'I realised it when we played with the doll!': nursing students' learning from participation in an action research project that included manikins

Jorunn Aas Handeland, Andreas Prinz, Else Mari Ruberg Ekra & Mariann Fossum

Published online: 01 Aug 2023.

Submit your article to this journal ☑

Article views: 603

View related articles ☑

View Crossmark data ☑

Routledge
Taylor & Francis Group

'I realised it when we played with the doll!': nursing students' learning from participation in an action research project that included manikins

Jorunn Aas Handeland [ID][a], Andreas Prinz[b], Else Mari Ruberg Ekra[a]
and Mariann Fossum[a]

[a]Department of Health and Nursing Science, Faculty of Health and Sport Sciences, University of Agder, Grimstad, Norway; [b]Department of Information and Communication Technology, Faculty of Engineering and Science, University of Agder, Grimstad, Norway

ABSTRACT

This qualitative educational action research study aimed to gain knowledge about nursing students' learning from participating in a developmental project that included human-like manikins. Twenty-three second-year Bachelor of Nursing students, one teacher, and one researcher participated in the study conducted at a Norwegian university. In collaboration, they planned and executed a developmental project with manikins in a nursing course. The project put manikins' reflective, explorative, and experiential potentials into play. Two Action Research cycles were carried out. Data were collected using audio recordings, observations, and written responses. The concepts of sayings, doings, and relatings guided the analysis to identify how the modified learning conditions influenced and changed the students' learning. The following four themes illustrate the students' learning in the project: ownership of the learning process, collaborative learning, understanding theory's significance for practice, and taking the patient's perspective. The student's participation in the project, including their independent use and exploration of the manikins, provided freedom and responsibility in decision-making, helped them experience problems, fostered creativity, and stimulated inner motivation. This moved their learning in a more practice-relevant direction.

Introduction

Simulation represents a diversity of educational methods used in health professional education and interprofessional learning. The International Association for Clinical Simulation and Learning (INACSL) defines simulation as 'an educational strategy in which a particular set of conditions are created or replicated to resemble authentic situations that are possible in real life' (INACSL 2016, S44).

Human-like simulators, also called manikins, are commonly used learning tools in nursing education. These can be full-sized models of a human body with different

technological levels (Lioce and Lopreaito 2020). Generally, manikins seem to provide reflective, explorative, and experiential learning potentials (Handeland et al. 2022), which may stimulate students' learning. In addition, the active and targeted use of manikin-based simulated activities shows potential for integrating theory and praxis and connecting education and professional practice. Simulation as a learning modality may reduce the gap between theory and clinical practice (Berragan 2013; Lee et al. 2019; Mulyadi et al. 2021).

However, although manikins are commonly used, we have insufficient knowledge about how to develop educational strategies including manikins that actively involve students in their learning process. Such knowledge may help teachers in developing new and creative methods for integrating manikins into learning activities. In this study, we used Action Research (AR) to explore how nursing students' participation in a developmental project with manikins, might promote their learning.

Background

The relevance problem

Nursing students should be supported in developing the knowledge and competencies they recognise as relevant when entering nursing practice. Nevertheless, nursing education faces challenges in preparing students to work as nurses (Lee and Sim 2020). When entering clinical practice, newly qualified nurses sometimes experience negative emotions, stress, and feelings of inadequacy (Jarden et al. 2021). This can partly be explained by a weak connection between the theoretical foundation students are equipped with from their education and the reality they experience in clinical patient care. Some refer to this gap between theory and praxis as the relevance problem (Hiim 2017; Schön 1987), which is recognisable in both nursing education and other professional education.

One could assume that theoretical knowledge is a precondition for practical performance and skillfulness in an educational context. However, this assumption underestimates the complexity and contextuality of practice. Theoretical concepts can rarely be directly transferred to and applied in practice. Theory and praxis do not always coincide, and theoretical concepts may have limited meaning in specific situations (Hiim 2017). Students' factual knowledge may be static, while the skills they must acquire are often relative and contextual (Kvernbekk 2018).

Manikins' potentials

Research leaves little doubt that manikin-based simulation benefits nursing students' learning. Learning outcomes include improved knowledge acquisition, development of psychomotor skills, and reflective and problem-solving skills (Cant and Cooper 2017; Kim, Park, and Shin 2016). Students' self-efficacy and self-confidence often increase through these activities (Cant and Cooper 2010; Labrague et al. 2019). Cant and Cooper (2017) found that self-efficacy is connected to experimental design. Self-confidence is essential because it stimulates engagement and motivation, which are fundamental for learning.

A motivational element in simulations can be related to the facilitators' behaviour and non-directive learning style (Díaz-Agea et al. 2021).

Given the widespread use of manikins in nursing education internationally, it is relevant to understand what this implies, looking beyond formal learning goals and how technologically advanced a manikin is. Whether students approach the manikins as a doll or a patient seems pivotal for their learning. Manikins may contribute to developing a professional identity if students allow themselves to step into the professional role. If students support each other in the experience of meeting a patient, relational realism may appear (Handeland et al. 2021). The manikin's presence as a patient substitute may facilitate interaction (Lavoie et al. 2020).

Handeland et al. (2022) indicate that manikins have reflective, explorative, and experiential learning opportunities. This can be explained by their ability to initiate curiosity and an urge to explore. Also essential is the manikin's potential to raise awareness of teamwork, experiences with professional reflections, and discussions. Experiences with full-body manikins may give students the feeling of working with a patient.

Educational action research

AR as a research tradition originates partly from Dewey's pragmatism and understanding of social experimentation (Miettinen 2000). When we experience situations where our automatic actions fall short, we mobilise previous experiences to find appropriate solutions (Frandsen 2018). AR also relates to Kurt Lewin's work, emphasising social experimentation to support democratic development and solve practical problems (Adelman 1993). AR aims to develop knowledge and improve professional practices through targeted changes in action with the people involved. Those affected by a developmental project should play an active part in it (Swantz 2008).

The Educational Action Research (EAR) tradition of Carr and Kemmis (1986) focuses on the educational field and teaching practice. Carr and Kemmis (1986) argue that traditional technical and linear research reduces the complexity of educational practice. Moreover, even if interpretive research enhances understanding and suggests solutions to educational problems, these solutions are not always compatible with educational practice. According to Carr and Kemmis (1986), the theory – practice gap cannot be closed through scientific theorising over practical problems. Instead, practical activities, such as education, need practical solutions. They suggest a change in perspective to produce credible and practice-relevant knowledge and encourage investigation from the practitioner's perspective. Then, new, adequate solutions can be developed by initialising and supporting changes in educational practices.

