Experiences with the use of simulation as transfer strategy[[1]](#footnote-1)

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**Summary**

In this article, we ask: Is simulation suitable as a learning activity when specific practices are thought to be trained and transferred from a simulation context to a specified application context? To answer this question, we present experiences from three individual cases where various forms of simulation were used as a transfer strategy.

The material from these three cases shows that several factors of the simulation and transfer contexts have an impact on whether the simulation is suitable as a transfer strategy. This applies particularly to factors such as context similarity, overlapping tasks, emphasizing of the borderline between the simulation context and the application context, and the extent to which the application context invites the use of experience gained in the simulation context.

**Introduction**

Simulation can be an effective learning activity and is used in both vocational and professional education programs. In this article, we are not primarily concerned with *learning* in the simulation context. Instead, we want to present findings from three cases and discuss how effective simulation acts as a *transfer strategy* when *practice[[2]](#footnote-2)* is to be transferred from a simulation context to an application context.

**Simulation**

The term "simulation" is perceived by many as synonymous with the use of technology. Pedagogical use of simulation is, however, not a technology in itself, but a technique for organising learning activities ([Gundersen & Aareskjold, 2012, s. 262](#_ENREF_18)). Simulation, therefore, means "the act of mimicking a real object, event, or process by assuming its appearance or outward qualities" ([Reznek 2004, s. 27](#_ENREF_36)). To simulate reality, thus, requires that participants experience a certain degree of realism in the design of the setting, interaction or artefacts related to the application context, so that potential situations can be understood and handled more quickly when they arise in the practice field after the simulation activity ([Aldrigde 2012](#_ENREF_3); [Cant & Cooper, 2010, s. 4](#_ENREF_7)).

Using simulations can, thus, tie together the distinction between the theoretical “knowing that” and the practical execution, “knowing how” ([Crookall & Thorngate, 2009](#_ENREF_9)) and can, in many contexts, develop a deeper understanding of how theoretical concepts work in domain specific practice ([Boe & Jensen, 2008](#_ENREF_5)). The learner is motivated to engage in problem solving and hypothesis testing and can develop experience, mental models and meta-expertise within the relevant professional field ([Boe & Jensen, 2008](#_ENREF_5); [Lunce, 2006, s. 37](#_ENREF_30)).

Based on relevant literature, four relatively different forms of simulation appear. The central element (hub) of the simulation activities are often linked to the use of models and artefacts, simulators, computer-based gaming technology or role play ([Aldrich, 2005, s. 4-5](#_ENREF_2); [Husebø & Rystedt, 2010, s. 155](#_ENREF_21); [Kaakinen & Arwood, 2009](#_ENREF_24); [Towne, 2007](#_ENREF_47)). The design of the simulation can mix these elements to varying degrees, but the main emphasis is often on one of the parts. The hub of the simulation activity is often related to:

**• Models and artefacts.** Use of models and artefacts for training serve different purposes. Models can *illustrate* a device or process, such as a gearshift system or a production process, while artefacts can be a central and interactive part of the simulation ([Brevik, 2007](#_ENREF_6); [Husebø & Rystedt, 2010](#_ENREF_21)).

• **Simulators.** Simulators are often highly sophisticated and designed to resemble, as much as possible, the work environment for which participants are trained. Simulators allow for creating and practicing for events that would have been too dangerous or too expensive to train on in reality. For example, cockpit simulators or management systems on an oil platform ([Komulainen, Sannerud, Nordsteien & Nordhus, 2012](#_ENREF_28))

**• Computer-assisted virtual reality.** Much of the literature on simulations is linked to descriptions of various forms of computer-based gaming applications where the outcome depends on the choices the participants make during, more or less, realistic scenarios. Simulation can, in this form, extend from relatively simple interactive spreadsheet simulations in economics education to complex forms of *serious gaming* where multiple participants play war games, strategy games or business games together or against each other ([Aldrich, 2005](#_ENREF_2); [Boe & Jensen, 2008](#_ENREF_5)).

