Knowledge Work Practices in Education
- Two cases of transforming pedagogical practices

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Abstract

Formal education is challenged by emergent trends highlighting students' needs to develop competencies and abilities to use technologies for collaborative knowledge creation and innovation. We present findings from two cases in which teachers transformed their courses towards promoting students' knowledge work competencies by following the design principles of the trialogical learning approach.

Extended abstract

Today's students will have to tackle jobs that are profoundly different from existing ones; for instance, outsourcing and entrepreneurship involve requirements on competencies which are typically not taught in higher education (The European Union, 2010). In order to manage changes in the society and in the work life, new types of competencies are needed, such as collaborative learning, cultural awareness, self-leadership and flexibility besides the "traditional" work life competencies, such as team work and social skills (Ilomäki, Lakkala & Kosonen, 2013). Formal education is expected to support students in acquiring competencies and abilities to use technologies for collaborative knowledge creation and innovation, but research indicates that pedagogical changes have not actualized as expected, and this is a concern for both higher education as well as upper secondary schools (Clarke & Clarke, 2009; Klusek & Bernstein, 2006; Tynjälä, 2008). New strategies are needed for introducing pedagogical models addressing the use of information technology into the educational systems.

There is an emergent trend to highlight knowledge creation practices as a basis for understanding modern knowledge work (Knorr-Cetina 2001), but fewer pedagogical approaches for promoting related competencies. Prevalent pedagogical methods and practices do not usually support these new challenges because the focus is on content learning rather than on fostering higher-order knowledge work competencies (Muukkonen et al., 2010). Students are reported to leave higher education with underdeveloped abilities to collaborate, manage their work processes, use computers, or solve open-ended problems (CAHE 2005). Particularly in secondary education, technology is used infrequently, only by some teachers and often for previously established teaching methods but not for transforming practices (OECD 2010). The basic communication tools (e-mail, file sharing) and commonly used virtual learning environments provide, typically, only limited support for collaboration (Lakkala et al., 2009). Students need interdisciplinary, goal-oriented projects, where cross-fertilization between schools, higher education institutions and professional organizations is

enabled. Educators are in need of models and support for developing teaching methods with digital technologies which aim at supporting students' innovation skills and digital competence but which are not too challenging to apply.

One starting point is a learning approach called "trialogical learning" which has the specific aim of emphasizing and supporting knowledge creation pedagogy (Paavola et al. 2011). In order to promote the development of new competencies through education, specific design principles based on the trialogical approach were created for supporting the design of pedagogy. The design principles are the following (Paavola et al, 2011):
1. Organizing activities around shared "objects" (e.g., wiki pages, documents and models).
2. Supporting integration of personal and collective agency and work through developing shared objects (e.g., combining participants' own interests and shared assignments).
3. Emphasizing development and creativity in working on shared objects through transformations and reflection (e.g., examine knowledge in various forms, apply declarative and conceptual knowledge in practical problems, and explicate tacit knowledge).
4. Fostering long-term processes of knowledge advancement with shared objects (e.g., building on previous achievements, or making several iterative revisions).
5. Promoting cross-fertilization of knowledge practices and artefacts across communities and institutions (e.g., students' collaboration with professionals in the field)
6. Providing flexible tools for developing artefacts and practices (e.g., tools that support integrated organization and co-construction of shared artefacts and practices).

A primary aim of our study is to investigate and develop pedagogical practices that support students' knowledge work competencies by following the trialogical learning approach. Results from previous studies (Lakkala et al., 2013) indicate that with some training and support, university teachers changed their teaching towards collaborative knowledge practices, but gradual transformation of course designs is more realistic than attempting to change all at once. Students appear to be relatively flexible; they adopt new practices if appropriately implemented, even if they first have doubts. We aim, first, to describe the existing pedagogical models which are used by teachers and, second, to investigate the pedagogical settings and teachers' experiences of these.

We describe two cases in which teachers promote students' knowledge work competencies. The first case was conducted in a Finnish upper secondary school. Three teachers created an integrated course assignment based on phenomenon-based learning (Francis, 2013). Over 70 first year upper secondary school students from three courses (biology, chemistry and physics) participated in the process. First the students had a joint brainstorming session about phenomena that interested them in the topic 'Energy in the ecosystem'. Students formed groups that had the task of creating materials about the phenomenon they had chosen to examine. All materials of the groups were combined into a larger entity to be used as study material in future courses of the school. An expert from a solar power company participated in the process by giving an expert lecture to the students. Open cloud services such as Google document or Padlet were used for sharing and co-authoring all versions of the material, and the final product is constructed with Prezi. According to the teachers, a major challenge in implementing the joint phenomenon-based assignment is its integration with other compulsory content of the three courses. The courses are the first courses of each subject in the upper secondary curriculum, and the assignment is only one part of the course content. The curriculum in Finnish upper secondary schools is very tight in terms of the amount of

content to be studied. At the start of the course, the teachers worried about the importance of ensuring that students learn the basics of all course content for future studies.