In AR, the researcher initialises and supports the study process, bringing experience, ideas, and reflections. The researcher identifies problems and investigates solutions with practitioners familiar with the practice in question. Action researchers are responsible for connecting knowledge and action and producing knowledge that benefits society (Adelman 1993; Hiim 2020; Kemmis and McTaggart 2008; McNiff 2013).

Through their contributions to designing learning activities and inclusion as participants in EAR studies, students can contribute to developing knowledge while learning (Magee, Bramble, and Stanley 2020; Mill and Morris 2000). However, Moch et al.'s (2016) review of AR in nursing education research showed that students' contributions were

weakly reported, making it difficult to determine the extent to which the students participated.

The study

Aim and research question

This EAR study aimed to gain more extensive knowledge about nursing students' learning from participating in a developmental project that included manikins. The research question was: 'How may nursing students' independent and active use of human-like manikins promote learning?'

Design

To facilitate a context in which the manikins' potential could unfold, we planned a qualitative EAR study in Carr and Kemmis' tradition (Carr and Kemmis 1986).

The study was implemented into the course 'Nursing for different patient groups: work methods and technology' during the second year of a three-year Bachelor of Nursing degree at one Norwegian university. In this nine-week course, lasting from August to October 2021, the students were introduced to evidence-based methods, standardised communication, assessment tools, and terminology. The course consisted of three modules in which the students worked in groups with written patient case studies. No manikins were used in the ordinary course.

This specific EAR study lasted eight months, from June 2021, when the first planning meeting found place, until January 2022, when the collaborative analysis process was completed. In other words, the study period was longer than the course period. The study surrounded the three mentioned modules. In the first module, the student participants followed the ordinary course. In modules two and three, they planned and performed alternative activities using a medium-advanced manikin from Laerdal®.

Changes in human activities can be identified by detecting changes in our understanding reflected in our verbal utterances (sayings), our behaviour reflected in our actions (doings), and in how we organise our practices (relatings) (Kemmis and McTaggart 2008). Therefore, we selected Kemmis (2009) concepts of sayings, doings and relatings as standards for systematically identifying manifestations of change from the project.

Participants

We recruited student participants using a purposive sample strategy. All registered second-year students were invited to participate in a digital information meeting, at which they received oral information about the study. 129 students followed the course. They were informed that study participation was voluntary, that those who first volunteered could participate, and that only 25 students could participate. This limit was set to keep the study manageable and ensure good communication among the participants. This is also the standard group size. Participation required the students to agree to expend extra effort on the course. Those interested e-mailed the corresponding author to register.

Group-based work is challenging for many students. Some are stressed about working in groups with unfamiliar students, while others have experienced group conflicts. It may feel safer to work with familiar peers. Therefore, we invited the students to register in groups to facilitate recruitment. As a result, most registered 2–5 students together.

The first 25 registered students received written information and signed consent forms. Twenty-three students (including three men) participated because two withdrew from participation before the first meeting. We divided the students into six groups of 3–5 based on their preferences. Each group signed a contract to specify how they wanted to cooperate and solve potential conflicts. The students' mean age was 28.1 years (range 20–44 years). Everyone had used manikins during their first year. Seven had experiences of simulations with or without manikins from previous education or work.

The participating teacher was personally invited and agreed to participate before signing a consent form. She had worked as a nurse for seven years, as a licensed practical nurse teacher for eight years, and as a nursing teacher for two years. She had limited experience with manikin simulations, which was viewed as an advantage since it allowed her to explore the manikins together with the students.

The participating researcher, who is also the corresponding author, was responsible for the project organisation, recruitment, data collection, and coding.

The study process

EAR is frequently performed as a cyclic, self-reflective process of planning, acting, observing, and reflecting (Kemmis and McTaggart 2008). Two AR cycles were carried out, including four planning and evaluation meetings and two seminars. The study process and how different data are related to the process are illustrated in Figure 1. The first module was not part of the project but formed the basis for the students' experiences of the other two modules. The learning goals for the two seminar modules are shown in Table 1.

Cycle 1

Plan: The first planning meeting was held digitally in mid-June 2021 upon students finishing their first year. The significance of their contribution was emphasised, and the students were introduced to AR principles. The planning was continued at a - physical second meeting at the start of the students' second year in September. Both the students and the teacher received training in operating the manikins. Through group and plenary discussions, the participants decided how they would like to work with a patient case surrounding pre- and postoperative nursing of a patient undergoing ostomy surgery at the first seminar.

Action: The first seminar was held in the skills laboratory a week after the second planning meeting. After an introduction, the groups installed one manikin each in a bed. First, they familiarised themselves with the manikin, testing its settings and features. Then, they worked for three hours with the patient case from their plan, using the manikin in a way
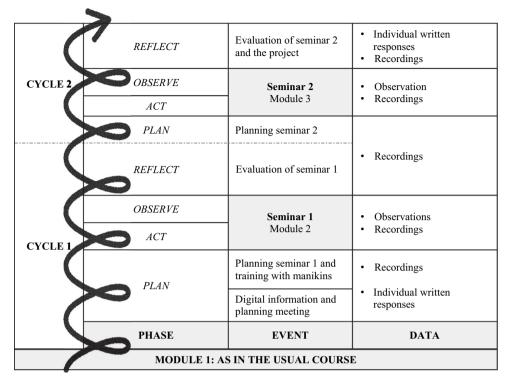
Figure 1. Study process and data collection.

Table 1. Learning goals for Module 2 (Seminar 1) and Module 3 (Seminar 2).

Learning goals Module 2 (Seminar 1)	Learning goals Module 3 (Seminar 2)
- Has knowledge about nursing for people who are acutely, critically, or chronically ill - Has knowledge about pre- and post-operative nursing - Is familiar with standard terminology for care planning in nursing	- Have knowledge about nursing for people who are acutely, critically, or chronically ill - Have knowledge about the nurse's treating and rehabilitative functions - Can apply knowledge about communication, learning, coping and change processes in guidance and teaching of patients and relatives - Can communicate and interact with patients and relatives based on respect, co-determination, and integrity - Is familiar with methods and tools for evidence-based nursing - Can apply knowledge about assessment, treatment, and follow-up to support the patient's decision-making - Is familiar with the importance of user participation in meeting with acutely, chronically, and critically ill patients

they judged appropriate. Some produced videos, others performed role-plays, while others discussed their way through the case while demonstrating on the manikin. Afterwards, the groups gathered for a plenary session, organised and led by the teacher. Two groups presented their works in the form of films and role-plays before the other groups provided feedback to raise questions and initiate discussions.

Table 2. Questionnaire guiding discussions after Seminar 1.

