Simulation used as a learning approach in nursing education

Students' experiences and validation of evaluation questionnaires

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ABSTRACT

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The overall aim of the thesis was to investigate bachelor nursing students' experiences with simulation as a learning approach conducted under various conditions. Additionally, the aim was to translate and validate questionnaires for the evaluation of simulation in a Norwegian context.

Methods: An evaluative and comparative design with quantitative and qualitative methods was used. Nursing students (n=86) representing different educational levels responded to three questionnaires, the *Student Satisfaction and Self-Confidence in Learning*, the *Educational Practices Questionnaire*, and the *Simulation Design Scale*, after attending either low- or high-fidelity simulation in a scenario developed for a spesific educational level (**I**). Nursing students (n=123) in their second year of education were included, and after a human patient simulation, they responded to the questionnaire *Student Satisfaction and Self-Confidence in Learning*. The questionnaire was subjected to a principal component analysis (**II**). Nursing students (n=138) in their second year of education, were divided into either large or small groups, and participated in a human patient simulation. The students responded to the questionnaire the *Debriefing Experience Scale*, which was subjected to a principal component analysis (**III**). Data were obtained from nursing students (n=20) in their second year of education concerning their experiences from the debriefing conducted in either small or large groups, through focus group interviews. The data were analyzed using a qualitative content analysis (**IV**).

Main findings: Independent of the fidelity level in the simulation and educational levels, the students reported satisfaction, and that the emphasized features in learning were present. Those who used a paper/pencil case study were the most satisfied (**I**). The Norwegian version of the questionnaire, the *Student Satisfaction and Self-Confidence in Learning*, revealed no stable factor solution (**II**), while the translated version of the *Debriefing Experience Scale* was shown to hold a good potential for evaluating debriefing, but benefited from reducing the subscales (**III**). Debriefing was reported to be crucial for learning, but also as a stressful and intrusive situation. The participation in the small groups was reported to be favorable, but the large groups to provide challenges, which the students meant were more accommodated to the requirements of being a future nurse (**IV**).

Conclusions: Simulations at all fidelity levels can be used in nursing education. The students seemed to prefer the familiar and traditional learning approaches. To help exploit the learning potential in simulation, the learning approaches should generally be integrated into the program through a systematic and structured building of a learning community. Additionally, a further validation and testing of the questionnaires in different programs and contexts is needed.

SAMMENDRAG

Simulering benyttet som læringsmetode i sykepleierutdanningen. Studenters erfaringer og validering av spørreskjema for evaluering.

Hensikt: Avhandlingens overordnede hensikt var å undersøke sykepleierstudenters erfaringer i bruk av simulering som læringsmåte gjennomført under ulike forhold. I tillegg var hensikten å oversette og validere spørreskjema til bruk for evaluering av simulering i en norsk kontekst.

Metode: Det ble benyttet en evaluerende og sammenlignende design med bruk av både kvantitative og kvalitative metoder. Sykepleierstudenter som representerte ulike utdanningsnivå (n=86), besvarte tre spørreskjema, *Student Satisfaction and Self-Confidence in Learning*, *Educational Practices Questionnaire* og *Simulation Design Scale*, etter å ha deltatt i enten lav- eller høy-skala simulering i et scenario tilpasset sitt utdanningsnivået (**I**). Sykepleierstudenter (n=123) i andre år av utdanningen ble inkludert, og etter en høy-skala pasient simulering, besvarte de spørreskjemaet *Student Satisfaction and Self-Confidence in Learning*. Spørreskjemaet ble psykometrisk testet ved hjelp av principal component analyse **(II)**. Sykepleierstudenter (n=138) i andre år av utdanningen, ble inkludert, og inndelt i enten store eller små grupper, og deltok i en full-skala pasient simulering. Studentene besvarte deretter spørreskjemaet *Debriefing Experience Scale*, som så ble testet ved hjelp av principal component analyse **(III)**. Data som omhandlet erfaringer fra debrifing ble samlet ved hjelp av fokus gruppe intervju med studenter (n=20) som hadde deltatt i enten store eller små grupper. Data ble analysert ved bruk av kvalitativ innholdsanalyse **(IV)**.

Hovedfunn: Uavhengig av graden av realisme i simulering og utdanningsnivå, rapporterte studentene at de var fornøyde og at de vektlagte læringselementene hadde vært til stede. De som hadde benyttet papir/penn case studier var de som var mest fornøyde **(I)**. Den norske versjonen av spørreskjemaet *Student Satisfaction and Self-Confidence in Learning*, viste ingen stabil faktorløsning **(II)**, mens den oversatte versjonen av *Debriefing Experience Scale,* viste å ha et godt potensiale for å evaluere debrifing, men at den ville dra fordel av at antall sub-skala ble redusert **(III)**. Studentene vurderte debrifing som avgjørende for å lære i simulering, men de mente også at situasjonen var stressende og påtrengende. De foretrakk å delta i små grupper, men at de store gruppene ga

utfordringer mer i samsvar med de krav som stilles til dem som fremtidig sykepleiere **(IV)**.

Konklusjon: Simulering på alle realisme-nivå kan benyttes i sykepleierutdanningen. Resultatene indikerte at studentene foretrakk de kjente og tradisjonelle læringsmåtene. For å bidra til å utnytte læringspotensialet i simulering, bør tilsvarende læringsmåter integreres i studieprogrammet generelt gjennom en systematisk og strukturert oppbygging av læringsmiljøet. I tillegg er det behov for ytterligere validering og testing av spørreskjemaene i ulike programmer og under forskjellige forhold.

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ABBREVIATIONS

DES	Debriefing Experience Scale
EPSS	Educational Practices Simulation Scale
HFS	High-fidelity patient simulator/high-fidelity simulation
HPS	Human patient simulation
LFS	Low-fidelity simulation
NLN	National League for Nursing
PCA	Principal Component analysis
PP	Paper/pencil case study
SM	Static mannequin simulation
SDS	Simulation Design Scale
SSS	Student Satisfaction and Self-Confidence in Learning
WHO	World Health Organization

ORIGINAL PAPER

I. Tosterud R., Hedelin B., Hall-Lord ML. (2013). Nursing students' perceptions of high- and low-fidelity simulation used as learning methods. *Nurse Education in Practice*, 13(4), 262–270, http://dx.doi.org/10.1016/j.nepr.2013.02.002

II. Tosterud, R., Petzäll, K., Hedelin, B., & Hall-Lord, M.L. Psychometric testing of the Norwegian version of the questionnaire, Student Satisfaction and Self-Confidence in Learning, used in simulation. *Nurse Education in Practice* (0). doi: http://dx.doi.org/10.1016/j.nepr.2014.10.004

III. Tosterud R., Petzäll K., Wangensteen S., Hall-Lord ML. (2014). Cross-Cultural Validation and Psychometric Testing of the Questionnaire: Debriefing-Experience-Scale. *Clinical Simulation in Nursing*. In press.

IV. Tosterud R., Hall-Lord ML., Petzäll K., Hedelin B. (2014) Debriefing in simulation conducted in small and large groups - nursing students' experiences. *Journal of Nursing Education and Practice*, 4(9). http://dx.doi.org/10.5430/jnep.v4n9p173

INTRODUCTION

Being a nurse implies exerting professional care towards persons, further referred to as the patient, being in a situation exceeding what can be handled by the patient's own capacity or what can be given in their ordinary network. Being a patient is characterized as having an extraordinary vulnerability by not possessing the ability, capacity, knowledge or overview of the consequences that might occur as a result of the disease or failure of basic needs, thereby having to rely on the protective actions of professionals (Berg & Danielson, 2007; Nortvedt, 2001; Sellman, 2005). The patients have the right to be met by professional caring, including experiencing the nurses as having protective dispositions and the ability to safeguard patient safety through both their own actions and the actions of others. Such dispositions and abilities must be developed and cultivated during education in order to be able to identify the evident or tacit claim that emerge in the encounter with the patient and to take a stand on how to prioritize and act in accordance with the patients' needs (Johnson, 2013; Martinsen & Eriksson, 2009). There is a need for changes in nursing education to help facilitate students to transfer theoretical knowledge into a clinical context, and to develop the necessary personal abilities (Benner, 2010; Kardong-Edgren, Willhaus, Bennett, & Hayden, 2012; Sherwood, 2012).

I have been a nurse educator for 20 years, with my occupation having been concerned with the learning methods used in the faculty and how to improve the teaching and learning and their relevancy to the clinic. This was the background when I was one of the initiators in 2002 in developing an advanced simulation center at the university college in Gjøvik, Norway. The idea was to facilitate learning in the simulation center with the purpose of preparing the students for their clinical practice. By being prepared, energy can be released in the limited amount of time available in the clinic for the students to learn what can only be acheived in the encounter with actual patients. Innovations in advanced technology provide new options through the use of a human patient simulator and arranged environments for reproducing clinical problems and realistic patient situations, further referred to as human patient simulation (HPS). The students are provided with an opportunity to experience and to practice nursing in clinical-type situations without any risk of harming the patients (Cant & Cooper, 2010; Jeffries & Norton, 2005), thus being recommended to be used in the education to improve patient safety (WHO, 2011). In the early stage of using HPS, the implementation was characterized by the trial and error method, often leading to frustrations among both the students and educators involved. Though the students were given learning opportunities in advanced environments close to clinical conditions, a hesitation and lack of enthusiasm among the students was registered. The motivation for this thesis was an increased interest of how the students perceived the use of simulation as a learning approach, and in addition, how simulation can be implemented and conducted to increase the quality of nursing education. For obtaining such data it was recognized that there was a need for validated and reliable assessment tools.

BACKGROUND

In the following, there will be a presentation of characteristics in nursing education and the theoretical basis for learning. Nursing students are educated in two arenas, in the faculty and in the clinic, and some of the challenges following this separation of theory and practice, often called the theory-practice gap, will be described. Thereafter, simulation and how to learn from simulation will be described, followed by a presentation of the prerequisites for learning in simulation. Previous research concerning what is known about learning outcomes for nursing students in simulation are presented, including evaluation questionnaires.

Characteristics in nursing education

Nursing education is characterized by being a professional field of study, meaning that it is vocationally oriented and qualifies for the exercise of specialized services (Molander & Smeby, 2013; Molander & Terum, 2008). A profession means having a social purpose or an institutionalized common goal, as well as unique knowledge applied in practice and education (Schlotfeldt, 2013), and being given the mandate to exert certain tasks based on a societal contract that obligates the profession to maintain an expected standard (Molander & Terum, 2008). To act professionally as a nurse is based on scientific knowledge, practical skills and professional judgment, in addition personal qualities, attitudes and values (Kenney, 2013; Molander & Terum, 2008). Nursing and exerting professional caring is governed by relevant sciences, by ethical guidelines and by law and regulations established for the profession (Molander & Smeby, 2013). Identification in a profession is often based and recognized by a common language, symbols and outer frames like uniforms and tools (Måseide, 2008).

According to Locsin (2005), quality in nursing means having the capacity to enter the world of the other with a holistic perspective. To relate to both the patient's subjective experience and the objective scientific world (Mitchell & Cody, 2013), knowledge based on natural, human and social sciences are all essential in nursing. Identifying, developing and incorporating ontological and epistemological perspectives are of importance in nursing education because without the meta-theoretical perspectives the students might unconsciously adopt the values of other disciplines in their practice, which could lead to a lack in their own professional focus (Arslanian-Engoren, Hicks, Whall, & Algase, 2013). Being essential for teaching and learning in nursing is compound scientific knowledge from multiple disciplines, including empirics, nursing science, and personal, ethics and moral knowledge (Carper, 2013). Moreover, technological competency is an essential part of nursing (Decker, 2007; Locsin & Purnell, 2013).

Nursing education requires not only focus didactical issues as *what to do* and *why*, but it includes also to know *how to do it* (Johnson, 2013). It also includes both technical and non-technical skills based on scientific knowledge, as well as a professional judgment in making professional practice fallible (Molander & Terum, 2008), which makes patient safety a fundamental principle of good patient care (WHO, 2011). Human errors are stated causing the most common incidents and posing the greatest threat to patient safety. Errors might possibly be linked to individual competence, team performance, properties of health personnel's tools, operating environment and tasks; whereas safety improvement comes from understanding and influencing these connections (Dekker, 2011). How to handle incidents and learn from errors are particularly important factors for patient safety (WHO, 2011).

Nursing students bring with them prior individual experiences, attitudes and knowledge, all of which will affect their behavior in the encounter with a patient (Eraut, 2008). Personal development, which should be in focus in professional education, is a time-consuming process that requires continuity, (Carper, 2013; Eraut, 2004; Lindseth, 2009; Moscaritolo, 2009). Among others, it is of importance to get help to cope with stress, meaning a dynamic interaction between the individual and the environment, including demands, limitations and opportunities related to the work that may be perceived as threatening to exceed the student's resources and skills (Kohler, Munz, & Grawitch, 2006). Sources of stress have been reported to be a fear of making mistakes, negative responses to the suffering and death of patients, managing technology, relationships with other members of the organization and working with people they do not know (Pulido-Martos, Augusto-Landa, & Lopez-Zafra, 2012). It is of importance that educators support and provide students with consciousness and effective coping strategies to deal with such situations (Benner, 2010; Moscaritolo, 2009; Pulido-Martos et al., 2012; Solvoll & Heggen, 2010).

