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Paper title: Technological literacy and innovation education - how new technologies changes and challenges the profession and the professional relationships
Theme: Learning inside and outside schools – bridging formal and informal learning
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Abstract:
Lately, in Denmark and internationally, there has been an increased focus on welfare technology and innovation. The Danish healthcare system is being fundamentally restructured and re-formed, the health professions are dealing with increased speed on the introductions of new political strategies, and a heavy digitization of the health care sector. These developments have actualized the fundamental question of how new technologies change and challenge the professions and their professional relationships? As one way to deal with this question, health education programmes have begun to focus on innovation education and educational activities fostering technological literacy. While focus on technological literacy has often (historically) taken a functionalist direction, and mainly been related to ICT and development of non-vocational curricula, more recent developments of approaches to technological literacy emphasizes profession oriented relational technological literacy. Furthermore, new definitions of 21st century competencies and skills emphasize creative learning and innovation skills and competencies as central ingredients in the 21st century labor market, and call for innovation education approaches. This paper inscribes itself in these latter movements, and contributes to opening up the question of *how health education programmes can deal with the ways new technologies change and challenge the professions and their professional relationships.* The paper presents and discusses three different conceptualizations of what it may imply to foreground profession oriented relational concepts of technological literacy that include various foci on innovation in the educational design.

Keywords: Technological literacy, innovation education, professional education.

INTRODUCTION

This paper refers to a large ongoing professional education development project at University College Zealand (UCSJ) in Denmark. The project is called Welfare Technology, Innovation, Care and Learning. It runs from January 2013 – December 2014, and includes developing welfare technology related teaching and learning practices in and across eight professional bachelor programs at UCSJ (www.ucsj.dk). The project's ambition is to further develop educational programs in order to better raise students' "technological literacy" – that is students acquiring "competencies for using, assessing, and innovating new welfare technological solutions in their professional field" (Source: Project application). The project takes point of departure in a model relating students' competence development to an analysis of the future workplaces within and across the welfare professional fields (Schlüntz et al. 2013). Furthermore, the project is grounded in

a design-based research and innovation approach[1] emphasizing four distinct yet iterative processes of research and innovation: 1. Establishing knowledge of context and domain, 2. Development of didactic solutions, 3. Testing in practice, 4. Evaluation, re-didactication. The paper is based on the first round of the first three processes, and refers to two case examples from two different educational programmes in 2013: Bachelor of Nursing programme Module 13 "Methods, development and innovation" and Bachelor of Physiotherapy Degree Programme Module 8 "Examination and treatment of strain injuries and degenerative disorders".

Lately, in Denmark and internationally, there has been an increased focus on welfare technology and innovation (Heilesen, 2013). The Danish healthcare system is being fundamentally restructured and re-formed, the health professions are dealing with increased speed on the introductions of new political strategies, and a heavy digitization of the health care sector (Hansbøl 2013a og 2013b). These developments have actualized the fundamental question of *how new technologies change and challenge the professions and their professional relationships?* As one way to deal with this question, health educational programmes have begun to focus on innovation education (e.g. Darsø, 2011) and educational activities fostering technological literacy (e.g. Dupret Søndergaard og Hasse, 2012). These matters, however, are often treated separate in education. Either focus is on innovation or focus is on technological literacy. Traditionally the emphasis on technological literacy has taken point of departure in *educational technology approaches* highlighting new technologies as media and environments for enhancing teaching and learning. In Denmark and internationally there has also been focus on *technology education approaches* highlighting abilities to use, manage, understand, and evaluate technology in general (Dugger og Naik, 2001). This paper pursues a technology education approach. However, while technological literacy has often taken a functionalist direction, and mainly been related to Information and Communication Technologies (ICT) and development of non-vocational curricula, more recent developments of approaches to technological literacy - focusing on technology education - emphasizes profession oriented relational technological literacy (Wallace, 2011). Furthermore, new definitions of 21st century competencies and skills emphasize creative learning and innovation skills and competencies as central ingredients in the 21st century labor market, and hence call for innovation education approaches (Dede, 2007). This paper relates to these latter movements, and contributes to opening up conceptualizations and discussions of what it may imply to foreground profession oriented relational concepts of technological literacy that includes various foci on innovation in the educational design.