Questions for the students:
- How did your group work with the manikin?
- What do you think about this way of working?
- What did you learn when using the manikin? Did it add something?
- Was something problematic? What can be done to make this work?
- How did the teacher's presence and guidance function?
- How do you assess your learning in relation to the learning goals?
- Have you lost anything by not handing in a written case assignment?
- What do you want to bring to the next seminar?

Questions for the teacher:
- How did you experience the seminar?
- What do you think of your role?
- How do you want to guide the students in the next seminar?

Observe: During the seminar, the researcher observed how the students and the teacher worked, talked, cooperated, and interacted.

Reflect: Four days after the seminar, we held an evaluation meeting. The students shared their experiences from the seminar in their groups before we discussed our experiences collectively. The teacher and the researcher participated actively in these discussions. To guide the discussions, the researcher provided a questionnaire (See Table 2). This meeting connected the two cycles, as the reflection on the first seminar and the planning of the second overlapped.

Cycle 2

Plan: The second seminar was planned based on the evaluations of the first seminar. Here, the students worked on a case of a patient with diabetes and kidney failure.

Action: Two weeks later, the second seminar was held and organised similarly to the first seminar. At the plenary session, two new groups presented their work. The first group showed a film with 'do's and don'ts' in a patient conversation, and the second group showed a film of the planning and performing of the conversation.

Observe: During the seminar, the researcher again observed how the students and the teacher worked, talked, cooperated, and interacted.

Reflect: The last meeting was held the day after the second seminar. We evaluated the seminar and the whole project. The students discussed their experiences with the project and their use of the manikins in their groups. A revised questionnaire guided these discussions (See Table 3). Finally, all the participants discussed and summarised their experiences and reflections on the project.

Table 3. Revised questionnaire guiding discussions after Seminar 2.

Questions for the students:
- How did your group work with the manikin?
- Did you do anything differently from the first seminar?
- What did you learn when using the manikin? Did it add something?
- Was something problematic? What can be done to make this work?
- Have the teachers' presence and guidance contributed to learning? How?
- How do you assess your learning in relation to the learning goals?
- How was it to 'be' the patient through Nursing Anne?
- How was it to 'be' the nurse for Nursing Anne?
- What significance did the plenary session of the seminars have?

After the first seminar, some students were unsure whether you had received enough exam-relevant writing training:
- How did your group carry out the written work this time?
- Did you write more than the first time?

After these two seminars:
- Is there anything about this way of working that could be useful to bring to this or other courses? If so, what?
- Has participation in the project provided relevant experience or knowledge? If so, what?

Questions for the teacher:
- Did you notice any differences in how the students worked with the manikin from the first to the second seminar?
- Has it added anything to use the manikin this time? What?
- Was something problematic? What can be done to make this work?
- What do you think of your role?
- Did the students make a concrete plan for their work this time? If so, did it have anything to do with how the seminar worked?

After the first seminar, some students were unsure whether they had received enough exam-relevant writing training:
- Have the student groups submitted more written text this time?
- Does it have anything to do with how they worked at the seminar?After these two seminars:
- Is there anything about this way of working that could be useful to bring to this or other courses? If so, what?Has participation in the project provided the students with relevant experience or knowledge? If so, what?

Data collection

We used three qualitative data sources to capture and document the participants' sayings, doings and relatings along with the project. First, we retrieved data from the students' individual written responses to open-ended questions before and after the project. Table 4 shows these questions. The SurveyXact software was used to distribute the questions and collect the responses anonymously. The responses provided

Table 4. Questions to students before and after the study, distributed via SurveyXact.

Before	After
- How old are you?* - How was it to work with manikins and have simulation in the first year? Write a few lines.* - What are your expectations before participating in this project?* - How do you think you can contribute? Write a few lines.* - Before starting nursing education, did you have any education beyond upper secondary school? - If yes, how many years and what? - Do you have experience with simulation or the use of manikins beyond what you have had in nursing education? - If yes, write briefly what and in what context. - Do you have any questions, or is there something you are wondering about? * Compulsory question.	- How has participating in the project and using the manikin contributed to your learning? - Can you briefly describe a situation that made an impression? - What can you bring from the project during your time as a student? - Have you learnt something you believe is relevant for you in your future nursing career? - What does it mean to be involved in the project process and to influence the work? - Has participating in the project inspired you to participate in developmental projects later? - Write 3 words that describe what you have experienced in participating in the project. - Do you have other comments or feedback?

Table 5. Questions to the teacher before the study.

- How have the students usually been sitting and organising themselves?
- What tools have been used? (Books, computer, internet sources)
- How have the students related to the patient case and the written assignment?
- How did the discussions go?
- How did the students collaborate?
- How have the students used you as a teacher?

Table 6. Observation guide.

- How do the students organise themselves around the bed/in the room?
- What tools are used? (Books, PC, internet sources) How do the students use them?
- How do they talk about the patient in the case?
- How do the students relate to the assignment?
- How do students collaborate when the teacher is not around?
- In what situations do students ask for guidance? What do they need help with?
- In what situations does the teacher offer spontaneous guidance?
- What characterises the guidance situations?
- How does the teacher guide?
- What characterises the use of the manikin? Are different uses being explored?
- What manikin features do they use?
- How do they talk about the manikin?
- How do they talk to the manikin?
- Does anyone take a role as a patient?
- How do the participants communicate with each other?

For the plenary session of the seminar:
- How do the groups present their work?
- How do peer students and the teacher assess this?
- What feedback is given and how?

information on the students' previous experiences and expectations of the project. The teacher answered questions about how she usually worked in the ordinary course (See Table 5). Second, we collected data by recording the planning and evaluation meetings and the plenary sessions. Third, the researcher collected data from observations and conversations during the seminars through handwritten notes. The observations were performed both out of the participants' sight and through direct observations and conversations. The researcher developed an observation guide to support the observations (See Table 6).

Analysis

In the initial data processing, the students' individual responses were retrieved from SurveyXact into a Word file. The teacher provided her reflections in a separate document. Except for minor revisions to improve readability, no changes were made to this text. The recordings were transcribed into text and adjusted to facilitate reading and understanding. Some passages irrelevant to the research question (e.g. practical information) were excluded. The handwritten observation notes were written up in a separate Word file. All the data were anonymised before being transferred into the NVivo software for coding.

McNiff's 2013 three steps for analysing qualitative AR data inspired the data processing. The first step involved the authors selecting the theoretical concepts of sayings, doings and relatings as standards to identify changes. In the second step, we analysed and interpreted the data in terms of these concepts. The researcher organised the data to follow the two project cycles and coded whether it related

Table 7. Analysis table with examples.

