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How can simulation help with learning project work skills? Experiences from higher education in Finland

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Abstract

Background: Effective project management and project work skills are important requirements in higher education and many other work place settings. Simulation-based learning, with its use of simulated scenarios and environments, may be a helpful way of supporting skill development. However, much more needs to be understood about the possibilities and challenges that can be involved in the application of this method of learning and teaching, from the perspectives of the learners.

Purpose: This exploratory qualitative study sought to describe university lecturers' experiences and views of simulation as a method of learning and teaching project skills. The simulation method was tested in Finland, in the context of the national Research and Development Expert Coaching Programme, which was developed for the staff of the Universities of Applied Sciences.

Research methods: Data were collected via a questionnaire with two open questions, to which total of 12 multi-professional participants, all lecturers from Universities of Applied Sciences, were asked to respond in essay form. The data was analysed using inductive content analysis.

Results: Overall, our analysis suggests that participants felt that simulation-based learning was suitable for learning project work. According to the participants, the method helped them learn concrete project work skills, identify and manage challenging situations and promote dialogical sharing between professionals.

Conclusion: The results indicate that simulation can be used to promote project work competence of both new and more experienced project workers in various fields. It is suggested that the method is suitable for both initial and continuing education.

 Keywords: multi-professional, simulation pedagogy, project skills, coaching, higher education, project management, collaborative learning

Introduction

This article describes university lecturers' views and experiences of simulation as a method of learning and teaching project skills. Lecturers from various parts of Finland participated in a multiprofessional Research and Development Expert Coaching Programme, targeted at the research and development staff of all the Universities of Applied Sciences. As part of this Programme, the lecturers were offered a simulation-based course in project skills. At the end of the course, their experiences were explored by means of open questions, which were analysed by inductive content analysis.

Project work skills are among the current requirements for lecturers and other staff at the Universities of Applied Sciences, but effective project management and project work skills are equally important everywhere in today's world of work, whether in diverse industries or in the public sector (Silfverberg, 2000). A study focussing on simulation-based learning of project skills can make a contribution to our understanding of how this method can support teaching and learning.

Background

This study was conducted in a higher education context, with representatives from Universities of Applied Sciences. Finland distinguishes between traditional research-driven Universities and the more practice-oriented Universities of Applied Sciences. During their over 30 years of existence, the Universities of Applied Sciences have invested a considerable amount of resource to ascertain a substantial research, development and innovation competence and a significant role in the national research, development and innovation arena. (Maassen, 2012; OECE, 2007; OECE, 2009). Much of this work is based on close interaction with various stakeholders. Besides building regional, national and international networks, these educational institutions have concentrated on promoting interdisciplinary collaboration and competence and on seeking practical, user-oriented and solution-focused approaches (Arene Rectors' Conference of Finnish Universities of Applied Sciences, 2017).

This paper is based on one example of the recent efforts to strengthen the research and development profile of the Universities of Applied Sciences: the national Research and Development (R&D) Expert Coaching Programme, launched in 2014 by a pilot funded by the Ministry of Education and Culture. The programme aims at improved effectiveness by increasing networking with actors in innovative environments and by developing more practical and user-oriented operational models. Further aims are to improve participants' competence in the following areas: project planning and implementation; research, development and innovation; management and leadership; commercialization of research results; targeting customers, and integration of the results into teaching (Saranki-Rantakokko & Lahti, 2014). It is believed that although lecturers in Finnish Universities of Applied Sciences usually have a work history in the area they teach, new competence will evolve when teachers are also engaged in research, development and innovation activities. To achieve the goals set for innovative research and development, staff members are expected not only to possess

research competence and practical development skills, but they must also be capable of establishing connections with relevant companies and organizations (Arene, 2017).

