Verkuyl M, Atack L, Mastrilli P, et al. Virtual gaming to develop students' pediatric nursing skills: A usability test. *Nurse Education Today*. 2016; 46: 81-85. <http://dx.doi.org/10.1016/j.nedt.2016.08.024>
- [20] Polit DF, Beck CT. *Essentials of nursing research: appraising evidence for nursing practice*. Philadelphia: Wolters Kluwer/Lippincott Williams & Wilkins; 2010. 610 p.
- [21] Derry SJ, Pea RD, Barron B, et al. Conducting video research in the learning sciences: guidance on selection, analysis, technology, and ethics. *Journal of the Learning Sciences*. 2010; 19(1): 3-53. <http://dx.doi.org/10.1080/10580400903452884>
- [22] Haraldseid C, Friberg F, Aase K. Nursing students' perceptions of factors influencing their learning environment in a clinical skills laboratory: A qualitative study. *Nurse Education Today* [Internet]. 2015. <http://dx.doi.org/10.1016/j.nedt.2015.03.015>
- [23] Haraldseid C, Friberg F, Aase K. How can students contribute? A qualitative study of active student involvement in development of technological learning material for the clinical skills training. *BMC Nursing*. 2016; 15(1): 1-10. <http://dx.doi.org/10.1186/s12912-016-0125-y>
- [24] PPS [Internet]. *Practical procedures in nursing*. Oslo: Cappelen Damm; 2014 [cited 2014 May 8] Available from: <http://www.ppsnett.no>
- [25] Braun V, Clarke V. Using thematic analysis in psychology. *Qualitative Research in Psychology*. 2006; 3(2): 77-101. <http://dx.doi.org/10.1191/1478088706qp0630a>
- [26] Heath C, Hindmarsh J, Luff P. *Video in qualitative research*. London: Sage Publications; 2010. 175 p.
- [27] Jackson D, Hickman LD, Power T, et al. Small group learning: Graduate health students' views of challenges and benefits. *Contemporary Nurse: A Journal for the Australian Nursing Profession*. 2014; 48(1): 117-28. <http://dx.doi.org/10.5172/comu.2014.48.1.117>
- [28] Cook SH, Matheson H. Teaching group dynamics: a critical evaluation of an experiential program. *Nurse Education Today*. 1997; 17(1): 31-8.
- [29] Jaques D. *Learning in groups: A handbook for improving groupwork*. 3rd ed. London: Kogan Page; 2001. 311 p.
- [30] Davies WM. Groupwork as a form of assessment: common problems and recommended solutions. *Higher Education*. 2009; 58(4): 563-84. <http://dx.doi.org/10.1007/s10734-009-9216-y>
- [31] Harder N, Ross CJM, Paul P. Student perspective of roles assignment in high-fidelity simulation: An ethnographic study. *Clinical Simulation in Nursing*. 2013; 9(9): e329-e34. <http://dx.doi.org/10.1016/j.ecns.2012.09.003>
- [32] Beard KV, Greenfield S, Morote ES, et al. Mobile technology: lessons learned along the way. *Nurse Educator*. 2011; 36(3): 103-6. <http://dx.doi.org/10.1097/NNE.0b013e3182161016>
- [33] Swan BA, Smith KA, Frisby AJ, et al. Evaluating tablet technology in an undergraduate nursing program. *Nurse Education Perspectives*. 2013; 34(3): 192-3.
- [34] Douglas T. *Groups: understanding people gathered together*. London: Tavistock Publications; 1983. 380 p.

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Appendix I – Ethical approval

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Norsk samfunnsvitenskapelig datatjeneste AS
NORWEGIAN SOCIAL SCIENCE DATA SERVICES



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N-5007 Bergen
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nsd@nsd.uib.no
www.nsd.uib.no
Org nr. 985 321 884

Cecilie Haraldseid
Institutt for helsefag Universitetet i Stavanger
Ullandhaug
4036 STAVANGER

Vår dato: 29.11.2013

Vår ref: 36260 / 2 / LMR

Deres dato:

Deres ref:

TILBAKEMELDING PÅ MELDING OM BEHANDLING AV PERSONOPPLYSNINGER

Vi viser til melding om behandling av personopplysninger, mottatt 11.11.2013. Meldingen gjelder prosjektet:

36260 *Utvikling av innhold i et digitalt verktøy for sykepleierstudenters læring av kliniske ferdigheter*
Behandlingsansvarlig *Universitetet i Stavanger, ved institusjonens øverste leder*
Daglig ansvarlig *Cecilie Haraldseid*

Personvernombudet har vurdert prosjektet og finner at behandlingen av personopplysninger er meldepliktig i henhold til personopplysningsloven § 31. Behandlingen tilfredsstiller kravene i personopplysningsloven.

