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Transfer Promoting Simulation in Education for High Technology Professions

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Introduction
The didactic strategy for teaching laboratory skills at the Faculty of Health Sciences, UCL University College, Denmark should in the future be based on real life simulation rather than just practical exercises. Programs such as Biomedical Laboratory Science and Radiography are both targeted towards high technology professions. The high-tech equipment can challenge simulation in the teaching laboratories when the equipment in these laboratories differs significantly from the equipment used in clinical praxis. This challenge can create far transfer. Far transfer occurs when actions must be transferred between two situations that are relatively different. Far transfer requires extra attention to the didactic approach, as students may find it difficult to identify identical elements between the two situations, which is necessary to create transfer. Therefore there is a need for changing the current practice in the teaching laboratory towards being more simulation based and include initiatives that support far transfer.

New learning activities is therefore to be linked to the current practical exercises in the teaching laboratories of the faculty by adjusting them to be more simulation based rather than just practical exercises.

Objective
The aim of this project was to develop a new didactic educational concept to increase transfer promoting simulation of the work of high technology clinical praxis performed in teaching laboratories. The educational concept was to be based on a didactic model accompanied by a guide for didactic reflections.

Method
Through a literature search, we located a relatively small amount of literature dealing with simulation in settings with far transfer due to a high technology profession. Due to the assemblage of literature focus group interviews with students from Biomedical Laboratory Science and Radiography were chosen in order to clarify challenges and possible solutions. The three elements of the concept have therefore emerged through the work with existing knowledge about simulation and transfer as well as the knowledge related to the students’ experiences. To operationalize the didactic model (the triangle), we developed an action-oriented reflection guide (the table) to support the teacher’s development of transfer promoting simulation. By combining the model and the instrument an action-oriented concept is obtained.

Choosing activities for making experiences
What key experiences are students expected to gain?
What activities would facilitate creation of these experiences?
Do the students have the relevant prerequisites for participating in these experience-creating activities?
Are there any disruptive elements that can remove focus from the core experiences that students need to acquire?

Fitting the professional setting
What setting from the profession reflects the experience-creating activities?
What high-tech equipment are used in the professional setting?
What are the differences and similarities between the professional setting and the experience-creating activities including technological differences?
How can the high-tech equipment from the professional setting be staged / displayed during the experience-creating activity?
What more than just the high-tech equipment is relevant from the professional setting?
How can the experiences-creating activities be contextualized so that they are perceived as real and believable?
What actions or objects can be used during the activity to promote transfer?

Identifying memorable reflections
What memorable reflections should link the activity to the professional setting?
What reflections can clarify the differences between the professional setting and the experience-creating activities?
What reflections can link the high-tech equipment in the professional setting to the technology in the experience-creating activities?
What reflections can put the experience-creating activities into a bigger perspective related to the profession?
How are the students’ implementation of the reflections ensured and structured?

The educational concept
We have developed an educational concept entitled Transfer Promoting Simulation. The educational concept is based on the interaction between “Making experiences”, “Professional setting”, and “Memorable reflections” as illustrated in the didactic model (the triangle). The concept is meant to increase the value of student learning when simulation is used as a method, in situations where the content is not directly transferable to the technology and workflow used in clinical praxis. The accompanying reflection guide (the table) is a toolkit to be used in adjusting existing practical exercises to achieve more simulation-based activities. One need not answer all the questions, but only choose those that seem relevant in the specific situation. Furthermore it is also important to bear in mind that the further along the students are the more they are able to reflect and go beyond the concrete action in the laboratory.

Examples of adjustments
A practical exercise in absorption photometry with first semester Biomedical Laboratory Science students. The exercise deals with analyzing copper sulphate solutions on a simple single beam spectrophotometer.

Adjustments:
- Making a case were the students pretend that the copper sulphate solutions are calibrators, controls, and patient plasma samples meant for albumin analyzing. The students have shortly before worked with albumin in their curriculum.
- The concentration of the calibrators and controls were fictively adjusted to fit the physiological level of albumin.
- As preparation the students watch a video about the equipment used in clinical praxis (Cobas 8000 clinical chemistry module)

A practical exercise in polymerase chain reaction (PCR) with fifth semester Biomedical Laboratory Science students. The exercise deals with analyzing CML-patients for the t(9;22) translocation.

Adjustments:
- To sharpening the students focus on the risk of contamination and how to handle it two approaches were made: Different areas of the teaching laboratory was assigned to a pre- and post-PCR area and the students were instructed to introduce errors in the procedure.
- Include reflections concerning the entire workflow from blood sample to the analytical answer this should strengthening the student ability to identify similar processes in clinical praxis.
- Emphasizing the differences in the process in the teaching laboratory to the more automated process in clinical praxis.

Literature

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