The lecturers who took part in the simulation-based course in project skills described in this article already had experience of project management, or expected to become project managers at some stage of their careers. A project manager is responsible for setting directions that the project workers can commit themselves to, and for ensuring that the team members have the necessary competence (Karlöf & Helin-Lövingsson, 2012). The competence of project managers very much rests on the ability to lead people. It has been suggested by several investigators that a dialogical and encouragingapproach to leadership is a suitable seedbed for creative project work and development activity (Syvänen et al., 2012). This kind of approach resembles coaching. Further requirements listed for project managers involve an ability to gain an overview of the whole process and to deal with change and insecurity (Viitanen et al., 2007; Sinkkonen-Tolppi & Viitanen, 2005). The work is not possible without social skills and networking, (Viitanen et al., 2007) which can mean, for example, that clients and stakeholders are involved early in the planning process of various projects (Silfverberg, 2000; Toikko & Rantanen, 2009). Ideally, project managers should learn to give space to different participants and opinions (Jabe, 2006). Effective teams conduct equal discussions, negotiate on meanings and design visions together (Tsoukas & Chia, 2002). However, even in a culture of such collaborative work, many decisions still need to be reached by project managers. This means that project managers must also possess decision-making skills. Decisions often need to be reached fast, but project managers must still be able to maintain the long-term perspective of the undertaking (Jabe, 2006). It is also useful if project managers are familiar with the subject matter of the project, besides possessing general business skills and an understanding of how organizations are managed and financed. Considering all these challenges, an ability to work in a creative and innovative way is a great asset (Viitanen et al., 2007).

The course described in this paper used simulation as a means to deepen understanding of project management and other project skills. Simulation technology has been used in the training of various professions for decades, for example in disaster management, military training, civil and military aviation, nuclear power generation and other high-risk performance environments. Examples involve flight simulators and technical operations scenarios (Goodman, 1978; Wachtel & Walton, 1985; Ressler et al.,1999; US Army Research Institute, 2005). There is growing evidence that besides securing technical competencies, multiprofessional simulation-based training may also be effective in enhancing the professionals' non-technical skills. These involve cognitive, social and personal resource skills, (Shields, 2013). such as teamwork, communication and decision-making, which, besides technical competence, are essential for safety and prevention of human error. The awareness of the significance of non-technical skills for safety has extended to the medical context as well (Langdalen et al., 2018). In emergency medicine, for example, simulations have been found to improve situational awareness, teamwork and leadership (Parson et al., 2018). Several studies have reported on experiences of using simulations to learn intensive care, anaesthesiology, geriatrics and maternity services. (Andersen, Kammer Jensen, Lippert, Ostergaard, &Wirenfelt Klausen, 2010; Markova, Sørensen, Holm, Nørgaard, & Langhoff-Roos, 2012; Brayde et al., 2015; Fransen, Banga, van de Ven, Mol, & Oei, 2015; Ross, Reedy, Roots, Jaye, & Birns, 2015; Sørensen et al., 2015). In Finland, multiprofessional simulation-based pedagogy has been applied to practice team work and interaction in acute nursing. The scenarios have mostly involved trauma, advanced life support and other emergency situations. (Hallikainen & Väisänen, 2007; Hoppu, Niemi-Murola, & Handolin, 2014; Vanhanen, Hyvämäki, Varkki, Vakkala, & Tervaskanto-Mäentausta, 2017).

Finally, simulation-based learning, with help of nearly-authentic environments and scenarios, has been considered of great potential for management education and project management as part of the management courses (Salas, Wildman, & Piccolo, 2009). For example, simulation has been found to support problem-based learning in business processes and process integration (Draijer & Schenk, 2004). A number of simulation-based training tools has also been developed for various project management domains (e.g. Davidovitch , Parush, & Shtub, 2009, 2010). The main advantage of simulation-based training for management education is that simulation allows complex learner-controlled learning combining theory and practice in a realistic, risk-free learning environment. The method is considered to be simple, engaging and ideal as a way of training infrequently engaged critical skills (Salas et al., 2009). As in any learning experience, the training should always be based

on an assessment of learning needs. Learning is energised when the knowledge gap is moderate and the participants succeed in the simulation (Zwikael, Shtub, &Chih, 2012).

Purpose

The purpose of the study was to describe university lecturers' experiences and views of simulation as a method of learning project skills. The study took place in the context of the national R & D Expert Coaching Programme, developed for the staff of Universities of Applied Sciences in Finland.

The research questions were as follows:

1. How helpful is a simulated project situation a learning experience?
2. How can simulation be used to teach project work?

Methods

*Participants and research context*The participants in this study were 12 staff members from various Universities of Applied Sciences in Finland, who participated in a national one-year R&D Expert Coaching Programme in 2018. The participants were lecturers, who, besides their teaching duties, were involved in project work and different research and development undertakings. They had managed projects before, or were likely to manage them in the future. Most of the lecturers worked in schools of health care and social services. The other areas represented were culture, business, pedagogy and police education.