• **Role-play simulation**. Role-play simulations can be described as a "practice for future events" and are used partly to challenge and change attitudes among participants and involve groups in active learning ([Aldrigde, 2012, s. 7](#_ENREF_3); [Nilsson & Waldemarson, 1988](#_ENREF_34); [Van Ments, 1994](#_ENREF_50)). The role play can have various functions, such as to illustrate a problem, demonstrate a technique, practise a skill, reflect or raise awareness of situations ([Van Ments, 1999, p. 46](#_ENREF_51)). The focus is more geared towards interactions between people than between people and artefacts, or people and computer technology.

Simulation is, thus, not only one kind of activity, but involves the use of various artefacts, learning activities and interaction contexts. We will return later to how simulations work as a transfer strategy, but first we will explain the transfer concept as used in this article.

**Transfer**

Traditionally, transfer means transferring and using something you have learned or experienced in one situation to another situation, which is somewhat different from the original situation ([Aarkrog, 2010, s. 19](#_ENREF_1); [Eraut, 2004, s. 212](#_ENREF_15); [Haskell, 2001, p. 24](#_ENREF_20)). Or more generally: "Prior learning affecting new learning or performance" ([Macaulay, 2000, s. 1](#_ENREF_31)).

In recent research, this traditional transfer perspective is questioned, and nuanced somewhat, by applying concepts such as transition, transformation and, not least, transcending learning, which emphasizes that interaction can occur from two sides ([Kilbrink, 2013, s. 8](#_ENREF_26)). In this article, we are still primarily concerned with the traditional meaning of transfer, given the desire to study participants' transfer of learning experiences from a limited training situation to a specified application context.

**Various forms of transfer**

Transfer is a multi-faceted concept with a variety of meanings ([Schunk, 2004](#_ENREF_40)). In this article, we emphasize so-called close or remote transfer, and whether or not the transfer activity is forward or backward oriented. Close transfer is understood as transferring more or less identical items between situations, contexts or practices. One can sooner talk about transfer of a bodily practice[[3]](#footnote-3) than the transmission of cognitive symbolic representations ([Tuomi-Gröhn & Engeström, 2003](#_ENREF_48)).

When situations, contexts or practices are not sufficiently similar for an automated form of practice to be transferred directly, the transfer depends on a more conscious abstraction and search for patterns, principles and connections that can establish a cognitive bridge between different contexts. Remote transfer is, therefore, more about the transfer of general knowledge and principles between situations, contexts or practices that seemingly do not necessarily have much in common ([Macaulay, 2000, s. 3](#_ENREF_31); [Perkins & Salomon, 1992](#_ENREF_35); [Schunk, 2004, s. 220](#_ENREF_40)). Specifically, this means that anyone planning simulation activities must establish a realistic *cognitive* representation of the application context if the goal is remote transfer, or a lifelike *physical* representation of the application context if the goal is close transfer (Goettler, Ashworth & Chaiken, 2007).

Both close and remote transfers can be forward or backward oriented. Forward transfer means a situation where the individual abstracts elements from the learning context and, through cognitive awareness, transmits this forward towards a potential transfer context, situation or practice. The potential for forward transfer occurs when the individual is proactive and establishes connections between what happens in the learning situation with potential knowledge, practical training or learning needs in the future. A backward transfer means that the individual abstracts conditions in the practice situation, looks back and handles today's challenges with yesterday's learning, practice or knowledge ([Keys & Wolfe, 1990](#_ENREF_25); [Schunk, 2004](#_ENREF_40)).

