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How Nursing Students Describe Their Learning in a Simulated Care Situation with Advanced Care Manikin

Mats Olsson[1], Johan Soderquist[1] & Micha Milovanovic[1,2]

[1] Department of Health, Medicine and Care (HMV) Faculty of Health Sciences, Linkoping University, 581 85 Linköping, Sweden

[2] Department of Internal Medicine, Vrinnevi Hospital, Norrköping, Sweden

Correspondence: Micha Milovanovic, Department of Health, Medicine and Care (HMV) Faculty of Health Sciences, Linkoping University, 581 85 Linköping, Sweden; Department of Internal Medicine, Vrinnevi Hospital, Norrköping, Sweden.

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Abstract

Background: Learning in simulated nursing situations with advanced manikin is considered to prepare nursing students for clinical care situations. Collaboration with classmates facilitates the learning process which is described in the literature. The study aimed to investigate whether there are factors that nursing students describe as important for learning in a simulated care situation. ***Method:*** A mixed method was used in this study. Data were collected from (n=53) nursing students. At first, a quantitative data collection consisting of questionnaires was conducted one week before the simulation exercise. Thereafter, group interviews were conducted (n=7), which became a basis for the qualitative data collection. ***Results:*** The students described that they were well prepared for the skills training. Getting support in their learning from classmates and teachers was described as significant. ***Conclusion:*** Reflection of classmates' processing of the situation work improves the student's individual learning during the skills education with subsequent reflection with a teacher. In order for the learning to be optimal, collaboration with other fellow students in the base group is necessary.

Keywords: problem-based learning, collaboration, knowledge, reflection, observation

1. Introduction

Simulation of care situations intends to imitate real situations. This approach is an effective teaching method for learning (Robyn & Cooper, 2009, Hjelmfors et al., 2016). Through training in a simulated care situation with the help of advanced manikin students are prepared for care situations that may arise in care situations during clinical placement (Nursing Program, Faculty of Medicine, Liu 2022). An example could be computer simulations on a screen or by using an advanced care manikin with visible respiration, palpable pulse, and vocal sounds which are controlled by computer programs. This type of advanced technology is used to produce a high level of realism and interaction (Issenberg & Scalese, 2008). Using simulated patient situations with an advanced care manikin has beneficial effects on learning and is an effective learning process for a patient-safety approach to clinical skills (Hansson, 2004, Reim et al., 2011), and contributes to theoretical knowledge and ensuring practical skills (Shin et al., 2015). Training in a simulated care situation prepares students for their future profession (Handeland et al., 2021. The risk of medical errors and patient suffering is reduced (Aggarwal & Darzi, 2011, Cant & Cooper, 2010, Lapkin et al., 2010). However, virtual aids and simulation cannot replace VFU, (clinic-based teaching) but should be a complement to other teaching elements (Johannesson et al., 2010).

2. Problem Based Learning (PBL) and Medical Simulation

The characteristic of PBL is the student's exploratory approach to the studies as well as their own responsibility

for learning. The teaching is based on reality-based situations that are analyzed and discussed in groups. The students reflect on their learning and thereby understand what is important (Barrow & Tamblyn 1980, Silén, 2004). PBL is also based on preparing students for a future occupation (Jakobsson 2005, Wilhelmsson et al., 2012). Simulations provide opportunities for students to come up with solutions to problems that are at a more qualified level of knowledge than students can achieve individually.

2.1 Reflection in Learning

Debriefing with subsequent reflection is often used in simulator-based medical education and is a form of reporting by the individual who, after the implementation, evaluated the skills training. For an effective reflection, communication with other students is central. Students become more aware of their learning by communicating with other students (Gardner, 2013). Bates et al., (2014) argue that studying in a PBL context is a learning process, which has benefits by making it easier for students to become competent and reflective. The student must be aware of his role in the learning process.

In a practical tutorial, the student learns to systematically reflect on the given theoretical assumptions and develops a new approach that affects the learning process. The student reflects on new factors, and thoughts that arise in a reflection, which strengthens the learning process, which re-evaluates and perhaps strengthens existing knowledge (Ekebergh, 2009, Silén, 2013).