  The R&D Expert Coaching Programme involved theoretical studies about project planning, applications and recruitment of partners, teamwork and negotiation skills. It also included familiarization with project life cycles and the Logical Framework Approach. The Logical Framework Approach (LFA) is a method that can be used for designing, monitoring and evaluating projects. The LFA approach involves steps that help to determine the relevance, feasibility and sustainability of a project. The instrument is useful for identifying a project goal, purpose and outputs, and for planning activities and inputs. (Örtengren, 2004) . These studies, conducted in classroom and Moodle learning environments, were followed by a one-day simulation-based training, which was led by two lecturers or facilitators. The purpose of the simulated scenarios was to learn to identify and cope with challenging project situations. A translation of the instructions for the two scenarios can be found in Figure 1 below.

[Figure 1]

The participants were first given an overview of the simulation method. The importance of a confidential atmosphere was emphasized. The learning objectives of the two scenarios were discussed, and the participants were assigned active and observer roles. During the action, the role of the observers was as follows: to identify challenges involved in project planning and to observe the interaction and methods used in enhancing partner motivation and commitment (scenario 1) and to pay attention to the project closure and to interaction and challenges resulting from the project manager's absence (scenario 2). The simulation experience was followed by debriefing or a facilitator-led discussion on the scenarios, challenges and solutions. Each actor described their action and experiences, and this was followed by shared reflection on the effectiveness of teamwork and interaction and on factors that may have contributed to the situation.

*Data collection*The participants' individual experiences were explored by means of a qualitative survey, conducted and analysed by the two lecturers in charge of the simulation-based training. The language of the survey was Finnish. All the 12 participants to the R&D Expert Coaching Programme took part in the simulation training day. Purposive sampling was, thus, used and all the participants were invited to contribute, based on their learning experience during the day. Participation was

voluntary and based on informed consent (Burns & Grove, 2009). The participants were asked to write an essay as a response to two open questions:

(1) How helpful was the simulated project situation as a learning experience for you?

(2) In your opinion, how can simulation be used to teach project work?

x The participants were given 60 minutes time for this task directly after the debriefing discussion. They were instructed to freely elaborate on their experiences, but to use full sentences if possible.

Data Analysis

Inductive content analysis was used to analyze the data. One investigator undertook this task, while the other provided views and comments on the results of the analysis. In other words, the other researcher also looked into the material and commented on the analysis. This was followed by a discussion on the results and on the best way to describe them (Graneheim & Lundman, 2004; Elo & Kyngäs, 2008). The material consisted of 12 pages of text (Times New Roman, font 12, double spaced). After reading the material several times, phrases that seemed to represent an answer to the two research questions were written and then rewritten as reduced expressions into separate word documents. Expressions with similar contents were gathered under sub-categories and given names which were illustrative of their contents. In further abstraction, sub-categories with similar contents were grouped into generic categories. Finally, a main category emerged that combined these generic categories. To ensure the consistency of the coding process, the investigator repeatedly returned to the respondents' contributions. The various stages of the analysis were also presented in tables and reviewed by the other investigator.

Ethics and Reliability

Although simulation as a pedagogical method has been gaining greater emphasis over the past years, there is still a need for further studies. The topic selected can be considered salient. National and international guidelines on research ethics and good scientific practice were observed during the research process (TENK Finnish Advisory Board on Research Integrity, 2012). Obtaining research permission was not necessary, as the target group members were participants in a national coaching programme run jointly by the Universities of Applied Sciences. Participation was voluntary, based on information provided both orally and in writing. The participants were told that they could withdraw at any stage of the process. They were also informed that the data would be destroyed directly after the analysis. Participants' identity was protected and they answered the questions anonymously (Burns & Grove, 2009).

In order to ensure the transparency of the analytical process and to increase the credibility and confirmability of the results, the investigators paid attention to careful description of the research process. Quotations from participants and illustrative tables were included to support the findings (Graneheim & Lundman, 2004).The investigators believe that the representation of the data reflects participants' experiences of simulation-based learning. The observations made by the investigators during the simulation day were in accordance with the results.

Reflexivity, or recognition of the influence of personal biases, was also discussed during the process (Graneheim & Lundman, 2004). Owing to their earlier experience of using simulation pedagogy in teaching, the investigators possessed some prior understanding of the topic. The same professionals

acted as facilitators in the scenarios and as investigators. Nevertheless, an effort was made to ensure that the analysis remained data-driven (Holloway & Wheeler, 2010). Bias was reduced by that fact that none of the participants worked in the same institutions as the investigators, or was well-known to them. The investigators were thus better able to approach both the scenarios and the essays with a neutral attitude. Last, attention was paid to the issue of transferability (Graneheim & Lundman, 2004). During the research process, the investigators considered the applicability of the concepts and simulation method to the various fields represented by the participants. Despite their different backgrounds and work histories, the participants agreed that the simulation coaching was relevant and useful to their specific area of expertise .

