Comparison of meaningful learning characteristics in simulated nursing practice after traditional versus computer-based simulation method: A qualitative videography study

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SUMMARY

Background: Nursing educators must ensure that nursing students acquire the necessary competencies; finding the most purposeful teaching methods and encouraging learning through meaningful learning opportunities is necessary to meet this goal. We investigated student learning in a simulated nursing practice using videography.

Objectives: The purpose of this paper is to examine how two different teaching methods presented students’ meaningful learning in a simulated nursing experience.

Design: The 6-hour study was divided into three parts: part I, general information; part II, training; and part III, simulated nursing practice. Part II was delivered by two different methods: a computer-based simulation and a lecture.

Settings: The study was carried out in the simulated nursing practice in two universities of applied sciences, in Northern Finland.

Participants: The participants in parts II and I were 40 first-year nursing students; 12 student volunteers continued to part III.

Methods: Qualitative analysis method was used. The data were collected using video recordings and analyzed by videography.

Results: The students who used a computer-based simulation program were more likely to report meaningful learning themes than those who were first exposed to lecture method.

Conclusion: Educators should be encouraged to use computer-based simulation teaching in conjunction with other teaching methods to ensure that nursing students are able to receive the greatest educational benefits.

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Introduction

In recent years, healthcare educators have been searching for and developing new teaching methods, including simulation, to find cost-effective ways to achieve better student outcomes. There is lack of places to organize practical training in hospitals, and there are not enough staff members to supervise students. New teaching methods offer practical training in alternative ways. Students may carry out their practical training as a part of the simulated nursing practice. Simulation has been suggested as one alternative and an appropriate teaching strategy (Swanson et al., 2011).

Simulations can be classified as computer-based, screen-based, or human-based. In computer-based simulations, the entire learning process can take place alone or online with other learners. A computer can direct screen-based simulation, with the simulation learning process projected onto a large screen. Finally, human-based simulation includes the use of a mannequin simulator that is directed by a computer (Banks, 2011; Eldabi et al., 1999; Lampotang, 2008).

As McAllister et al. (2013) stated, there is an absence of basic pedagogical studies in the field of simulation. To fill this gap, this pilot study was conducted to provide insight into and an understanding of how meaningful learning characteristics appear during a simulated nursing practice after an introduction by two different teaching methods. Simulation learning should receive further evaluations using a variety of research methods. This study will give a new pedagogical basis for investigating not only nursing education outcomes, which are extremely important, but also explore how meaningful learning is evidenced and perceived by nursing students using the videography method.

Theoretical Background

Keskitalo et al. (2010) developed a simulation-based learning model of facilitating, training, and learning (the FTL model, Fig. 1). The model
was built on the process of teaching, studying, and learning (TSL) (Kansanen et al., 2000), the characteristics of meaningful learning (Ausubel, 1968; Hakkarainen, 2007; Ruokamo and Pohjolainen, 2000), and the process of learning through simulation (Joyce et al., 2002). Based on theoretical examination and empirical research, the following 14 characteristics of meaningful learning were selected for the focus in this model: experiential, experimental, emotional, socio-constructive, collaborative, active, responsible, reflective, critical, competence-based, contextual, goal-oriented, self-directive, and individual (Fig. 1). Dreifuerst (2012) has studied that using meaningful learning (DML) in debriefing, clarify students' support students' learning and development teaching practice.

In an earlier paper, we presented a computer-based simulation program analysis based on the FTL model. We developed an extension of the FTL, namely, the introduction, the simulation, scenario, and debriefing (ISSD) model (Poikela et al., 2013; Fig. 2). The ISSD model follows the same phases as the FTL model. In our previous paper (Poikela et al., 2014), we validated this model by examining first-year nursing students' statements to identify which meaningful learning characteristics appeared in the model and to what degree: not at all, weakly, or strongly. In our earlier studies (Poikela et al., 2013, 2014), students' descriptions pointed to experimental and contextual as the most important characteristics of learning for their level of nursing education. Individual and competence-based characteristics are missing from the model because first-year students do not have enough basic knowledge of nursing practices.