Some studies have discouragingly shown that nursing students and nurses do not perceive the theoretical part of their education to be sufficiently relevant to the requirements they encounter as an executive nurse (Berg & Danielson, 2007; NOU 2008:3; Smeby, 2007). Didactical considerations deal with what is to be learned, how to learn and why. Continuously it should be discussed how to help to facilitate in education to well-qualified nurses being prepared for a health service characterized by increasingly complex patient situations that demand a hands-on expertise (Benner, 2010; Dobbs, Sweitzer, & Jeffries, 2006; Long, 2004). Challenges in nursing education are the increased intakes, decreased clinical placements and an increased shortage of patient availability caused by a reorganization of the health sector (Hayden, Smiley, Alexander, Kardong-Edgren, & Jeffries, 2014; Wilford & Doyle, 2006). There is no guarantee that the clinical studies will provide the students with sufficient opportunities to be exposed to learning situations important for achieving the necessary competency as a nurse.

Theoretical basis for learning

The epistemic level of philosophy concerns the question of how learning occurs. There are two main approaches to learning: learning as construction (constructivism) and learning as transmission of knowledge (behaviorism) (Cohen, 1999). In constructivism, the learner is perceived as the active participant and the teacher as the facilitator for learning. Knowledge transmission from the teacher to the student cannot be accomplished, but is constructed by the learner as possessing meaning for the individual (Parker & Myrick, 2009), and in the view of social constructivism, learning is constructed in interaction with other learners (Vygotsky, 1978).

Traditionally behaviorism has been the dominant theoretical grounding as an educational basis for nursing education (Bisholt, 2012; Ironside, 2001; Parker & Myrick, 2009). In a behavioristic view, the teacher is perceived as "the gate-keeper" (Shovein, Huston, Fox, & Damazo, 2005), who points out to the students what should be emphasized and learned. The learning process is conceived as a transmission of knowledge from the teacher to the student, with repetition and practice being of urgency for preventing the decay of knowledge (Grunwald & Corsbie-Massay, 2006). Learning is perceived as acquisition (cf. Sfard, 1998) and the student as being in a receiving role. Behaviorism is an efficient approach to learning when there is a large student-teacher ratio, as is often seen in nursing education, and it is also well-suited for evaluation of educational outcomes (Ironside, 2001). Additionally, a professional education such as nursing requires specific qualifications obtained during the education, and a priori specifications of the learning outcomes are given to the faculty.

The optimal learning in nursing is conceived to be, as in participation, in interaction with patients and in the nursing community, by transferring the abstract universal in a uniquely particular situation (Carper, 2013; Kunnskapsdepartementet, 2008; Martinsen, 2005). However, a prerequisite for this learning is to understand the situation, to recognize and obtain relevant knowledge for the current situation and to have a basis to work from. In both the clinic and the encounter with the patient, the situation may not facilitate well for learning; for reasons of patient safety, mistakes should not be done, the need for rapid actions is present and the patient should feel safe and secure about the treatment and nursing being provided. As a student to be guided by the professional nurse's behavior and by observing prioritizing and actions in a professional community, facilitates for learning. However, it is not obvious for a student to understand or perceive the rationale for how the situation is to be solved, and tacit or implied knowledge might be difficult to grasp for a novice (Eraut, 2008). The student's learning could also end up as a low priority in a busy and hectic everyday life in a clinical unit, which is influenced by a shortage of a sufficiently amount of time for reflection, verbalization and connection to knowledge. Learning in the sense of the master-apprentice learning method could make learning simply copying and not deeper learning (Bisholt, 2012; Howard, Englert, Kameg, & Perozzi, 2011; Martinsen, 2005).

The theory-practice gap

Nursing students are educated in two separate and independent organizations, each with their own primary function area; the faculty has teaching and learning in focus, whereas the clinic primarily focuses on the care and treatment of patients. The students should ideally bring acquired theoretical knowledge into the encounter with the patient, while in opposite direction, experiences and knowledge achieved in the clinic should be brought back to the faculty for further learning (Kunnskapsdepartementet, 2008). However, the transformation of knowledge from theory into practice and previously achieved knowledge and experiences to be recontextualized on new arenas is not an easy process (Eraut, 2004; Smedby & Mausethagen, 2011). The separation of theory and practice causes challenges for ensuring the quality of study, often referred to as "the theory-practice gap" (Kenney, 2013; NOU 2008:3), or "the practice-to-education gap" (Benner, 2010). This "gap" illustrates that theory and practice interact imperfectly, infrequently and sometimes even insignificantly (Cody, 2013). The quality of the study program requires the students to perceive a close connection between theory and practice (NOU 2008:3). Unfortunately this "gap" has led to a mutual devaluation between the faculty and the clinic; the educators argue that the lack of use or nurses' inability to use theory in clinical practice as the reason for the "gap" (Kenney, 2013; Zierler, 2014), while nurses in the clinic assert the theory being taught and focused on in education to not be sufficiently relevant for the exercising of the profession (Smeby, 2007). The process of developing nursing as an academic discipline is pointed out as one reason for "the gap" (NOU 2008:3). In this view, the teachers are perceived to have left the nursing community and entered an academic field. They have shifted their focus from the practice field they are supposed to educate for, develop knowledge about and serve, instead emphasizing the academic and theoretical perspectives (academic culture), that could be perceived as not useful for the exercise of nursing (Eraut, 2004; NOU 2008:3; Smeby, 2007; Zierler, 2014). Whatever the reasons might be, the focus must be on bridging this "gap". The students, educators and nurses need to perceive that the nursing community includes two arenas, the arena of exercise and the arena of theoretical knowledge. Corresponding to other professional disciplines, nursing needs to be based on its unique knowledge applied in practice (Kenney, 2013). Nurses are guided in their execution of the profession by the theory they have achieved during their education, both in the faculty and in the clinic.

There is a need in nursing education to focus on helping students to apply classroom learning in a clinical context to enhance patient safety (Benner, 2010; Sherwood, 2012; WHO, 2011). This has caused simulation-based training in nursing education to rapidly expand and be used worldwide (Cant & Cooper, 2010; LaFond & Van Hulle Vincent, 2012; Lewis, Strachan, & Smith, 2012).

Simulation

Gaba (2004, p.4) describes simulation as a technique that can be used "to replace or amplify real experiences with guided experiences that evoke or replicate substantial aspects of the real world in a fully interactive manner." Simulation can also be outlined as a continuum from low-fidelity simulation

(LFS) to high-fidelity simulation (HFS) (Hovancsek, 2007), in the further referred to as fidelity level or simulation method. LFS by means of paper/pencil case studies, or by the specific learning of psychomotor skills, represents a learning approach that has a long tradition in nursing education. However, innovations in advanced technology provide new options in simulation. The human patient simulator is high-fidelity, full-scale, computer integrated and a physiologically responsive mannequin, and in being used in a learning environment characterized by equipment and surroundings closed to the clinic, the students are provided realistic learning opportunities, referred to as human patient simulation (HPS). Such learning opportunities offer the student the possibility to experience and exert nursing without any risk of patient harm. In simulation, the focus could be on decision making, problem solving, prioritizing, and an awareness of personal feelings or attitudes (Hovancsek, 2007; Maas & Flood, 2011), including the affective, cognitive and psychomotor domains, as well as an approach to team training (Cant & Cooper, 2010; Jeffries & Norton, 2005). To help facilitate learning, it is important to take into consideration that the cognitive load is not too high. The content of the lesson must be at a level that makes it possible for the student to integrate the new information into existing knowledge (intrinsic load), the learning approach must be familiar (germane load), and the surroundings must be at a level that is manageable (extraneous load) (Grunwald & Corsbie-Massay, 2006).

To what extent there is a need for the optimization of realism in simulation must be discussed in relation to the need for such realism, but it is of importance that the participants perceive the simulated situation as being relevant to clinical practice (Johnson, 2009). Participants with a high degree of experience are able to bring relevant mental pictures into the situation, which help them to "get drawn into" the simulation, while those with limited experience may have a greater need for realism (Rettedal, 2009). As a result of this, factors such as educational level could exert an impact.

There is a lack of research that underpins the educational foundation and how to implement simulation as a technology-based tool for learning in nursing (Parker & Myrick, 2009). Rourke et al. (2010) examined to what extent the research on simulation has a theoretical basis. It was found that 45% of the studies did not use any theoretical basis, 45% just minimally, and only 10% had an adequate way of using the theory. In a literature review conducted by Blum and Parcells (2012), it was found that concepts and terms used in the research are defined, named and applied in various ways. There is a need for a depth of thought as to why it is relevant, appropriate or pertinent for the actual program and the learning process (Parker & Myrick, 2009). Without a sound philosophical and knowledge-based foundation, there is a chance that it could end up as the latest educational and technological fad, insofar as being something that "pops up" as very popular, but then vanishes and is forgotten, which is often seen when new tools for learning are introduced (Parker & Myrick, 2009; Rasmussen, Kruse, & Holm, 2007). Experiences and research developed in other disciplines are valuable, although it is important to take into consideration that experiences from one discipline cannot be directly transferred to another. Educational traditions, perceptions of the teacher's and student's role in learning, culture and learning foundations will all influence to what degree simulation will be a success (Aldrich, 2006; Dieckmann, Friis, Lippert, & Østergaard, 2012; Eraut, 2004; Jeffries, 2006).

When new technology, such as in HPS, is introduced in nursing education, it brings forth a discussion about beliefs in relation to education in general and on theoretical, ontological and epistemological issues in nursing that focus on the question: What is nursing and how is it learned? (Shovein et al., 2005). Granted that nursing is about relationships, humanity and interaction, objections about the conflict between the human elements versus technology can be submitted. Nonetheless, new technology is often embraced and included in nurseing education (Parker & Myrick, 2009). The new generation of learners, called "the millennial generation" (Dede, 2005), are familiar and habituated to technology as an important and incorporated tool in their daily life, probably expecting such tools to be a naturally integrated part of learning and education (Skiba, Connors, & Jeffries, 2008). It is however, important to recognize that the proliferation of technology in education will change the pedagogical process (Myrick, 2005).

The theoretical grounding in simulation is often seen based on theories focusing on learner-centered practices, constructivism and collaboration including individuals representing different sociocultural backgrounds (Childress, Jefferies, & Dixon, 2007; Dieckmann, 2009; Jeffries & Rogers, 2007b). Learning is described as being transferred from the individual into a collaborative learning community and knowledge is constructed by the individual through collaboration and interaction with objects, events and people in this environment (Cohen, 1999). The learning vision is reflected in that the one who leads the simulation is referred to as a facilitator. However, the recommendations about how to implement simulation are quite similar to what is known as the basic function of the teacher in behaviorism (Vestergaard, 2005); the teacher is "the gate-keeper", setting the aim and objectives, as well as facilitating, organizing, evaluating and choosing the content and topic of the simulation. Behaviorism is also often the basic when technology is used to reinforce learning (Haugsbakk, 2000; Säljö, 2001). Even so, it can be argued that in instructor-facilitated simulation experiences the freedom in learning lies in facilitating the students to search for their own way in problem solving, in accessing information and knowledge, in thinking critically and making their own resolution, all of which help on their own path towards a defined goal (Magee & Consortium, 2006; Parker & Myrick, 2009). Such activities in learning have characteristics of interpretive pedagogies (Ironside, 2001), and are used as arguments for simulation to not represent the conventional (Bannan-Ritland, Dabbagh, & Murphy, 2000; Dabbagh, 2007; Parker & Myrick, 2009). Regardless, it is important to recognize that the technology and equipment' involved in simulation are tools for learning and cannot alone prescribe the epistemic level. If the facilitator is a teacher, the students will probably have problems with adjusting the role to how they in general perceive the teacher's role to be. In this thesis both the concepts facilitator and teacher will be used for the one who is leading the simulation.

Learning by the use of simulation

A prerequisite for the students to achieve learning, and essential for a positive learning outcome, is simulation competency (Dieckmann, 2009). This includes being familiar and accustomed to the principles and strategies used (Henneman & Cunningham, 2005; Jeffries & Rogers, 2007b; Keitel et al., 2011; Savoldelli, Naik, Hamstra, & Morgan, 2005), being able to problem-solve the topic and willingness to be involved and actively participate (Dieckmann et al., 2012). To ensure a good learning environment is emphasized as crucial for achieving learning in simulation, which poses challenges, both in terms of organizing groups and for the facilitator's ability to conduct the session. Anxiety is known as a challenge in the use of HPS (Jackson, 2013). Some level of anxiety is positive in that it mobilizes one for action, but is dependent on that person's ability to cope with such feelings (Davis-Berman & Berman, 2002). If the learner perceives the situation as possessing challenges that exceed the learner's ability to cope, thereby causing a high level of stress and anxiety, it will impede effective learning (Fanning & Gaba, 2007; Ganley & Linnard-Palmer, 2012). A reluctance to be willing to actively participate and be involved is reported to be one of the barriers to success in the use of HPS (Dieckmann et al., 2012). There is also a need for the minimization of competition and to emphasize that mistakes must be acknowledged as part of the learning process (Jeffries & Rogers, 2007b).

Similar to the students, the facilitator must possess simulation competency (Dieckmann, 2009; Steinwachs, 1992), as simulation-based learning is a complex intervention that needs to be planned (Howard et al., 2011; Wilford & Doyle, 2006). Beside the preparation of the session, the facilitators must also set a safe and confidential scene for the session, and provide a supportive learning climate (Fanning & Gaba, 2007). To help facilitate a safe learning environment in HPS, the use of small groups (2–10 participants) is recommended (Alinier, Hunt, Gordon, & Harwood, 2006; Childress et al., 2007; Grunwald & Corsbie-Massay, 2006; Sinclair & Ferguson, 2009), which as is often seen in nursing education, can be in conflict with a frequent exposure to HPS due to the large student–teacher ratio. In addition to the recommendation of small groups, HPS is a resource-intensive method compared to ordinary lectures because of the resources needed for the initial setup and maintenance of a simulation laboratory, the preparation for the setting, the teachers needed in the implementation of the scenario to assist the students and the technology being used (Dieckmann, 2009; Jeffries & Rogers, 2007b; Mikkelsen, Reime, & Harris, 2008). Successful learning in large groups of medical students has been reported (Heitz, Brown, Johnson, & Fitch, 2009). The use of large groups may provide the possibility for a more frequent and repeated HPS training, which contributes to each student becoming more acquainted to the learning approach. It is of interest to obtain the nursing students' experiences with regard to attending small and large groups.

