Tutorial on CSCL in Vocational Education and Training (VET): The Current Critical State and Future Solutions

Raija Hämäläinen, University of Jyväskylä, raija.h.hamalainen@jyu.fi
Beat A. Schwendimann, École polytechnique fédérale de Lausanne, beat.schwendimann@epfl.ch
Alberto Cattaneo, Swiss Federal Institute for Vocational Education and Training, Alberto.Cattaneo@iuffp-svizzera.ch

Abstract: In the future, to tackle the complex problems being faced in the workplace, adults will need the ability to network and engage in shared problem solving activities, rather than solely individual skills. Vocational education and training (VET) systems are challenged to prepare current and future workers not only to excel at routine work but also to be able to adapt to complex and changing work environments. In the future, employees with VET background will participate in various problem-solving processes inside and across work organisations and professions. So far, technology-supported vocational learning has been under-represented in this field of study in the CSCL community. This is critical from the viewpoint of empowering vocational education to better meet the emerging needs of the global workplace. Therefore, CSCL research calls for innovative approaches to foster VET. This tutorial session will contribute to this challenge by presenting and discussing opportunities for and the challenges of technology-supported vocational education in different contexts.

Keywords: CSCL, vocational education, boundary-crossing, VET adults’ problem-solving skills

Theme

Work environments are undergoing radical social and technological changes. Workers need to learn how to operate in such changing environments (Dall’Alba, 2009), i.e., how to use mass-production technology and more flexible production methods in industry, how to use new technologies in the health care sector, etc. There has been an increasing demand from employers for workers with more integrated knowledge that allows them to understand the whole labour process and to deal with new and unpredictable situations (Ertl, 2004). Vocational education and training (VET) systems are challenged to prepare current and future workers not only to excel at routine work but also to be able to adapt to complex, changing work environments. For apprentices, technology can serve as a boundary-crossing platform that supports learning theoretical and practical knowledge across different learning contexts such as vocational schools and workplaces (Illeris, 2009). For adult workers, these structural changes often mean changes in their job requirements as routine tasks are taken over by technologies (Goos, 2013). As a direct result, many of today’s workplaces require creative problem solving instead of routine activities. The ability to work on and solve problems in technology-rich environments (TREs) plays an increasingly important role (Frey & Osborne, 2013; Goos, 2013). Related to this change, workers’ problem-solving skills (or the lack thereof) may have a short-term influence on how well they are able to manage their work tasks and a long-term influence on their welfare and competitiveness. As a direct result of this advancement, problem solving in TREs is one of the most important skills for future working life (Goos, 2013). In line with these emerging requirements, it is generally agreed that there is a need to develop workers’ skills and abilities to better meet the changing needs of the workplace in terms of problem solving in TREs, for example, through formal education (Billett, 2008; Teichler, 2007; Fuller & Unwin, 2004), lifelong (Loveder, 2011), and workplace learning (Billett, 2008; Tynjälä, Hääkkinen, & Hämäläinen, 2014).

This tutorial will bring together experts in technologies for training apprentices and adults in different VET contexts. For example, researchers in the DUAL-T project develop and implement technologies as boundary-crossing tools that can bridge the gap between school and workplace contexts. The central hypothesis is that digital technologies will improve school effectiveness by connecting workplace experiences to classroom reflective activities. Several different DUAL-T technologies have been developed to meet the specific needs of apprenticeship programs for different professions, including bakers, cooks, dental assistants, and commercial employees. Research on adult VET learners is being represented by findings from the PIAAC dataset. So far, no international large-scale assessment data have been available for VET. The PIAAC data comprise the most comprehensive source of information on adults’ skills to date. The recent study of Hämäläinen and colleagues (2014) (N=50,369) focused on gaining insight into problem-solving skills in TREs of adults with a VET background. The results indicated that at a general level, when examining VET adults’ problem-solving skills in
TREs across 11 European countries, adults with VET perform lower on average than adults with other educational backgrounds. As problem-solving skills in TREs are becoming increasingly important in work life (Goos, 2013), the findings are in line with the critical notion that there seems to be a gap between what is learned in VET and what is required in workplaces (Baartman & de Bruijn, 2011).

Relevance to field and conference
In the future, to tackle the complex problems being faced in the workplace, adults will need the ability to network and engage in shared problem solving activities, rather than solely individual skills (Hämäläinen & Vähäsantanen, 2011). More and more, employees with VET background participate in various problem-solving processes inside and across work organisations and professions (Billett, 2006; Noroozi et al., 2013). Thus, extensive collaboration skills are needed, as problem-solving proficiency will not only be a function of sharing knowledge but equally will require jointly building upon this shared knowledge. So far, technology-supported vocational learning has been under-represented in this field of study in the CSCL community (e.g., as of November 11, 2014, only eight studies conducted in vocational education contexts were found for the search term “vocational” in ijCSCL). This is critical from the viewpoint of empowering vocational education to better meet the emerging needs of the global workplace. Therefore, CSCL research calls for innovative approaches to foster VET. This tutorial session will contribute to CSCL by presenting and discussing opportunities for and the challenges of technology-supported vocational education in different contexts.