The role of the Supervisor/ Tutor in the PBL concept is to support the student's learning process instead of providing knowledge (Hmelo-Silver, 2004). To support the learning process, the relationship between supervisor/teacher and student is significant, which generates student-centered learning (Silén & Uhlin, 2008). It is a challenge for the supervisor/tutor to get the student to think critically about the problem-solving process (Barrow, 1992; Silén, 2004).

2.2 Procedure for Simulation

In the nursing program (fourth semester), students are prepared for clinical care situations with an advanced care manikin. The simulated situation illustrated a patient with acute abdominal injury with increasing internal bleeding. It is possible to program the manikin so that it simulates a deterioration of the intended patient. By doing that, the patient will become worse and worse, and the students must, by starting from the nursing process together, try to solve the situation. Based on the patient's problems, adequate nursing measures are implemented. Students practice communication, teamwork, and collaboration. The scenario is designed with influences from a real care situation. The pedagogical basis is to start from PBL. The simulation exercise normally lasts for a total of 90 minutes (including debriefing/reflection). The students are placed in base- groups of 6-8 students. In the simulation scenario, a "whole body simulator"; ALS Simulator no. 205-05050 was used, which is controlled by a computer program (Laerdal Medical®). The most common features used in the manikin are respiratory rate and blood pressure. Adequate infusions and medicines could also be administered. The external environment is decorated to mimic a nursing room. All the students are dressed in hospital clothes.

During the simulation exercise, the students are divided into two groups. One group of students observe when the other group act. After 30 minutes, the acting group must submit a report on the care situation and the measures taken to the other group, who are observers. The observed group is located behind a glass screen and is not visible to the acting group. The supervisor/tutor participates as an instructor during the simulation exercise and is also present in subsequent debriefing and reflection.

3. Problem Description and Aim of the Study

Nursing programs that use PBL as a teaching model in both theory and practical education. Very few studies have investigated how PBL can be of value as a pedagogical tool in terms of the practical part of education. Moreover, the student's own learning experience has not been fully examined in practical situations such as stimulations of care situations. For that reason, it is important to investigate what students describe as key factors for learning within a simulated care situation with an advanced care manikin.

4. Material and Methods

4.1 Inclusion Criteria

The study was conducted in 2014 when 53 registered students were in the fourth semester of the nursing program. The students were asked about participation in the study during a regular basic group meeting (eight to nine students). They were informed about the purpose of the study both orally and in writing by the basic-group supervisor. All students (n = 53) surveyed agreed to participate in the study. Students were also informed that they could cancel their participation at any time (informed consent) (Polit & Beck, 2014).

To answer the aim of the study, a mixed method (mixed-methods) was used in the current study (Leech & Onwuegbuzie, 2009). The method in our study involved a mixture of quantitative and qualitative approaches where both quantitative and qualitative data were collected. In phase 1 quantitative data were collected one week

before the skills training through a questionnaire. The reason for using the questionnaire was to get a factor of what the students describe as important for the learning process. After the skills training i.e., phase 2 base-group interviews were conducted, where qualitative data were collected. No respondent's identity can be revealed.

4.2 Quantitative Data Collection

The students answered a questionnaire one week before the simulation exercise. The questions were about expectations of their learning and how they had prepared for the exercise. The content of the questionnaire was based on an already constructed questionnaire (Johannesson et al., 2010), which was adjusted somewhat based on the aim of the present study. Some of the questions were designed as a rating scale (1-6 where 1= "does not agree at all" and 6= "agrees completely"). All students who were asked to participate in the study agreed to participate (n = 53). The questionnaire was designed in two parts. The first part, questions no. 1-5 included the student's background. The students answer background data such as gender, and age, about the previously used simulation programs. The second part, question no. 6 was designed as a Likert scale with the question; "*My expectations before the skills training with an advanced care manikin simulator.*" There was also the possibility of free answers. Question no. 7 was "*My previous knowledge is sufficient for the skill training*". Question no. 8; "*I've heard of whole manikin simulation before.*" Question no. 9; "*I have used simulation in other contexts e.g., computer games.*" Question no. 10, "*I think I will get good support in how I learn from the teacher/instructor*", Question no. 11; "*I think I will get good support for how I learn from classmates*" The last Question no. 12 "I think I will get good support in how I learn *from the simulation scenario*".