Several phases are included in HPS: The *prebriefing phase* serves the purpose of decreasing the intrinsic load by the students to be theoretically prepared, by having skills training or through the help of electronic resources. Solving the topic includes also becoming familiar with the technology and equipment' involved and the opportunities and limitations that are present, called *the briefing phase,* which serves the purpose of reducing the extraneous load. In *the scenario,* some participants perform actions, while the rest of the group are observing. In *the debriefing phase,* which is considered to be crucial for learning in simulation

(Dieckmann et al., 2012; Fanning & Gaba, 2007; McCaughey & Traynor, 2010; Shinnick, Woo, Horwich, & Steadman, 2011), the educators and the students reexamine what took place in the scenario, as a reflective learning process to help promote the development of clinical reasoning and judgment skills in an active learning environment. Additionally, it also offers the possibility to resolve feelings and the opportunity to learn from either successes or failures (Dreifuerst, 2009; Fanning & Gaba, 2007; Grabinger & Dunlap, 1995; McGaghie, Issenberg, Petrusa, & Scalese, 2010). Debriefing can be done as a suspension of the scenario to instruct and allow reflection throughout the experience, or by following immediately after the scenario, with the latter seeming to be preferable (Van Heukelom, Begaz, & Treat, 2010). Neill and Wotton (2011) found no evidence of a structured or unstructured debriefing in nursing education is the most successful, though a structured debriefing seemed to possess a better opportunity for reflection and an increased student activity. Debriefing might be conducted individually or in groups as instructor-facilitated debriefing, video-assisted, self-debriefing, multimedia debriefing and in-simulation debriefing. No generalizable conclusions can be drawn from studies to identify the best evidence of the effectiveness of debriefing (Levett-Jones & Lapkin, 2014). There is still a lack of knowledge about how the participants experience debriefing sessions in order to provide an understanding of the learning process provided therein (Neill & Wotton, 2011; Reed, 2012).

Learning effects in simulation

Some studies support simulation to help create a positive learning environment and contribute to self-confidence (Cant & Cooper, 2010; Foronda, Liu, & Bauman, 2013; Harder, 2010; Norman, 2012). However, a review conducted by Yuan et al. (2012) revealed that there is not a sufficient amount of evidence to ascertain the relation between simulation-based learning and student' self-confidence. In studies comparing achieved self-confidence by traditional lectures or simulation-based learning, various results are revealed (Brannan, White, & Bezanson, 2008; Kameg, Howard, Clochesy, Mitchell, & Suresky, 2010). Some studies showed that students who had progressed in their studies reported a lower degree of self-confidence, and were less satisfied with simulation based learning, than those who were at the start of the program (Schlairet, 2011).

Comparing students' satisfaction in using HFS and LFS demonstrate different results insofar as being able to detect significant differences between LFS and HFS in how fidelity levels are evaluated. However, some studies underscore that in verbal responses from the participants, HFS seems to create more enthusiasm and inspiration than LFS (Butler, Veltre, & Brady, 2009; Grunwald & Corsbie-Massay, 2006; Hoadley, 2009; Jeffries & Rizzolo, 2006; Kardong-Edgren, Lungstrom, & Bendel, 2009; McCaughey & Traynor, 2010). Enthusiasm and inspiration are factors considered to be essential characteristics for a good learning environment (Jeffries & Rogers, 2007b). In a review concerning the effectiveness of simulation-based training, Harder (2010) reported an increase in clinical skills among students and health professionals compared to the use of traditional methods. An improvement in exam results among those who participated in simulation compared to those attending the traditional has also been found (Gates, Beth Parr, & Hughen, 2012; Wolfgram & Quinn, 2012). Moreover, an improvement in the ability of medication management when training is conducted in realistic environments has also been found (Sears, Goldsworthy, & Goodman, 2010; Zahara-Such, 2013).

Research concerning patient outcomes as a result of learning from simulation is limited (Kardong-Edgren, Adamson, & Fitzgerald, 2010; Norman, 2012). Still, some studies have shown that simulation training has an improved effect in the clinic through increased patient survival (Andreatta, Saxton, Thompson, & Annich, 2011; DeVita, Schaefer, Lutz, Wang, & Dongilli, 2005), or by an improved ability in communication and patient outcomes (Carroll & Pignataro, 2009). Blum and Parcells (2012) conducted a literature review that did not find a correlation between simulations-based training and the development of nursing students' competency in implementing patient safety care. In other studies it was found that nursing students considered simulation to be an effective method to prepare them for the transition to be professionals at the end of their program (Maxson et al., 2011; McCaughey & Traynor, 2010; Miller, Riley, Davis, & Hansen, 2008).

Kardong-Edgren et al. (2010) examined approximately 20 questionnaires for the evaluation of simulation, with the majority of these measuring cognitive aspects of learning, while fewer measured affective or psychomotor abilities. The review showed that the majority of the measurements were not sufficiently tested and several studies had few participants. The authors concluded that there is a need for validated and reliable questionnaires that can be used across boundaries and cultures for improving and developing simulation (Kardong-Edgren et al., 2012). Such questionnaires provide the possibility to compare results across different studies, both nationally and internationally, with validated questionnaires increasing the certainty of the results by accurately reflecting what they are supposed to measure (Gjersing, Caplehorn, & Clausen, 2010). Construct validity as an ongoing process is considered as the basic meaning of validity, with both the theory and measure being assessed (Streiner & Norman, 2008). As part of this process, the psychometric testing of the translated questionnaires is required to help draw conclusions about the conceptual and semantic equivalence to the original (Polit & Beck, 2012), which is also recommended as contributions to the science of nursing education (Kardong-Edgren et al., 2010).

RATIONALE FOR THE THESIS

Due to the need for changes in nursing education, there is an increased and widespread use of simulation as a learning approach. There is still a lack of knowledge about how simulation can be implemented in nursing education. It is therefore of interest to investigate the students' experiences with regard to the need for level of fidelity in simulation and whether educational level influences their perceptions. Questionnaires based on the self-reported effects on learning outcomes, satisfaction and self-confidence are available, and are all essential measurements to help guide educators in planning and implementing simulation as a learning approach. However, there is a need for translation and validation of internationally used assessment questionnaires in a Norwegian context. The recommended use of small groups constitutes a challenge to nursing education insofar as being characterized by a high student-teacher ratio, and by the learning approaches being resource-intensive. Knowledge about facilitating for learning by the use of large and small groups in HPS is lacking, and though debriefing is considered to be the most important phase for achieving learning in simulation, there is still a lack of research about how to implement this phase. Hence, to acquire knowledge about how the students experience the debriefing in simulation is of importance.

AIMS

The overall aim of this thesis was to investigate bachelor nursing students' experiences with simulation as a learning approach conducted under various conditions. Additionally, the aim was to translate and validate questionnaires for the evaluation of simulation in a Norwegian context.

The specific aims were to:

- examine baccalaureate nursing students' perceptions of scenarios played out in different simulation methods, and whether educational level influenced their perceptions **(I).**

- test the questionnaire *Student Satisfaction and Self-Confidence in Learning* for psychometric properties in a Norwegian nurse education context **(II).**

- translate and validate the *Debriefing Experience Scale* in a Norwegian bachelor nursing program **(III)**.

- describe nursing students' experiences of the debriefing conducted in small and large groups **(IV).**

METHODS

Study design

The thesis includes four studies **(I-IV)**. In order to address the overall aim, both quantitative **(I-III)** and qualitative methods **(IV)** were used. An evaluative and comparative design was used to investigate how the students experienced the different fidelity levels in simulation and whether their educational level influenced their perceptions **(I)** and for investigating the effect on the scores reported in sub-groups **(III)**. A descriptive and explorative design was used to psychometrically test the properties of the translated questionnaires **(II-III)**. To help to gain a broader perspective of the rationale for the experiences in attending small and large groups in debriefing, a qualitative descriptive design was used **(IV)**. Overview of designs and methods are shown in Table 1.

Table 1 Overview of designs and methods

Study	Design	Participants	Data collection	Data analysis
I	Evaluative Comparative Quantitative	86 bachelor nursing students	Questionnaires	Statistics
II	Descriptive Explorative Quantitative	123 bachelor nursing students	Questionnaires	Statistics
III	Descriptive Explorative Quantitative	138 bachelor nursing students	Questionnaire	Statistics
IV	Descriptive Qualitative	20 bachelor nursing students	Focus group interview	Qualitative content analysis

Participants

The participants in the studies were recruited from bachelor nursing program at a university college in Norway. Approximately 300 bachelor nursing students were invited to participate **(I)**, and 86 students signed up from different educational levels. No background data were obtained.

Bachelor nursing students (n=130) conducting their second-year level of their three-year program were invited to participate, and 123 students responded to the questionnaire with the participants ranging in age from 19 to 51 (median score 22) **(II)**. Prior to the present study, the students had participated in simulation training.

Bachelor nursing students (n=146) conducting their second-year level were invited to participate, and 138 students responded to questionnaire (**III**), ranging in age from 19 to 46 years (median score 21). Only half the students (50.4%) reported having HPS experience in advance, while concerning previous work in health-care, 72.9% reported having such experiences before commencing their nursing studies.

A convenience sample (n=22) signed up from the sample of 146 participants in Study III for the focus group interviews (**IV**). Two informants dropped out because of illness, resulting in 20 informants, 19 women and one man, ranging in age from 20 to 44 years (median score 22). The students had participated in HPS and had undergone debriefing either in small (between eight to 11 students) or large groups (between 38 and 50 students). Twelve students represented the large groups in the focus group interviews and eight the small ones, although they had not necessarily attended the same group during the HPS.

Implementation of the simulations

The simulations were implemented in a simulation center at a university college in Norway. When the HPS was conducted, the *Laerdal SimMan human patient simulator©* was used. The simulations included four phases as shown in Table 2.

Table 2 Phases in the simulations

Prebriefing	Ahead of the situation the students prepared for the topic being played out theoretically or by training skills.
Briefing	The students got familiar with the technology and equipment' involved and the opportunities and limitations that were present.
Scenario	In the paper and pencil case studies groups, the students solved a patient case theoretically. In the use of a static mannequin and high-fidelity, two or three students performed actions while the rest of the group, placed in another room, followed the performance by transferred audio and video to a screen, and was given particular observation tasks for the scenario performed.
Debriefing	The teachers involved and the students reexamine what happened in the scenario immediately after the scenario.

Study I

A panel consisting of three teachers with expertise in both simulation and the topic being played out developed three scenarios, focusing on respiration adapted to each educational level. The simulation was offered as extra additional learning to their ordinary program. The students were randomly divided by an education manager into three groups of three or four students each. Each group solved the patient case adapted to their study program in year one (Y1), year two (Y2) and year three (Y3), respectively, either in a hands-on simulated experience using a high-fidelity patient simulator (HFS), a hands-on simulated experience using a static mannequin (SM) or a paper/pencil case study simulation (PP) as shown in Table 3.

Table 3 Attending students

	Paper/Pencil (PP)	Static mannequin (SM)	High-fidelity (HFS)
Y1 (n=22)	7	7	8
Y2 (n=19)	6	6	7
Y3 (n=45)	15	15	15
Total (n=86)	28	28	30

Two teachers, a facilitator and an operator handling the mannequin software, were responsible for assisting the HFS group; one teacher was responsible for the SM group and one for the PP group. The time for solving the scenario was 20 minutes, with a maximum of 20 minutes allowed for a debriefing after the scenario.

Study II
The HPS scenario was a part of the students' ordinary study program, focusing a patient developing a severe heart failure. The students were divided by an education manager into three groups, with each consisting of approximately 40 students. All the participants were exposed to the same scenario, and two teachers, an operator and a facilitator, both experts in the topic and simulation, conducted all the three HPS.

Study III
The HPS scenario was a part of their ordinary study program. An education manager divided the participants into a total of eight groups, with two large groups consisting of 38 and 50 students, respectively, and six small groups of eight to 11 students each. All the groups focused on a patient developing a severe heart failure. Two teachers, an operator and a facilitator, both experts on the topic being played out and in simulation, conducted the HPS in all the groups. The scenario lasted about 10 minutes, and the debriefing about 25 minutes each.

Data collection

Data were collected in the period from 2009–2012 through the use of questionnaires and focus group interviews.

Questionnaires

The background questions obtained data about age **(II-IV)**, previous HPS experiences and experiences from health-care work prior **to** nursing education **(III)**.

The National League for Nursing questionnaires
The data were obtained through the use of the questionnaires developed by the American National League for Nursing (NLA), and based on the theoretical framework: The Nursing Education Simulation Framework (NESF) (Jeffries &

Rogers, 2007b) **(I-II)**. The questionnaires were all developed for designing, implementing and evaluating simulation (high- or low-fidelity) used in nursing (Jeffries & Rogers, 2007b). The basics are the declaration that learning outcomes are influenced by the teacher (facilitator), student, educational practices and simulation design characteristics. The questionnaires have frequently been used in studies and, as confirmed in the original results (Jeffries & Rogers, 2007b), the Cronbach's alpha was found to be > .86 (Butler et al., 2009; Cantrell, Meakim, & Cash, 2008; Kardong-Edgren et al., 2010; Reese, Jeffries, & Engum, 2010; Sittner, Schmaderer, Zimmerman, Hertzog, & George, 2009).