	SAYINGS	*DOINGS*	*RELATINGS*
CYCLE 1	*It was frustrating at first; we felt uncertainty in how to solve the tasks and feared missing parts of the syllabus. The fact that we were 'left' to ourselves was unusual and a little frustrating.* (Student)	*When we sit and write, it's been very clinical.* (Student) -- *Previously, the students often spent time getting started with the written work. They've dealt with the case on a theoretical level.* (Teacher)	*They've shared the written work between them in the group. They worked with one part each and put it together into one text at the end.* (Teacher) -- *Some needed a conversation with the teacher and guidance to get started and use the manikin, but then it seemed to work better for most of them.* (Researcher's observation note)
CYCLE 2	*To be allowed to choose how to work, I believe, can promote learning and motivation more than if there are strict rules for how the work should be performed.* (Student)	*But when you see it on film, it suddenly seems so natural. Problems and measures are connected. It's a great way to see how natural it can be, as opposed to writing.* (Student) -- *It's easier to understand the syllabus when you can use it practically.* (Student)	*The way we communicated with each other helped me to see different perspectives. You can probably practise this without the manikin, but it's been easier to have the manikin here; you manage to communicate more seriously or approximately more real than if it had been just us students there.* (Student)

Pattern for theme: *Ownership of the learning process*	**Pattern for theme:** *Understanding theory's significance for practice*	**Pattern for theme:** *Taking the patient's perspective*

to sayings, doings or relatings. An analysis table was designed to facilitate the data organisation (See Table 7).

All student participants were invited to contribute to the analysis. Only three students volunteered. The reason for few students accepting the invitation is uncertain. One reason may be that they were in clinical practice at that time. Another reason may be that it was almost three months since they had participated in the project. In two meetings, these three students and the researcher discussed and validated the data. Additionally, the participating teacher was consulted to give her thoughts about the data. Together, the three students, the teacher and the researcher identified and agreed on four key patterns. After identifying these patterns, the researcher coded the data that related to these four patterns.

When entering McNiff's (2013) third step of moving from analysis to evaluation, the four authors reflected on the findings and formulated the four patterns into themes. Lastly, the three students and the teacher were consulted to verify these themes.

Ethical considerations

The Norwegian Centre for Research Data and the university's ethical board approved to perform the study. Written informed consent was obtained from all the participants before the start of the study. No sensitive information was collected. The participants were informed that they could withdraw from the study at any time without any explanation. The participants were served lunch at the two evaluation meetings. Initially, all the participants agreed that everything that was said or happened related to the study remained confidential. All data were anonymised to secure the participants' confidentiality before the three participating students read them. Because only one teacher participated, it would be possible to recognise her in this manuscript. She, therefore, read the manuscript and consented to submission.

The project was considered not to cause any harm to the participants. During the planning, the researcher was concerned about risking the participating students' learning outcomes. Afterwards, the concern was that the non-participating students might have received a poorer learning experience than the participants. Nevertheless, they received the same learning experience customarily offered. However, the study results impose a responsibility for the researchers to explore its implications further and ensure that its strengths are shared in nursing education.

Results

In the project, the context changed from working theoretically in small rooms to a setting in the clinic, wearing uniforms and using manikins. These modified learning conditions contributed to changes in the students' activities. In other words, the developmental project changed their sayings, doings and relatings. We identified four themes illustrating these changes: ownership of the learning process, collaborative learning, understanding theory's significance for practice, and taking the patient's perspective. The first two themes surround the students' participation in the project, while themes three and four relate to added learning outcomes. In the following section, we describe these themes.

Ownership of the learning process

When they were given the freedom to shape their work, the students said that they shifted from emphasising the written assignment to appreciating the work process. Previously, they focused considerably on the text they submitted. They stated that the stress in correctly formulating care plans almost diverted their attention from understanding the syllabus. Now, this stress seemed to decline.

Usually, the teacher spent significant time guiding the students in structuring their texts. Now, they received guidance during their work process because the teacher was always available. Without answering questions directly, the teacher supported the students in thinking and trying out solutions, as one student noted:

> It was nice; there was a suitable amount of guidance. We had the opportunity to work alone; there was no one hanging over us all the time, but the teacher was always available if we had questions.

Gradually, the students became familiar with their opportunities. However, they reported that the freedom was both demanding and constructive. They found it was motivating to choose a work form based on how they prefer to learn, as one student stated:

> Having the opportunity to influence the work was nice. We work differently and learn in different ways. To be allowed to choose how one wants to work, I believe, can promote learning and motivation more than if there are strict rules for how the work should be performed.

One student said, 'Being forced out of the comfort zone fostered creativity'. Another said that she had to 'twist her brain'. This became clear while observing the variety of activities that emerged. The students created new ways of working, such as playing out scenarios and testing different ways to inform the patient, as in the example below:

> It was possible to practise different ways to present the information. For example, we could play a bad reaction and a good reaction. It will happen when you are in practice. It is ingenious to practise how to present information; you try and fail on the way.

Before the first seminar, the students wanted to write as little as possible. Therefore, they decided to hand in only a draft or plan to the teacher in preparation for the seminar. Paradoxically, their attitudes to writing changed during the project. Some feared that they would not get exam-relevant writing training, as expressed by one student:

> It is important to have the written part before the exam. The manikin is great for practice and future work, but it is the exam on which we are graded.

Therefore, before the second seminar, all the groups decided to submit a complete case solution. Instead of being a product for evaluation, they turned the text into a tool for their learning. For example, one student noted:

> We wrote the case completely this time, and we think we got more out of the curriculum from it. However, even though we only wrote keywords the first time, we had an equally good discussion.

Their project participation moved the students' attention from the written text to appreciating their learning process. They took control and gained ownership of both their learning process and the product, as exemplified by this quotation:

> We feel more ownership of the project when we can take part in decisions.

Collaborative learning

The students' collaborative style changed from working individually in groups to a group collaboration characterised by mutual discussions. They said that receiving input from peers, reflecting on the literature, and discussing solutions was fruitful. Previously, the students had worked individually on one part before they put the parts together. As a result, they effectively completed the task, but they worked in a fragmented way, gaining a weak overall picture of the patient situation, as one student expressed:

> Usually, we just share the task without discussion: 'You take that part, I take this', but now we did not do that since we did not have that pressure on us. I feel that I have learned a lot more

from these cases than we did in the other case assignments. [in the previous year and the first module]

Because of the seminars' open structure, the groups had to shape their work together, leading them to relate differently to each other. One group stated that they worked more closely together than usual. 'Play' and 'playing' were concepts that the students recurringly used to describe their collaboration, as one student aptly said:

I realised it when we played with the doll!