The data processing program SPSS was used for the processing of quantitative data (SPSS version 22, IBM, United States). Descriptive statistics were used.

4.3 Qualitative Data Collection

After the simulation exercises, the students were gathered in each base group (eight to nine students) for a subsequent debriefing and reflection. Group interviews with each base group were then conducted for a total of seven interviews (*n*=7), these interviews lasted about 15–20 minutes. The base-group interviews were performed in the practice room with chairs and tables, near the simulation room. The interviewer noted student descriptions during the group interviews. A digital recorder (Olympus© Digital voice recorder VN 850PC, Olympus Europa SE & CO. KG consumer product division. Hamburg, Germany), was used to record all interviews. During the interviews, notes were also taken with paper and pen. The following issues were discussed during the base group interview. Was the prior knowledge sufficient? How do you learn from a simulated situation? Communication, leadership? Is the basic group a good aid for learning? / Why? Did you learn anything from observing when others act? How did you learn to observe? What was especially rewarding about using the whole manikin simulator? What was less good about using the whole manikin simulator?

Each base group interview ended with the interviewer summarizing the content of the interview. Finally, the students were asked if the content of the summary gave a correct picture. During the base-group interview, the students were given the opportunity to discuss and reflect on issues related to how they perceived their learning in connection with the simulation exercise. The students also described key factors that were seen as important for learning.

5. Analysis and Interpretation

The analysis procedure has been based on conventional content analysis from on Elo & Kyngäs (2007). The actual method consists of three phases, an example of the procedure is shown in table 1. Audio-collected data were transcribed and compared with notes from the group interviews. Four main categories that students described as important for learning emerged. These were "Role and communication", "Support of the base group", "Learn from others through observation" and "Prerequisites are an important part before the simulation exercise." These factors are presented, and some quotes have been chosen to illustrate student descriptions. Table 1 shows examples of conventional content analysis (free from Elo & Kyngäs, 2007).

Table 1.

Transcription of data	**Open coding**	**subcategory**	**Generic category**	**Downloads**
"Does not matter if you know each other" think it matters "know a little how others think a little easier" (student group F *"The base group feels like a security" (Student group D)* *"Greater security also because the practice is completely new, feeling insecure. Nice to have the support group, know that everyone is going through it "(student group C)* *"Good to know each other a little" (student group E* *"It had not been a disaster with others that you do not know but still more beautiful to be in the base group" (student group A)*	Will be able to work with everyone Nice to have the group as a support. Feeling insecure Knowledge of each other Know each other a little	*Have some sense to know each other* *Supporting comrades* *Know each other*	*Feel support in the group, which gives more security*	**Support of the base group**

5.1 Ethical Consideration

The underlying study originates from a degree project within the Master's program in medical education at a university in Sweden Linkoping University and thus received ethical approval from Linköping University (Faculty of Medicine at Linköping University, 2018) (reg. number: 2018/269-32). In all research, research ethics must be followed based on the research's ethical aspects (Swedish Research Council 2014). A review of the Ethical Principles for Medical Research Involving Human Subjects (WMA) has also been carried out (WMA). The author of the study was a teacher in the course. However, no close relationship. No respondent's identity can be revealed in this study. Students were informed verbally and in writing by base-group supervisors about the purpose of the study. All students surveyed agreed to participate in the study. Students were informed that they could cancel their participation at any time.

6. Results

6.1 Quantitative Results

The age distribution was between 20 and 41 years. The majority of students (64.2%) were between 20-25 years. Female students were overrepresented with 41 individuals (77.4%) against 12 (22.6%) male students. All

participating students in the study had completed upper secondary education (question no. 3). In terms of previous healthcare, 83% of the students stated that they had previously acquired medical experience (questions nos. 4 and 5). On the question of students had used simulation in other contexts, 26.4% answered that they used simulation programs in other contexts, mainly computer games (question no. 9).