Student Satisfaction and Self-Confidence in Learning (SSS) (I-II)
The questionnaire was used to measure, Satisfaction with current learning (five items), in relation to simulation activity, and, Self-confidence in learning (eight items), measuring how confident the students felt about the skills they were practicing, as well as their knowledge about caring for the patient presented in the simulation. The response scale used is a five-point Likert-type rating scale (1=strongly disagree with the statement, 5=strongly agree with the statement). The questionnaire has been tested by a national multi-site, multi-method project that took place from 2003 to 2006 (Jeffries & Rizzolo, 2007). The content validity of the sub-scales was established by nine clinical experts and the Cronbach's alpha in the NLN project was reported to be .94 for satisfaction and .87 for self-confidence (Jeffries & Rizzolo, 2007). The alpha values revealed in this thesis are shown below in Table 4.

Table 4 Student Satisfaction and Self-Confidence in Learning (SSS)

Scale, Dimension	Alpha I	Alpha II
Student Satisfaction and Self-Confidence in Learning (SSS)	.82	.82
Satisfaction with current learning	.84	.84
Self-confidence in learning	.59	.64

Educational Practices Questionnaire (EPSS) (I)
The questionnaire is based on Chickering & Gamson's (1999), "Seven Principles for Good Practice In Undergraduate Education", with the seven principles reduced to four after conducting a factor analysis (Jeffries & Rizzolo,

2007). The questionnaire consists of 16 items, measuring the implementation of the simulation by focusing on Active learning (10 items), Collaboration (two items), Diverse ways of learning (two items) and High expectations (two items). Two five-point Likert-type rating scales are utilized, with the first rating the presence of educational practice (1=strongly disagree with the statement, 5=strongly agree with the statement, NA=not applicable) and the second measuring the importance of these practices to the individual (1=not important, 5=very important). The reported Cronbach's alpha was .86 for the presence of educational practice and .91 for the importance of those features (Jeffries & Rizzolo, 2007). In **Study I**, the Cronbach's alpha was shown to be .84 for the presence of the simulation features and .85 for the importance of these features.

Simulation Design Scale (SDS) (I)

The questionnaire consists of 20 items, and measures the simulation design/development, focusing on Objectives and information (five items), Support (four items), Problem solving (five items), Feedback (four items) and Fidelity (Realism) (two items). There are two response scales, both of which used a five-point Likert-type rating scale with subscales descriptors such as the EPSS. The first is for the presence of the specific features in the scenario, while the second is for the importance of these features to the individual. The content validity was established by a group of 10 experts in simulation, and the reliability value reported by the use of Cronbach's alpha was .92 for the presence of the design features and .94 for the importance response scale (Jeffries & Rizzolo, 2007). The Cronbach's alpha revealed in **Study I** was .90 for the presence of the features of simulation, and .92 for the importance of these features.

Instrument translation

Permission to translate and use the questionnaire was given by the National League for Nursing and the questionnaires were translated through the use of a back-translation process **(I)** to help achieve a semantic equivalence (cf. Polit & Beck, 2012). Due to having received feedback about semantic ambiguities in the questionnaires **(I),** it was decided to conduct a new translation process inspired by Brislin (1970) **(II)**.

1. The instrument was translated from English to Norwegian by a bilingual person who was an educator, but not an expert in simulation.
2. The translated version was reviewed by an expert group of three persons with expertise in simulation and nurse education, and some minor semantic and conceptual changes were made.
3. The back-translation was conducted by a bilingual person who was not familiar with the English version.
4. The expert group compared the new English version with the original, also by consulting a third native English speaking person about specific concepts and words.

The content validity was established by the expert group, and a pilot study was also conducted in a group of 14 students selected from an equal population to strengthen both the semantic and content equivalence (cf. Polit & Beck, 2012). After having participated in simulation, they were asked to answer and comment on the statements and the form's layout, and no comments were given. A translation of the SSS was known to be carried out by another Norwegian educational institution. This provided the opportunity to compare the translated versions of the questionnaire, exhibiting a consistent result that should increase the safeguarding of conceptual equivalence.

Debriefing Experience Scale (DES) (III)

Data was collected through the use of the *Debriefing Experience Scale* (Reed, 2012), which was developed by Shelly J. Reed (DNP, APRN) at Brigham Young University in the US. The development of the scale is based on literature and expert opinion, and initially consisted of 37 items. Through the use of a peer review process two more items were added, thus resulting in a scale with 39 items, grouped by the researcher to seven subscales. The scale was further improved for clarity by the input received from a pilot study, and from the psychometric testing of the questionnaire a two-step explorative factor analysis was conducted (the type of analysis is not described). In the remaining 20 scale items, four factors were identified as subscales. The response alternatives were categorized into the areas of student experience and the importance to the student, both of which were rated with a Likert-type rating. The experience response-scale uses a rating from 1 (strongly disagree) to 5 (strongly agree), and also includes the alternative, Not Applicable (NA): The statement does not pertain to the debriefing activity performed. The importance response-scale is rating from 1 (not important) to 5 (very important).

The subscale, Analyzing Thoughts and Feelings (four items), identifies experiences related to emotional, psychological, behavioral, and environmental aspects. The subscale, Learning and Making Connections (eight items), which measures learning in the experience of the debriefing participant. The subscale, Facilitator Skill in Conducting the Debriefing (five items), is related to the facilitator's skill in conducting debriefing, particularly focusing on skills related to the facilitator being able to manage the time and structure of the debriefing, in addition to the importance of the facilitator being a content expert. Lastly, the fourth subscale, Appropriate Facilitator Guidance (three items), emphasizes the finesse of the facilitator in guiding the debriefing. On the scale level, the Cronbach's alpha was .93 for the experience scale, and between .80 - .89 on the subscale level. The importance scale revealed an alpha value of .91 on total scale level, and between .61- .91 on the subscale level (Reed, 2012). **Study III** revealed alpha values of .86 on the total scale level (between .84 - .44 on the sub-scale level) and .64 for the importance scale (between .27 and .84 on the sub-scale level). The questionnaire offered a possibility to give comments.

Instrument translation

Permission to translate and use the questionnaire was given by Reed. The translation process followed a back-translation model inspired by Brislin (1970):

1. The instrument was translated from English to Norwegian by a bilingual person.
2. An expert group of three persons with expertise in simulation and nurse education followed the translation process in different steps to help obtain cross-cultural equivalence (Gjersing et al., 2010; Hilton & Skrutkowski, 2002). Some minor semantic and conceptual changes were made after the review of the translated version.
3. The back-translation was conducted blinded by a bilingual person.
4. A native English-speaking person who had not previously taken part in the process was consulted, and a consensus was obtained in the expert group after a final semantic adjustment was made.

A pilot test among 11 participants following a facilitator course was conducted to strengthen both the semantic and content equivalence. Some comments were given about the need for the replacement of particular words, and the proposals were taken into account.

Qualitative interview

Five focus group interviews were conducted **(IV)** in groups consisting of two to six students, which was determined by how many signed up from the same clinical practice. The interviews were conducted by the author of the thesis, and an observer, not included in the research group, followed the interviews to help and support the moderator to include all the informants during the interviews, to ensure approximately the same conditions and to help prevent no statements from being overheard. Information about the study, including the aim and a map showing the simulation phases' schematic (prebriefing – briefing – scenario – debriefing) was introduced to the students to emphasize the focus on debriefing. An open-ended question was used: "Can you please tell how you experienced the debriefing?" as well as follow-up questions such as: "Can you please tell me more about/give an example of/ explain…" in an attempt to promote a common understanding of meaning (Elo & Kyngäs, 2008; Kvale & Brinkmann, 2009).

A pilot focus interview not included in the study was conducted among a group of bachelor students at the same educational level as the participants in the study to test the interview questions, and for the interviewer to be comfortable in the situation.

Procedure

Study I

Information about the study was given by the teachers being responsible for the particular simulation. The questionnaires were immediately after the debriefing handed out and the students were left alone to fill in. A place for the submitted questionnaires was placed by the exit door.

Study II

Following the debriefing, information about the study was given by the author of this thesis who had not participated in any of the simulation phases. The questionnaire was handed out and the students were left alone to fill in. A place for the submitted questionnaires was placed by the exit door.

Study III

After the debriefing the author of this thesis who had not participated in any of the simulation phases gave information about the study. The questionnaire was handed out and the students were left alone to fill in. A place for the submitted questionnaires was placed by the exit door.

Study IV

According to the students' desire, the interviews took place on campus or in the clinic where they conducted their clinical studies approximately three weeks after the students had attended the HPS. The interviews took the form of a dialogue lasting from 50 to 60 minutes, and were conducted during a period of eight days. After the interviews, the observer and the moderator made a short summary of the content (cf. Polit & Beck, 2012; Wibeck, Dahlgren, & Öberg, 2007). The interviews were digital recorded and transcribed verbatim.

Data analysis

Statistics (I - III)

Data were analyzed by using IBM SPSS Statistics, version 18. Descriptive statistics, non-parametric and parametric tests were used. A p-value of $p < .05$ was considered appropriate **(I, III)**, and a conservative statistical significance was set at $p < .01$ when multiple statistical tests were run from the same data **(I)** (cf. Field, 2009; Polit & Beck, 2012; Tabachnick & Fidell, 2013). The application of statistical analysis is presented below in Table 5.

Table 5 The application of statistical analysis

Statistics	Application of statistical analysis
Frequency, percentage, mean, median, standard deviation **(I-IV)**	To use for descriptive results.
Kruskal-Wallis test **(I)**	To test for differences among the three educational levels and fidelity levels in simulation.
Mann-Whitney *U*-test **(I)**	To analyse the differences between two groups when a significant difference appeared between students at different educational levels or simulation fidelity levels.
Exploratory factor analysis (EFA) **(II, III)**	To explore a set of items because there was assumed no *a priori* hypotheses about dimensionality of a set of items and the fact that the questionnaires were translated to a new context.
Principal components analysis (PCA) **(II, III)**	To be used because the aim was to obtain an empirical summary of the data set.
Independent-samples t-test (two-tailed probability) **(III)**	To compare the differences between attending in small or large groups, previous experiences of HPS or not and previous experiences from clinical health work or not.
Cronbach's alpha **(I-III)**	To test the internal consistency of the questionnaires.

Missing data (I-III)
The missing data were generally low for the experience scales.

In Study I (n=86), the missing data frequency was 1.2% for SSS and EPSS and 2.3% for the SDS.

In Study II (n=123), no missing was registered.

In Study III (n=138), a missing data frequency was registered concerning the subscales, Appropriate Facilitator guidance (2.2%) and Facilitator skills in Conducting the Debriefing (2.9%).

Qualitative content analysis (IV)

The data was analyzed through the use of a manifest content analysis (Elo & Kyngäs, 2008) in order to describe the students' experiences in having attended a debriefing after HPS. The analysis process was conducted in the research group, and consisted of three phases, including going forward and back as a process until a consensus was obtained. The analysis phases are presented below in Table 6.

Table 6 The content analysis process

Phase	Content analysis
Preparation	The unit of analysis was selected on the basis of the aim of the study. Making sense of the data and the whole was done by listening to the interviews and reading the transcript repeatedly.
Organising	Open coding was performed by writing freely notes in coding sheets representing all aspects of the meanings in the text. The notes which belonged together were collected into groups and those which were similar were reduced into sub-categories. Generated from similar sub-categories the generic categories emerged. An abstraction into a main category to represent a general description of the content was done.
Reporting	An overview of the categories labeled by the characteristic words was used showing the process and the findings.

ETICHAL APPROVEMENT AND CONSIDERATIONS

The access to the research field was approved by the Norwegian Social Science Data Services (NSD) and by the university college. Ethical guidelines for nursing research (Northern Nurses' Federation, 2003) were followed.

The principles of anonymity and voluntariness were emphasized in both written and oral information in all the studies. According to the NSD, signing a consent form was not relevant in **Studies I-III**, as simply filling in the form was considered to be confirmation of a willingness to participate. In **Study IV**, the informants signed a consent form ahead of the interviews. No names were obtained in the interview and each voice was given a code in writing. The students were informed that the results from the interviews would be presented at a group level, but that anonymized authentic citations would in reporting be used, which the students gave their approval to. Due to the principle of anonymity and the fact that few men participated, data concerning gender was not obtained in the quantitative studies **(I-III)** to help ensure confidentiality. Obtaining data about age could threaten anonymity, but since only the researchers had access to the questionnaires and none of these participated in any part of the simulations, anonymity was ensured. According to NSD, no identification of the university college should be done in the publications.

In the **Studies II and III**, the simulation settings were a part of their ordinary program, which represented a chance that the students might perceive the survey also to be an included part of the program. The principle of voluntariness was therefore strongly emphasized in the written information and repeated in the oral information when the questionnaires were distributed.

Nursing students are not to be considered as a vulnerable group by being adults, possessing autonomy and consent competency. Nevertheless, a teacher–student relationship is characterized by disequilibrium with regard to a power balance. Though anonymity was ensured and it was stressed orally and in written that the individual answers would have no impact on them as students or in their study program, the students could have been fearful of sanctions in relation to their opinions about the learning situation, for the evaluation of the teachers being involved or not to fill in the questionnaires. Information was therefore given by the author of the thesis not being involved in the simulation setting, emphasizing that the students' responses would not be available to anyone except the researchers. When filling in the questionnaires, the students were left on their own, and a place for the submitted forms was placed by the exit door where nobody could check if or who delivered them.

The principle of non-malfeasance was considered not to be relevant in any of the studies, and no sensitive information was obtained. However, in written and oral information, an opportunity was offered to consult the researchers if reflections or questions occurred during the studies and afterwards, although no one did so.