Many comparative studies of different teaching methods have been conducted. These studies have compared traditional teaching and simulation-based teaching, methods used in classroom teaching, blended learning methods, and comparisons between low-, moderate-, and high simulation. Moreover, there are many studies of web-based versus traditional teaching methods (Arnold et al., 2013; Campbell et al., 2008; Reime et al., 2008; Swanson et al., 2011; Tosterud et al., 2013). Previous research was primarily been carried out using quantitative methods; significant differences between teaching methods have not been found. However, it has been reported that nursing students are more confident and satisfied after simulation-based teaching. In addition, studies have compared computer-based, web-based, and online learning to face-to-face, traditional, and classroom approaches (Campbell et al., 2008; Golchai et al., 2012; Siegel, 2005). Most of the results show that combining e-learning technology with traditional teaching and blended learning enhances, for example, students' motivation and efficiency.

Knowledge constructed through experience and experimental learning is still the base of nursing education (Kolb, 1964). Experimental learning can be defined as the foundation for further developing teaching and learning strategies. Very simply, Kolb's learning cycle involves...
feeling from the concrete experiences of the nursing practice, watching with reflective observation what is happening, thinking to build new knowledge and skills, and doing through rehearsal and practice. Poikela (2012) developed Kolb’s experiential learning cycle further and adapted the ideas of Nonaka and Konno (1998) about the zones and spaces of learning. Learning spaces represent concrete spatial environments and zones of learning are expressing situations where the learning takes place. Simulation-based learning always connects to the spaces and the zones of learning, reflection for action (before action), reflection in action (during action), and reflection on action (after action) comprise the roles of reflection and action in learning (Poikela, 2012).

In this research, we addressed the following question: To what extent do meaningful learning characteristics appear in a simulation nursing practice presented after lecture or computer-based simulation? To answer this question, we chose communication for the topic of the simulated nursing experience. The renewed emphasis on patient safety in nursing practice has highlighted the challenges in routine daily healthcare communication processes and has raised awareness of the importance of reaching colleagues quickly. Finnish legislation requires the medical sector to use the State Security Networks Ltd., Homepages (2014), which is known in Finland as the VIRVE network (VIRVE is an abbreviation of the Finnish words ViranomaisVerkko). This network uses a special phone called a terrestrial trunked radio (TETRA) (Terrestrial Trunked Radio, 2014) for healthcare communication. The use of the TETRA phone enables experts to reach one another quickly in emergencies, even if the network is interrupted and normal phones fail (Poikela et al., 2013). Therefore, the use of TETRA was the subject of the instruction and simulation experience.

Fig. 3. The research design.

Fig. 4. The description of the simulated nursing practice.
The current study adopts the methods of videography inquiry. This method is one form of qualitative research, and its main use is in fieldwork; it is valuable in nursing research because it involves the researchers as part of the environment and content (Lambert et al., 2011; Morse and Field, 2002; Robinson, 2013; Roper and Shapira, 2000). The videography method is useful for developing an understanding of something new, different, or unknown (Cruz and Higginbottom, 2013). In this study, a video record was used to explore the effects of two different teaching methods in a simulated nursing practice. Data were analyzed using videography because this type of analysis allows for a deeper understanding of learning, human interaction, and human behavior. Video, as an epistemological tool, can sometimes be a better tool than words (Goldman, 2009; Barron, 2009).

### Methods

The experiment day lasted 6 h, which included a 1-hour lunch break (Fig. 3).

Group 1 was taught to use the TETRA phone through lecture. The decision as to which university group was to receive the lecture and which computer-based simulation learning was based on practical consideration; the computer-based simulation program was already downloaded by the staff of the other city hospital. The teacher was recruited because she was a paramedic nurse and had used a TETRA phone for years; she taught what she had learned through her experience. The researchers named this type of teaching, where the teacher gives knowledge top down, “lecture”. Group 2 was trained to use the phone via a computer-based simulation program. The computer-based simulation training was self-directed (Fig. 3).

Six volunteer students from each of the two groups continued on to part III, the simulated nursing practice. The scenario of the simulated nursing practice was based on students’ knowledge and skills; it followed the FTL model (Fig. 1). The main goal of the simulated nursing practice was to learn and use the TETRA phones for communicating and sharing information.

**Fig. 4** describes the students’ roles and the aims and content of the simulated nursing practice. Students were divided into pairs in part III, resulting in three groups from each of the teaching method conditions. They reflected learning for, in, and on the action in learning zone.