**Simulation as transfer strategy**

Our starting point for this article is that learning means *doing* and *experiencing*. It is through meeting with "things" that we form an image of the world around us. Experiencing, therefore, involves two elements, one active and one passive. The active element involves action – to try. The passive element involves the consequences of action – to be exposed to. We're doing something with the object, and then it does something to us. The quality of the experience is determined by how conscious individuals are of the connection between these phases ([Dewey, 1996, s. 53](#_ENREF_11); [Jarvis, 2002](#_ENREF_22" \o "Jarvis, 2002 #431); [Kolb, 1984](#_ENREF_27)). Without the concrete experience, learning can be incomplete and external. Something that does not affect life. To embody experiences through concrete experiences, however, affects life in the sense that the entire body of emotions is involved in learning, not only the cognitive processes ([Grendstad & Sandven, 1986](#_ENREF_17)).

That claim that simulation of practice can function as a transfer strategy between the education and application contexts is based on an increased interest in more bodily and sensual forms of knowledge ([Jensen, 1999, s. 8](#_ENREF_23)) and an understanding of the benefits of embodying skills so that participants can release their cognitive capacity in order to manage emotional factors like stress, uncertainty and low self-esteem in a complex and confusing beginning phase ([Berger & Luckmann, 2000](#_ENREF_4); [Ellström, 1996, s. 35](#_ENREF_14)). In that regard, it is important that the simulation context is as identical as possible to the application context, so that the learner recognizes applicable situations and associates certain procedures relating to these ([Goettl et al., 2007, s. 99](#_ENREF_16)).

If the participants have already gained experience with complex situations through simulation activities, they will have developed a certain repertoire of practices and action alternatives before they start their practice. The participants are, therefore, no longer beginners, but "advanced beginners" with greater potential for both reflection-in-action and reflection-on-action ([Dreyfus, Dreyfus & Athanasiou, 1988](#_ENREF_12); [Schön, 1987](#_ENREF_41), [1995](#_ENREF_42)), so that they can deal with potentially complex situations. The beginners’ context-free "know-that" is replaced by a certain "know-how" ([Ryle, 1984](#_ENREF_37)) in that they have acted and had experiences through "meeting the consequences" in the simulation. They are not yet competent, but have gained a form of expertise.

The question is whether further simulation is an effective transfer strategy in all contexts, and potentially which factors inhibit or promote transfer between a training context and a practice context in which simulation is used as a learning activity.

**Methodology and description of the cases:**

The empirical data has been extracted from three different cases. By *case*, we refer to "a bound system"; for example, an (educational) programme or training system, where there is a short distance in time and space from the training activity to a current practice field ([Creswell, 2007, s. 73, 78](#_ENREF_8); [Stake, 2005, s. 444](#_ENREF_44)). The case studies have phenomenological aspects, in that they describe the participants' subjective experiences with a concrete concept (training) or phenomenon (transfer) in relation to different contexts ([Creswell, 2007, s. 57](#_ENREF_8)). Each of the cases described in this paper consist of a limited training sequence, where simulation is used as a learning activity, followed by a practical implementation of what has been rehearsed through the simulation in an adequate practice field for the participants.

*Case 1 - simulation of platform-specific work processes in the oil industry*

The first case study was conducted as a quantitative survey by Komulainen and Sannerud in the oil and gas industry on the Norwegian Continental Shelf (Komulainen et al., 2012) from October to December 2011.

The aim of the study was to investigate how simulators are used in the Norwegian oil and gas industry and key factors for appropriate use of simulator training within the industry, particularly with regard to economic and environmental benefits and experience of coping.

An electronic questionnaire was prepared, which was electronically distributed to approximately 250 simulator users in the oil and gas industry on the Norwegian continental shelf, where the respondents could answer online from their PCs. The approximately 100 people (40%) who responded to the questionnaire represented professionals such as operators, instructors, automation engineers, process engineers, system administrators, managers and operations managers in a variety of businesses. Most participants had more than 10 years’ experience from the oil industry, and all had experience with simulators.

The empirical material was analyzed based on, among others, social and economic benefits, productivity and safety, work environment, and what characterizes good simulator training.