Results

The Simulated Project as a Learning Experience

(Insert Table 1 here)

The first question to the participants of this study concerned their views on the simulated project situations as a learning experience. Table 1 shows the main, generic and sub- categories that emerged as a result of inductive content analysis. The main category was named a *multi-level learning experience,* and the two generic categories under it were named *learning project work skills* and *dialogical sharing.* In the sections that follow, the findings from the two generic categories will be discussed in more detail. Where relevant, illustrative translated quotations from the data are included. The quotations have been translated from Finnish into English by the authors.

Generic category 1: Learning Project Work Skills

In their essays, the participants described the multiprofessional simulation as an interesting and educational experience. The scenarios had felt authentic and encouraged participation. The participants expressed a wish that a greater amount of simulation-based teaching were integrated into the R & D Expert Coaching Programme in the future. One participant said, for example,

"The simulation teaching nicely encouraged participation, everybody had a change to participate and to observe, too."

The participants' learning experiences were characterized by the reflection and processing of the challenges involved in project work. The scenarios seemed authentic and "full of life", which facilitated the recognition of challenges and caused the participants to reflect on the skills, knowledge and attitudes required in project work. In the words of two other participants,

"Simulation made me think of how various the challenges can be in project work."

"Simulation gave me ideas about how to cope in project work and what abilities and skills are needed"

According to the results, the simulated situations helped the participants understand challenging project situations more profoundly. These insights seemed to involve problems related to group dynamics and different opinions and views. As two participants said,

"All those observations helped me understand challenging situations in project work."

"Simulation helped me recognize what it is about project work that irritates me, it opened a psychological window to project work."

The participants found it useful to have different perspectives on project work presented and commonly reflected on. The simulated scenarios involved situations that were similar to their earlier real-life experiences during various projects, which stimulated discussion on challenging situations and made it possible to search for alternative solutions. The simulation coaching was experienced as "peer work supervision". The quotations below are from two participants:

"We had a very realistic example of a working life situation, I had a similar situation once in project work."

"Both the participant and the observer can relate to old/current/future project events and so they can even find models how to approach/solve the situations and problems"

Another important aspect of the participants' learning experiences involved giving attention to the project worker role and letting go of the role. Taking on the role of a project worker in a simulated situation was considered important but demanding, and it rendered the learning situation genuine. As the participants became fully immersed into their roles, debriefing and letting go of the role were considered essential. After being instructed by the facilitator to come out of the role, a participant had an opportunity to scrutinize the learning situation more objectively. The role was experienced strongly, both intellectually and emotionally. Below are some original comments from three participants.

"My role acting a project worker was challenging."

"Stepping into the role was a demanding experience."

"Letting go of the roles is a must, they really get under your skin."

The participants did not present many improvements. One person suggested allowing the participants create their roles during the scenario, instead of relying on predefined roles. Otherwise the scenarios were appreciated as realistic and helpful for avoiding pitfalls in project work.

Generic category 2: Dialogical Sharing

The possibility of presenting and bringing together various perspectives was reported as a meaningful learning experience during the simulation coaching. The participants found the debriefing discussion the most important stage of the sessions. They felt it offered them space to share experiences and open up different perspectives. During the debriefing discussions, the participants became aware of the importance of articulating differing perspectives and opinions in project meetings. Even the value of opposing opinions was recognized as stimulants to discussion and critical reflection. The participants said, for example,

"Bringing up the perspective that all perspectives and opinions are needed, that was good."

"The usefulness of having opposing opinions in a project meeting became clear."

Reaching a synthesis together from time to time during the process was also appreciated as an important learning experience. A synthesis was found to provide an overall picture of progress made and to help the project manager and workers keep the project in control. As one participant put it,

"Regular recapping of the issues and making a synthesis during the discussion is important."

The Simulated Project as a Teaching Method

(Insert Table 2 here)

The second question that was put to the participants of this study addressed their attitudes towards the simulated project situations as a method of teaching project work. The participants stressed the concrete and authentic nature of the simulation-based pedagogy. Table 2 lists the three generic categories, their sub-categories and the respective reduced expressions that were the result of the inductive content analysis. According to the participants of this study, simulated projects can be useful in *strengthening individual project work skills,* in *promoting collegial project work and* in *coaching new project workers.* The three subsections below describe the analysis findings in more detail.