Initially, the students wanted all the groups to work approximately similarly. However, after the first seminar, they no longer wanted everyone to do the same. Instead, they appreciated and wanted to keep the flexible structure so that each group could fill it the way that suited them best. One student said:

It was harder last time to know how to work, but now that we have been here once, we have found a way to do it in our group.

In both seminars, it was striking how the students experimented with different roles. Some played the nurse role; others played the roles of relatives or the patient. They played out the scenario several times and shifted the roles so that everyone could try each role. They also shifted between the dialogue in these roles and mutual reflections, as reflected in the researcher's notes:

Repeatedly, after playing out the situation, I hear the groups start to discuss blood pressure, kidney failure, diabetes, and blood samples. One group alternates between patient–nurse dialogue and reflections on the situation.

The teacher played an essential role by initiating, taking part in, and guiding the group discussions. Throughout the project, she supported the students to work together in new ways where everyone engaged and shared responsibility.

Understanding theory's significance for practice

The results indicate that the project improved the students' understanding of professional concepts and theoretical knowledge. Several students reported that they had previously experienced that manikin simulation helped them understand the connection between practice and theory. Now, they expected that the project would make understanding the syllabus's implications for patient care more accessible.

What significantly contributed to this change was that the students did something practical and saw something concrete in the manikin. One said that being physically active created an understanding of the context. The fact that they had a patient replacement to relate to added meaning to the theory, as one student noted:

We learned more from this than just sitting and listening in a classroom. We played it out, and it opened up discussions, making linking the theory to the practical easier. We broke the pattern of sitting in the classroom by using the manikin.

Moreover, the different learning conditions provided opportunities to acquire theoretical knowledge practically, since it required the students to consult and understand the theory

to work appropriately. The theory became more understandable when they experienced the syllabus used in practice. As one student said:

> We managed to turn the problem into something understandable. It does not seem so concrete on paper, but it seems so natural when you sit and talk to a doll—so professional.

Here, the teacher directed the conversations to the specific case. She included relevant theory in the conversations and supported them in acting out the situation, as reflected in the researcher's notes:

> The teacher encouraged them to try to 'do' what they were talking about to be able to see the situation 'from within'. Then it looked like someone got an 'Aha!' experience. Then they started playing the scenario.

Initially, some students talked in ways that separated the upcoming exam from clinical practice. They appeared almost as two opposites. The theory seemed irrelevant in 'real life' and only relevant for the exam. Some read and worked to pass their exam; later, they could concentrate on patient work. After the first seminar, the students realised that this way of working could both support them in understanding theory and prepare them for the exam, as one student said:

> Working with the manikin helped me imagine a patient when writing the exam. This made me answer the task better; it was easier to imagine what challenges the patient faced.

Although some students were probably stressed about the upcoming exam, the project enabled others to look past the exam. Immersing oneself in theory is not peripheral but relates to 'real life'. One student said:

> From now on, I will try not to separate written and practical knowledge, and [I will] imagine the patient when I write assignments and exams.

Taking the patient's perspective

The students reported that they experienced a different perspective on the patient through the project. Their attention was directed to a specific patient situation and enhanced their understanding of how they could adapt previously acquired theoretical knowledge to patients. The manikins played the most central role in this theme.

The students said that they obtained a limited impression of what it meant to plan nursing with ordinary written case solutions. Therefore, they came up with general nursing interventions. In previous simulations, the students felt that the manikins had improved their understanding of patient care and made the patient situation more realistic. They also hoped that this would be the case in this study.

Initially, some students experienced stress and frustration that how to use the manikins was not planned in detail. One student said:

> Our group likes guidelines. It was a bit difficult: 'What exactly are we going to do?' Our group was confused: 'Then we take some vital signs, we look a bit at the ostomy equipment, then we talk a bit with the manikin'. It was a little too loose.

The students did little to reinforce the impression of the manikin as a patient. Some put the manikin under a blanket to avoid exposure of its genitals; others did not. No groups put on clothes or gave them props. However, the manikin lying in bed provided a more accurate idea of a patient. One student said, 'It felt as if you had a patient there'. Although they did not use the voice or other functions, the manikin's presence made something happen, as expressed in the following:

> When we got to see what the stoma looks like in real life, it changed my mindset about having a stoma. It was not as bad as I had imagined. I realised that it could be an incredible help for the patient.

Even if a student only sat beside the manikin, giving it a voice, it helped them take the patient's perspective. They understood what it was like to be a patient. For example, when acting as the patient, they experienced how overwhelming it was to receive too much or incomprehensible information, as expressed by one student:

> I was the patient's voice, and when we filmed that 'don't scenario', I was left with an unpleasant feeling. I felt that this was going too fast. What happened? I got a feeling of being run over.

Each scenario turned out differently because the roles were played out differently. This provided varied patient perspectives, and the students advanced from talking about a patient in general terms to talking about a specific patient. Then, the nursing measures also became more definite, as the following quote shows:

> We used the manikin to play pre- and postoperative scenarios and ostomy care. We used it as an actual patient. It was good because we got the patient in focus. We not only imagined that there was a patient there. We also got to practise the nurse role. We swapped between being the patient, relatives, and nurses, so everyone got to test and feel the difference.

The manikins provided opportunities to practise patient communication. One student stated that communication training was the most relevant experience for clinical practice, as follows:

> We got much practice in communicating with the patient, getting to know the different roles of nurses, the patient and relatives, and bringing out different perspectives. When you give all the information, how does it feel to receive it? We had the patient more in focus.

By extension of this, it became more accessible for the students to enter, practise, and experience the nurse role. By being the patient, the manikin made it easier for the students to understand the patient's situation and what it takes to be a nurse.

Discussion

Discussion of the results

When we considered the results, we recognised that they were about how the students' participation and use of manikins created conditions for increased motivation, actualising Díaz-Agea et al. (2021), who hold that motivation is crucial for learning. This notion directed us to the works of Ryan and Deci (2000) and Pink (2009), who together describe four prerequisites for stimulating inner motivation.

Both Ryan and Deci (2000) and Pink (2009) hold autonomy as the first prerequisite, implying that people need free space and opportunities to make their own choices to grow and engage. The second prerequisite is competence (Ryan and Deci 2000) or mastery (Pink 2009). The joy and satisfaction of mastery is a motivator, as it strengthens our desire for learning. Ryan and Deci (2000) describe the third prerequisite: relatedness. A sense of belonging in a social context is substantial for being motivated. Regarding the fourth prerequisite, purpose, Pink (2009) states that people seek an aim for where to direct their efforts. All four prerequisites were recognisable in the results. Therefore, we applied them to understand the four themes.