Questions nos. 6, 7, 8, 10, 11, and 12 were designed as Likert scales of estimates. The rating scale was (1-6 where 1= "does not agree at all" and 6= "agrees completely"). Mean was used the students answered the questions that follows; question no. 6; *"My prerequisites are sufficient for the skills training",* with a mean of 3.81. Question no. 7; *"I have used full-body simulation earlier in education"* with a mean of 2.92. Question no. 8; *"I have heard of simulations"* mean 4.70. Question no. 10; *"I think I will get good support in how I learn from teacher/instructor"* mean 4.87. Question no. 11; "I think I will get good support for how I learn from the simulation scenario" the students answered a mean of 4.66 The final question no. Q12; *"I think I will get good support in how I learn from classmates"* and here the students answered mean 4. Table 2 is showing the answers that the students gave based on the questionnaires (questions question no. 6-8 and questions no. 10-12).

Table 2 Shows the answers that the students gave based on the questionnaire's questions about their preparation for the exercise with an advanced manikin in simulated care situation what the students answered questions about the preparations for the simulation.

Table 2.

Question	Lower limit	High limit	Mean	Std Deviation
(Q 6) My expectations before the skills training with an advanced care manikin simulator	2	6	3.81	0,878
(Q 7) My previous knowledge is sufficient for the skill training	1	6	2.92	1.878
(Q 8) I have heard of simulations previously	1	6	4.70	1.588
(Q 10) I think I will get good support how I learn from the teacher / instructor	1	6	4.87	0.941
(Q 11) I think I will get good support on how to learn from the simulation scenario	1	6	4.66	0.137
(Q 12) I think I will get good support in how I learn from classmates	1	6	4.89	0.941 (*n*=53)

6.2 Qualitative Data

After completing the content analysis of the base-group interviews, the following areas crystallized, which the student described as important for learning; "Important to be theoretically prepared". "Roles and communication", "Support from the base group", "Learn from others through observation" and finally; Significant to the learning process was also a "subsequent debriefing/reflection" that was carried out in close proximity to the skills training. On several occasions during base-group interviews, students returned to describe the "supervisor/teacher" actions in learning situations are also important to learning.

6.3 Important to Be Theoretically Prepared

The students described that they had theoretical knowledge and practical skills that needed to be practiced more. In general, the students gave a good picture of their knowledge. They felt that the preparations were sufficient for the simulation exercise. However, the students described that it was difficult to translate learned theory into practical action. The students experienced that the information and instructions for the simulation exercise were described as completely adequate. The fact that the implementation of clinical placement in combination with the skills training with advanced care manikin was also described by students as important for what and how they learn.

"Harder to practice practically than to sit and read." (informant group E)

The students described that the skills training was adequate by letting them act together in base-groups. Then it is easier to translate theory into practical knowledge. This notion was described by the students as an advantage for learning. However, some students expressed the following.

"It does not feel so good to train many practical moments on a manikin. It does not feel real" (informant group F)

Students also portrayed the lack of realism with the advanced manikin, it was difficult to see the real situation. The work around a "real patient" gives more real answers than in action than with an advanced manikin, more realistic. Which may include imitations, facial expressions such as pallor, pain analyzes, etc. The students described that they are more careful in the care of a real patient because it becomes easier to understand what problems the patient has.

However, the students described that the more they get the opportunity to work with advanced manikins, the more real it becomes. Being used to playing different care situations that are described by students as very important for what and how they learn.

"The training with an advanced manikin before during clinical placement provides better conditions to work with a real person. A good preparation" (informant group E)

The fact that the implementation of training during clinical placement in combination with the skills training with advanced care dolls was also described by students as important for what

6.4 Roles and Communication

Communication and leadership were described by the students to have a decisive influence in satisfactorily solving nursing tasks. During the simulation, the students described that there were shortcomings in structure, prioritization, and how the work would be optimal. The students described that it was difficult to structure the care during the short time that the simulation lasted. The students explained that it was good when a student in the group took leadership responsibility and decided on the next step. However, the students described that it was difficult to take a leading role in the group of actors around the patient. A leading role must be organized to ensure that care measures are prioritized and that they are implemented adequately. In real situations, the students were told that there are described roles and in real situations, no preparation time is given.

"We had no knowledge of how to organize the work. Because we had the same professional role" (informant group D)

During the simulation, the students described that communication and teamwork between students who acted were necessary. Students describe a picture of a lack of communication, which is described in the quote below.

"Learn how others in the group think, perhaps" (informant group A)

The students described how they used each other as resources by communicating about how the measures would be implemented and receiving feedback on implemented measures. Students related to the importance of learning how other students communicated. Group dynamics and collaboration played an important role in learning.