Generic category 1: Strengthening Individual Project Work Skills

According to the participants, simulation pedagogy could be used to strengthen individual project work skills. Its potential in practising challenging situations was mentioned in particular. For example, simulation allows the construction of scenarios, which illustrate problematic points in project work or represent various project meetings. To quote two participants,

"The simulated situations can give you an idea of the difficulties involved in project work."

"Surprising situations could be injected into the scenarios."

Secondly, simulation was considered to be effective in learning project roles and improving interaction skills. The various roles assigned to the participants during scenarios, whether as active members or as observers, offered them an opportunity to examine factors that seemed to influence the interaction. According to the participants, simulation makes it possible to alternate between project roles to look at the situation from different perspectives. It can also help gain insight into the position of other project workers in a real-life situation. It was suggested, for example, that simulation could be used for practising project management roles or dealing with group dynamics, especially when different temperaments seem to "clash". To quote three participants,

"The various project roles give you skills and an ability to look at things from a different perspective."

"The various project roles disclose issues that should be taken into consideration in interaction in project meetings."

"It is always good to prepare for the situations in project work, simulations can help practise having various discussions and managing a project meeting."

Simulation was also found to be helpful in gaining an overview of the project process. In other words, the simulated scenarios facilitated the understanding and practicing of the various project stages. In the participants' experience, simulation can help present the progress of a project swiftly, in a concise form. The participants pointed out that a project manager, especially, should be conscious of the essential tasks involved in each stage of project, so as not to lose the "main thread". An overview of the project process was regarded as necessary to reach the project goals,

and simulation-based training was considered an excellent tool for learning the relevant skills. In the participants' own words,

"This simulation showed the overall picture and the process with all the stages."

"Simulation learning is especially suitable for those who work as project managers."

"A good toolkit as a method for all those who teach project work."

Simulation pedagogy was seen to promote professional growth, because it helped the participants become aware of their personal development needs in project work and interaction. Participants thought that the close-to-authentic situation and the encouraging atmosphere created by the simulation facilitators helped the participants relax and gain both theoretical and practical project work skills, as well as confidence in their competence. The quotations are from three participants:

"Also gave me some ideas on how to improve my work with projects."

"When you can practise and learn project work in a safe environment, you are stronger in the real situation, you pluck up courage to act in a project."

"My meta-skills were developed."

Generic category 2: Promoting Collegial Project Work

Besides strengthening individual project work skills, simulation pedagogy was found to promote collegial project work. According to the participants of this study, learning by simulation might decrease competition between organizations and promote collaboration between professionals.

The debriefing discussion, especially, was emphasized as an excellent opportunity to share experiences. It was considered the most important phase of the simulation coaching process. In their projects, the participants had often experienced a lack of support when faced with problematic situations, so they welcomed the opportunity to reflect on their experiences together. Hearing examples of various cases and sharing one's experiences were considered "educational" and useful as a form of peer support. The debriefing discussions came close to representing supervision work. One of the participants said,

 "A good foundation for a discussion, which enabled and activated us to make observations and to present different perspectives",

while another said,

"The dialogue that emerges around the simulation session is good."

Simulation teaching was also seen as a good method of developing action. The participants, who represented different universities of applied sciences, found the simulation coaching an excellent opportunity for benchmarking, collaborative development of ideas and general development of action. According to the participants, the simulation sessions were conducive to an initial idea-activating -type of activity, or generation of ideas together. It was suggested that simulation might be useful at the ideation stage of a new project, when the project workers gathered together for the first time. The quotations represent four participants.

"A good method as a platform for the development of new ideas."

"When new things are presented in scenarios, they improve and develop action."

"One person could take the role of documenting new ideas, another person could write down threats and risks. Somebody could write down issues according to a SWOT analysis, some observer of a scenario."

"How to integrate RDI projects into teaching. Together with project workers, teachers, students, and curriculum developers. You could get ideas for how to do it and anticipate pitfalls together, but also discover good and effective practices."

Generic category 3: Coaching New Project Workers

Finally, simulation was appreciated as a method of coaching new project workers. As an action-based and participatory method, participants felt that it was found to promote remembering and in-depth learning. Using simulation to develop the mentoring skills of experienced project workers was also suggested. Participants said,

"You learn by doing and acting, it is easier to make things stick in your memory."

