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Editorial: Technology-mediated learning in VET – Perspectives on changing educational landscapes in the 21st century

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The idea of this special issue started in 2018, when the guest editors together with colleagues at OsloMet – Oslo Metropolitan University and a team of vocational education and training (VET) teachers organised a symposium at the Nordyrk 2018 conference on the theme 'Didaktiska perspektiv på simulatorstödd undervisning i yrkesutbildning' (Didactical perspectives on simulator-based teaching in vocational education and training)[1]. Here, simulators and simulation-based training were of central interest, along with the kinds of issues that the process of inclusion of new digital tools in education often entails, in terms of challenges and opportunities. Some of the contributions in this issue include the results of fruitful collaborative endeavours between scholars and practitioners that deal with the planning, implementation and evaluation of the use of digital tools in the teaching and learning of vocational subjects in VET. In 2019, again at the Nordyrk conference, we took our collaboration one step further during a workshop on 'Virtual vocational education in VET: Analytical explorations' where we could welcome other scholars from Northern Europe in our team[2] with whom we are currently developing new ideas and projects that all deal with the theme in this special issue.

Technologies, and especially digitally-mediated practices of teaching and learning, are connected with change, and in this special issue, change involves

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the educational landscape of VET more specifically. We constantly live in times of transition, even more so when we deal with the study of educational landscapes. Having said that, institutional educational arenas in their different forms have often been studied in their act of balancing between the need to maintain and transmit their societies' sociocultural heritage to the next generation and the urge to move along with how such societies, and the world, change. VET as an educational arena is particularly interesting when dealing with such tensions and contradictions. The nature and relevance of VET is inevitably intertwined with the ways in which innovation and change shape the world, in terms of providing relevant and sustainable knowledge and competences for future professionals.

At the time of writing, we are experiencing a unique time in history, caused by the COVID-19 pandemic. The everyday lives of individuals, at a global level, have radically changed due to the measures undertaken to control the spread of the virus. One such measure has been, in all of the Nordic countries, to close the secondary schools' physical buildings for the students and move the teaching completely online[3]. The educational landscapes have thus radically changed and are currently changing at a speed never witnessed before. Furthermore, transition to online education has occurred over a fortnight and digital tools are playing a central role in the process. Videoconferencing platforms, learning management systems and other tools for documentation and the training of vocational students are being used as mediating artefacts as we speak, to solve the problem of educating students (both youth and adults) without access to physical common spaces. What consequences such a quick and unexpected transition will bring along is difficult to foresee now. Here, VET will play a particularly important role, we argue, in identifying the kinds of challenges and opportunities that a transition to online distance education could entail for the teaching and learning of upper-secondary vocational education subjects like the ones focused upon in the studies in this special issue.

The individual contributions in this issue all deal with digital technologies and the ways these are implemented as part of the teaching and learning practices in VET. The profound crisis we are facing now, during the forced transition to online education in parts of the globe, is yet another proof of the kind of trust and hope that many professionals (in this case teachers, educators and school managers) put in technology as the solution to a variety of problems. But this is, in fact, nothing new under the sun. Digital technologies have been framed in terms of an educational panacea for a rather long time, envisaging the implementation of so-called digital innovations in schools and other professional arenas as the solutions to a wide range of issues, from inclusion to accessibility and equity, to growing efficiency and marketisation. Issues of professional-based training, control, standardisation, globalisation and sustainability are only some examples of the challenges where digital technologies and online learning environments are seen as possible and relevant solutions in a post-modern era.

Many innovative developmental projects in schools and adult education, including VET, are the outcome of individual efforts and are often delivered as ready-to-use packages from private organisations, rather than emerging from organic pedagogical investments and developmental endeavours based on end-users' professional competence and needs. Thus, critical perspectives have started to raise concerns about the actual benefits of the implementation of digitally-mediated teaching and learning practices in educational contexts, in favour of an approach that takes technology as not inherently likely to bring advancements in education *per se*, but rather as an approach that takes technology *as it is* in a practice. However, there currently exists a paucity of scholarship that focuses on pedagogical issues related to the use and implementation of digital tools in VET. And yet, as we have seen, educational institutions are currently facing several challenges that deal with increasingly digitised teaching and learning practices where more critical and, not least, *theoretically informed* pedagogical development work is urgently needed.