The students related to the fact that they did not experience similar situations during the completed clinical placement. However, some students described that they had some experience with emergency situations. The discussion between students in the base-group during the skills training was presented by the students as important for learning. Individual learning became more effective. Adequate communication and good leadership were described by students as crucial. However, the students gave the impression that it would be more optimal with fewer students acting at the same time in the skills training. The number of students acting at the same time can be limited to two or three.

6.5 Support of the Base Group

Another area that the students described as important for their learning were support from classmates in the base group. Earlier in the semester, the students had worked together. It provided a sense of security.

"Greater security also because the practice is completely new, feeling insecure. Nice to have the support group, know that everyone is going through it" (informant group C)

Since the students had previously worked together in the base group during the semester's different scenarios, the students explained that they were comfortable reasoning with each other. The students also gave an idea that learning was enhanced by discussion in the base-group. In general, the students stated that there was support in learning when the group members knew each other before. However, students also described that they could imagine working in other group configurations.

As the students had previously worked together in the base group during the semester's different scenarios, students gave the idea that they were more used to reasoning with each other. However, some students described that it was beneficial not to know each other so well.

"I think almost the opposite, I get more focused if you do not know people, tag more and become accurate. You must be able to work with anyone" (informant group F)

As the quotes show and based on the interpretation of how the discussion progressed, the students described that

collaboration in the base group was important for learning. The students gave the idea that their learning was reinforced by the discussion in the base group. In general, the students stated that it was supported in learning when the group members already knew each other. However, students described that they could imagine having worked in other group constellations.

6.6 Learn from Others by Observation

Observing how base group peers acted during the simulation was described by the students to promote learning. Observing each other in the simulation meant that the individual student himself reflected based on the scenario. This matter was seen as developing and effective for learning and in-depth knowledge. However, the students illustrated that it felt a bit stressful at the beginning of the simulation exercise because they were observed. But the students described that the feeling of being observed disappeared after a short while.

"By sight to see how the others miss, easier than when they are in the situation" (informant group A)

To observe how others act individually and in a group of students was crucial for their learning. The students described that the implementation of adequate feedback is important for developing learning, which can lead to new knowledge, and thereby be applied in other similar nursing situations. In addition, the student described that the supervisor/teacher had an important role in the learning process. For learning to be optimal after observing the actions of other classmates, the students described that adequate reflection and feedback are required. Based on the experiences students described, which were processed in the debriefing/feedback, students presented that inspired the learning process and that new knowledge in the field began to emerge. Furthermore, students described that the supervisor/teacher had an important role in the learning process. Observing how other classmates act both individually and in groups was reproduced by the students, which was of significant importance for their learning. The students described that implementing adequate feedback is important for new learning to be generated, which leads to new knowledge. This matter can then applied to be applied in other similar situations.

7. Discussion

Knowing "support from the base group" and "observing" how classmates acted on the skills training in a simulated care situation with advanced nursing manikin was described and exemplified by the students as important for learning. Reflection and debriefing in connection with the simulation exercise were also described by the students as an important factors for learning.

The students described that they prepared well and considered that they had sufficient conditions for skills training in a simulated care environment with an advanced nursing manikin. In the answers from the questionnaire in the quantitative part of the study, 68% of the students described their prior knowledge between four and more. The majority of the students described their conditions as a four. Earlier in term four, the students had processed scenarios, which were of the nature of surgical diseases, that were similar to the scenario for the simulation exercise. The scenarios are based on problem-based learning. The students have earlier education experience in clinical placement and connection of theoretical knowledge in practical action (Faculty of Medicine LIU, 2022). The students had stated in the questionnaire that "My Prerequisites are an important part before the simulation exercise with a mean of 3.81." In the base-group interviews after the simulation exercise, however, the students agreed that the prior knowledge was sufficient and described that previously processed knowledge was at an acceptable level. However, students explained that they should have read the instructions and studied the scenario a little more carefully. The scenario and associated instructions were available one week before the simulation exercise.