The first theme, ownership of the learning process, actualises autonomy, as it shows that freedom and responsibility supported the students to experience ownership of their work. Some students stated that they found it motivating to influence and choose a work form based on how they prefer to learn. Taking the initiative, self-direction, and clinical reasoning skills are essential for nurses to provide safe patient care (Levett-Jones 2017). We understand autonomy as being connected to these skills. Students will encounter situations without clear or defined answers when facing patients. They must then cope with variations and unpredictability; finding practical solutions is up to them. We perceive the students' project experiences as a taste of such situations. Consequently, being provided with freedom and responsibility may promote a connection between education and working life.

We draw a line from the second theme, collaborative learning, to the prerequisite of relatedness. When the students experienced less control and more flexibility, their ability to cooperate seemed supported. We did not design a traditional simulation. However, the students almost instantly started to simulate. They took different roles, pretended, and role-played, exemplifying relational realism (Handeland et al. 2021). Some students said it was easier to role-play with the manikin than with a peer student. Here, the manikins' potential for collaborative learning was activated. Nevertheless, the teacher's presence and guidance were essential for supporting the students' cooperation. The teacher was nearby and available if the students wanted to discuss issues. She stimulated reflections and critical thinking in a non-directive learning style, as in Díaz-Agea et al.'s study Díaz-Agea et al. (2021). Her role was to create a communicative space (Kemmis 2012) where the students could have free discussions. This communicative space influenced the students' interactions with each other and supported their collaboration.

The third theme, understanding theory's significance for practice, shows the relevance of the prerequisite of competence or mastery. Despite experiencing the project as challenging and sometimes unclear, the students put effort and creativity into inventing solutions. Frustration did not seem to obstruct their learning. Instead, it seemed to be a challenge they overcame. The students were encouraged to explore ideas and solutions with the manikins, which contributed to practical knowledge of, for example, how to customise information provided to a patient. These experiences contributed to self-confidence and engagement, which fostered motivation for learning (Cant and Cooper 2010; Labrague et al. 2019).

Theme four shows that the students seemed to understand the practical relevance of theoretical knowledge better. They said that their project participation broadened their understanding of patient care. We relate this to the prerequisite of purpose. The students realised that theoretical concepts have value for future patients and not only for their

exams. According to Schön (1987), practice research aims to bring up practice-relevant knowledge. Although the students paid little attention to the manikin's appearance and features, its presence was essential. Experiencing the patient perspective made it possible for them to consider what it takes from them as nurses to provide individual care. When they felt overwhelmed as patients, the students understood that nursing is not just about giving information but also about adapting information to the current patient. Instead of being taught problem-solving, they experienced what a problem entailed before finding practical solutions themselves.

Overall, the students were placed in a situation in which they did not specifically know how to act, and where they could not follow a familiar pathway. However, through experimentation and testing ideas, guided by the teacher, they found new possibilities for action together. This experimental process seemed to increase their self-efficacy and motivation for further learning (Frandsen 2018; Miettinen 2000).

Already today, and to an even greater extent in the future, health services demand that nurses show innovative skills and the ability to develop nursing practic (Norwegian Ministry of Education and Research 2019). Consequently, nursing education is responsible for inviting students to co-create in developmental projects and research. Our study shows that students have the potential to contribute if they are allowed to. Furthermore, manikins seem to be tools that could release this potential.

Limitations and validity

Most of the students were familiar with each other, which may have facilitated group processes and spared them from spending time establishing groups. Their familiarity might have motored the project in a way that would be unachievable if the project were to be conducted with a randomly selected student group. Some students had hoped to use the manikin's technical functions more actively. Unfortunately, the cases did not facilitate this, because they were not written with this study in mind. More suitable cases written explicitly for the project could have influenced the students' work and use of the manikins. The course's timeframe restricted us to carry out only two project cycles. It would have been preferable to follow the project through more cycles to explore how the students' learning developed further.

Despite these limitations, the three students' and the teacher's contributions to the analysis increase the trustworthiness of the results. They added a critical voice: for example, they had the impression that the project's open nature caused more frustration for some students than the data reflected. The study was conducted in Norwegian. All processed data were translated into English while preparing this manuscript. The participants did not validate these translations, entailing limitations on the accuracy of the statements and findings. Additionally, the three authors who were not directly involved in the project contributed an outside perspective. Together, these perspectives add credibility and relevance to the interpretations and conclusions.

We applied Bradbury et al. (2019) seven choice points to judge and report the quality of this paper. These points offer a framework for improving reliability, as in Lin et al. (2021) study.[1]

Transparency and validity are keywords to ensure quality in AR (Feldman 2007). Hopefully, transparency has been ensured through this study description. The validity

of AR knowledge can be assessed according to whether the actions it produces are suitable for solving the depicted problem, i.e. its usability, according to Kemmis (2009). Here lie some practical challenges. Working in the outlined way presupposes having access to a clinical lab and enough manikins. The clinic is often fully booked at the university where this study took place, and there are few manikins, constraining how similar projects could be implemented.

Besides the usability criteria, another criterion is whether there are possibilities for this knowledge to persist. Although future interventions or activities may not be carried out precisely as in this study, we provided experiences that may improve nursing education. We can state little about the results' long-term value or specific individual learning outcomes or changes. Nor can we compare the results to the experiences of the students who participated in the ordinary course. However, the experiences and learning of each student, the teacher and the researcher may persist and shape their future nursing practice, education, and research. Although the study was small and only took place in nursing education at one site, it may contribute suggestions relevant to other educational contexts.

Researcher's reflexivity

The participating researcher is an educator and a doctoral candidate at the university where the study took place. She is a trained simulation facilitator but has limited experience operating the manikins used in this project. Her role was to facilitate and coordinate the study process, engage in discussions, and share reflections. The study stands in a tradition where investigations of one's own educational practice may create relevant and credible knowledge (Gjøtterud 2020). Familiarity with the context was viewed as a tool for understanding (Hiim 2020). However, this may have challenged the ability to bring up or contribute to new knowledge and perspectives. The researcher aimed to view the students as co-researchers, not research objects. In retrospect, establishing a balanced and symmetrical relationship between the researcher and the students was demanding. This challenge may arise from our unconscious tendency to assume traditional teacher and student roles, which inherently creates a power imbalance. This dynamic may have hindered the establishment of the desired balanced relationship. However, the students' participation benefitted in this aspect because they challenged and problematised the existing education.

Conclusions

This EAR study aimed to gain knowledge about nursing students' learning from participating in a developmental project with human-like manikins. The students' participation in the project provided freedom and responsibility in developing and choosing learning activities. Additionally, their collaborative experimentation with the manikins helped them experience problems the way patients experience them and increased their understanding of theory's significance for practice. The students were placed in a practice-like work context that resulted in knowledge that they perceived as relevant to nursing practice.