With regard to the principle of justice, all the students had the opportunity to participate in **Studies I-III**. **In Study IV**, a convenience sample was used including all the students that sign up for the interviews.

The principle of beneficence was safeguarded by the "voice of the students" to be communicated. The students' experiences and feedback have resulted in changes in the planning and implementation of HPS. Based on the students' experiences and their rationale, an introduction program is already integrated into the university college to help to increase simulation competency among the students.

MAIN FINDINGS

The main findings are presented in the following in the same order as the studies were implemented. First, the main findings concerning the nursing students' perceptions with different fidelity levels in simulation are presented, followed by a subgroup comparison with regard to educational level (**I**). The results of the psychometric testing of the two questionnaires used in a Norwegian context follow thereafter (**II-III**). Lastly, the findings concerning nursing students' experiences of the debriefing conducted in small and large groups are presented (**IV**).

Perceptions of different fidelity levels in simulation (I)

The findings showed that regardless of the fidelity level used in simulation, the students were mostly satisfied and had achieved self-confidence in learning. Concerning the SSS, significant differences appeared on the total scale and on both dimensions. Those who had attended the PP group reported being the most satisfied and having achieved self-confidence. Regardless of the fidelity level used, the students agreed that the educational practices elements were present, measured by EPSS. In relation to the presence of the simulation design features, measured by SDS, the only significant difference was shown with regard to SDS on the dimension, Fidelity (Realism). The PP group reported higher scores than the SM and HFS groups. The results from the experience scale are shown in Table 7.

Concerning the importance of the educational practices elements, measured by EPSS, the students who used HFS (n=27) reported a mean score at the scale level of 4.17 (SD 0.48), the SM users (n=28) 4.33 (SD 0.38) and the PP group (n=26) 4.26 (SD 0.43), meaning that the students agreed about the elements being of importance.

With regard to the importance of the simulation design features, measured by SDS, the students who used HFS (n=27) reported the mean score at the scale level to be 4.17 (SD 0.48), the SM group (n=28) 4.33 (SD 0.42) and the PP group (n=25) 4.31 (SD 0.54), meaning that the students agreed on the features being of importance. Only one significant difference emerged on the dimension level, as the PP group rated higher scores than the HFS group for Fidelity(Realism) (p=0.008).

Table 7 Comparisons between the students' responses in relation to different simulation methods.

Scale, Dimension[1]	High-fidelity patient simulator (HFS) (n=29)		Static mannequin (SM) (n=28)		Paper/pencil (PP) (n=28)		Kruskal-Wallis test		Mann-Whitney *U*-test
	Mean	SD	Mean	SD	Mean	SD	χ^2	p-value	p-value
Student Satisfaction and Self-Confidence in Learning	3.59	0.59	3.96	0.39	4.15	0.31	14.536	0.001	PPv.HFS(p=0.001)
Satisfaction with Current Learning	3.48	0.88	4.07	0.62	4.32	0.43	14.430	0.001	PPv.HFS(p=0.001)
Self-Confidence in Learning	3.66	0.49	3.89	0.35	4.04	0.34	10.244	0.006	PPv.HFS(p=0.003)
Educational Practices Questionnaire	3.90	0.70	4.11	0.49	4.12	0.40	0.985	0.611	
Active Learning	3.97	0.75	4.02	0.53	4.10	0.42	0.270	0.874	
Collaboration	4.66	0.56	4.68	0.56	4.50	0.66	1.616	0.446	
Diverse. Ways of Learning	3.24	1.38	4.04	0.80	4.15	0.86	7.750	0.021	n.s.
High Expectations	3.84	1.11	4.05	0.80	3.92	0.78	0.488	0.783	
Simulation Design Scale	3.78	0.64	4.03	0.55	4.18	0.49	6.017	0.049	n.s.
Objectives and Information	3.63	0.86	4.14	0.60	4.05	0.61	6.116	0.047	n.s.
Support	3.81	0.80	3.90	0.78	3.86	0.92	0.048	0.976	
Problem Solving.	3.84	0.86	3.93	0.69	4.24	0.63	3.830	0.147	
Feedback	4.08	0.85	4.43	0.62	4.59	0.52	5.514	0.063	
Fidelity (Realism)	3.19	1.26	3.48	1.21	4.38	0.77	13.817	0.001	PPv.HFS(p=0.001) PPv.SM (p=0.005)

[1]Scores could range from 1 = strongly disagree to 5 = strongly agree, n.s. = not significant

With regard to EPSS, the number of students who chose the response alternative, Not applicable, varied for the HFS group between one (6.7%) and 12 students (40%), between one (3.6%) and two students (7.1%) for the SM group and between one (3.6%) and four students (14.3%) for the PP group. Concerning the SDS, the number of students who chose the response alternative, Not applicable, varied for the HFS group between one (6.7%) and 12 students (40%), between one (3.6%) and three students (10.7%) for the SM group and between one (3.6%) and seven students (25%) for the PP group.

Subgroup comparison educational level (I)

Concerning SSS, the findings revealed that regardless of education level, the students were satisfied and had achieved self-confidence in learning. The mean score on the scale level for Y1 (n=22) was 3.89 (SD 0.54), for Y2 (n=19) 3.80 (SD 0.57), and for Y3 (n=44) 3.95 (SD 0.45).

The students agreed that regardless of educational level, the educational practices elements (EPSS) were present in the learning situation. The mean score on the scale level for Y1 (n=22) was 4.03 (SD 0.58), for Y2 (n=19) 3.91 (SD 0.59), and for Y3 (n=44) 4.10 (SD 0.52).

The same results were shown concerning the students agreeing on having perceived the simulation design features to be present (SDS) regardless of educational level. The mean score on the scale level for Y1 (n=22) was 3.90 (SD 0.52) and for Y2 (n=19) was 3.81 (SD 0.66), while Y3 (n=44) reported 4.11 (SD 0.55).

With regard to the importance of practices concerning the EPSS, the students in Y1 (n=21) reported a mean score at the scale level of 4.26 (SD 0.35), Y2 (n=18) reported 4.37 (SD 0.43) and Y3 (n=42) 4.20 (SD 0.47).

In terms of the importance of practices concerning the SDS, the students in Y1 (n=20) reported a mean score at the scale level of 4.17 (SD 0.40), Y2 (n=18) reported 4.34 (SD 0.46) and Y3 (n= 42) 4.31 (SD 0.51).

There were no significantly differences on either the scale or dimension level.

The Norwegian version of the Student Satisfaction and Self-Confidence in Learning (II)

Psychometric testing

The questionnaire *Student Satisfaction and Self-Confidence in Learning* (SSS) was considered to be well appropriate for psychometric testing. The questionnaire consists of two dimensions, with a number of items above the limit considered to be well appropriate for factor analysis (cf. Costello & Osborne, 2005; Tabachnick & Fidell, 2013). Prior to conducting the analysis, the suitability of data for the EFA was assessed (cf. Field, 2009; Pallant, 2010), initiating the data to be proper for the EFA. Based on the results from the initial analysis (PCA), the scree test and results from the parallel analysis (Watkins, 2000), it was decided to retain two components as being appropriate, also consistent with the original NLN questionnaire, which explained 49.5% of the variance (38.3% and 11.1%, respectively). However, the analysis extracting the two components showed the items belonging to, Satisfaction with Current Learning, and, Self-Confidence in Learning, respectively, to distribute and mix, rather than creating clusters as in the original.

In an attempt to achieve an improved factor structure, two items associated with Self-Confidence in Learning ("I am confident that I am mastering the content of the simulation activity that my instructor presented to me" and "It is the instructor's responsibility to tell me what I need to learn of the simulation activity content during class time") were removed, which was justified by showing no significant loadings in the correlation matrix (cf. Field, 2009). The two-component solution explained 57.3% of the variance (44.1% and 13.1%, respectively). The oblique rotation with Kaiser Normalization converged in 15 iterations, which revealed clear clusters in the Pattern matrix with seven loadings only on Component 1 and four only on Component 2. However, the Structure matrix showed several moderate to strong cross-loadings.

A new PCA was conducted by regarding the two dimensions in the questionnaire as two separate scales as they initially were. For, Satisfaction with Current Learning, the result revealed medium to strong correlations on all the items in the Correlation matrix. The result suggested a one-component solution, also confirmed by the parallel analysis, which explained 62.8% of the variance and communality values above the recommended (cf. Field, 2009).

With regard to Self-Confidence in Learning, few significant loadings appeared in the Correlation matrix. A three-component solution was suggested, thus explaining 63.1% of the variance (32.9%, 16.1% and 14%, respectively). A new analysis was conducted by extracting two components justified by the results of the parallel analysis. In addition, two items were removed ("I am confident that I am mastering the content of the simulation activity that my instructor presented to me" and "It is the instructor's responsibility to tell me what I need to learn of the simulation activity content during class time"). This was justified by the fact that these items exhibited values below the acceptable range in the Communalities matrix and no significant values in the Correlation matrix. The new analysis resulted in an improved alpha value of .72, hence explaining 64.4% of the variance (42.9% and 21.4% respectively). Nonetheless, few significant values appeared in the Correlation matrix. The Pattern matrix showed four moderate to strong loadings only on Component 1, and two strong loadings on Component 2. In the Structure matrix, however, two of the items showed a cross-loading on both components.

The Norwegian version of the Debriefing Experience Scale (III)

Content validation

Content validation of the translated version of the *Debriefing Experience Scale* was established by an expert group, by participants in the pilot study and by the participants attending the study to be given the opportunity to give their comments. The expert group discussed the content and the wording until a consensus was obtained. After attending the debriefing, the participants in the pilot study were asked to respond to the scale with particular regard to detecting confusing, misleading or not applicable items for the cultural context. Two words were pointed out as unclear and were replaced.

The Known-group technique

The Known-group technique revealed the construct validity of the questionnaire to hold a potential for separating groups predicted to differ. This prediction was based on the theory that a safe learning environment is preferable in learning (Sinclair & Ferguson, 2009). The prediction was supported by the results showing the students attending the small groups reporting significantly higher scores on the total scale level and on three of the subscales as shown in Table 8.

Table 8 The Debriefing Experience Scale scores dependent on participation in small or large groups

	Small group (N=58)		Large group (N=80)				
Scale, *Dimension*[1]	*Mean*	*SD*	*Mean*	*SD*	*Df*	*t-test*	Sig.[2]
Debriefing Experience Scale	4.49	.285	4.19	.596	120.07	3.94	.000
Analyzing Thoughts and Feelings	4.46	.467	4.08	.688	135.46	3.90	.000
Learning and Making Connections	4.57	.304	4.30	.614	122.16	3.47	.001
Facilitator Skill in Conducting the Debriefing	4.31	.454	4.07	1.015	132.00	1.71	n.s[3]
Appropriate Facilitator Guidance	4.61	.462	4.24	.672	133.00	3.68	.000

[1]Scores could range from 1 = strongly disagree to 5 = strongly agree
[2]Two-tailed
[3]n.s. = not significant

In comparing means dependent on previous HPS experiences, a significant difference was only revealed on the sub-scale, Learning and Making Connections, showing the students who had previous experiences reporting higher scores (M=4.51, SD=.342) than those without (M=4.31, SD=.663, t-test (95.498)=-2.156, p=.034). Concerning previous experiences from working in health care, no significantly difference was shown.

Psychometric testing

Internal consistency was established by the use of Cronbach's alpha, and demonstrated values on total scale level .86 and between .44 - .84 on the subscale levels. The initial analysis (PCA) revealed five components with eigenvalues above a Kaiser's criterion of 1, thereby explaining 65.3% of the variance (39.7%, 8.2%, 6.4%, 5.6% and 5.1%, respectively). The scree test showed a clear break after the second component. Based on this and the result from the parallel analysis (cf. Costello & Osborne, 2005; Gaskin & Happell, 2013), a new analysis extracting two components was conducted, but did not reveal a stable solution by showing cross-loadings.

An extraction of three components was conducted, justified by the parallel analysis to show the third component to demonstrate a marginal value below the acceptable. Two items were removed, "The facilitator allowed me enough time to verbalize my feelings before commenting", by showing no significant correlation in the Correlation matrix and "Unsettled feelings from the simulation were resolved by debriefing", by showing few low loadings in the Correlation matrix and cross-loadings in the Pattern matrix. An alpha value of .91 was shown.

Component 1 represented a stable factor by consisting of 11 items of moderate to strong loadings. However, Component 2 (four items of moderate to strong loadings) and 3 (three items of moderate to strong loadings) consisted of a number of items below the recommended limit (cf. Costello & Osborne, 2005).

The experiences of debriefing after attending small or large groups (IV)

In analyzing the interviews, three generic categories emerged based on each of the two sub-categories. The main category was labeled as, *The fear of being put into the discomfort zone,* based on that the students repeatedly expressed that they perceived to be in a vulnerable situation by being exposed among their fellow students. They expressed a fear to be challenged in the HPS beyond what they perceived to master. The different levels of the categories are shown in Table 9.

Table 9 Sub-categories, generic categories and main category

Main category	The fear of being put into the discomfort zone					
Generic category	Experienced as transferable learning		Activity is a prerequisite for learning		Predictability and preparedness are essential for learning	
Sub-category	To facilitate the digestion of knowledge	To be relevant for professional requirements	To ensure safety and security	To be challenged	To be familiar with the facilitation	To possess knowledge of the topic

The generic category, Experienced as transferable learning, included two sub-categories concerning the experience of debriefing as effective learning and the relevancy for professional requirements.

In the sub-category, To facilitate the digestion of knowledge, the students stated debriefing to be an effective learning situation. They had an option to understand difficult theoretical issues transferred to a patient situation.