*Case 2 - simulation of "conflict in urban areas" at the Norwegian Defence University College*

The second case study was conducted in autumn 2010 at the Norwegian Defence University College (NDUC), where part of the cadet tactical leadership training was conducted using computer-based simulation games ([Boe & Jensen, 2008](#_ENREF_5); [Skarpaas & Kristiansen, 2010](#_ENREF_43)). The purpose of this pilot study was to examine how cadets who simulated "conflict in urban areas" using computer-based combat games (VBS2), transferred experiences from the game to a "tactical exercise without troops"[[4]](#footnote-4) in Lillestrøm.

In this case-study, the group was split into two. Half of the cadets conducted the tactical exercise in Lillestrøm *first*, and completed their training with the computer-based simulation game at NDUC. The second half of the cadets conducted a computer-based simulation at NDUC *first*, and then the tactical exercise in Lillestrøm. The question was whether the cadets who had simulated conflict in urban areas using a computer simulation before completing the tactical exercise verbalised, visualized or planned an attack in Lillestrøm differently from cadets who had not simulated conflict in urban areas before they were in the field.

The empirical material was collected through eight individual interviews, with two cadets in each group, a total of four cadets. Cadets who participated in the survey were selected by a group who volunteered after a request from the group leader. None of the cadets knew each other in advance. The interviews were summarised and analyzed based on recordings ([Kvale, Brinkmann & Torhell, 2009, s. 212](#_ENREF_29)).

*Case 3 - simulation of a teaching model in the teacher training programme in restaurant and food processing at Oslo and Akershus University College of Applied Sciences(OAUCAS)*

This case study involves six third-year students from the three-year study programme in restaurant and food processing at OAUCAS. These students simulated the implementation of a five-step didactic teaching model ([Sund, 2005, p. 201](#_ENREF_45)) for how a school-based vocational training may be interest-differentiated[[5]](#footnote-5) and professionally anchored[[6]](#footnote-6) to increase student motivation and vocational skills ([Dahlback, Hansen, Sund & Sylte, 2011](#_ENREF_10)).

The simulation was completed as a role play during approximately 14 days from mid-January 2012. One of the students played a vocational teacher and led a real training of the five other participants, who played students. During the role-play period, the "teacher" led the teaching, practice monitoring, student presentations and assessment of the "students’" tasks based on the five-step model of Sundt (2005). All the "students" had role cards where they played various student roles, participated in the teaching, conducted practices in companies outside their own field, wrote an essay that the "teacher" assessed, and presented tasks for the "teacher" and for each other.

The rol- play simulation was completed without organized reflection breaks during the period. Reflections on learning, and the students’ evaluations of the role-play simulation as a learning activity, were conducted right after the role play simulation was completed at the end of January.

After the role-play simulation, all the students conducted an interest-differentiated training sequence based on their chosen vocation with students in the education programme Restaurant and Food Subjects (RF-subjects) as part of the compulsory educational practice in the study.

The study was oriented towards how the students conducted this training sequence with RF-students in the first and second year, and what experiences the students believed to have transferred from the role-play simulation to teaching in their practice. Interviews with all six participants were completed in mid-March 2012.

In addition to the interviews in March 2012, individual interviews were also conducted with the same six students in November 2012, to investigate the extent to which interest-differentiated vocational anchoring had become an integral part of their teaching repertoire after they started working as vocational teachers. Special emphasis was laid on whether any transfer of learning experiences from the role-play simulation to their study period had been experienced.

A first (initial) analysis of the material has been carried out ([Saldaña, 2009](#_ENREF_38)). The results presented in this article are based on this analysis.

**Summary**

The cases in this article are taken from different contexts at different times, but common to them all is that different forms of simulation are used as a transfer strategy to transfer learning experiences from a training context to a specified application context.

Some weaknesses can be mentioned. In case 1, the percentage response rate was only 40. However, the 100 people who responded represent all the occupational groups that participated in the survey and, therefore, provide a relatively representative picture of platform employees’ perception of how simulations are perceived as a learning activity to promote daily work skills.