### Data Collection

During part II, four TETRA phones were circulated in each group (the universities only have four phones, and it was administratively difficult to get more). The students were trained on the use of the TETRA phone, and data were collected through questionnaires and video recordings; after part III, interviews of each pair of students took place and were recorded by video. Moreover, three researchers took field notes of their

### Table 1

<table>
<thead>
<tr>
<th>Group 1</th>
<th>Group 2</th>
</tr>
</thead>
<tbody>
<tr>
<td>For action</td>
<td>Part II action</td>
</tr>
<tr>
<td>In action</td>
<td>27 min 27 s</td>
</tr>
<tr>
<td>On action</td>
<td>16 min 2 s</td>
</tr>
<tr>
<td>Photos</td>
<td>Photos</td>
</tr>
</tbody>
</table>

| For action | Part III action | 46 min 52 s |
| In action | 39 min 36 s | 20 min 8 s |
| On action | 16 min 37 s | 4 min 12 s |
| Photos | Photos |

<table>
<thead>
<tr>
<th>Group 1</th>
<th>Group 2</th>
</tr>
</thead>
<tbody>
<tr>
<td>Reflection</td>
<td>Concrete</td>
</tr>
<tr>
<td>For</td>
<td>In</td>
</tr>
<tr>
<td>Concrete</td>
<td>x</td>
</tr>
<tr>
<td>Personal</td>
<td>x</td>
</tr>
<tr>
<td>Social</td>
<td>x</td>
</tr>
<tr>
<td>Liable</td>
<td>x</td>
</tr>
<tr>
<td>Content-based</td>
<td>x</td>
</tr>
<tr>
<td>Metacognitive</td>
<td>x</td>
</tr>
</tbody>
</table>

### Table 2

<table>
<thead>
<tr>
<th>Themes of meaningful learning</th>
<th>Description</th>
<th>Experiential learning</th>
<th>Concrete simulation experience</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. Experimental</td>
<td>Practice nursing skills, try many times, establish role clarity, demonstrate effectively, know the environment</td>
<td>Doing, watching</td>
<td>Reflection in action (during)</td>
</tr>
<tr>
<td>= Concrete</td>
<td>Facial expression, gestures, confusion, happiness, joy</td>
<td>Feelings</td>
<td></td>
</tr>
<tr>
<td>2. Emotional, individual</td>
<td>Find a solution together, discuss, use cognitive aids, designate leadership</td>
<td>Thinking, watching, doing</td>
<td></td>
</tr>
<tr>
<td>= Personal</td>
<td>Eager to learn even though others students are passive</td>
<td>Doing, thinking</td>
<td></td>
</tr>
<tr>
<td>3. Socio constructive, collaborative</td>
<td>Goal-oriented action combined with previous knowledge and skills, able to integrate all available information, distribute the workload</td>
<td>Thinking</td>
<td>Reflection</td>
</tr>
<tr>
<td>= Social</td>
<td></td>
<td>For/in/on action</td>
<td>(before/during/after action)</td>
</tr>
<tr>
<td>4. Active, self-directed, responsible</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>= Liable</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>5. Competence-based, goal-oriented, contextual, experiential</td>
<td>Be able to critically examine one’s own actions and reflect on one’s own thinking, common skills and knowledge, allocate attention wisely, anticipate and plan</td>
<td>Thinking</td>
<td>Reflective observation in/on action (during/after action)</td>
</tr>
<tr>
<td>= Content-based</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>6. Critical, reflective</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>= Metacognitive</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
observations. Our previous two papers (Poikela et al., 2013, 2014) presented the results of the analysis of the interviews and observations by the researchers. One of these researchers is the first author of the present paper, which allows for a videography analysis of the recordings because she was present during all parts of the study. In this study we used video recording data. We use the term videography rather than video analysis because it includes exploiting the observer’s knowledge from nursing teaching. The observer was involved in the process and, therefore, understands the meanings of the actions (Knoblauch and Tuma, 2011). In this study we used video recording data.

The video recordings were 4 h, 2 min, and 1 s long; Table 1 shows the breakdown of time by group. The time allotted to parts II and III are also presented.

**Data Analysis**

The analysis started with the first author of this paper watching video recordings; the videos were reviewed very carefully through the Windows Live Movie Maker (version 15.4.3555.308, 2010 Microsoft Corporation, Redmond, WA, USA) three times. The second researcher did the same analysis, and then we compared the results. Videography analysis requires that the researcher is involved in the processes and know the content of the students’ knowledge and the study environment. After review, the themes of meaningful learning, evidenced by the students during the training in the use of the phone and the simulated nursing practice, were identified (Table 2). Themes of meaningful learning were classified into the following six groups: 1) concrete, 2) personal, 3) social, 4) liable, 5) content-based, and 6) metacognitive. The categories were based on the students’ work and conversation visible in video recordings. We combined the data with the learning theories, experiential learning, and concrete simulation experience, and found a connection between the themes of meaningful learning and experimental learning cycles: feeling, watching, thinking, and doing (Kolb, 1964). As mentioned previously, concrete simulation experiences are divided into reflection for, in, and on action (Poikela, 2012). These three categories combine the themes of meaningful learning and experiential learning (Table 2).