Emphasized for knowledge understanding were the immediate feedback, the time and the chance to think, reflect and discuss several solutions. Clarifying of questions and confusions supported the students to remember, and empathized was that they were forced to explain and thinking holistically. They acknowledged that having to justify their suggestions and solutions to the issues in problem solving were of importance. The students claimed however, to achieve learning the reflections and different suggestions had to end up with the teacher giving the correct answer or solution. To be in the observer role was stated as a good learning opportunity, and even better than being the performer in the scenario because in being the performer the level of stress and the preoccupation with the students' own actions made them forget what had taken place in the scenario and to be unfocused in debriefing.
The sub-category, To be relevant for professional requirements, emerged from the students' statements about debriefing to make them aware and conscious of their own and others' competency, which they perceived to be of importance for professional requirements. Acknowledged as important to developing professionalism was training in justifying in one's own actions, attitudes and options, also under conditions not providing safety and security. The small, safe and secure groups were conceived as not providing sufficient challenges for such a future required competence. However, the challenges perceived caused doubts about their suitability for the profession.

The generic category, Activity is a prerequisite for learning, emerged from the students to acknowledge that being active such as asking questions, loudly expressing their suggestions in problem solving and formulating reflections was of great importance for achieving learning in debriefing. To be so, they pointed out prerequisites for actively participation, collected in two sub-categories.
The sub-category, To ensure safety and security, was emphasized as crucial for being active and thereby learning. The students expressed in being active the fear of the risk of disgrace or failure. In the small groups, by few witnessed the chance could be taken, and the debriefing was considered as a student-active method. They had experienced group identity, being part of a team and a shared responsibility in problem solving. Such experiences were lacking in the large groups by the fear of failure or disclosure in the presence of many unknown fellow students made the students reluctant to participate actively. The energy and attention were to a large extent used to hide and avoid being the one being exposed. The students experienced in attending the large groups

the experiences of individual exposure, as well as the feelings of being abandoned and "small".

The sub-category, To be challenged, was acknowledged for being active, as well as the need to be set under pressure to a certain extent to help increase activity. Open-ended questions and breaking down existing viewpoints to make the students think and reflect was appreciated. Highly valuated was that the teacher was an expert in the topic, but of equal importance was the interest and dedication shown for the students' learning process. The feeling of mastery was experienced when the students stretched beyond their borders and received constructive feedback. Greatly appreciated were the encouragements given and that failure was not in focus.

The generic category, Predictability and preparedness are essential for learning, included statements based on two sub-categories concerning the need for an habituation to the learning approaches in their program in general. The need to be familiar with the teacher's way of leading the debriefing was emphasized. Additionally, the requirement for individual preparedness for the topic being played out was reported.

The sub-category, To be familiar with the facilitation, was stated as important for achieving learning. Of importance was also to be familiar with the teacher's way of including and leading the debriefing, expectations, humour, and the way of asking questions, responding and giving feedback. More information and knowledge with regard to the principles and requirements involved in simulation were also requested. The lack of similar learning strategies used in general in the programme was pointed out as important for the perception of unfamiliarity and insecurity.

The sub-category, To possess knowledge of the topic, was reported to be of importance. The students acknowledged that the preparedness for the topic being played out was each student's responsibility. Nevertheless, some kind of evident requirement and check that the individual was actually prepared was requested. Hence, fellow students' knowledge in the topic was thought to be important for learning.

Summary of findings

Independent of the fidelity level in simulation and educational level, the students reported satisfaction and the emphasized features in learning to have been present. In comparing different fidelity levels in simulation, the results indicated that the students preferred the familiar and traditional learning approaches. Debriefing was reported to be crucial for learning, with being an observer in the scenario providing the best conditions for learning the topic being played out. Basic pedagogical principles such as safety and security were shown to be a prerequisite for actively participation in learning. Preparedness and predictability were of importance for achieving learning. Attending the small groups was preferred, though the large groups were perceived to provide challenges more accommodated to the requirements of being a future nurse. Successive habituation to exposure in large groups in debriefing provides the opportunity for the individual to develop courage to speak up, argue and justify their own priorities and solutions. To integrate active learning, individual exposure and involvement as an integrated part of the student's role in the nursing program in general was found to be a potential for increasing learning by the use of simulation. The Norwegian version of the, *Student Satisfaction and Self-Confidence in Learning,* revealed no stable factor solutions, whereas the translated version of the, *Debriefing Experience Scale,* exhibited a good potential for evaluating debriefing, but that it would benefit from reducing the subscales.

METHODOLOGICAL CONSIDERATIONS

This thesis combines both quantitative **(I-III)** and qualitative **(IV)** methods. Obtaining quantitative data and the use of statistical procedures to organize, interpret and communicate numeric data **(I-III)** have provided generalizable information about the students' characteristics, in addition to describing, exploring, comparing and evaluating how they experienced the use of simulation in their learning (cf. Polit & Beck, 2012). Obtaining qualitative data **(IV)** added narrative materials to investigate the phenomena in an in-depth and holistic way in an attempt to investigate the rationale for their perceptions (cf. Polit & Beck, 2012). To assess the quality of the studies, several criteria are required. In quantitative studies validity and reliability are important criteria, while in qualitative studies the concern is about enhancing trustworthiness (Polit & Beck, 2012).

Validity (I-III)

Validity in a study refers to what degree the inferences are accurate and well-founded (Polit & Beck, 2012). In connection to measurements, validity is about to what degree it measures what it is intended to measure. Validity might be identified as four types of different aspects of a research design: statistical conclusion validity, internal validity, construct validity and external validity (Polit & Beck, 2012).

Statistical conclusion validity concerns the use of statistical tests and to what degree there is truly an empirical relationship or correlation between the presumed cause and the effect (Polit & Beck, 2012). The decision to use parametric **(III)** and non-parametric **(I)** tests for this thesis was based on the research design (cf. Greene & d'Oliveira, 2006), the data level and the sample size (cf. Pallant, 2010).

In **Study I,** approximately 300 students were invited to participate, and 86 signed up for an additional learning situation and filled out the questionnaires.
By the students being divided into groups consisting of few participants, the use of non-parametric tests was considered to be suitable to compare differences dependent on educational level and simulation methods (cf. Greene & d'Oliveira, 2006; Pallant, 2010). The missing data were considered as being random and did not seem to have influenced the results.

Since the multiple statistical tests were run from the same data **(I)**, a conservative statistical significance was set at $p < .01$ in conjunction with a large number of comparisons to help reduce the risk of a Type I error (cf. Polit & Beck, 2012). In **Study III,** the use of parametric tests was considered to be appropriate by the sample size to be large enough (n=146), which tended to make these tests more powerful (cf. Pallant, 2010). The high response rate (94%) obtained strengthened the validity by making the risk of bias relatively small (cf. Polit & Beck, 2012).

In the conducting of psychometric testing of the questionnaires **(II, III),** the use of an exploratory factor analysis (EFA) was chosen because it assumes no *a priori* hypotheses about the dimensionality of a set of items (cf. Polit & Beck, 2012). This was considered to be appropriate due to the fact that the questionnaire was translated for a new context. In addition, no prior psychometric tests were found to be published for the NLN questionnaires. A principal component analysis (PCA) was further conducted because it was considered to be the best choice when the aim was to acquire an empirical summary of the data set (cf. Tabachnick & Fidell, 2013). Factors with items loading at .40 and above were defined as significant. Factors with eigenvalues over the point of inflexion were retained (cf. Field, 2009), which was also confirmed by the scree plot. A Monte Carlo PCA for Parallel Analysis (Watkins, 2000) was also conducted. Due to the PCA and oblimin rotation, both structure and pattern matrixes were used (cf. Field, 2009).

Internal validity concerns the independent variables to be measured rather than other factors that cause the outcome (Polit & Beck, 2012). Moreover, the fact that different teacher facilitated the groups **(I)** could cause the outcome to be influenced by an evaluation of the facilitator's style rather than the method used. This was attempted ensured by the students being provided the same conditions, i.e. with the facilitator and operator involved, available time. Data were also collected at the same time for the participants in each study **(II, III)**.

Construct validity being an ongoing process that is considered a basic meaning of validity, with both the theory and measure being assessed (Streiner & Norman, 2008). This makes it a key criterion for assessing the quality of a study, which concerns the inferences from a particular example of a study of higher-order constructs that they are intended to represent (Polit & Beck, 2012) as a ”mini-theory” to help explain the relationship among various behaviors and attitudes.

The questionnaires used in this thesis **(I-III)** have all been developed in US. The use of questionnaires across national boundaries and cultural conditions presents challenges in developing both culturally and linguistically equivalent questionnaires (Polit & Beck, 2012).

The NLN questionnaires were chosen to be used to obtain data **(I)** because of being theoretically grounded and frequently used in assessing simulation in nursing education. In the psychometric testing of the Norwegian version of the, *Student Satisfaction and Self-Confidence in Learning* **(II)**, the dimension, Satisfaction with Current Learning, indicated the items to measure an underlying construct. With regard to Self-Confidence in Learning, no stable factor solution was achieved. The high frequency of the use of, Not Applicable, **(I)** might indicate that the students perceived some of the concepts or content presented as being unfamiliar for the context, which could have influenced the results. Because of the lack of corresponding studies, it is not possible to draw essential conclusions from these data as to whether the results are related to the properties of the questionnaire, or instead are dependent on the present data or on the cultural context of the implemented study.

The validation process of the Norwegian version of the *Debriefing Experience Scale* **(III),** showed the scale to hold a good potential for assessing the debriefing. The use of, Not applicable, was used to a low extent, thereby indicating that the students perceived the concepts used as being relevant and familiar for the context. Due to the fact that testing for construct validity is an on-going process, there is a need for more studies to draw conclusions about the questionnaire.

Polit and Beck (2012) point out “reactivity to the study situation” as a threat to construct validity, meaning that by knowing that they are a part of a study, the participants tend to behave in a special manner. This could be relevant by the chance that the students felt they got extra learning **(I)** and were in particular focused in the interviews **(IV).** This threat was reduced by the studies involving learning situations being a part of their ordinary program to support the results **(II, III)**.

Simulation as a learning approach was quite new for the students. This might pose a threat against construct validity by what is called "the novelty effects" (cf. Polit & Beck, 2012), either by the students being enthusiastic about experiencing a learning method different from more traditional lectures, or by being skeptical about a new change being unfamiliar. In comparing different methods in the simulation **(I),** this could be the reason for the results indicating that the students reported to prefer the alternative that was most familiar.

It is also known that the teachers involved in the simulation to possess a great enthusiasm, which might be a subtle or not so subtle influence on "the researcher expectancies", as Polit and Beck (2012) label this threat. The researchers did not take part in any of the implementation of the simulation settings **(I-III)**, but the students may have perceived the teachers conducting the simulations as to be included in the research group. In the interviews **(IV)** this could also have been a threat, by the researcher to be the moderator and to be expected to have a special interest in simulation, and the students to have perceived that they also should be enthusiastic.

The content of the concept *simulation* could have been interpreted differently by the students, either as including only being the one to perform in the scenario or as including all roles in all the various phases in simulation. Even though it was emphasized both orally and in writing that the simulation should be understood as including all roles and phases, some might have responded as, Not applicable, because of not being the one to perform the action.

External validity is concerning to what degree the inferences in a study will hold over a variation in persons, time and setting. In **Study I,** the question can be raised concerning who from the accessible population participated in the study, what is called "the non-response bias" (cf. Polit & Beck, 2012). It might be presumed that those who were willing to use extra time had a positive attitude in advance towards simulation, and that the participants who enjoy active, hands-on and social learning experiences were those who had signed up. The samples **(I-III)** were all bachelor nursing students in a three-year program, and different samples were used in each study, which could indicate the results to be generalizable. Nonetheless, these studies were conducted at one institution, and the different cultural conditions and contexts must be considered before generalization.

Reliability (I–III)

Reliability refers to the degree of accuracy, dependability or consistency of the information being obtained that means how reproducible the results are under different conditions (the stability of an instrument) (Polit & Beck, 2012). An internal low reliability in measurements is considered to be a threat to statistical conclusions. The questionnaires used were tested concerning internal consistency **(I-III)**. Cronbach's alpha was used in all studies to establish internal consistency in the questionnaires **(I-III)**, with acceptable values revealed on the total scale level, except for the importance scale concerning the *Debriefing Experience Scale* (alpha .64) **(III)**.

In **Studies I** and **II**, the students were asked to fill in 49 items included in the three questionnaires, which could have been perceived as many, hence leading to a demotivation for seriously filling out the items. Homogeneity may have been a factor influencing the reliability score negatively in **Study I** (cf. Polit & Beck, 2012), although the result was supported by the results in **Studies II and III**, which was based on a more heterogeneous sample.

Trustworthiness (IV)

In qualitative research, trustworthiness is about the degree of confidence that the researchers have in their data. To ensure trustworthiness, the three criteria of credibility, dependability and transferability were used (Graneheim & Lundman, 2004).

Credibility is related to confidence in the truth and the interpretation of the data. Conducting a content analysis means to break down (deconstruct) the text and rebuild it. When dialogue is described as the method used in the interviews, it might conceal the asymmetrical relationship between the interviewer and the informant; the interviewer is the one to ask questions and draw conclusions, and has the monopoly on the interpretation process (Derrida & Caputo, 1997). This aspect of credibility was of great importance in the reflections and consciousness about the premises in the interview situation and how it influenced the knowledge produced.