Personvernombudets vurdering forutsetter at prosjektet gjennomføres i tråd med opplysningene gitt i meldeskjemaet, korrespondanse med ombudet, ombudets kommentarer samt personopplysningsloven og helseregisterloven med forskrifter. Behandlingen av personopplysninger kan settes i gang.

Det gjøres oppmerksom på at det skal gis ny melding dersom behandlingen endres i forhold til de opplysninger som ligger til grunn for personvernombudets vurdering. Endringsmeldinger gis via et eget skjema, <http://www.nsd.uib.no/personvern/meldeplikt/skjema.html>. Det skal også gis melding etter tre år dersom prosjektet fortsatt pågår. Meldinger skal skje skriftlig til ombudet.

Personvernombudet har lagt ut opplysninger om prosjektet i en offentlig database, <http://pvo.nsd.no/prosjekt>.

Personvernombudet vil ved prosjektets avslutning, 31.12.2016, rette en henvendelse angående status for behandlingen av personopplysninger.

Vennlig hilsen

Vigdis Nantvedt Kvalheim

Linn-Merethe Rød

Kontaktperson: Linn-Merethe Rød tlf: 55 58 89 11

Vedlegg: Prosjektvurdering

Dokumentet er elektronisk produsert og godkjent ved NSDs rutiner for elektronisk godkjenning.

Avdelingskontorer / District Offices:
OSLO NSD, Universitetet i Oslo, Postboks 1055 Blindern, 0316 Oslo. Tel: +47-22 85 52 11. nsd@uio.no
TRONDHEIM NSD, Norges teknisk-naturvitenskapelige universitet, 7491 Trondheim. Tel: +47-73 59 19 07. kyrre.svarva@svt.ntnu.no
TROMSØ NSD, SVF, Universitetet i Tromsø, 9037 Tromsø. Tel: +47-77 64 43 36. nsdmaa@svtuit.no

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Appendix II – Research approval from the University

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Cecilie Haraldseid
Universitetet i Stavanger
Institutt for Helsefag
Kjell Arholms Hus
4036 Stavanger

Deres ref.:

Vår ref.:

Dato: 16.12.2013

Godkjent søknad angående studenters deltagelse i doktorgradsprosjekt

Viser til din søknad om mulighet til å inkludere sykepleiestudenter i forskningsstudien som omhandler sykepleierstudenters læringsprosess ved bruken av et digitalt verktøy mottatt 16.12.2013. Søknaden er herved innvilget uten øvrige kommentarer.

Med vennlig hilsen

Kari Vevatne
Instituttleder

Saksbehandler: , tlf.:

Det samfunnsvitenskapelige fakultet

Kjell Arholms hus

Universitetet i Stavanger
4036 Stavanger
Org.nr. 971564679

All post/e-post som inngår i saksbehandling, bes
adressert til UiS og ikke til enkeltperson.

Telefon: 51831500
Telefaks:
E-post: kari.vevatne@uis.no
www.uis.no

Appendices

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***Appendix III – Information letter to students
participating in paper I and II***

Appendices

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Forespørsel til 2.års sykepleierstudenter om å delta i forskningsprosjektet: Utvikling av innhold i et digitalt verktøy for sykepleierstudenters læring av kliniske ferdigheter

Bakgrunn og hensikt

Dette er et spørsmål til deg om å delta i en forskningsstudie for å bidra til å utarbeide det faglige innholdet i et digitalt læringsverktøy for sykepleierstudenter. Jeg er ansatt som stipendiat ved Universitetet i Stavanger og studien er en del av min doktorgradsavhandling. Hensikten med studien er å utarbeide et faglig innhold i et digitalt læreverktøy som er tilpasset 2.års studenters lærebehov. Din deltagelse vil gi oss kunnskap om hvordan vi kan utvikle slike læringsverktøy for å bedre tilrettelegge for sykepleierstudenters læring av kliniske ferdigheter. Jeg er interessert i at nettopp du deltar ettersom du har vært 2.års sykepleierstudent og dermed besitter verdifull erfaring for utviklingen av slike verktøy.

Hva innebærer deltagelsen?