The knowledge that the students acquired from previous semesters should be a sufficient basis for the simulation exercise. Studies show the importance of having a good knowledge education and that it is important for the effectiveness of learning (Jakobsson, 2005; Wilhelmsson et al., 2012). An engaging base group environment, including variation, is also important (Silén et al., 1989). Students described in the questionnaire that they previously had experience of the advanced manikin. Earlier in the semester, competence training in drug calculation was carried out in a simulated care situation. Students calculated drug dosages, which were given to advanced care manikin, to evaluate the effect (Faculty of Medicine LIU, 2022). Shreiber & Valle (2013) describe the importance of using different resources for the student group in a structured way as necessary for more efficient learning. Therefore, scenarios used in training/simulation exercises can change and vary more to make learning more effective. Marton & Booth (2008) also states that students learn through variations and changes.

Based on what the students describe, it is probably the case that theoretical knowledge is necessary for the learning in connection with the simulation exercise with an advanced manikin to be optimal. It is therefore to conclude that theoretical knowledge before the simulation exercise is necessary before the simulation exercise to adapt this form of the teaching model.

Regarding roles and communication with each other in the base group, the students explained that it was not

realistic with 3-4 nurses acting around a simulated patient in the form of an advanced manikin. In health care, the students described that the nurse is often alone in her professional profession. For that reason, it was difficult to act in a simulation exercise with several students playing the same professional role. Nevertheless, students expressed that it generally functioned relatively well during the simulation exercise. Adequate communication and relevant leadership of students who played the role of leader. Tweiten (2000) claims that students by acting in different professional roles in their education provide good conditions for the transition from student to professional. Playing a role is important for effective learning and communication through roles should be a useful experience. Chan (2012) believes that role play in a PBL context motivated students to creative solutions to a problem. The students were active and were forced to experience characters in the role play, and how it affected the choice of care measures in the simulated situation.

Another study shows that simulation exercises provide an opportunity to carry out training in a more realistic way. Easier to combine theory with practical action. Simulation exercises also train critical thinking based on problem treatment, which facilitates the transition to the nursing profession (Thomas et al., 2011). There are benefits to role-playing such as actively listening, which increased students' motivation. Collaboration between students in the group increased (Vizehfar et al., 2019). The current study is in line with previous studies in that prospective nurses must be given the opportunity to practice communication, as suggestions through role play. Though one must bear in mind that role play may not be optimal for all students.

A study by Medaille & Usinger (2020) shows that collaborative learning increases stress for some normally quiet students. It emerged that "silent" students could experience communicative tensions between speech and silence during collaborative exercises. This means that the teacher has an important role in skills training in these situations.

Students described in the group interviews that it would be better and more realistic if fewer students had acted simultaneously during the simulation. Wong (2018) shows in a study that dividing students into small groups is an effective method for developing knowledge. Another study (Edmunds & Brown, 2010) suggests that even if the group size decreases, the supervisor has an important function in terms of communication and cognitive skills. Which is the basis for effective learning. For effective learning, it is important to follow the group process through observation. Communication in small groups may facilitate the acquisition of knowledge. In the questionnaire, question nos. 10, 12 the students answered that they expected to receive support from each other in learning, which they returned to during the base group interviews.

To support the learning process, the relationship between supervisor/teacher and student is significant, which generates student-centric learning (Silén & Uhlin 2008; Hmelo-Silver, 2004). The supervisor/Teacher in the PBL concept is to support the student's learning process instead of providing knowledge. The students also stated that they wanted to carry out simulation exercises several times to become more confident in their actions.

In connection with the group interviews, the students described that it was important to gather for debriefing/reflection after the simulation, which gave them inspiration for the learning process and the acquisition of knowledge. Strandberg (2006) believes that the individual's learning and knowledge development takes place in collaboration with others.

However, for learning to be optimal, effective reflection is required, and that the supervisor/teacher uses some form of debriefing reflection model, which has a well-described structure (Gardner, 2013; Dufrene & Young, 2014). Repeating and reflecting on a scenario provides better security and more effective learning. Well covered by pedagogical literature (Kolb, 1981; Illeris, 2007).

To facilitate student learning, the supervisor/teacher structure the debriefing/reflection with a meaningful and committed discussion (Ekebergh 2009; Wickers 2010; Thorsen & DeVore, 2013). As a guide and structure, "Kolb's" reflection cycle may be used (Kolb, 1981). Silén & Uhlin (2008) believes that PBL as a method of Debriefing/reflection after the simulation was described by students as an important factor for future professional practice.