In case 2, the question of bias may be posed when the sample consists of four volunteer participants. That precisely these four were chosen is still relatively random, since there were approximately 8-10 cadets who volunteered at the request of the group leader. Of these 8-10 volunteers, the four who sat closest to the interviewer were selected. It is also important to note that when the empirical data from this pilot study are based on four respondents, it is not necessarily representative of the entire cadet group's overall opinion. It may, nevertheless, indicate how cadets experienced the use of game simulators to train for "conflict in urban areas".

**Results**

Based on the analysis of the data, we will point out what we consider to be particularly important factors for transfer of learning from the training context to the application context in these three cases.

*Case 1 - simulation platform-specific work processes in the oil industry*

Over 80% of the respondents believed that the use of a simulator on their offshore platform or facility was a suitable learning method in relation to the transfer of learning to their "daily work". Key factors for successful simulator use were: maintained and updated simulator models, good instructors, systematic simulator organization, and facilitation of simulator training. Specifically, they express that simulator training:

• Improves my understanding of the process and makes me more confident on operation of the process (84%)

• Enhances my ability to handle the process (81%)

• Makes me more confident and comfortable in my daily work (71%)

Most operators identified several advantages of simulator training. They claimed to have gained better understanding and greater confidence to operate the installation safely. Furthermore, they claimed that they had become better at dealing with disruptions and that they were more confident and comfortable in their job, not least because they felt able to handle potential critical situations. Other participants (non-operators) found that the greatest benefits of simulator training are shortened time to start of production, reduced operational risk, high production efficiency, and increased safety and environmental awareness.

The survey results show that participants in the simulation experienced a high degree of transfer from the simulation activities to their daily work – not only when it came to normal procedures, but also for handling potentially unforeseen and critical situations. The success criteria for transfer implies, in this context, that the simulation artefacts and activities are, and are perceived as, so similar that participants can "move" work processes and practices directly from simulation to their daily work. This is a typical example of a close transfer strategy where the employer facilitates, and invites, transmission of identical items from a training context to an application context.

*Case 2 - simulation of "conflict in urban areas" at the Norwegian Defence University College*

Based on the material, it is difficult to document any connection between the order of learning activities and how the cadets at NDUC solved their assignment. The material does not indicate that the cadets who simulated conflict in urban areas in advance transferred any learning experiences from the computer-based game simulation which had significance for their implementation of the tactical exercise without troops.

Cadets point to several reasons for the lack of importance of the simulation activity. Firstly, the cadets experienced several technical computer annoyances in the game simulation, especially when it came to managing the troops. This meant that the game lost relevance and became only a technical data activity without a link to the upcoming mission. Cadets also explained the low degree of transfer from the game simulation to the application context by the fact that the simulation used Tromsø and not Lillestrøm as the practice area. The geographical context was, thus, different and was not seen as relevant to the later tactical practice in Lillestrøm. This may seem like a small detail, but it illustrates how important experience of relevance and context is for transfer after simulation activities. Although the game simulation ended with an "after-action review", the material does not indicate that the game simulation developed either embodied competence or "cognitive bridges" that had significance for the cadets in the practical application context in the field. In the absence of structured help for reflection and border crossing during the game simulation, it was up to the cadets themselves to transfer relevant experiences. In the absence of both identical elements and structured assistance to help with border crossing through reflection and abstraction, this game simulation became an activity that did not contribute to either close or remote transfer.

The fact that the cadets were not invited to any form of backward-oriented transfer by the leader of the tactical practice without troops, may also help to explain their lack of transfer. The game simulation and tactical practice were perceived as two activities without a direct relationship, not as a comprehensive learning process. In the absence of such an invitation to backward-oriented transfer, the cadets instead used what they called "gut feeling" and reorganised previous strategies for conflict in the forest when they were conducting a, for them, new activity, which was conflict in urban areas.

*Case 3 - simulation of a teaching model in the teacher training study programme for restaurant and food processing at Oslo and Akershus University College for Applied Sciences*

In this third case, the situation is more complex and results are more divergent than in the preceding cases, in that the *roles* played by the vocational teacher students in the role-play simulation seem to have a major impact on the extent and form of transfer.