The students' independent and active use of manikins fostered creativity, stimulated inner motivation, and moved their learning into a more practice-relevant direction. The study exemplifies the significance of letting students participate in project work as a source of learning, which may contribute to reducing the gap between theory and practice.

Implications for practice and research

This study offers suggestions for new and creative ways to include manikins. We believe that more varied use of manikins and facilitating students' free use of them would be beneficial. Including manikins in activities other than traditional scenario simulations can create knowledge and encourage learning.

This study may benefit resource-constrained contexts in designing less expensive yet effective methods to use manikins, as it seems possible to engage more students with less and simpler equipment. The study is especially relevant to nurse educators. However, we believe it is also relevant to educators in other health professional education by inspiring them to include students as participants in EAR projects.

AR should be explored as a research methodology to investigate and develop high-quality educational practices. Although AR seems suitable for nursing education, we have found that it is rarely used in educational nursing research. This study exemplifies how AR can be performed in nursing education and other health professional education. The authors encourage researchers to facilitate student engagement and participation in educational research. Students can be creative, and they can think outside the box – a resource we should make use of, both in education and research.

Note

1. A table showing the results of this appraisal can be accessed via the 'Supplemental' tab on the article's homepage (see https://www.tandfonline.com/toc/reac20/current)

Acknowledgments

Disclosure statement

Funding

ORCID

Jorunn Aas Handeland 🔟 http://orcid.org/0000-0002-8369-2457

Author contributions

JAH conceived and designed the study and undertook the data collection and coding. All four authors contributed to the data analysis and interpretation. JAH drafted and revised the manuscript in line with the other three authors' comments and contributions. All the authors have made substantial contributions to the manuscript, given final approval for this version of the manuscript to be published and agreed to be accountable for all aspects of the work to ensure that questions related to the accuracy and integrity of any part of the work are appropriately investigated and resolved.

This manuscript has not been published or presented elsewhere in part or in its entirety and is not under consideration by another journal.

Data availability statement

The data are not publicly available due to privacy or ethical restrictions.

References

Adelman, C. 1993. "Kurt Lewin and the Origins of Action Research." *Educational Action Research* 1 (1): 7–24. https://doi.org/10.1080/0965079930010102 .

Berragan, L. 2013. "Conceptualising Learning Through Simulation: An Expansive Approach for Professional and Personal Learning." *Nurse Education in Practice* 13 (4): 250–255. https://doi.org/10.1016/j.nepr.2013.01.004 .

Bradbury, H., K. Glenzer, B. Ku, D. Columbia, S. Kjellström, A. O. Aragón, R. Warwick, et al. 2019. "What is Good Action Research: Quality Choice Points with a Refreshed Urgency." *Action Research* 17 (1): 14–18. https://doi.org/10.1177/1476750319835607.

Cant, R. P., and S. J. Cooper. 2010. "Simulation-Based Learning in Nurse Education: Systematic Review." *Journal of Advanced Nursing* 66 (1): 3–15. https://doi.org/10.1111/j.1365-2648.2009.05240.x.

Cant, R. P., and S. J. Cooper. 2017. "Use of Simulation-Based Learning in Undergraduate Nurse Education: An Umbrella Systematic Review." *Nurse Education Today* 49:63–71. https://doi.org/10.1016/j.nedt.2016.11.015.

Carr, W., and S. Kemmis. 1986. *Becoming Critical: Education, Knowledge, and Action Research*. London: Falmer Press.

Díaz-Agea, J. L., M. J. Pujalte-Jesús, C. Leal-Costa, J. A. García-Méndez, M. G. Adánez-Martínez, and D. Jiménez-Rodríguez. 2021. "Motivation: Bringing Up the Rear in Nursing Education. Motivational Elements in Simulation. The Participants' Perspective." *Nurse Education Today*, Vol. 103, 104925. https://doi.org/10.1016/j.nedt.2021.104925.

Feldman, A. 2007. "Validity and Quality in Action Research." *Educational Action Research* 15 (1): 21–32. https://doi.org/10.1080/09650790601150766.

Frandsen, M. S. 2018. "Sociale Læreprocesser - John Deweys Pragmatisme Som Udgangspunkt for Aktionsforskning" [Social Learning Processes - John Dewey's Pragmatism as a Starting Point for Action Research]." In *Den ufærdige fremtid - Aktionsforskningens potentialer og udfordringer*, edited by Annette. Bilfeldt, Michael Søgaard Jørgensen, John Andersen, and Kevin Perry, 69–99. Aalborg, Denmark: Aalborg Universitet.

Gjøtterud, S. 2020. "Forskning I Egen Undervisningspraksis I Høyere Utdanning" [Research into Own Teaching Practice in Higher Education]." In *Aksjonsforskning i Norge, Volum 2: Grunnlagstenkning, Forskerroller og Bidrag til Endring i Ulike kontekster*, edited by Sigrid Gjøtterud, Hilde Hiim, Dag Husebø, and Liv Helene Jensen, 225–251. Oslo: Cappelen Damm Akademisk. https://doi.org/10.23865/noasp.121.ch8.

Handeland, J., A. Prinz, E. M. Ekra, and M. Fossum. 2021. "The Role of Manikins in Nursing students' Learning: A Systematic Review and Thematic Metasynthesis." *Nurse Education Today*, Vol. 98. https://doi.org/10.1016/j.nedt.2020.104661.

Handeland, J., A. Prinz, E. M. Ekra, and M. Fossum. 2022. "The Sense of a Patient: An Ethnographic Multi-Site Field Study Exploring the Influence of Manikins on Nursing students' Learning." *International Journal of Educational Research Open* 3. https://doi.org/10.1016/j.ijedro.2021.100110.

Hiim, H. 2017. "Relevant Lærerutdanning og Aksjonsforskning" [Relevant Teacher Education and Action Research]." In *Aksjonsforskning i Norge; Teoretisk og Empirisk mangfold*, edited by Sigrid Gjøtterud, Hilde Hiim, Dag Husebø, Liv Helene Jensen, Tove H Steen-Olsen, and Else Stjernstrøm, 45–70. Oslo: Cappelen Damm Akademisk. https://press.nordicopenaccess.no/index.php/noasp/catalog/book/17 .

Hiim, H. 2020. "Likheter og Forskjeller Mellom Tilnærminger til Aksjonsforskning" [Similarities and Differences Between Approaches to Action Research]." In *Aksjonsforskning i Norge, Volum 2: Grunnlagstenkning, Forskerroller og Bidrag til Endring i Ulike Kontekster* edited by 25–54. Oslo: Cappelen Damm Akademisk. https://doi.org/10.23865/noasp.121.ch1.

