Attwell, G., Roppertz, P. S., & Deitmer, L. (2021). MOOCs and artificial intelligence - potentials for the professional development of VET teachers and trainers. In C. Nägele, B.E. Stalder, & M. Weich (Eds.), *Pathways in Vocational Education and Training and Lifelong Learning. Proceedings of the 4th Crossing Boundaries Conference in Vocational Education and Training, Muttenz and Bern online, 8. – 9. April* (pp. 67–72). European Research Network on Vocational Education and Training, VETNET, University of Applied Sciences and Arts Northwestern Switzerland and Bern University of Teacher Education. https://doi.org/10.5281/zenodo.4602924

# MOOCs and Artificial Intelligence - Potentials for the Professional Development of VET Teachers and Trainers

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## Abstract

Digital transformation is leading to pressure for vocational education and training in Europe to adapt. Teachers should prepare young people for the changing world of work but also provide social and civic education. At the same time, they should be able to use new digital and AI-based applications with confidence. In addition, they need general AI knowledge to participate as responsible citizens in the discussion about AI and ethical and social questions. The work of vocational educators significantly determines the quality of VET. Accordingly, the issue of the training and continuing education of VET teachers is of paramount importance to ensure the quality of VET. We look at Massive Open Online Courses (MOOCs) as an innovation in the provision of professional development in AI for VET teachers and trainers.

## Keywords

MOOCS, professional development, artificial intelligence

## 1 Introduction

Artificial intelligence (AI) and machine learning allow texts to be translated into other languages, voice assistants to give ever more precise answers to questions and support the development of so-called smart factories. These and other innovations make likely a fundamental change in the world of work, as tasks previously performed by humans can now potentially be taken over or assisted by computers and computer-controlled machines (Brynjolfsson & McAffee, 2014; Dengler & Matthes, 2018).

The digital transformation is leading to pressure for vocational education and training in Europe to adapt. Educational institutions and teachers and trainers have the crucial task of preparing learners for the changing world of work. Technological change also affects educational institutions both at the management level and at the pedagogical level including the introduction of adaptive learning systems and learning analytics (Seufert, 2018). Education is responsible not only for preparing people for the changing world of work but also to help shape the world of work and society in a socially, economically, ecologically, and individually responsible way. Against this background, the qualification of teachers and trainers must be

brought into focus, because they have to prepare the next generation for the world of work. How can teachers and trainers be trained and supported for this from a European perspective? This is the question we address in this paper. In the next section, we look at the challenges for VET teachers and trainers in the age of AI. We then examine the potential of Massive Open Online Courses (MOOC) to support the training of VET teachers for AI. Based on these considerations, a project is presented that aims to implement these ideas in practice. In the final section, we provide recommendations for action in developing online MOOCs.

## 2 A European perspective on artificial intelligence and VET

### 2.1 Changes in the world of work

Although goals and priorities vary in different countries, artificial intelligence is a major issue for education and training around the world. In 2016, the European Commission published a paper (New Skills Agenda for Europe) with recommendations for upskilling as a response to the changing labour market. They further proposed "making VET a first choice" and developing apprenticeship programmes (European Commission, 2016). The Digital Education Action Plan published in 2018 promoted the use of technology in education and the development of digital competences (European Commission, 2018b). Finally, the European AI strategy paper (European Commission, 2018a) aimed to build on these developments to ensure that no one was left behind in the digital transformation of the economy and wider society. This included more people understanding the use of AI and especially involving more women and people with disabilities in the development of AI. This is to ensure that AI is non-discriminatory and inclusive. In Finland, an online course[1] has been developed providing citizens with a basic understanding of artificial intelligence: What is AI? What can and what can AI not do? How are AI methods created? The current goal is to educate 1% of European citizens in the basics of AI by 2021.

But it is not only general knowledge about AI which is needed to respond to the emergence of AI based technologies. Sector specific domain knowledge is also needed by those working in the growing number of occupations deploying AI. This knowledge is essential for the development of value-added AI systems. For example, for an AI-based system to be used in medicine for cancer detection, doctors, as well as computer scientists, are needed to contribute their expertise to the development.