The student who played a teacher in the role-play simulation showed a far greater degree of transfer than the students who played pupils. Unlike the "students", the "teacher" verbalised explicit forward-oriented transfer in the interview after the simulation, by expressing the importance of concrete experiences from the role-play for their future practice as a vocational teacher. The "teacher" also implemented more parts of the didactic five-step model, both in the educational practice period right after the role-play simulation and in their teaching repertoire as vocational teacher, than the "students" in the rope play did.

A clear feature of the interviews after the role-play simulation is that the "students" placed, perhaps due to lack of relevant *learning tasks* in the role play simulation, more emphasis on the need for organized reflection breaks during the role play simulation so that they could get more out of the simulation. Where the "teacher" could learn from reflections on their *own* specific practices, the "students" did not have the same opportunity since no structured assistance, to make the *student experience* in the role play simulation relevant for later teacher work, had been organized. The "Students", therefore m – due to lacking transfer of specific experiences, put more emphasis on the fact that they had used some of the *principles* of interest-differentiation in the field of practice, but that these principles were not necessarily built on experiences from the rol- play simulation.

An interesting feature of this case is the importance of school culture for transfer of interest-differentiated vocational anchoring as a teaching method from the teacher-training program to the practice field. When the students, after the role-play simulation, carried out an interest-differentiated vocational anchoring with RF-students as part of the educational practice in the study period, they experienced that the teacher and their surroundings were positive to the testing of this new form of teaching method because they were students. This changes after the students have been hired as vocational teachers. There is a clear correlation between the role the students played in the role-play simulation and how difficult it is for them to implement interest-differentiated professional anchoring in school cultures where this philosophy is not known as a teaching method. The "teacher" used concrete experiences from the role paly simulation, experienced greater expertise and got more room for maneuverings in the school culture. The "students", on the other hand, experienced lower skills, less autonomy and greater cultural constraints in carrying out interest-differentiated vocational profiles as part of their teaching repertoire.

This may be a result of chance, but the material is so unambiguous that it may seem as if the experience of leeway, and thus greater implementation capacity, is linked with the role in role-play simulation.

In summary, it seems that experiences that the "teacher" gains in the role-play have a direct impact on the subsequent choice of action in the field of practice, while the experiences of "students" in the role playing simulation are of less importance for later practice. This may be because the students in the role-play simulation are having *student experiences* while the teacher in the role play simulation has *teacher experiences*. To transform student experiences to teaching skills does not just happen automatically.

**Summary**

The results show that the use of simulation activities is not necessarily an effective transfer strategy in all contexts. Organized use of simulation activities in the oil industry proves to be a very effective transfer strategy, because there is a large degree of identical elements between the activities in the simulation and work in the application context, in addition to the training and application context being integrated. In case 3, we see the same issues, where the student who played a teacher in the role-play has a greater degree of transfer than the other students, who played students. In cases where the participants experience a small degree of overlap between the activities in the simulation activity and in the application context, it drastically reduces the effectiveness of simulation as a transfer strategy, as partly shown in case 2 and among the students who played students in case 3. This is particularly the case where the application context does not invite the use of experiences made in the simulation.

**Discussion**

In the discussion about the use of simulation as a transfer strategy, we focus on the importance of context similarity, overlapping tasks, reflection breaks during the simulation activities and how the application context invites use of activities trained in the simulation context.

**Factors in the simulation activities – context similarity and overlap**

The findings in these three cases show that the shape of the simulation activities can have large or small significance for participants’ transfers of learning experiences from the training context to the application context. Some simulation activities rehearse practices that participants transfer, so to speak, directly to the application context and integrate into their practice. Other forms of simulation activities have little impact on subsequent practice. Simulation activity is, in some cases, only an activity and does not leave traces.