BACKGROUND AND METHODOLOGY

The two courses belong to two different educational programmes (Nurse education and Bachelor Programme of Physiotherapy), and the courses are rather different. The premises for empirical gatherings relating to the two cases have also been different.

Empirical gatherings	Module 13 Nurse (Fall 2013)	Module 8 Physiotherapy (Spring 2013)
Observation of teaching activities		One day observation
Semi-structured conversations	After the end of the course. Two	Under as well as after the

[1] This approach will not be elaborated further here. Design based research and innovation has been critisized for relating to a positivistic approach. It is central to underline here, that design based research and innovation covers many different theoretical sources of inspiration, methodological approaches and not the least – purposes (see for instance Kelly, Lesh og Baek, 2008). The work presented in this paper relates to a situated, distributed and relational concept of learning, and a relational materialist concept of technology.

with teachers	teachers that have run individual courses	course. One teacher.
Semi-structured group conversations with students	Two groups (4 + 2 students), each representing group and a course.	One group (5 students).

The conversation guides used with students and teachers were the same, and focused on two main aspects: description of the courses form respectively students' and teachers' perspectives, and students' and teachers' perspectives on how the educational programme overall prepares students for being able to use, evaluate and innovate new welfare technological solutions within their field of work.

The description of the two courses and the ways they engage technological literacy and innovation education are represented in a brief schematic form below:

Courses and elements	Module 13 Nurse (Fall 2013)	Module 8 Physiotherapy (Spring 2013)
Authenticity	Innovative projects	Health care clinic
Learning theory	Creative and situated learning	Situated learning, acquisition, community of practice and apprenticeship thinking
Didactic principle	Problem orientation	Participation
Welfare technological element	Innovation with a focus on the identification of a profession grounded problem and suggestions for future welfare technological solutions.	Digital patient portfolios, video training and virtual supervision (a focus on professional knowledge and engagement as linked with technologies). Focus on existing technology supported practices.
Learning goals	Several goals, among other to acquire knowledge about innovative and creative working processes, and being able to develop, concretize and innovative ideas, professional practices and potentials.	Several goals, among other being able to engage in professional practices involving the rehabilitation approach and belonging professional tools such as digital patient portfolios.

The two cases represent very different approaches to profession oriented concepts of technological literacy and include innovation in the educational design in dissimilar ways.

Module 13 foregrounds innovation projects, and evidence-based engagements in future professional practices. I is in a sense *a prospective approach* to innovation. Module 8 foregrounds new professional technology supported practices in the existing professional field. It is in a sense *a retrospective approach* to innovation, foregrounding enculturation practices. Both approaches focus on technological literacy and innovation education. However, while innovation education in Module 13 is a matter of learning to be a creative and innovative professional, Module 8 is a matter of learning to be a technology and practice competent professional. Both cases are about teaching with and through innovation (rather than merely about), but Module 8 does not imply that the student engages in innovation and creative learning practices. Instead the focus is on mirroring, understanding and engaging in existing innovative and professional knowledge creation and learning practices.

The two cases raise central challenges when dealing with technological literacy and innovation education, and the question of how new technologies change and challenge the profession and the professional relationships. Both courses include commitments to *authentic educational designs*[2]. However:

- Innovation projects (though innovation competencies are highlighted as central 21st century skills and competencies) are not very likely the everyday event for health care workers. (Hansbøl 2013a, Hansbøl 2013b, Hansbøl 2013c, Hansbøl 2013d)

- Apprenticeship learning may be limited in the sense, that students should not necessarily master exactly these technologies, professional practices and approaches. Rapid changes in the professional field through digitization of the health care profession challenges community of practices – enculturation - approaches. (ibid.)

The increased speed on changes in the Danish health care system seems to bring with it a widening and reconfiguration of the theory-practice gap dealt with in health education programmes. In many ways the health care system and health educational programmes are becoming increasingly challenged by existing asynchrounicities between what is presented, imagined and forecasted as the past, current and future states of the health care system, and what is practiced.

