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## **Editorial**

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Awareness and reflection play a crucial role in the learning process, helping the involved actors to succeed in self-regulated learning and to optimise their learning experience. Whether in traditional education, workplace training or lifelong learning, appropriate feedback together with proper assessment of previous practices can bring benefits for all the participants and cultivate their reflective skills, which are essential for effective learning.

In technology enhanced learning (TEL), the challenge is to collect relevant data about the learning process, support the participants in interpreting the data meaningfully and

present the outcomes in an understandable form. In order to offer useful technology for this purpose, its designers and developers need to incorporate knowledge from various disciplines, like pedagogy, psychology, neuroscience and informatics.

To provide a forum for researchers and professionals from different backgrounds, who are interested in awareness and reflection in TEL, a series of workshops started in 2011, first under the acronym awareness and reflection in personal learning environments (ARPLE) and awareness and reflection in learning networks (ARNETS), until it became the awareness and reflection in technology enhanced learning (ARTEL) workshop series in 2012. This series of workshops has mostly taken place at the European conference on technology enhanced learning (EC-TEL), which is one of the most prominent venues in its field (Reinhardt and Ullmann, 2011; Reinhardt et al., 2011; Moore et al., 2012; Kravcik et al., 2013, 2014, 2015, 2016). The ARTEL series was organised by a number of scholars, and the editors of this special issue want to specifically thank Adriana Berlanga, Owen Conlan, Birgit Krogstie, Adam Moore, Lucia Pannese, Kamakshi Rajagopal, Wolfgang Reinhardt, Peter Scott, Christian Voigt and Fridolin Wild for their engagement in the organisation of the series.

This IJTEL special issue aims to provide an overview of the research that was discussed in the ARTEL workshops and beyond, addressing awareness and reflection in TEL. The papers presented in this special issue include novel methodologies and systems in this area. In particular, 21 submissions were thoroughly reviewed and 8 of them were accepted for publishing. The accepted papers can be divided into several categories. The first three papers present a theoretical overview of the field - starting with a general overview and then focusing on blended and workplace learning respectively. The next two articles introduce methodological approaches, namely annotations in online course and digital storytelling. The last three contributions describe implementations of different systems - personalised dashboards, ambient visualisations and remote labs.

Fessler et al. (2017) give a general overview of reflective learning, reviewing the existing literature about different approaches and tools. They provide the guidance on how to facilitate this kind of learning. This literature analysis leads to insights and recommendations on how to design reflection functionality in computing systems.

Rodriguez-Triana et al. (2017) deal with monitoring, awareness and reflection in blended learning models. Their systematic literature review in the areas of educational data mining and learning analytics considered more than 1000 papers from several academic databases.

Pammer et al. (2017) focus on reflection in workplace learning, introducing a terminology and a process model. They also discuss the relevance of their theoretical considerations for designing information and communication technology, and the role of data and materials in the reflection process.

Verpoorten et al. (2017) present the results of their controlled experiment investigating the effects of frequent and local digital annotations in an online course. These suggest that students who manage to coordinate cognitive and metacognitive activities (like studying and making notes) perform better.

Challinor et al. (2017) describe a multiple case study on the use of digital storytelling to support the development of reflection and digital skills in professional education. It suggests that digital storytelling provides a highly engaging way of introducing both reflective and open educational practices.

Michel et al. (2017) propose a general system architecture for project-based learning that enhances learners' reflective processes by supporting them in creating customisable

indicators. They found that their system supports learners to reflect and regulate their activities and learning.

Charleer et al. (2017) claim that ambient information visualisations can help raise awareness of the balance of distribution in meetings and small learner groups. They show the effects on student perception and feedback participation through the actual deployment of such visualisations in real classroom sessions.

Broisin et al. (2017) investigate how the design of awareness tools could leverage reflective thinking and peer support in a remote laboratory. Their experimentation showed that awareness and reflection tools had small but positive impact on students' perception of learning, and that learners significantly used these tools and highly rated the system.

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