Goal
This full-day tutorial session will demonstrate the advances of CSCL for VET by bringing together recent theoretical and empirical endeavours in this area. Facilitated by experts, participants will actively explore and collaboratively discuss the affordances of different technologies developed for VET. Groups of participants will work collaboratively to learn about different VET platforms by taking on the roles of different stakeholders (teachers, supervisors, and apprentices). Discussions will identify the challenges and opportunities of conditions for collaborative learning through platforms in VET. The goal of this tutorial session is to facilitate in-depth discussions between experts in the field of VET technologies and the CSCL community. In particular, we aim to explore how to apply research-based knowledge to enrich vocational education and workplace learning as well as how new technologies can enhance VET. Opportunities and challenges of technology-supported tools for VET in different contexts will be demonstrated and discussed. The session will bring together researchers and other experts working on formal (school- or work-based) VET as well as on lifelong and workplace learning. In practice, we will have pre-selected short position papers (provided by the tutorial organizers) that illuminate different approaches to enrich VET. Additionally, we will solicit case studies from other participants (open call). These position papers will form the foundation of the tutorial and the discussions around the future challenges of VET. We open this tutorial to all members of CSCL. In particular, we welcome those who have initiative ideas on research in the area of VET and CSCL.

Tutorial position papers
The indicators for VET adults’ problem-solving skills differences based on the PIAAC data
Raija Hämäläinen, Bram De Wever, Antero Malin, and Sebastiano Cincinnato

Nowadays, workers with VET need flexible abilities to solve problems in technology-rich work settings. This study builds on PIAAC data to understand VET adults’ skills for solving problems in TREs. The study focuses on identifying adults’ (N=4503) problem-solving skills in TREs in Finland. The results indicate the critical issue that more than two-thirds of VET adults have weak skills or lack the skills in solving problems in TREs. Furthermore, the results show that over one-fifth of VET adults are at risk. Finally, this study indicates that the likelihood of having weak problem-solving skills is six times higher for adults with VET than for adults with at least upper secondary qualifications. Since the need for TRE problem solving is likely to increase in the future, this study also identifies the indicators for problem-solving skills differences. In this paper, the models predicting problem-solving skills on the basis of theoretical assumptions as well as empirical support are presented. Our results indicate that in Finland VET adults’ lower performance does not seem to be associated with the VET system itself but is mostly due to age, education in years, occupation, and gender, as well as work-related and everyday-life factors. In practice, the models help to develop new approaches to enable novel forms of problem solving in technology-rich environments based on current workplace needs.
DUAL–T: Technologies for initial vocational training
Beat Schwendimann, Alberto Cattaneo, Jessica Dehler-Zuffrey, Jean-Luc Gurtner, Mireille Bétrancourt, and Pierre Dillenbourg

Initial vocational education training taking place in the dual contexts of workplace and school often lacks integration of practical experiences (made at the workplace) with theoretical knowledge (taught at vocational school). The interplay between workplace and school contexts and their often antagonistic priorities calls for a specific pedagogical model that transforms these divergences into learning opportunities and connects different forms of knowledge into an integrated body of knowledge that contributes to developing vocational competence. The DUAL-T project developed a multi-dimensional pedagogical model for the design and implementation of educational technologies as a way to foster this integration in initial dual VET. The model describes a digital space – called an ‘Erfahraum’ – that serves as a shared space for capturing and reflecting on experiences made in different contexts in which VET takes place. The model particularly emphasizes the importance of shared reflection processes in turning concrete experiences into relevant, integrated knowledge. In the tutorial session, participants will explore different implementations of the ‘Erfahraum’ developed for different professions using a range of different technologies.

Triggering CSCL with game-based environments
Kimmo Oksanen and Raija Hämäläinen

Technological developments permit evermore diverse ways of designing digital learning spaces for future vocational education. In practice, these virtual learning environments enable new kinds of activities to supplement traditional classroom practices. With the help of these new learning spaces and environments, vocational students can practise different work–life situations. For example, there is a long history of using simulations and games in support of individual learning in vocational learning (e.g., training pilots). Currently, in addition to individual learning, there is also a growing interest in the study of collaborative learning and of how social skills can be more effectively rehearsed in game environments. This position paper illustrates two scripted 3D learning games (“Voltage” and “GameBridge”) for vocational education. Voltage meets the needs of authentic context. Within the game, players are solving tasks in the area of electric installation in a house. Thus, the aim was to enhance understanding of electrical installation in a house and to support collaborative learning processes. The game provides approximately two to three hours of goal-oriented activities. Collaboration scripts are integrated in the game design process in a way that higher levels can be reached by solving problems set for the players (see Hämäläinen, 2011). GameBridge, in turn, focuses on work–life skills needed to improve human sustainability. Its aim was to create favourable conditions for collaborative learning and to structure learners’ actions to boost and maintain social interaction and collaborative activities. In the game design, special attention was paid to the use of game mechanics (see Oksanen & Hämäläinen, 2014).

Expected outcomes and contributions
The tutorial session will bring together researchers and other experts working on VET and CSCL. Demonstrations of current technologies will stimulate in-depth discussions about the challenges and opportunities for collaborative learning through technologies in VET. Contributors to this tutorial session will develop a joint publication on CSCL and VET.

References