Studien innebærer at du deltar i tre ulike forskningsaktiviteter. Den første vil bestå av et fokusgruppeintervju hvor du kan delta med mening om hvordan et læringsverktøy for 2.års studenter utformes. Den andre aktiviteten er å teste ut en prototype av verktøyet før du i den tredje aktiviteten vil delta i et nytt gruppeintervju knyttet til dine erfaringer med verktøyet og hvordan vi kan videreutvikle det. Intervjuene vil finne sted på Universitetet og vare i ca. 1 time. Intervjuene vil omhandle dine synspunkter på hva læringsverktøyet bør inneholde og hvordan læringsverktøyet kan utvikles og forbedres. Både teoretiske, systemiske, tekniske og pedagogiske forhold vil bli drøftet.

Mulige fordeler og ulemper

Erfaringene du deler dersom du velger å være med, vil bidra til bedre forståelse av studenters behov, samt videreutvikling og forbedring av digitale læringsverktøy til sykepleierstudenter. Det vil ikke være noen direkte fordeler eller ulemper knyttet til deltagelse i studien. Dersom du i løpet av studien ikke ønsker å delta vil dette ikke ha noen konsekvenser for deg.

Hva skjer med informasjonen om deg?

Informasjonen som registreres om deg skal kun brukes til å utvikle innholdet i det digitale læringsverktøyet. All informasjon vil bli behandlet uten navn og fødselsnummer eller andre direkte gjenkjennbare opplysninger. En kode knytter deg til dine opplysninger og informasjon gjennom en navneliste. Det er kun undertegnede som har adgang til navnelisten og som kan finne tilbake til deg. Det vil ikke være mulig å identifisere deg i resultatene av studien når disse publiseres. Alle personidentifiserbare opplysninger vil bli slettet ved prosjektslutt desember 2016.

Frivillig deltagelse

Det er frivillig å delta i studien. Du kan når som helst og uten å oppgi noen grunn trekke ditt samtykke til å delta i hele, eller deler av studien. Dette vil overhode ikke få noen konsekvenser for deg videre

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som student. Dersom du ønsker å delta, undertegner du samtykkeerklæringen og leverer den direkte til undertegnede. Ved å skrive under på samtykkeerklæringen samtykker du til å delta i hele studien. Du vil allikevel ha mulighet til å reservere deg dersom du ønsker det. Gi i så fall beskjed til undertegnende.

Studien er godkjent av Personvernombudet for forskning, Norsk samfunnsvitenskapelige datatjeneste (NSD) og av ledelsen ved institutt for helsefag ved [REDACTED].

Dersom du har spørsmål til studien, ønsker ytterligere informasjon, eller på et senere tidspunkt ønsker å trekke deg, ta kontakt!

Takk!

Med vennlig hilsen

Cecilie Haraldseid
Institutt for helsefag
Universitetet i Stavanger
4036 Stavanger
Mail: cecilie.haraldseid@uis.no
Tlf: 984 38 930

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Samtykkeerklæring

Jeg har mottatt skriftlig informasjon om studien 'Utvikling av innhold i et digitalt verktøy for sykepleierstudenters læring av kliniske ferdigheter' og er villig til å delta:

Signatur:.....

Tlf:.....

Mail:.....

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Appendix IV – Interviewing guide for paper I

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Intervjuguide fokusgruppeintervju nr.1

Hovedspørsmål: *Hvilke elementer/tema tas opp av studentene som essensielle for læring av kliniske ferdigheter når de skal trene på ferdigheter uten lærer?*

1. *Kan dere fortelle litt om hvordan dere øver når dere er alene i sykepleielaboratoriet for å øve på praktiske ferdigheter?*
2. *Hva skulle dere ønske at det var muligheter for med tanke på læringsverktøy eller hjelpemidler når dere øver?*
3. *Hva trenger dere når dere øver?*
4. *Hva er vanskelig når dere øver?*
5. *Hva kan gjøres for å bedre forholdene når dere øver?*
 - a. *Utstyrmessig*
 - b. *Tidsmessig*
 - c. *Samarbeidmessig*
6. *Dersom dere kunne bestemme helt fritt, hvordan ville dere:*
 - d. *Lagt til rette for trening på praktiske ferdigheter?*
 - e. *Designet et digitalt læringsverktøy?*

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Appendix V – Interviewing guide for paper II

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Intervjuguide Fokusgruppeintervju nr.2

Hovedspørsmål: Hvordan kan design og innhold på det digitale læreverktøyet forandres for å bedre passe til brukerne?

1. Hvordan fungerte prototype av det digitale verktøyet når dere testet det?
 - a. Hva fungerte?
 - b. Hva fungerte ikke?