The videography of learning to use the TETRA phone was based on the ISSD model in group 2 and lecture in group 1. Simulated nursing practice was carried out based on the FTL model. Table 3 shows how the themes of meaningful learning appeared on the video analyses.

**Results**

Figs. 5 and 6 describe students’ learning to use the TETRA phone via two different teaching methods.

Group 1 participated in a teacher led lecture. The students sat very quietly; there were no comments, discussion, or questions. The teacher was the only one who spoke, and she gave her opinion regarding the use of the TETRA phone. She showed power point slides based on her own experiences. In this phase (reflection for action), none of the meaningful learning themes could be found. It was difficult to determine whether reflection for action was taking place because the students were so quiet. They were divided into four groups because there were four TETRA phones available. For reflection in action, one student from each group held the TETRA phone. Personal and liable themes could be seen because one student at a time practiced on the phone. Some of the others made comments and the rest of the students were quiet.

![Fig. 5. Group 1: Learning to use the TETRA phone.](image-url)
showed that only some students had held the TETRA phone, and only one student could analyze the learning experience. Reflection on action was drawn from only one student’s personal monologue. They could not integrate the new knowledge with previous studies because they were not involved in building a new orientation to their knowledge and skills.

Group 2 learned the use of the TETRA phone through a computer-based simulation program. The ISSD model supported students’ personal learning. The program follows simulation learning phases and clarifies students’ independent learning. In reflection for action, students were able to engage with the simulation environment and devices. They could conceptually determine and set individual goals.

"A student said, we used this function in the computer-based simulation program so and now we can do same in real simulated practice." The scenarios were built around simple problem cases. The students had to reflect on their action, and they were able to use their previous knowledge. Concrete, personal, social, liable, and content-based themes of meaningful learning can be seen in reflection on action.

**Using the TETRA Phone in the Simulated Nursing Practice**

Figs. 7 and 8 show how the TETRA phones were used in the simulated nursing practice. Both groups (the students who trained the use the TETRA phone through computer-based simulation program and the students who got a lecture about using the TETRA phone) were in their own group in simulated nursing practice part III (see Fig. 3).

The students in the group I were confused about how to use the phone in practice. In the facilitating phase of the simulated nursing practice, part III, they argued over who would take the TETRA phone. They had not acquired the sense of learning and availability of new
knowledge in part II. During the training, when they encountered problems in using the phone, they did not support each other; students tried to solve the problem by themselves. The same students who were active in part II took part in the simulated nursing practice and used the phone. In the learning phase, some of the students described their feelings of uncertainty about what to do and where to get more information. Other students agreed with this opinion. They felt that hearing about the phone, but not using it, made it difficult to use in the simulated nursing practice.

Group 2 participated in the computer-based simulation; this was evident in their actions during the simulated nursing experience. They were excited and eager to try what they had learned about using the TETRA phone. In the facilitating phase, there were no problems regarding who would take the phone. All the students were very eager to take

<table>
<thead>
<tr>
<th>Phase</th>
<th>The snapshot of the video</th>
<th>Description</th>
<th>Concrete simulation experience</th>
<th>The themes of meaningful learning</th>
</tr>
</thead>
<tbody>
<tr>
<td>Facilitating</td>
<td><img src="image" alt="Facilitating" /></td>
<td>The goals for the students in the simulation process were to get information and familiarize themselves with their roles, as well as the simulation environment and devices. It was difficult to get six volunteer students to continue their participation in part III. They wondered whether they would be able to use the TETRA phone. They were unsure how they could operate the phone.</td>
<td>Reflection for action</td>
<td>Personal</td>
</tr>
<tr>
<td>Training</td>
<td><img src="image" alt="Training" /></td>
<td>The students were nervous and one asked help from the others. However, the students were not collaborative and the other students did not respond to this request.</td>
<td>Reflection in action</td>
<td>Personal, Liable</td>
</tr>
<tr>
<td>Learning</td>
<td><img src="image" alt="Learning" /></td>
<td>The students were frustrated. The main goal was to learn how to use the TETRA phone, there were many of critical statements (e.g., “We only heard how to use the phone”). Most of the students did not practice the use of the phone in part II.</td>
<td>Reflection on action</td>
<td>Personal</td>
</tr>
</tbody>
</table>

**Fig. 7.** Group 1: part III: simulated nursing practice.
part in simulated nursing practice because they wanted to test their skills and knowledge of the use of the TETRA phone. Reflection in action was very lively. All students agreed that there was an anticipatory atmosphere and it was nice to try the skills in practice.