Taking the above as point of departure, this special issue *Technology-mediated learning in VET – Perspectives on changing educational landscapes in the 21st century* has grown from specific research that deal with overarching issues that are central for the development of VET research and practice and whose aim is to shed light on the following issues: i) to investigate and critically review some of the identified challenges and opportunities that arise with the digitalisation of vocational education and training and ii) to shape and develop successful systematic development work as conditions for change in educational practice as well as in the overall organisation. This special issue includes six research articles, five written in English and one in Swedish, and a magazine article, in English.

The first article *Simulation-based training in VET through the lens of a sociomaterial perspective* by Song-ee Ahn and Sofia Nyström discusses the relationship between students, teachers and simulators through a systematic analysis of previous research, enhanced by a sociomaterial perspective. Ahn and Nyström identify three themes in the literature: i) the effect of technology-enhanced simulation training, ii) the fidelity and authenticity of simulation and learning, and iii) pedagogical consideration and underpinnings. The results shed light on the differences between an educational practice and a vocational practice in that the implementation of simulators influences and changes the relations and the overall set-up of the educational practice. Here teachers are expected to be able to understand, interpret and foresee the kinds of vocational learning that simulation as a practice may (or may not) support. The authors conclude that process-oriented research is needed to shed light on the ways in which simulation can be used to its full pedagogical potential to prepare students for their future vocational practice.

The second article *Both novice and expert? How apprentices develop vocational competence in workplaces where technology is continuously changing: Examples from the Norwegian media graphics programme*, by Nina Aakernes, is interested in the ways

in which young apprentices can develop vocational competence in media graphics, a trade where digital technologies continuously change. The article is based on a longitudinal study over two years during which apprentices were observed at various workplaces. Aakernes discusses the paradox of the apprentices being considered novices on the one hand, and the kinds of advanced demands on competence in working life that are put on them, on the other. The results show that to be able to develop relevant competence, the apprentices need to be granted a certain degree of autonomy to make their own decisions and try their solutions to different problems. However, the apprentices also need support and feedback from the colleagues at the workplace. The results show that knowing how to design implies the development of specific skills that are rather stable in time, along with other competences and skills that are continuously changing, like the ability to use certain technologies for instance. Together, these competences are vital parts of a holistic vocational competence wherein the apprentices' active engagement in the performance of work-related tasks and the discussions that occur at the workplace are central.

The third article *Connecting school and workplace with digital technology: Teachers' experiences of gaps that can be bridge*d, by Ann-Britt Enochsson, Nina Kilbrink, Annelie Andersén and Annica Ådefors explores vocational teachers' experiences of digital tools as boundary objects between school and workplace during students' work placements in VET. Enochsson and colleagues start from the assumption that during such work placements, there exists a distance between vocational students, their supervisors at the workplace and the VET teachers. This distance is conceptualised in terms of 'gaps' between school and workplace, gaps that need to be bridged. The study is based on interviews with vocational teachers about their use of digital tools as boundary objects between school and workplace. The results illustrate different kinds of gaps between school and workplace and they show that digital technology has different functions in the attempt to bridge these gaps. Furthermore, the vocational teachers use strategies and make choices that differ depending on the identified gap and where technology plays different roles as a boundary object. These strategies and choices are conceptualised in terms of important elements of the vocational teacher's pedagogical and didactic competence.

The fourth article, written by Stig-Börje Asplund and Janne Kontio, with the title *Becoming a construction worker in the connected classroom: Opposing school work with smartphones as happy objects*, focuses upon the formation of identity as a construction worker in the Building and Construction programme. Through careful analysis of naturally-occurring interaction among students who, in different ways, orient towards their smartphone during task-oriented school activities, the authors investigate the ways in which male students use the smartphone as a significant resource to create opportunities for identity work in the VET classroom. In their use of the smartphone as a happy object, i.e. as a tool to identify

shared interests and funny diversions from the task at hand, the students also engage with identity work that seems to align with the kinds of professional identity of the construction worker that has been previously researched at the workplace and during workplace-based learning. The results show that students, by orienting towards their smartphone and the activities available in that environment. i.e. using different application in their smartphones to connect and create a common jargon, are in fact already dealing with becoming construction workers where the creation of a counter-culture, the establishment of a team, a community and an anti-study culture appear as central elements.