The study was carried out by interviewing a convenience sample of 20 participants, representing a variation of attending a simulation in small and large groups. Concerning age there was a variation, but with regard to gender only females attended with the exception of one male, though mainly reflecting the gender balance in nursing education. The author of this thesis being an expert in simulation carried out the interviews, which can be considered as both strength and a weakness. The possessed expertise may have influenced the follow-up questions and provided chances to have ignored comments and statements by interpreting it in one's own knowledge, while the strength of possessing this expertise was to be able to stimulate a rich amount of data. An observer, who was scholar in interview technique, but without a background in simulation, followed all the interviews and supported the moderator (the author) in follow-up questions and in including input from all the participants (cf. Polit & Beck, 2012; Wibeck et al., 2007). Credibility was also increased by the research group representing a variation in competency with regard to simulation. Interpretation involves a balancing act between the researchers' particular perspective to the phenomena and "to let the text talk" for itself (cf. Graneheim & Lundman, 2004). The risk of the findings being influenced by preconceived opinions was reduced by several researchers being involved in the interpretation phase. The main-, generic- and sub-categories were discussed within the research group until a consensus was obtained.

With regard to dependability, the same introduction and open-ended question were used in all the groups. However, through the ongoing process of interviewing, the experiences and knowledge obtained during the interview process may have influenced the foci in the interviews that were the latest performed. As often seen in groups, some persons set the agenda for opinions, and it has to be taken into consideration that another composition of informants could have led to different findings. Yet, the findings were strikingly similar in all the groups. Some weeks had passed since the implementation of the simulation, and the findings could have been influenced by the students not having the experiences quite present in mind. At the same time, they had experienced in between clinical practice, thereby having the chance to consider the relevancy of the achieved learning in the simulation to the clinic.

Authentic citations were used in reporting, which helped to enhance the possibility of transferability. Concerning transferability, the results have relevance when simulation is used, especially for nurse education, but also in general when student activity in learning is required. However, it is of importance to have in mind that there are differences in class culture, familiarity with the learning approaches and the perceived teachers' and students' roles in education, all of which that could have influenced the results.

DISCUSSION

The discussion is structured in the following parts: validation and psychometric testing of the questionnaires, simulation as a learning approach, prerequisites for learning in simulation, the teacher's abilities in conducting simulations and simulation as bridging the "gap".

Validation and psychometric testing of the questionnaires

In psychometric testing of the SSS questionnaire **(II)**, the result indicated that the scale would benefit from being two separate scales as they initially were (Jeffries & Rizzolo, 2007). The dimension, Satisfaction with Current Learning, revealed a factor solution coincident with the original, which indicated that the items measured an underlying construct, also considered to do in the perspective of face validity. With regard to the dimension, Self-Confidence in Learning, a two-component solution was suggested, which was divergent from the NLN questionnaire, and no stable factor solution was achieved, thereby indicating it not to measure an underlying construct. Differences in conducting simulations between institutions or settings might have influenced the results. A high degree of the use of, Not Applicable, was revealed concerning EPSS and SDS, which could indicate the statements in the questionnaire not to be perceived as relevant for this context **(I)**.

The expert group participating in the translation and validation process considered the DES to hold a good potential for evaluating debriefing in a Norwegian context **(III)**. The DES offered the alternative, Not Applicable, but few of the students used this option, thus indicating the response alternatives to be perceived as relevant for the setting. Though to help safeguarding the conceptual equivalence was sought through the back-translation process, through the use of an expert group following the translation process and the use of a pilot study, the students may have perceived ambiguities in the meaning of the concepts or the content. The translation process could have been well conducted concerning semantic equivalence, but still leading to ambiguities in relation to idiomatic expressions, jargons and word clarity related to different cultural settings. An asymmetrical translation, meaning loyalty to the original langue (Hilton 2002) might have given ambiguities.

By conducting a principal component analysis on the translated version of the DES, the result indicated that the scale would benefit from reducing the subscales. In the perspective of face validity, the two sub-scales, Facilitator Skill in Conducting the Debriefing, and, Appropriate Facilitator Guidance, might not be obviously two separate scales, which was also discussed by Reed (2012). In the psychometric testing, the items from these two subscales also mixed into a common component. With psychometric testing of the DES, the need to remove two items was revealed, both associated with resolving and verbalizing feelings. This result can be explained by the various ways of the implementation of the debriefing, and may reflect that feelings were not in focus in the debriefing.

Due to the fact that both of the questionnaires had theoretical foundations **(II, III)**, a dimensionality of the items could be expected. A further analysis by the use of a confirmatory factor analysis (CFA) could therefore have been conducted (Polit & Beck, 2012). However, on the item level the reliability test revealed alpha values below the acceptable for both questionnaires, indicating that there was not a strong correlation (cf. Field, 2009). A further testing by the use of CFA was therefore not considered to be appropriate. Due to testing for validity being an on-going process (Streiner & Norman, 2008), there is a need for more studies to draw conclusions about the properties of the questionnaires.

Simulation as a learning approach

The overall result showed that the students experienced simulation as a well-appropriate learning approach in nursing education **(I, III, IV)**. In accordance with previous studies (Cant & Cooper, 2010; Darcy Mahoney, Hancock, Iorianni-Cimbak, & Curley, 2012; Gore, Hunt, Parker, & Raines, 2010), the students reported to be satisfied, to have achieved self-confidence, and the emphasized features to have been present in the learning situation, all independent of the fidelity level in simulation and their educational level **(I)**. The low-fidelity approaches seemed to be preferable, which could indicate that the need for advanced technology and environmental equipment such as HPS provides for is exaggerated, and even can be distracting in relation to what should actually be learned (Dieckmann, 2009). For the students, the low-fidelity simulation was a well-known focused theoretical learning situation, while their experiences in HPS, including cognitive, psychomotor and affective challenges, were limited. The students described in their habituated student role as typical in a behavioristic learning approach, and as being passive and recipient **(IV)**, without having to leave what is known as their comfort zone (Jensen, Eldridge, Hu, & Tuten, 2010).

To learn something new, however, means to leave one's comfort zone and enter the learning zone, also known as the (dis)comfort zone (Jensen et al., 2010). It means to have to relate to something new, complicated, unfamiliar and to the disruption of previous views. Being in the learning zone can therefore lead to feelings such as frustrations, confusions, dissatisfaction and decreased self-confidence (Brown, 2008; Jensen et al., 2010; Kenney, 2013). The exposure and challenges the HPS provided for **(I, III, IV)** could have given the students the experience of not having mastered, succeeded or of not having met their own or others' expectations, hence leading to a negative impact on satisfaction and affecting their perception of self-confidence (cf. Seifert, 2004). This could also be the explanation to a study conducted by Schlairet (2011), in which the lower scores for satisfaction and self-confidence were found among senior-level students. Because the senior-level students approached graduation, they could have perceived their lack of success as a greater threat to their self-confidence compared to the junior-students, whose expectations toward themselves may be lower in that they still have time to improve. Nonetheless, it is of importance to bear in mind that satisfaction is not a homogeneous and unproblematic phenomenon in relation to learning, and that studies based on self-reporting might have uncertainties concerning learning outcomes (Davis et al., 2006; Schuck, Gordon, & Buchanan, 2008).

As human beings we have both the need for security and safety, but also to grow, develop and to learn something new. The weight of the two conflicting needs is different among individuals (Davis-Berman & Berman, 2002), which must be taken into account in the planning and implementing of simulations. The situation should not pose challenges that exceed the learner's ability known as to enter the discomfort zone (Jensen et al., 2010). If so, it will cause a high level of stress and anxiety, which could impede effective learning (Dieckmann, 2009; Ganley & Linnard-Palmer, 2012). The results showed that the students, in particular those who attended the large groups, to have perceived the challenges exceeding their ability to cope because of the unfamiliarity in the learning approaches used **(IV)**. In comparing various learning approaches, Zulkosky (2012) also found that the students preferred the familiar and traditional. This may be associated with what is called learning anxiety, meaning a hesitation towards the risk of exposure of one's incompetency and a resistance to exposure (McGarry, Cashin, & Fowler, 2012). To overcome this hesitation, survival anxiety must exceed learning anxiety (McGarry et al., 2012), which could be what the students meant when they expressed a need for some pressure and to be challenged to overcome their hesitation towards active involvement **(IV)**. Clearly communicated requirements about active participation in education can also be assumed to contribute as an incentive to overcome learning anxiety. Nevertheless, the students need help and support from the educators to be conscious of their learning zone (Jensen et al., 2010), which is of importance for the students' learning, but also an influence as to how the students as future nurses will be part of building learning communities also for the patients, often being in situations characterized by a high level of stress and anxiety (cf. Renshaw, 2003).

In this thesis, the interpretation of activity could have been different, insofar as some of the students performed actions in the scenarios, while others were observers **(I, III, IV)**. An interpretation of activity could be the hands-on performers, therefore the observers could have been perceived to be passive. However, the results showed that the activity experienced by the students also included the mental factor, which is in accordance with how Dewey (1997) envisioned activity in learning. The students claimed that the observers in the scenario achieved the best learning **(IV)**, which is equivalent with the results of a study conducted by Hober and Bonnel (2014). Objections against an observer role in learning could be that observing means to only acquire knowledge by imitation, thereby only leading to copying without raising one's own thoughts. Observing and imitation however, include the mental factor in that it requires activities such as attention, observation, selection, experimentation and confirmation through the results (Dewey, 1997). This is also known in the theory of situated learning as *legitimate peripheral participation*; to approach own action in a process from being an observer into an independent practitioner (Lave & Wenger, 1991).

The students explained the benefit of learning in an observer role to provide a low level of personal stress and anxiety, while being the one to perform action in the scenario was characterized as being concerned with avoiding failure and the chance to reveal one's incompetency. In being the performer, they asserted to learn to cope with stress, while in being the observer to learn about the topic

(IV). These findings highlighted that the term "active learner" (Grunwald & Corsbie-Massay, 2006) includes both the physical and mental components of simulation. To help to increase the observers' activity, Hober et al. (2014) recommend to allocate specific tasks to the observers during the scenario, e.g. to use a checklist, to write notes or to observe particular aspects. The positive experiences in being an observer **(IV)** indicated that simulation could be an efficient replacement for ordinary lectures.

The debriefing was reported to be the most urgent phase to help achieve learning in simulation **(IV)**. The students appreciated the discussions and the breaking up of various viewpoints as essential activities for learning. They experienced that questions and confusion were clarified, which supported the learning process. This seemed to be in accordance with what Dewey (1997) called reflective thinking, by emphasizing in learning to disturb the students' equilibrium of prior experiences or suggestions. However, the students stated that in order to achieve learning, the discussions and reflections had to end up with the teacher giving the correct answer or solution **(IV)**. Such statements might be perceived as being in conflict with a pedagogic that emphasizes critical thinking, the constructing of one's own meaning and student activity as essential for learning. It could also be applied as evidence that the students were too much habituated to a behavioristic learning environment. Although they applied the correct answer in the end of the debriefing, they appreciated being able to discuss several suggestions to the problem and being trained to take their own standpoint in the process, thereby including reflective and critical thinking. Being a novice means having limited knowledge and experiences, hence making it difficult to be critical or to be able to construct one's own knowledge. The simulations provided the students to experience a simulated encounter with a patient who was critically ill, though experiences are not self-explanatory, as they can even lead to a higher degree of confusion and failure. To help achieve learning, the experiences have to be understood (Dewey, 2007), with debriefing perceived as providing for such an understanding **(IV)**.

The students appreciated having to think holistically in the debriefing by having to include compound knowledge from multiple disciplines in problem solving **(IV)**. In a conventional approach to learning, the underlying assumption is that phenomena can be broken down in learning into different subjects or topics (Ironside, 2001). In accordance with the literature (Kenney, 2013), the students reported the need for help and exercise in synthesizing achieved knowledge into a complex whole, and they reported the debriefing to help to facilitate for such **(III, IV)**.

Simulation and in particular the HPS, provided also for training in the use of technology, being an included part of nursing. Such training is of great importance because the use of technology can either bring the patient closer to the nurse or increase the gap between them (Locsin & Purnell, 2013). It depends on the student's and nurse's capacity and awareness of how it is used as a part of the interaction with the patient.

The students need help and support to develop strategies for coping with clinical stressors (Moscaritolo, 2009; Pulido-Martos et al., 2012), with verbalizing and resolving feelings emphasized in the DES. However, the result indicated that these issues seemed not to be focused in the debriefing **(III)**. It should therefore initiate a debate about how emotional processing in simulation is ensured. An objection against highlighting the students' perceived feelings could be that in a professional education such as nursing, the focus and the aim are to secure the patients' situation, and not the care-giver's. It could also be argued that focusing on the students' feelings may contribute to sustaining an attitude in the new generation, characterized in thinking *what is it in this for me*, rather than *how can I contribute* (cf. Solvoll & Heggen, 2010). Nevertheless, an awareness and consciousness about one's own emotions are important aspects in becoming a professional (Carper, 2013; Eraut, 2004; Keitel et al., 2011). Such issues cannot be tested or secured through traditional school exams, and are therefore often being primarily perceived to be associated with the student's clinical studies. However, such processes are time consuming and require continuity, which the clinical studies do not necessarily provide for by the student only staying in a unit for a short time and the nurses not only being supervisors, but also assessing the students' abilities in the clinic. The latter probably influences how and what the students wish to reveal in relation to their problems and short-comings. They need supervision from the teachers in these matters (Moscaritolo, 2009), and simulation could possess such an option.

Prerequisites for learning in simulation

The students acknowledged activity as a prerequisite for achieving learning and simulation to help provide for this **(I, III, IV)**. It is known that the students retain 20% of what they hear, 40 % of what they see, and 75% when they see, hear and interact (Fletcher, 1990). However, the students also pointed out several prerequisites for being active **(IV)**.