The choice of focus in respectively Module 13 and 8 raises a need to further include other foci on the complexities involved when dealing with technological literacy, professional education programmes, innovation education, and innovation in the health care system and belonging professional practices and relationships. Rather, than trying to fit all welfare technology teaching into one course, it appears that spreading out various approaches across the educational programmes is more realistic.

Furthermore, both of the above approaches in a sense involve instrumental approaches to technology, as both emphasize new technologies and solutions as the way forward. While module 8 focuses on how to engage with a set of particular concrete new professional technologies, module 13 focuses on developing an innovative mindset of the students, and belonging innovative competencies. Module 13 does not deal with the implementation aspect of innovation, and module 8 deals with already implemented professional practices. This calls for supplementing with critical reflexive approaches to new professional technologies. Innovation and new technologies may not always be the answer! And if innovation is the answer, then what was the question? How does new welfare technological solutions alter relationships in the profession – for better and worse? How do new alternative practices become new and better alternative practices? How do new alternative educational practices become new and better alternative practices?

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[2] In the sense that both courses aim to engage authentic professional situations.

Schlüntz, D. et al. (2013) illustrate that the different health professions and their present situations and challenges with welfare technologies are very diverse. When looking historically at the ways different health professions and health education programmes have been challenged by new technology, it appears that the health education programmes may not need the same educational approaches to technology education. When viewed from a relational perspective on didactics, the choice of educational approaches must be grounded in the particularities and actual situations of each educational programme – hence also with respect to the students and teachers and the health professional situation currently represented.

Both teachers and students in the two courses in 2013 experience particular challenges:
Teachers (nurses): we focused on innovation (broadly – we thought), but ended up with a solution oriented rather than e.g. an implementation oriented approach to innovation.

Students (nurses): I never actually noticed that we had something about innovation and different forms of innovation and welfare technology. I learned that I can contribute to changing my profession. That was an important eye-opener. Now I will not be so afraid of volunteering for development projects.

Teacher (physiotherapy): the introduction of digital patient portfolios and the health care clinic (as opposed to theoretical teaching and simulated treatment practices) moves the focus and visibilities in teaching activities. I for instance became aware that students are not used to writing patient portfolios. This kind of teaching brings with it new challenges as well as openings for learning.

Students (physiotherapy): the health care clinic was our somewhat first real encounter with this treatment practice – this was important. So much to learn. The digital was somehow repressed because of this precondition. However, the students who managed to engage in the digital, saw digital patient journals and especially video training and supervision videos as radically eye opening for both professional and patient learning.

RESULTS AND CONCLUSIONS

The paper has dealt with the question of *how health education programmes can deal with the ways new technologies change and challenge the professions and their professional relationships.* It has presented and illustrated a situated, distributed and relational understanding of two different educational approaches to technological literacy (from a technology education perspective) and innovation education. The two cases are markedly different, however, both cases share a *single technology* and *single disciplinary focus*. Furthermore, both the technological literacy and innovation education aspect is represented in functional and hence very limiting ways, neither of which foregrounds and centralizes welfare technology and its complex relationships with the profession. This has lead to the following suggestion for a third pathway to engagements in welfare technology teaching activities which emphasizes a focus on professional relational comparative sensibility. An approach which foregrounds the question of *how new technologies change and challenge the profession and the professional relationships*.

New course: Multi-technology and cross-disciplinary focus
Focus on interoperabilities of variations of technologies in and across the professional fields. Questioning their different and shifting powers, competencies and agencies. Challenging professional identities and new formations of the professions and their relationships.