2. Hva kan vi forandre for at det skal bli til det bedre?
 - a. Layout av scenario?
 - b. Utformingen av innholdet?

3. Noe dere synes var vanskelig/uforståelig? (ord, instruksjer o.l)

4. Noe dere savnet?

5. Hva var bra?

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***Appendix VI – Information letter for students
participating in paper III***

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Forespørsel til 2.års sykepleierstudenter om å delta i forskningsprosjektet: Utvikling av innhold i et digitalt verktøy for sykepleierstudenters læring av kliniske ferdigheter

Bakgrunn og hensikt

Dette er et spørsmål til deg om å delta i en forskningsstudie for å bidra til å studere læringsprosessen til studenter som øver med det teknologiske læringsverktøy SimPad. Jeg er ansatt som stipendiat ved Universitetet i Stavanger og studien er en del av min doktorgradsavhandling. Hensikten med studien er å få økt kunnskap om hva som kjennetegner treningens læringsprosesser. Din deltagelse vil gi oss kunnskap om hvordan vi kan utvikle slike læringsverktøy for å bedre tilrettelegge for sykepleierstudenters læring av kliniske ferdigheter. Jeg er interessert i at nettopp *du* deltar ettersom du er i målgruppen for de som skal ha nytte av verktøyet.

Hva innebærer deltagelsen?

Studien innebærer at vi får lov til å filme deg mens du trener på sårscenarioet på SimPad i lag med 2 av dine medstudenter. Treningen er identisk med den som alle 2.årsstudenter gjennomfører, bortsett fra at dere blir filmet på et eget rom. Filmingen foregår i ferdighetstreningen i sykepleierlaboratoriet på Universitetet i Stavanger og varer ca. 30 min. Vi er ikke interessert i å se hva dere kan eller ikke kan, men derimot hvordan dere samhandler og bruker læringsverktøyet, slik at vi igjen kan bruke dette til å videreutvikle og forbedre verktøyet.

Mulige fordeler og ulemper

Din deltagelse vil bidra til å bedre forståelse av studenters behov, samt videreutvikling og forbedring av digitale læringsverktøy til sykepleierstudenter. Det vil ikke være noen direkte fordeler eller ulemper knyttet til deltagelse i studien. Dersom du i løpet av studien ikke ønsker å delta vil dette ikke ha noen konsekvenser for deg.

Hva skjer med informasjonen om deg?

Informasjonen som registreres om deg skal kun brukes til å forstå læringsprosesser og utvikle innholdet i det digitale læringsverktøyet. Videopptakene vil bli lagret på en datamaskin som er sikret med brukernavn og passord. Tilgangen til videoene vil kun bli gitt til undertegnede og hennes to veiledere. Ingen skriftlig eller muntlig fremstilling av hva som sies eller gjøres på opptakene vil kunne tilbakeføres til deg som enkeltperson. Opptakene vil bli slettet etter at prosjektet er avsluttet i 2017.

Frivillig deltagelse

Det er frivillig å delta i studien. Du kan når som helst og uten å oppgi noen grunn trekke ditt samtykke til å delta. Dette vil overhode ikke få noen konsekvenser for deg videre som student. Dersom du ønsker å delta, undertegner du samtykkeerklæringen og leverer den direkte til undertegnede.

Appendices

Studien er godkjent av Personvernombudet for forskning, Norsk samfunnsvitenskapelige datatjeneste (NSD) og av ledelsen ved institutt for helsefag ved Universitetet i Stavanger.

Dersom du har spørsmål til studien, ønsker ytterligere informasjon, eller på et senere tidspunkt ønsker å trekke deg, ta kontakt!

Takk!

Med vennlig hilsen

Cecilie Haraldseid
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Appendices

Samtykkeerklæring

Jeg har mottatt skriftlig informasjon om studien 'Utvikling av innhold i et digitalt verktøy for sykepleierstudenters læring av kliniske ferdigheter' og er villig til å delta:

Signatur:.....

Tlf:.....

Mail:.....

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Appendix VII – Observation guide for paper III