What participants *do* in the simulation is, therefore, important. It may seem as though it is of great importance that the participants experience the context and activities in the simulation, as similar to the application context as possible. If the simulation is to be significant for later practice, activities must preferably be overlapping so that identical elements can be transferred. Participants must *do* the same in the simulation as they do in the application context, so that they not only develop general skills, but increasingly develop a concrete and skill-based practice in the same way as in sports, where relevant practice makes perfect ([Haga & Sigmundsson, 2005](#_ENREF_19)).

It is crucial that the simulation is realistic, but this also applies to the *phases* in the skills development. Lifelike simulation may work best when existing skills will be further developed and transferred to the practice field ([Goettl et al., 2007, s. 98](#_ENREF_16)). This might explain some of the transfer variation in the cases, particularly in cases 1 and 2.

The transmission of identical elements can be both forward- and backward-oriented close transfers. Forward-oriented transfers are those where the participants gain experiences that they themselves see will affect later actions in the application context, and backward-oriented are when the participants refer to the experiences of the simulation when planning or implementing actions in practice, as seen with the "teacher" in case 3. The point is that experience gained in the simulation, is perceived as real and relevant by the participants. They get a sense for practice in the application context, either as a basis for reflection-on-action or reflection-in-action.

This leads us to the first sub-conclusion: Simulation may be suitable as a *close transfer strategy* of practice, given context similarity and overlap of activities, but it can be an advantage if the goal is further developing already existing skills.

*The way* simulations are carried out also emerges as crucial to the degree of transfer. Successful transfer is documented in those situations where simulation context and activities are perceived as relevant to later practice, and minimal transfer is seen where this is not the case. That does not mean that the simulation context and activities must be the same as the application context, but if the experience of relevance requires a mental imagination then it puts more demands on reflection, abstraction and "border crossing" between the simulation context and the application context, as we see with the "students" in case 3. When this is missing, it is difficult to track any kind of transfer, as we see with the "students" in case 3 and the cadets in case 2.

The second sub-conclusion is, therefore: If simulation activities and contexts are not overlapping with the transfer context, the "boundary crossing" requires a more cognitive approach to the organization of the simulation activity. Without such a didactic approach, we will argue that simulation is better suited for close transfer than remote transfer.

**Factors for the transfer context – invitation and building bridges**

Factors in the transfer context also prove to have a relatively large impact on the degree and form of transfer. Since the oil workers in case 1 are participating in simulation activities that are initiated, planned and implemented in close relation and understanding of the tasks in the application context, it is no surprise that there is a high degree of transfer. The simulation activities are overlapping and the transfer context invites to application afterwards in that it is the same organization that has responsibility for the application context, the simulation context and the work tasks to be practiced.

For the cadets at the Norwegian Defence University College, it is a bit different. Although it is the same organization that arranges both the tactical practice simulation activities, we believe that missing transfer is not only linked to a lack of reflection and "bridging" of the game strategy and the practice, but also how leaders of the practice invited the transfer of experience from the game simulation. There is nothing in the material that suggests that leaders of the tactical practice emphasized backward-oriented transfer. When the cadets did not experience forward-oriented transfer in the game simulation, it remains just an activity without significance for action in the field of practice.

The situation in the third case study is somewhat more complex because some of the participants show a high degree of transfer, while others show a small degree. What roles they played in role-play simulation proved to be of great importance. In addition, the importance of the individual school culture and openness to alternative forms of teaching must not be underestimated. Participants with good experiences from the role-play simulation and practice period managed to create a scope for interest-differentiated vocational anchoring when they were hired as vocational teachers after studying, although the surroundings were not inviting. Participants with more mixed experiences of their study periods are more influenced by the school culture and experience less leeway as vocational teachers.