In the educational context, teachers and trainers are the domain experts who have pedagogical action knowledge that is needed for the development of pedagogically meaningful AI-based school applications. Furthermore, if AI-based applications such as learning management systems and personalised learning paths are used in educational institutions, teachers who are familiar with the systems and the opportunities and risks are also needed. The current European Digital Education Action Plan (2021-2027) sets the goal that "digitally competent and confident teachers and education and training staff" are needed to foster “the development of a high-performing digital education ecosystem" (European Commission, 2020). In the following section, we will briefly present the role of teachers in different European VET systems and then further consider how a qualification can be designed from a European perspective.

### 2.2 The implications for AI for vocational education and training

Vocational education and training systems in the European countries differ greatly and so do the training programmes for VET teachers. In Lithuania, there is no institutionalised provision for VET teacher and trainer training. VET centres organise the training of their teachers and provide the necessary pedagogical and professional competences (Klein et al., 2020). In Italy,

1 www.course.elementsofai.com

initial vocational training can be provided both by private vocational training centres funded by the region and by public vocational schools. Teachers working at state-funded vocational schools are trained at universities. There are no uniform regulations for the training of teachers in private VET centres and whether training courses for teachers take place depends on the will and financial resources of the VET centre (Klein et al., 2020). In Germany, three phases of teacher education can be distinguished. The first phase comprises teacher training at a university. The second phase includes the practical preparation phase at school (*Referendariat*). The third phase includes professional development and continuing education. The Standing Conference of the Ministers of Education and Cultural Affairs (Kultusministerkonferenz, KMK) sets out the curricula framework that guide vocational schools. It emphasises that the educational responsibility of vocational schools is not only to prepare learners for the changing world of work, but also to prepare them to "help shape the world of work and society in a socially, economically, ecologically and individually responsible manner" (KMK, 2018, p. 14). In the context of the digital transformation, this social aspect becomes more important, as the changes will be profound. However, there is no concrete "job profile" for vocational school teachers in Germany (Bauer & Grollman 2018, p. 353).

The constant change in the requirements for the labour markets requires both breadth and depth in a range of vocational knowledge and practice and the ability to incorporate change in teaching practice (Frommberger & Lange, 2020, p. 521). In addition, there is an increasing use of technology in teaching and learning practice and the use of artificial intelligence in digital applications promises further change.

In summary teachers should prepare young people for the changing world of work but also provide social and civic education. At the same time, they should be able to use new digital and AI-based applications with confidence. Some may be involved in the development of AI applications by contributing domain knowledge. In addition, they need general AI knowledge to participate as responsible citizens in the discussion about AI and the ethical and social questions.

## 3 Innovative learning concepts for the professional development of VET teachers and trainers

The work of vocational educators significantly determines the quality of VET (Frommberger & Lange, 2020, p. 519). Accordingly, they say the issue of the training and continuing education of VET teachers is of paramount importance to ensure the quality of VET (ibid.). The new demands for domain practice and knowledge around the use of AI, as well as the pedagogic practice of AI in education and training will require both changes in the initial training of VET teachers and trainers and for professional development for existing VET practitioners. Yet our survey of existing systems for the training of CVET teachers and trainers (Attwell et al., 2020) suggests present systems lack the competence and capacity to provide that training. What innovative concepts are there to support the continuing education of VET teachers in the AI context?

According to Laur-Ernst (2006) innovations in VET should function as (1) improving the existing situation, (2) eliminating a pressing problem or (3) opening up new options and opportunities. Innovations are not just ideas, but practical models with the aim of broad implementation. The innovation process consists of several phases, which include conception, development and embedding (Laur-Ernst, 2006, p. 82). In the next section, we look at Massive Open Online Courses (MOOCs) as an innovation in professional development for VET teachers and trainers.