### Discussion

This study showed that the students who learned to use the TETRA phone through a computer-based simulation were much more willing to use the phones simulated nursing practice. They could reflect for, in, and on action. Many of the themes of meaningful learning were visible in the simulated nursing practice; metacognitive and content-based themes appeared on action very strongly, and the social theme appeared less strongly. The concrete theme was present in all reflections of action (Beyer, 2012). It was more difficult to highlight the themes of meaningful learning in group 1, because they were so uncertain about using the TETRA phone in the simulated nursing practice. The personal theme was strong, and many students mentioned being frustrated. Frustration is an emotion that may inhibit learning. Some other themes of meaningful learning could be seen, including more personal in action and metacognitive on action, but very faintly. The pivotal result is that the students of the group 2 were more ready to use the TETRA phone. They were curious and found it fun to learn it in action. Enjoyment creates a good learning atmosphere and builds the foundation for gaining deeper knowledge and skills, for example, using the TETRA phone. The computer-based simulation learning before the simulated nursing practice improved the students’ outcomes (Curtin et al., 2011).

We have described how the themes of meaningful learning appeared for, in, and on action. Students’ deeper learning could be supported by use of the debriefing for meaningful learning (DML) method and the six

### Phase | Snapshot of the video | Description | Concrete simulation experience | The themes of learning |
--- | --- | --- | --- | --- |
Facilitating | ![Facilitating](image) | The goals for the students in the simulation process were to get information and familiarize themselves with their roles, as well as the simulation environment and devices. They were very eager to try the TETRA phone in practice. It was not difficult to get students to volunteer for the simulated nursing practice. | Reflection for action | Social, Liable, Content-based |
Training | ![Training](image) | All the students took part into discussion how to use the TETRA phone. They were very collaborative. | Reflection in action | Concrete, Personal, Social |
Learning | ![Learning](image) | The students were eager to share their experiences in the training phase. They talked about how they could improve their use of the TETRA phone through practice. | Reflection on action | Social, Content-based, Metacognitive |

*Fig. 8. Group 2: part III: simulated nursing practice.*
consistent components: a) engage, b) explore, c) explain, d) elaborate, e) evaluate, and f) extend. The DML process focused students’ learning more toward patient-care reflection on action (Dreifuerst, 2012). The DML should be used more often to help students focus on patient-care learning during reflection on action (Dreifuerst, 2012).

Videoegraphy represents an effective approach to assist nursing students in making decisions and monitoring their thinking in action. Even in their reflections on action the participants, in this study nursing students who took part in part III, had time to embellish what they said; in the other words, they could find words to explain their thinking and learning. Videography has been used in nursing research, but it is not usual in simulation area. However, video record as a research method can also be very useful when we are interested in knowing what happens during the learning process. The limitations of this pilot study were that the video recordings were not of sufficient length and not recorded systematically. For this reason, the data were unevenly distributed between the groups. Another limitation of the study was the short duration of experiment and small number of participants. Therefore, these results cannot be generalized. If the nursing students from the traditional group had more TETRA phones, the results could have been different.

The nursing students knew beforehand that they were participants in the study. Some students were absent on the research day. The nursing students self-determined participation. The rest of the students signed the assent papers and informed the researchers that they forgot the research after a while. Bearing ethical considerations in mind, it should be noted that the researchers took video clips from their own perspective.

Conclusion
This pilot study showed that computer-based simulation has a readiness meeting learning goals. Nursing students were able to transfer knowledge and skills gained through computer-based simulation in simulated nursing practice. The students became aware the computer-based simulation learning effectiveness, and they were able to continue to improve their nursing skills and enhance knowledge in coming working life. The incoming generation of nursing students, who are future nursing employee, need innovative learning solution. All innovators and developers of learning have to move a step forward from what has gone before. All tools that support learning need to involve inquiry, particularly those based on information and communication technology.

Author Contributions
Paula Poikela contributed to the study design, data analysis and manuscript preparation. Heli Ruokamo contributed to data analysis and manuscript preparation and Marianne Teräs to manuscript preparation.

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