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Oversikt over prosedyreutførelse vedr: sårstell og kompresjon							
	Gr1	Gr2	Gr3	Gr4	Gr5	Gr6	Gr7
1. Informere pasienten	x	x	x	x	x	x	x
2. Finner rett utstyr	x		x		x		
3. God sittestilling				x	x	x	x
4. Utfør håndhygiene		X		x	x	x	X
5. Rene hansker/beskyttelsefrakk		x	x	x	x	x	x
6. Fjerne gammel sink pasta				x			X
7. Bytt hansker		x	x			x	x
8. Skyll såret	X	x	X	x		x	X
9. Vask benet med vann og mild såpe	x	x	x		x	x	x
10. Temperer sårskyllevæske/prontosan					x	x	X
11. Legg på omslag med prontosan	x	x	X	X	x	x	x
12. Dekk til omslag med rent håndkle	x	x	x		x	x	x
13. Fjern uønsket masse fra såret	x		x	x	x	x	
14. Tørk sårkantene med kompress			x	x	x	x	
15. Legg på sink rundt sårkanten			x	x	x	x	X
16. Legg sårgel i sårbunnen	x	x	X	x	x	x	x
17. Smør foten med fuktighetskrem			x	x	x	x	
18. Velg rett bandasje		x	X	x	x	x	
19. Fikser bandasjen ved hjelp av gassbind	x	x	X		x	x	x
20. Ta av hansker/kast			x			x	
21. Utfør håndhygiene			x			x	
22. Rett stilling på fot m7lett bøyd kne90 c ankelledd			x				*
23. Cover skin from toes to knee with strømpe	x	x	x				*
24. Apply padding from toes to knee	x	x	x	x			*
25. Apply elastic bandage	x	x	x	x			*
26. Correct type of elastic bandage		x					*
27. Even pressure/uniform tension	x	x	x	x			*
28. Ingen rukker/ ujevnheter	x	x		x			*
29. Discuss Observations			x		x	x	*
30. Discuss Vurderinger			x		x	x	*
	14	17	24	17	18	21	14

Prosedyre fra praktiske prosedyrer i sykepleien (PPS): Stell av venøst leggsår

- Ta på hansker og beskyttelsesfrakk/plastforkle.
- Fjern bandasjen så skånsomt som mulig og kast den i avfallsposen.
- Ta av hansker.
- Utfør håndhygiene.
- Ta på hansker.
- Skyll såret med kroppstemperert sterilt NaCl 9 mg/ml (med kroppstemperert vann hvis prosedyren utføres i hjemmet).

Rengjør huden

- Rengjør hudområdet rundt såret samt beinet og foten med vann og mild, flytende såpe.
- Tørk huden inn mot sårkanten med ren kompress.
- Anvend ev. pinsetten til å fjerne løstsittende fibrin fra sårbunnen.
- Smør inn frisk hud med hudkrem.

Legg på aktuell bandasje

- Legg på hydrofiberbandasje, alginatbandasje eller skumbandasje. Fikser bandasjen mot såret ved hjelp av gasbind.
- Kast hanskene i avfallsposen og lukk den.
- Utfør håndhygiene.

Trekk på bomullsstrømpe og legg på kompresjonsbind

- Trekk på en bomullsstrømpe fra stortåa og opp til knehasen.
- Legg på kompresjonsbindet.

Legg på komp bind

Utfør aktuell prosedyre for sårstell

- Stell såret/eksemet etter gjeldende prosedyre for den aktuelle sårfasen eller eksemtypen.

La pasienten sitte eller ligge med beinet i riktig horisontal stilling

- Pasienten skal sitte eller ligge med beinet i horisontal stilling.
- Kneet skal være lett bøyd.
- Ankelleddet skal være bøyd i ca. 90 graders vinkel.

Trekk på bomullsstrømpe og polstre med ortopedisk vatt

- Trekk på en bomullsstrømpe fra stortåa og opp til kneet.
- Legg ortopedisk vatt på aktuelt sted, dvs. på forfot, skarplegg og/eller rundt ankelen.
- Legg en sammenrullet bit av ortopedisk vatt bak malleolene.

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- Legg ortopedisk vatt rundt ankel og nedre del av legg der hvor beinet har omvendt champagneflaskeform.

Legg på et langelastisk bind fra basis av lilletåa og opp til knehasen

- Legg et langelastisk bind med et jevnt drag i bindet fra basis av lilletåa og opp til knehasen. Overlapp med 50 til 60 %.
- Start med et dobbelt lag rundt forfoten for å feste bindet.
- Fortsett over vristen og ned på undersiden av hælen.
- Fortsett over vristen igjen og ned på undersiden av hælen, for så å ta nok en tur over vristen.
- Fortsett en tur i overkant av hælen, over vristen, rundt ankelen og deretter ned for å dekke hælen. Hælen skal være med for å unngå stase!
- Fortsett sirkulært oppover leggen til knehasen (unngå åttetallslegging av langelastiske bind, det kan føre til at trykket blir for høyt).
- Klipp av bindet dersom det er for langt. Skjøl på i samme retning dersom det er for kort.

Fikser og trekk ev. en bomullsstrømpe utenpå kompresjonsbindet

- Fikser med tape.
- Trekk eventuelt en bomullsstrømpe utenpå kompresjonsbindet.