Rather than focusing on being innovative and competent at applying particular professional practices. The focus would be on understanding and critically as well as strategically being able to handle and engage with the shifting hanging-togethernesses of the health care professional practices - related to the continuous introduction of new welfare technological solutions. The following scheme illustrates the three suggested educational approaches to welfare technology teaching activities (each approach with its own situated strengths and weaknesses):

	Module 13 Nurse	Module 8 Physiotherapy	New module Cross-disciplinar
Authenticity	Innovative projects	Health care clinic	Shifting professional contexts of knowledges and engagement
Learning theory	Creative, innovative and situated learning	Situated learning, acquisition and apprenticeship thinking	Socio-material learning
Didactic principle	Problem orientation	Participation	Comparison
Technology concept	Functionalist	Functionalist	Relational
Welfare technological element	Innovation (a particular process and ambition – though heavily focused on solution innovation)	Digital patient portfolios, video training and virtual supervision (a focus on professional knowledge, learning and engagement as linked with technologies)	Different coexisting (digital) technologies, different professionals approaching same technologies across disciplines, same professions approaching same technologies differently etc.
Learning goals	Being able to engage in innovative projects and being able to innovate Naturalizing these kinds of innovation practices	Being able to engage in particular professional rehabilitation practices and use digital technologies (digital patient portfolios and video training) as supportive tools in these practices Naturalizing these professional practices with digital technologies	Being able to identify different technologies and professional practices with technologies. Understanding how technologies in complex ways influence and change the health care profession. Denaturalizing professional practices and innovation with new welfare technological solutions.

REFERENCES

Dede, C. (2007) Transforming Education for the 21st century: new pedagogies that help all students attain sophisticated learning outcomes. Located on WWW 07.01.2014:
http://www.thenetwork.typepad.com/files/dede_21stc-skills_semi-final.pdf

Dugger, W., & Naik, N. (2001). Clarifying misconceptions between technology education and educational technology. *The Technology Teacher*, *61*(1), 31-35.

Dupret Søndergaard, K. og Hasse, K. (red.) (2012): *Teknologiforståelse – på skoler og hospitaler*. Aarhus Universitetsforlag.

Kelly, A. E.; Lesh, R. A. og Baek, J. Y. (2008). Handbook of Design Research Methods in Education – Innovations in Science, Technology, Engineering, and Mathematics Learning and Teaching. Routledge.

Hansbøl, M. (2013a) Fysioterapeutfeltet. I: Schlüntz, D. et al. *VIOL Delrapport Projektfase 1: Velfærdsteknologi: Kortlægning og analyse af nuværende fremtidige kompetencebehov inden for de sundhedsfaglige arbejdsfelter.* Chapter 5, p. 43-59. Research report. University College Zealand. (Chapter title in English: The field of physiotherapy)

Hansbøl, M. (2013b) Sygeplejerskefeltet. I: Schlüntz, D. et al. *VIOL Delrapport Projektfase 1: Velfærdsteknologi: Kortlægning og analyse af nuværende fremtidige kompetencebehov inden for de sundhedsfaglige arbejdsfelter.* Chapter 6, p. 61-82. Research report. University College Zealand. (Chapter title in English: The field of nursing)

Hansbøl, M. (2013c) Et tværgående blik på velfærdsteknologi og sundhedsprofessionerne. I: Schlüntz, D. et al. *VIOL Delrapport projektfase 1: Velfærdsteknologi: Kortlægning og analyse af nuværende fremtidige kompetencebehov inden for de sundhedsfaglige arbejdsfelter.* Chapter 8, p. 92-95. Research report. University College Zealand. (Chapter title in English: A view on welfare technology across the health care professions)

Hansbøl, M. (2013d) Teknologiforståelse, velfærdsteknologi og professionsuddannelse. Work in progress paper. University College Zealand. (Paper title in English: Technological literacy, welfare technology and professional education)

Heilesen, S. (2013) Om internationale forsknings- og udviklingsprojekter inden for velfærdsteknologi. Rapport fra VIOL-projektet – Velfærdsteknologi, Innovation, Omsorg og Læring. Roskilde Universitet.

Schlüntz, D. et al. (2013) VIOL Delrapport projektfase 1: Velfærdsteknologi: Kortlægning og analyse af nuværende fremtidige kompetencebehov inden for de sundhedsfaglige arbejdsfelter. Research report. University College Zealand. (Report title in English: Wellfare technology: Mapping and analyzing present future competency demands relating to the professional fields of healthcare workers.)

Wallace, J. (2011). Technological Literacy Seminar 16 May 2011 DPU – A review of Definitions. Paper. DPU/Aarhus University.