As an aid to individual learning, the interaction between students is emphasized by "social constructivism" (Vygotsky, 1978; Partanen, 2007; Säljö, 2010). Gathering one's experiences in a context improves learning objectives (Säljö, 2010). Debriefing with reflective conversations is central to nursing student learning (Neill & Wotton, 2011; Fey et al., 2014). The idea is that students should critically reflect on their individual learning and then increase awareness of new knowledge (Ekebergh, 2009; Thorsen & DeVore, 2013).

Ehrenberg et al., (2007) show in a study that the work process in PBL encourages the student to reflect on their learning. In conclusion, by using PBL in simulation exercises with an advanced manikin, the student is thereby challenged to reflect on their learning based on the exercise situation. PBL is an expensive method for the learning process of students. However, it is important to use the teacher as a resource to support the student to take advantage of the opportunity to acquire good skills and motivation to reflect on their actions (Bate et al.,

2014).

When it comes to choosing a method, to achieve the purpose of the studies, the idea was to use quantitative and qualitative data (mixed methods) in the study (Leech & Onwuegbuzie, 2009; Östlund et al., 2011; Patton, 2015).

The students who carry out studies at the Faculty of Medicine based on problem-based learning in the learning process to achieve the course objectives (Linkoping University, 2022), which means that the students start from a problem-processing process, to solve tasks (Barrow & Tamblyn, 1980; Silén, 2004). The students, therefore, had to prepare for the simulation exercise, using the content and the scenario a few days before the exercise, so it was interesting to ask some questions about how students described their expectations about factors that matter. The subsequent basic-group interview provided a picture of what the students described as important for learning.

To reach many students (n = 53), basic group interviews were chosen. One point was also that the students during the entire simulation exercise, even the theory section of the course worked together, therefore knew each other well. The questionnaire could have a better link to the base group interviews. It may have been an idea to conduct individual interviews before and after the simulation exercise.

8. Conclusion

The study shows that reflection/debriefing after the simulation exercise is an important part of the learning process for the student, where both tutor and classmates have an adequate role. In order for learning to be optimal, collaboration with other fellow students in the base group is required. It is also necessary to prepare well for the nursing situations that may arise. Knowledge of nursing science, behavioral science, and medical science is required to carry out adequate nursing. By working based on PBL, there are prerequisites for developing and consolidating learning in order to reach a relevant level of knowledge.

The study shows that an important part of the learning process for the student is reflection/debriefing after nursing situations. There, the tutor and classmates have an adequate role. In order for learning to be optimal, collaboration with other fellow students in the base group is required. It is also necessary to prepare well for the nursing situations that may arise. Knowledge of nursing science, behavioral science, and medical science is required to carry out adequate nursing. By working on the basis of PBL, there are prerequisites for developing and consolidating learning in order to reach a relevant level of knowledge.

9. Proposal for Continued Studies

In simulation exercises at LIU, students are using it as a pedagogical model. In the review of previous studies on simulation exercises, there is often no description of the pedagogical model used in simulation exercises. Following the students' learning process in a student group with problem-based learning as a pedagogical model in a couple of terms can be an idea for future studies. The goal can then be to study how competence training in a simulated care environment with an advanced care manikin affects the student's learning over time.

Statements and Declarations

Funding

No funding was received for conducting this study.

Conflict of Interest

We declare that no economic relationship exists that can be construed as a conflict of interest.

Ethics Approval

The study has been approved by the local ethics committee at Linköping University, Sweden (Faculty of Medicine at Linköping University, 2018). (reg. number: 2018/269-32).

Consent to Participate

Informed consent was obtained from all participants.

Written Consent for Publication

Informed consent for publication was obtained from all participants. All information from patients was anonymized.

Availability of Data and Material

The datasets used and/or analyzed during the current study are available from the corresponding author upon reasonable request.

Code Availability

Not applicable

Author Contribution

Mats Olsson collected and analyzed all quantitative and qualitative data. Also contributed to the writing of the manuscript.

Johan Soderquist contributed to the writing of the manuscript.

Micha Milovanovic contributed to the discussion regarding the study's quantitative and qualitative data. Also contributed to the writing of the manuscript.

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