The second case, is a case study course in health informatics at a Swedish medical university in which students collaboratively investigate and develop solutions to authentic health informatics problems.

Groups of students tackle challenging health informatics scenarios and develop solutions to problems in these. The shared "object" in this case was the prototype developed in each group and that was presented at seminars four weeks apart. Besides a learning management system, the possibilities of a number of tools were introduced to the students; shared walls using Padlet, shared mind maps using Popplet and shared environments for organizing work and time management in Trello. The students had either medical or technical backgrounds and were expected to define roles in the collective activities and they were able to follow and build on the efforts of others by using the tools.

Overall, the trialogical approach was received well and considered as an appropriate path for transforming students' individual course work into more collaborative activities. However, one of the teachers expressed concern that some groups might not work really well together or that some students may risk feeling left out.

Preliminary findings show that while the tools that were introduced were considered helpful, not all were used extensively. Other tools such as Facebook and Google Drive were used as well for sharing and communication. Using numerous separate tools highlighted the need for instant notifications of changes. Moreover, the students' first case study brought their attention to the need for setting rules for the collaborative work.

The data consists of observations during the courses, teachers' plans, students' course products and teacher interviews addressing knowledge practices in course contexts. We expect that challenges relate particularly to students' collaboration with professionals, combining individual accountability and group goals, and appropriate but easy-to-use technologies that would increase collaboration. Findings will be reported in the presentation.

References
CAHE – Commission on Accountability in Higher Education. (2005). *Accountability for better results: A national imperative for higher education*. Boulder, CO: State Higher Education Executive Officers.

Clarke, T., & Clarke, E. (2009). Born digital? pedagogy and computer-assisted learning. *Education & Training, 51*(5-6), 395-407.

Knorr-Cetina, K. (2001). Objectual practice. In T. R. Schatzki, K. Knorr Cetina & E. von Savigny (Eds.), *The practice turn in contemporary theory* (pp. 175–188). London and NY: Routledge.

European Union (2010). 2010 joint progress report of the Council and the Commission on the implementation of the 'Education and Training 2010 work programme'. *Official Journal of the European Union,* C 117.

Francis, C., Breland, T. A., Østergaard, E., Lieblein, G. & Morse, S. (2013). Phenomenon-based learning in Agroecology: A prerequisite for transdisciplinarity and responsible action. *Agroecology and Sustainable Food Systems, 37*(1), 60-75.

Ilomäki, L., Lakkala, M. & Kosonen. K. (2013). Mapping the terrain of modern knowledge work competencies. A paper presented in a symposium "Generating working life competencies during higher education" at the 15th Biennial EARLI conference for Research on Learning and Instruction. August 27-31, 2013, Munich, Germany.

Klusek, L., & Bernstein, J. (2006). Information literacy skills for business careers: Matching skills to the workplace. *Journal of Business & Finance Librarianship, 11*(4), 3-21.

Lakkala, M., Paavola, S., Kosonen, K., Muukkonen, H., Bauters, M., & Markkanen, H. (2009). Main functionalities of the Knowledge Practices Environment (KPE) affording knowledge creation practices in education. In C. O'Malley, D. Suthers, P. Reimann, & A. Dimitracopoulou (Eds.), *Computer supported collaborative learning practices: CSCL2009 conference proceedings* (pp. 297–306). Rhodes, Creek: International Society of the Learning Sciences (ISLS).

Lakkala, M., Toom, A., Ilomäki, L., & Muukkonen, H. (2014). University teachers developing their pedagogical practices to promote students' knowledge work competencies better. A manuscript submitted for publication.

Muukkonen, H., Lakkala, M., Kaistinen, J., & Nyman, G. (2010). Knowledge creating inquiry in a distributed project management course. *Research and Practice in Technology-Enhanced Learning, 5*, 73–96. Available at: http://www.worldscinet.com/rptel/05/preserved-docs/0502/S1793206810000827.pdf

OECD (2010). *Inspired by Technology, Driven by Pedagogy. A Systemic Approach to Technology-Based School Innovations.* Educational Research and Innovation. OECD Publishing.

Paavola, S., Lakkala, M., Muukkonen, H., Kosonen, K., & Karlgren, K. (2011). The roles and uses of design principles for developing the trialogical approach on learning. *Research in Learning Technology, 19*(3), 233–246.

Tynjälä, P. (2008). Perspectives into learning at the workplace. Review. *Educational Research Review 3,* 130–154.