INACSL (International Association for Clinical Simulation and Learning) Standards Committee. 2016. "INACSL Standards of Best Practice: Simulation[SM] Simulation Glossary." *Clinical Simulation in Nursing* 12:39–47. https://doi.org/10.1016/j.ecns.2016.09.012.

Jarden, R.J., A. Jarden, T. J. Weiland, G. Taylor, N. Brockenshire, and M. Gerdtz. 2021. "Registered Nurses' Experiences of Psychological Well-Being and Ill-Being in Their First Year of Practice: A Qualitative Meta-Synthesis." *Journal of Advanced Nursing* 77 (3): 1172–1187. https://doi.org/10.1111/jan.14667 .

Kemmis, S. 2009. "Action Research as a Practice-Based Practice." *Educational Action Research* 17 (3): 463–474. https://doi.org/10.1080/09650790903093284.

Kemmis, S. 2012. "Researching Educational Praxis: Spectator and Participant Perspectives." *British Educational Research Journal* 38 (6): 885–905. https://doi.org/10.1080/01411926.2011.588316.

Kemmis, S., and R. McTaggart. 2008. "Participatory Action Research: Communicative Actions and the Public Sphere." In *Strategies of Qualitative Inquiry*, edited by Norman K. Denzin and Yvonna S. Lincoln, 271–330. California: Thousand Oaks: Sage Publications.

Kim, J., J. H. Park, and S. Shin. 2016. "Effectiveness of Simulation-Based Nursing Education Depending on Fidelity: A Meta-Analysis." *BMC Medical Education* 16. (1). https://doi.org/10.1186/s12909-016-0672-7.

Kvernbekk, T. 2018. ""Evidensbasert Pedagogisk Praksis: Utvalgte kontroverser" [Evidence-Based Practice: A Selection of Controversies]." *Nordisk Tidsskrift for Pedagogikk & Kritikk* 4:136–153. https://doi.org/10.23865/ntpk.v4.1153 .

Labrague, L. J., D. M. McEnroe-Petitte, A.M. Bowling, C. E. Nwafor, and K. Tsaras. 2019. "High-Fidelity Simulation and Nursing Students' Anxiety and Self-Confidence: A Systematic Review." *Nursing Forum* 54 (3): 358–368. https://doi.org/10.1111/nuf.12337 .

Lavoie, P., M. Deschênes, R. Nolin, M. Bélisle, A. B. Garneau, L. Boyer, A. Lapierre, and N. Fernandez. 2020. "Beyond Technology: A Scoping Review of Features That Promote Fidelity and Authenticity in Simulation-Based Health Professional Education." *Clinical Simulation in Nursing* 42:22–41. https://doi.org/10.1016/j.ecns.2020.02.001.

Lee, B.O., H. F. Liang, T. P. Chu, and C. C. Hung. 2019. "Effects of Simulation-Based Learning on Nursing Student Competences and Clinical Performance." *Nurse Education in Practice* 41:41. https://doi.org/10.1016/j.nepr.2019.102646.

Lee, J. E., and I. O. Sim. 2020. "Gap Between College Education and Clinical Practice: Experience of Newly Graduated Nurses." *Nursing Open* 7 (1): 449–456. https://doi.org/10.1002/nop2.409.

Levett-Jones, T. 2017. "Clinical Reasoning: What It is and Why It Matters." In *Clinical Reasoning-Learning to Think Like a Nurse*, edited by Tracy Levett-Jones, 2–13. Melbourne: Pearson.

Lin, C. C., C. Y. Han, M. L. Wu, P. R. Hsiao, L. H. Wang, and L. C. Chen. 2021. "Enhancing Reflection on Medical and Surgical Nursing Among Nursing Students: A Participatory Action Research Study." *Nurse Education Today* 102:104935. https://doi.org/10.1016/j.nedt.2021.104935.

Lioce, L., and J. Lopreaito Founding, Ed 2020. *Healthcare Simulation Dictionary*. Second ed. Rockville, MD: Agency for Healthcare Research and Quality. https://doi.org/10.23970/simulationv2.

Magee, D., M. Bramble, and D. Stanley. 2020. "Expanding an Action Research Framework for an Evidence Based Mentoring Programme in Nursing: An Exploration of Cooperative Enquiry." *Educational Action Research* 28 (4): 597–608. https://doi.org/10.1080/09650792.2019.1636695.

McNiff, J. 2013. *Action Research: Principles and Practice*. 3rd ed. Abingdon, England: Routledge. https://doi.org/10.4324/9780203112755.

Miettinen, R. 2000. "The Concept of Experiential Learning and John Dewey's Theory of Reflective Thought and Action." *International Journal of Lifelong Education* 19 (1): 54–72. https://doi.org/10.1080/026013700293458.

Mill, J. E., and H. M. Morris. 2000. "The Ambivalence of Ownership: Nursing Graduate Students as Collaborators in Action Research." *Educational Action Research* 8 (1): 137–149. https://doi.org/10.1080/09650790000200110.

Moch, S. D., R. Todd Vandenbark, S. Pehler, and A. Stombaugh. 2016. "Use of Action Research in Nursing Education." *Nursing Research and Practice* 2016:8749167. https://doi.org/10.1155/2016/8749167 .

Mulyadi, M., S. I. Tonapa, S. S. J. Rompas, R. H. Wang, and B. O. Lee. 2021. "Effects of Simulation Technology-Based Learning on Nursing Students' Learning Outcomes: A Systematic Review and Meta-Analysis of Experimental Studies." *Nurse Education Today* 107:105127. https://doi.org/10.1016/j.nedt.2021.105127.

Norwegian Ministry of Education and Research. 2019. *Forskrift om Nasjonal Retningslinje for Sykepleierutdanning*. Regulations on National Guidelines for Nursing Education. https://lovdata.no/dokument/SF/forskrift/2019-03-15-412.

Pink, D. H. 2009. *Drive: The Surprising Truth About What Motivates Us*. Edinburgh, Scotland: Canongate.

Ryan, R. M., and E. L. Deci. 2000. "Self-Determination Theory and the Facilitation of Intrinsic Motivation, Social Development, and Well-Being." *American Psychologist* 55 (1): 68–78. https://doi.org/10.1037/0003-066X.55.1.68 .

Schön, D. A. 1987. *Educating the Reflective Practitioner*. San Francisco: Jossey-Bass.

Swantz, M. L. 2008. "Participatory Action Research as Practice." In *The SAGE Handbook of Action Research*, edited by Peter Reason and Hilary Bradbury, 31–48. London: SAGE Publications. https://doi.org/10.4135/9781848607934.n8.