"A good, concrete way to learn project work, it also suits inexperienced project workers."

According to the participants, simulation-based coaching might be useful in improving new project workers' ability to endure stress. Practising demanding situations, especially in terms of how to deal with challenges in group dynamics, was mentioned as an example in this context. To quote two participants,

"It might be useful to use simulation to practse being a project manager, for example in a situation, where one of the project workers turns out to be too lazy to do their duties. The facilitator of the scenario could take the role of the challenging project worker, and the new project worker could play the part of the project manager."

" It could work as an exercise that increases new project workers' ability to endure stress."

Discussion

This study reports university lecturers' experiences and views of simulation as a method of learning and teaching project skills. The twelve participants on the national Research and Development Expert Coaching Programme found simulation to be a multi-level learning experience. On one hand, they felt that the scenarios helped them learn concrete project work skills and on the other, they had an opportunity for more abstract learning and reflection during debriefing discussions. The participants found simulation an authentic, tangible and effective way of learning project work.

At the more practical level, simulation was found to be useful in gaining an overview of the entire project process, including the various project stages and roles of the participants. Earlier research has also confirmed that simulation enables preparing for project work by looking into various roles to gain an overall picture of the work (Strygacz & Sthub, 2018). In this study, the participants highlighted the importance of reaching a synthesis for each project stage to keep all project workers updated throughout the process. Secondly, in this study, simulation was found to be helpful in practising interaction and challenging situations in a safe environment. It has been suggested in other research that having multiprofessional teams learn together by means of simulation can help cross professional borders and result in better collaboration and communication (Tervaskanto-Mäentausta & Vanhanen, 2016; Kokko, 2016; Morisette et al., 2017). The importance of a near-authentic and safe learning environment in practising complex situations has been emphasized in earlier studies as well (Salas et al., 2009; Hansen & Bratt, 2015).

Besides learning actual project work skills, the participants in this study appreciated dialogical sharing and reflection during the debriefing discussions. This is related to the conviction that learning is based on successful integration of experience and reflection (Salas et al., 2009; Decker et al., 2013). Exposing oneself to different perspectives was considered to be beneficial for learning, and simulation was found to contribute to professional growth and learning of meta-skills, which can be claimed to be essential in project work. Similar results have been reached in earlier literature, too. For example, simulation pedagogy has been found to promote professional growth (Bradley, 2006; Berragan, 2013) and the debriefing discussions have been referred to as the most significant phase in simulation-based learning (Issenberg, McGaghie, Petrusa, Lee Gordon, & Scalese, 2005; Fanning & Gaba, 2007). It has been confirmed that the simulation method, combined with reflection, can be effective in learning problem solving and other meta-skills (Burton & Hope, 2018). It also provides a platform for teaching staff, students, project workers and clients to share ideas and information (Salas et al., 2009; Kelly, Berragan, Husebø, & Orr, 2016).

At its best, simulation can contribute to mutual appreciation and sharing of knowledge, skills and values between professional groups (Salas et al., 2009; Bridges, Davidson, Odegard, Maki, &Tomkowiak, 2011). It can even result in innovative solutions, as suggested by some respondents in this study (cf. Sirkka, 2013). To sum up, the results of this study suggest that simulation-based learning can promote both individual and collaborative project work competence. According to the participants in this small scale study, the method was considered suitable for orienting and supporting new project workers, but also for more experienced professionals. This echoes and resonates with other findings and experiences (Burton & Hope, 2018; Sirkka, 2013).

Limitations

x As the sample size was small and the study involved only two simulation scenarios, the results cannot be generalised to other situations. On the other hand, this is a qualitative study, in which a careful analytic description of participant experiences with all the relevant nuances and variations is essential. The participants represented both men and women, and various geographical and educational backgrounds. This in-depth analysis may offer important insights to other professionals working in this way. In future it might be fruitful to involve the participants as co-collaborators in helping to design new simulation-based tasks or use the participants' experiences to inform the design. This simulation coaching approach could also improve collaboration in international and multicultural research and development projects.

Conclusion

Project management skills and other project work skills are important for any industry or public organization.
Our small, in-depth study of rich data suggests that simulation-based education can be used to promote the project work competence of new and more experienced project workers. The authors believe that the method could be useful and have potential in teaching project work in various educational institutions. It is likely to be suitable, we suggest, for both initial, higher and continuing education in various fields.

Declaration

The authors declare that they have no competing interests.

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