In the fifth article, *Virtual welding: A didactic perspective*, Steinar Karstensen and Arne Roar Lier investigate the simulation of welding in a virtual reality (VR) environment. VR technology adds further elements to simulation in VET and the article aims at shedding light on the ways in which VR-integrated technology can be used as an educational and didactical tool in VET. More specifically, focus lies on the use of 'mixed reality', an environment in which real and virtual worlds merge and where real, tangible objects are mixed with virtual ones. Here, issues of fidelity, realism and photographic quality all play a significant role to provide a realistic experience in VET and especially in activities like welding, where the learning of precise hand and arm movements is in focus. The analysis is grounded on a phenomenological approach and focuses on interviews with teachers and the logs that the teachers were prompted to write during the project. The results highlight issues of transfer, similarity between virtual and real dimensions of the simulation and the kinds of challenges that the implementation of new digital tools entails for the pedagogical practice of teachers and students. The welding simulation machine could not be implemented in its original format in the course, but teachers had to develop the design of the tool in line with the didactical needs and the teachers' professional competence.

The last research article in the issue, *Digitala körsimulatorer i yrkesutbildning: Utmaningar och möjligheter* [Digital driving simulators in vocational education: Challenges and opportunities] by Susanne Gustavsson, Giulia Messina Dahlberg and Ingrid Berglund also deals with the implementation of new simulation tools in VET. The article presents three action research projects carried out in collaboration with four vocational teachers in the natural resource programme, when digital driving simulators were implemented in the educational practice. The vocational teachers identified, based on their own experiences, problem areas, issues and action plans. The action plans were implemented and evaluated in collaboration with the researchers. The projects focused on fidelity, transfer and progression when implementing different kinds of digital driving simulators in the teaching and learning practices. The results highlight the vocational teachers' professional competence to use and 'master' the digital tools to support the students' vocational learning. The article is also an illustration of the ways in which

systematic investigations and school development work can be carried out by vocational teachers in close collaboration with researchers.

The special issue also includes a magazine article, *Five years with vocational teacher education online*, by Steinar Karstensen and Runar Oudmayer. The article deals with the evaluation and development of online technical and vocational teacher education (TVTE). More specifically, it focuses on the pedagogical and didactical considerations that online TVTE entails in terms of its challenges and opportunities and the ways in which it may be compared to a campus programme. The online format of TVTE has meant wider opportunities for students' access to education in terms of flexibility in time and space. It has also meant that teachers developed alternative methods when transitioning from campus to digitally-mediated activities. The article provides interesting insights on, for instance, issues of synchronous vs asynchronous communication and the creation of a community of students completely online.

To conclude, all contributions in the special issue shed light on the kinds of implications that a digitalisation of VET entails for VET teachers and, not least, for VET teacher education. What kinds of competences are relevant in VET when digital tools (of different kinds and with different purposes – from simulators to smartphones) become central in the everyday practices of VET for teachers and students? This special issue, we argue, has contributed to the VET field in two specific ways: *firstly* by investigating how teachers and students use, implement and evaluate online and digital tools in their practice through various theoretical lenses and *secondly*, by adding theoretical depth on the ways in which tools, people and different kinds of knowing are mutually connected. Tools (digital or analogue) cannot be studied in a vacuum. They are tools in that they are entangled in a practice and, when the practice in focus is an educational practice, this gains even more interesting dimensions. In such a practice, we argue, issues of teacher intention and professionalism, curriculum and different competences of teachers and students, all play a significant role in shaping the implementation and use of digital tools to support learning in VET.

Endnotes

[1] Symposium organisers: Giulia Messina Dahlberg, Ingrid Berglund, Susanne Gustavsson, University of Gothenburg, Sweden; Bengt Jonsson, Felix Hermansson, Hans-Ulric Göransson, Jörgen Holmén, Region Västra Götaland natural resource schools, Sweden; Steinar Karstensen, Arne Roar Lier, Oslo Metropolitan University, Tor-Gunnar Karterud, Rune Stensrud, Ove Østerud, Ås videregående skole, Norway.

[2] Team members: Ingrid Berglund, Giulia Messina Dahlberg, Susanne Gustavsson, University of Gothenburg, Sweden; Vibe Aarkrog, Aarhus University, Denmark; Hanne Søgaard, Jørgen Theibel Østergaard, University College Copenhagen, Denmark; Steinar Karstensen, Arne Roar Lier, Oslo Metropolitan University, Norway.

[3] Sweden is the only country in Scandinavia and in Europe to have kept primary schools open during the pandemic.