It may seem as if the role play simulation initiates two different spirals; one good spiral, where it gave concrete learning experiences that were embodied and transferred directly to the applicable context in such a way that the "teacher" experienced mastery in the practice period and thus gained the confidence to create a scope for interest-differentiated vocational anchoring also after their appointment as vocational teacher. On the other hand, a negative spiral can also be seen where "students" had, in the simulation, experiences which were of little significance for the exercise in the practice period and, thus, led to a reduced willingness to use interest-differentiated vocational anchoring later when the school culture was not pronounced as positive. Little experience of mastery in the role-play simulation, thus, decreases the expectation and willingness to implementation – so that the participants follow the school code more closely, rather than manoeuver enough to integrate interest-differentiated professional anchoring in their teaching repertoire.

Sub-conclusion three: The extent to which use of the experiences from the simulation are desired, opened, and invited has great significance for how practice is transferred from simulation activities to an application context. With embodied, relevant skills from simulation activities, the perceived leeway, and thus, the implementation of simulated practice in the application context increases.

**Closing and some didactic consequences**

The transfer problem between education and the workplace is still a big challenge ([Wahlgren, 2009](#_ENREF_52)), yet we know that transfer of learning can be dramatically increased by manipulating both context and content ([Tuomi-Gröhn, Engeström & Young, 2003, s. 2](#_ENREF_49)).

The material from these three cases shows the importance of factors in the simulation and transfer context, on the question of whether the simulation is suitable as a transfer strategy.

Based on the sub-conclusions, we argue that:

• Simulation can be well suited as a close transfer strategy for transfer of practice, given context similarity and overlap of tasks between the simulation and the application context, but it can be an advantage that there are already existing skills to be developed further.

• If the context and simulation activities are not overlapping with the application context, it may be necessary to support the participants’ "border crossing" through stronger emphasis on cognitive strategies such as reflection and abstraction of learning experiences in the simulation. Simulation *can,* therefore, be suitable as a *remote transfer strategy,* but that puts greater demands on the didactic organization of simulation activities.

• The extent to which use of experience gained from the simulation is desired, facilitated and invited, has great significance for how practice is transferred from the simulation activities to the application context. Embodied, relevant skills from simulation activities increase the perceived leeway in the practice field and, thus, also the implementation of simulated practice in the application context.

That transfer is related to the transfer of identical items from a training context to an application context ([Thorndike & Woodworth, 1901](#_ENREF_46)) may not be surprising. What was surprising for us was how small deviations from what the participants experienced as relevant practice in a simulation context were of great importance for their transfer of practice to the application context. This means that although simulation activities are accurate, relevant practice is automatically transferred from a simulation context to an application context. When we look at the importance of interaction between factors in the simulation context and application context, it seems that a shift in transfer research with an emphasis on border crossing between activity systems would be a good tool for both learning and transfer ([Tuomi-Gröhn et al., 2003](#_ENREF_49)).

**Literature**

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1. This article is previously published in the Nordic Journal of Vocational Education and Training (http://www.nordyrk.org) (2013-5) [↑](#footnote-ref-1)
2. In this context, we understand practice as: "arrays of activity in which the human body is the nexus" ([Schatzki, Knorr-Cetina & Savigny, 2001, s. 2](#_ENREF_39)). [↑](#footnote-ref-2)
3. A bodily practice means that experiences become ingrained in one’s body as body forms. Practice is incorporated and becomes the bodily expression that "I can" ([Duesund, 1995, s. 32, 45](#_ENREF_13)). The social recording of the action is stored as "institutionalised expression" ([Nerheim, 1996, s. 317](#_ENREF_32)). [↑](#footnote-ref-3)
4. In this context, a "tactical exercise without troops" means that a group of cadets completes a physical movement through Lillestrøm together with a specialist trainer. During the exercise the group discusses, led by their trainer, various strategies for combat in a populated area. [↑](#footnote-ref-4)
5. Interest-differentiation means an educational differentiation where students with different career interests are working with the same learning objectives, but in different ways, depending on what professional skills are required for their preferred profession ([Nilsen & Sund, 2008](#_ENREF_33)). [↑](#footnote-ref-5)
6. The training is anchored in the professional practice of the subjects, more than in a general practice activity (ibid). [↑](#footnote-ref-6)