### 3.1 MOOCs: an innovation to support professional development in VET?

The first Massive Open Online Course (MOOC), led by George Siemens and Stephen Downes was in 2008 around the topic of Connectivism. According to Downes (2012) it was based on

the realization that the use of distributed open resources would support – with ease – attendance in the thousands. The vision grew out of the idea of Open Education, where everybody could access free online courses (Storme et al., 2016). The idea quickly took off, especially with the launch of the Coursera and Udacity platforms. Although the founders of these companies saw their innovation as disruptive to traditional education institutions, universities and other traditional education and training providers have been quick to pick up on the potential of MOOCs. In Europe one of the biggest MOOC providers is OpenLearn, with the UK Open University leading a consortium of educational providers, which they claim attracts more than 10 million visitors each year from around the world. There has been and continues to be discussion over pedagogic approach to MOOC design, with advocates of so called cMoocs emphasising the active contribution of participants, using digital platforms and technologies, while so called xMOOCs, for example from Stanford University, are more focused on the transmission of knowledge. MOOCs have mostly been confined to the academic sphere (Egloffstein, 2018), but now MOOCs are increasingly being used for professional development, for instance by companies like Siemens and Microsoft.

### 3.2 Potential for the professional development of VET teachers and trainers in the context of AI

OpenLearn has also run a number of MOOCs for professional development for teachers and as we noted earlier in Finland an open online course has been developed providing citizens with a basic understanding of artificial intelligence. The Erasmus+ project 'Tacle AI - Improving skills and competences of VET teachers and trainers' , with partners from five European countries (Greece, Germany, Italy, Lithuania, UK) are developing a Massive Open Online Course as an innovative concept for the professional development of VET teachers and trainers on the topic of AI. This marks the third stage in the project, with earlier work focused on a literature review and interviews with experts and teachers and trainers in the five countries, with the aim of extending the European DigiCompEdu framework to include the use of AI in vocational education and training. Following on this needs analysis the project partners have developed an online toolkit, providing accessible resources around AI. These resources are now being incorporated in the design and development of the MOOC.

There are two key dimensions on how to connect Artificial Intelligence and MOOCs. The first is MOOCs as a way to learn about AI. The second key dimension is the integration of AI into a MOOC platform. Although this is still work in practice, with the MOOC expected to be launched in September 2021, both dimensions are being addressed. At the level of content, the MOOC will be organised through five modules:

module 1: AI, Automation and Vocational Education and Training
module 2: AI and the future of work
module 3: AI and Teaching and Learning in VET
module 4: AI, the curriculum and the skills required for teachers and trainers
module 5: AI and ethics

Each module will be subdivided into shorter learning activities and will include the extensive use of multimedia. One of the findings of the earlier interviews was that while teachers and trainers are in general optimistic about the benefits of AI, they ask for practical examples of how it can be used in education and training (Attwell et al., 2020). Thus, there will be a major focus on examples of innovative and effective practice both for work-based learning and within VET schools.

In terms of the integration of AI in the professional development programme, we are experimenting with the use of AI for developing content. The MOOC will be delivered through a

Wordpress platform, albeit including a number of plugins to provide enhanced functionality. We are extending the platform, by integrating the Experience API, which tracks data on learner outcomes and through learning analytics allows both analysis and evaluation of learning and recommendations for further learning activities.

MOOC will not be based on a set period but will be open to participants to pursue at their own time and pace. Similarly, we will not require participants to work through the course in a set sequence but will provide flexibility for those who want to explore those topics in which they are most interested. If participants complete all of the programme, we will award them an Open Badge certificate. We will also be licensing the MOOC under A creative Commons license and will encourage the reuse of content by different organisations.

## 4 Conclusion and outlook

The development and adoption of AI poses a profound challenge for vocational education and training in Europe, including the development and updating of curricula and programmes for the use of AI in work processes, changing occupational profiles and engaging with the potential of AI for teaching and learning. Responding to this challenge will require professional development for teachers and trainers. MOOCs offer a potential for providing flexible opportunities for professional development to respond to the challenge. Nevertheless, MOOCs are not the only solution to respond to these challenges, it is rather an impulse for innovation in professional development for VET teachers and trainers (Storme et al., 2016).

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