The prebriefing phase was found to be crucial for learning because the students emphasized possessing a solid knowledge of the topic being played out as a prerequisite to be active **(IV)**. Though they claimed that preparedness should be a mutual duty among the students and each student's responsibility, they acknowledged the need for some type of evidentiary requirement and check that the individual was actually prepared **(IV)**. This relates to the discussion in terms of whether voluntariness or mandatory participation should be the basis of simulation. The challenge for educators is to protect the well-being of the student, while simultaneous safeguarding the mandate to ensure health professionals' qualifications in the interest of patient safety and quality of care. Compulsory or pressured participation could be perceived as intrusive, and the students should not feel pressured to go beyond their own boundaries (Morrissette & Gadbois, 2006; WHO, 2011). It is known that a sense of self-worth is positively correlated with well-being, which is an important part of being motivated to learn (Seifert, 2004). At the same time, it is important concerning the matter of patient safety and quality in care that students experience limitations and shortcomings in their ability to take action, which the simulation was reported to have provided for **(IV)**.

To learn from errors and how to handle incidents are particularly important aspects in enhancing patient safety, which show human errors being stated as causing the most common incidents and posing the greatest threat to patient safety (Dekker, 2011; WHO, 2011). However, a prerequisite for learning from mistakes is that the error is acknowledged and the reason for it to have occurred is examined. The students seemed to report an attitude towards errors, mistakes and lack of knowledge or skills **(IV)** to be contrary to how the recommended use of errors for learning and in practice should be treated (WHO, 2011; Ziv, Ben-David, & Ziv, 2005). They were reluctant to participate because of the fear of making mistakes, felt ashamed when they did, and they feared their fellow students to perceive their questions as stupid **(IV)**. This demonstrated the need for a change in the mind-set concerning the attitude towards error (Sherwood, 2012). To err should be treated in feedback and debriefing as a learning opportunity by investigating what happened, why it happened and what could have prevented it from happening. The students need to be encouraged to ask "stupid" questions, talk about what they do not understand and share it, not only for their own learning, but for the sake of patient safety (WHO, 2011). Dewey (1997) pointed out a simple thought to be of importance; the reflective thought is consecutive, meaning it starts with a thought emerging from what we see, hear or touch, and is further developed by reflection. Dewey claimed a reflective thought to be the "active, persistent, and careful consideration of any belief or supposed form of knowledge in the light of the grounds that support it, and further conclusions to which it tends", (Dewey, 1997, p. 6). When a simple thought is raised in a patient situation, it may be an important contribution to patient safety by changing the perspective from fixed or preconceived opinions, attitudes or overlooked facts (Sherwood, 2012). The results **(IV)** demonstrated that to learn from errors should be emphasized in education as an important competency for the clinic, with simulation providing an opportunity for this.

The results showed that simulation competency (Dieckmann, 2009; Jeffries & Rogers, 2007b) cannot only be developed isolated in relation to the simulations **(IV)**. The results demonstrated the importance of an early, systematic and structured building of a learning community in education in general that encourages active participation. The students suggested at the start of their program to be provided a habituation to actively participation by the use of small groups and then successively merge them into larger ones **(IV)**. It is of importance to bear in mind that HPS in particular is known as an intrusive learning approach by the student being exposed in front of others concerning knowledge, attitudes, skills, personality and behavior in a complex context (Jeffries & Rogers, 2007a; Parker & Myrick, 2009). This was also underpinned by the students, who reported that the learning experiences had a strong impact, and that the feeling of success or failure affected how they perceived their suitability for the profession **(IV)**.

Simulation is resource-intensive (Dieckmann, 2009; Jeffries & Rogers, 2007a; Sinclair & Ferguson, 2009), hence, an extension of the number of students participating in each group could make it run more efficiently, in addition to offering the students a more frequent exposure to simulation, which is considered to be a prerequisite for achieving simulation competency (Dieckmann et al., 2012). However, the results **(IV)** emphasized what is known about learning, namely that it is dependent on to what degree safety and security are ensured. A shame-and–blame attitude is known to be a barrier for success in simulation (Dieckmann et al., 2012) and that learning depends on a solid foundation and a strong relationship of trust and support between educator and learner, as well as between learners (Brown, 2008; Vella, 2002). The perceived lack of trust and support in attending the large groups, caused the debriefing to be more like an ordinary lecture by being dependent on the teacher's initiative and questioning **(IV)**. A similar result was also found in a case study conducted by Overstreet (2009), showing that in debriefing the teacher spoke up to 80% of the amount of time allowed.

The teachers' abilities in conducting simulations

Not unlike how the students perceived the unfamiliarity and intrusiveness in HPS, the same perceptions have been fund among teachers (Howard et al., 2011; Jeffries & Rogers, 2007a). As a teacher in simulation, you never exactly know what will happen or what kind of questions, discussions or reactions that will appear.

The results showed the students to have experienced the teacher as an expert in the topic being played out **(III, IV)**, showing credibility to be present to such an extent that the simulation was perceived as a legitimate learning method (cf. Johnson, 2009; Kenney, 2013; Mikkelsen et al., 2008). The teacher showed not only to know the optimal "what to do", but also "how to do it", which can be assumed to help to increase the teacher's authority in nursing. The results highlighted the teacher's abilities in conducting the HPS as essential **(III, IV)**, and as stated in the literature, that the teacher is crucial for creating a good learning environment (Davis-Berman & Berman, 2002; Husebø, Dieckmann, Rystedt, Søreide, & Friberg, 2013; Keitel et al., 2011). The teachers' abilities in knowledge of the topic were for the students of importance, though they perceived the teacher's interest for- and dedication to the students' learning process as being equally important **(IV)**. The students appreciated having to think for themselves, and perceived having been given support and help to reflect, analyze and transfer knowledge at all levels into a specific patient situation **(I, III, IV)**.

To facilitate for others to learn is not an easy task (Steinwachs, 1992). In simulation, the border demarcation between teaching and facilitation can be difficult; the students possess limited experience, which makes the transferring of knowledge into practice to not be obvious, thereby creating the need for the repetition of theoretical knowledge in an actual patient situation necessary.

However, by keeping the attention on the actual experienced situation in the scenario and not primarily on knowledge, the teacher's position can turn to being the leader of a group more than being the one to possess "the right answer" (cf. Dewey, 2007). This can help facilitate the students developing an open and exploratory attitude towards learning, theory and knowledge, all of which is urgent for helping to ensure educational quality, patient safety and nursing as a profession (Kunnskapsdepartementet, 2008; Rønnestad, 2008; Schlotfeldt, 2013). Additionally, simulation can provide a possibility to help strengthen the students' perception of the faculty and the educators' position in nursing and thereby contributing to bridge between the faculty and the clinic.

Simulation as bridging the "gap"

The findings supported previous studies that show simulation to be a tool for bridging the theory-practice gap (Botma, 2014; Thidemann & Söderhamn, 2013). Simulation seemed to have contributed to a connection between the two learning arenas **(I, III, IV)**. This was exemplified by the students by the fact that they told about the introduction that the supervisory nurses held at the start of their clinical studies, emphasizing urgent matters in the clinic to be aware of and to know. The students told quite proudly about having confirmed to the nurses that they were prepared for these matters through simulation **(IV)**. Such experiences are of great importance regarding bridging the "gap" between the faculty and the clinic by showing that both arenas focus on the same matters (NOU 2008:3; Rasmussen et al., 2007; Zierler, 2014).

Collaboration was underscored as an important feature in the EPSS **(I)**, also being considered to be an aspect of good educational practice (Chickering & Gamson, 1987). As members of staffs building patient safety culture, nurses must be conscious and trained in leadership, teamwork, evidenced-based practice, open communication, learning from mistakes and, errors recognized as system failures simultaneously holding individuals accountable for their actions (Sammer, Lykens, Singh, Mains, & Lackan, 2010; WHO, 2011). The students reported having perceived collaboration to have been present in simulation **(I)**. They perceived debriefing to be an opportunity to make them more aware and conscious of the focus on their own and others' competency **(IV)**, which was also found in a study conducted by Stewart et al. (2010). Attending the small groups provided experiences with group identity, being a team and having a shared responsibility in problem solving, which was reported to be absent in the large groups, in that they felt individually exposed and "alone" **(IV)**. Though training in team building and collaboration is of importance, the students also need to be trained to stand forward and be prepared to be individually accountable for their actions (Sammer et al., 2010). Nursing culture has been described as being characterized by collectiveness, tradition, closeness and a high degree of inner solidarity (Christiansen, Heggen, & Karseth, 2004). These are characteristics worth defending, also being important for the maintenance of a profession (Jensen & Lahn, 2005), but could also adversely affect the individual in a temporal world challenging the individual. This was shown to be acknowledged by the students, who requested training in individual exposure to help accommodate professional requirements, which they perceived that attending large groups in simulation provided for **(IV)**.

The scenarios being played out were experienced as relevant and realistic **(I)**, which are of great importance for credibility in the situation. The development, prioritizing of relevant topics and the validation of updated scenarios can help to facilitate cooperation between the faculty and the clinic. It provides an opportunity for the clinic to not only be a recipient of students in their clinical studies, but to have an impact on what is being emphasized in teaching and learning in nursing. Such cooperation can help to increase a mutual understanding by creating a common arena for the educators and the clinical nurses, which can contribute to an increased shared responsibility for educating nurses, as well helping to increase the degree of mutual trust, and thereby bridge the "gap" (Barnett, Becher, & Cork, 1987).

The present results **(I-IV)** and previous studies (Butler, Veltre, & Brady, 2009; Kardong-Edgren, Lungstrom, & Bendel, 2009) comparing students' satisfaction in using high- and low-fidelity simulation have not been able to demonstrate different results insofar as being able to detect significant differences in how the fidelity levels are evaluated. The available advanced technology in learning creates enthusiasms and high expectations for learning outcome (Wellard, Solvoll, & Heggen, 2009), but it is of importance to take into consideration to what extent realism is necessary. Too much focus on optimal equipment and surroundings in relation to the clinical setting may take away the opportunities that the learning situation actually provides for, and can also negatively impact on learning due to the students being overwhelmed (Dieckmann, 2009; Grunwald & Corsbie-Massay, 2006).

Reorganizations and remodeling in health services entail major challenges in ensuring that the students have covered the required experiences of different patient situations. It provides challenges in relation to offering the students with an equitable clinical practice in the future. Consequently, it might therefore be necessary to replace some of the clinical studies with simulation with regard to patient situations that rarely occur, but are essential that they are prepared for.

The use of HPS can provide relevant patient situations "on demand," whereas in the clinic one can only hope it occurs while on duty.
The use of simulation will never be able to provide all the conditions that a real patient situation entails, though it does provide opportunities that real patient situations do not offer. Dieckmann (2009, p. 58) points this out by illustrating simulation in general as an equation:

$$\text{Simulation Reality} = (\text{Clinical Reality} - X) + Y.$$

This equation shows simulation to be both less and more than the part of realism being simulated. By X representing the aspects, which is insufficient compared with the clinic, Y represents what simulation adds to the situation specifically: time, no patient harm, no forced action, the possibility to interrupt, repeat and to err, which the clinical situation not provides for. Results from a study conducted by Hayden et al. (2014) indicated that traditional clinical hours may be replaced by high-quality simulation experiences. However, because of the lack of knowledge and research concerning the patient outcomes from simulation, conclusions should not be drawn too quickly. The realism in the total setting included in the X-factor in the equation cannot be replaced by simulation, but simulation seems to provide a learning approach that can contribute as one "bridge" between the faculty and the clinic.

CONCLUSIONS AND IMPLICATIONS

- ✓ The students reported that simulation at all levels of fidelity was an appropriate learning approach independent of educational levels in nursing education.

- ✓ The students seemed to prefer the familiar and traditional approaches to learning in simulation.

- ✓ Debriefing was experienced as being of urgency for learning in simulation.

- ✓ Awareness and consciousness about how the students' feelings are handled in debriefing are of importance.

- ✓ The use of small groups in simulation was preferred, but attending large groups provided training in personal development with regard to the exercising of courage and the justification of professionalism.

- ✓ Active learning approaches must be integrated in general into the nursing education through a systematic and structured building of a learning community.

- ✓ There is a need to enhance the focus on patient safety in nursing education.

- ✓ There is a need for further validating and testing of the evaluation questionnaires in different programs and contexts.

FURTHER RESEARCH

- To investigate how simulation competency can be achieved when there is a large student–teacher ratio.
- To investigate how the learning achieved in simulation can be integrated into clinical studies to help enhance learning.
- To investigate how the learning approaches used in simulation can be integrated into the curriculum.
- To investigate if and how simulation can bridge "gap" between the faculty and the clinic.
- To validate and psychometrically test questionnaires used for assessing the simulation in different programs and contexts.
- To investigate how learning achieved in simulation effects patient outcomes.

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Simulation used as a learning approach in nursing education

In nursing education internationally, there is an increased use of simulation to assist the students to transfer theoretical knowledge into patient situations for enhancing patient safety. Educational practice must be knowledge-based. The students' experiences and perceptions are of importance for exploiting the learning potential in simulation, which also generates a need for frameworks and reliable and valid evaluation tools. The aim of this thesis was to investigate bachelor nursing students' experiences with simulation conducted under various conditions, as well as to translate and validate evaluation questionnaires used in simulation in a Norwegian context. The students reported all types of simulation to be well-suited learning approaches and the debriefing as crucial for learning. However, the learning approaches used were experienced as unfamiliar, intrusive and stressful. To facilitate for and enhance learning in simulation, a frequent use of simulation and an integration of active learning in the program in general were found to be of importance. A further validation and testing of the evaluation questionnaires in different programs and contexts is also needed.

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