Editorial: New teaching and learning worlds – potentials and limitations of digitalization for innovative and sustainable research and practice in education and training

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Editorial on the Research Topic
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Digital transformation is changing the structures and organization of learning and teaching. New technologies such as artificial intelligence (AI), virtual reality (VR), or augmented reality (AR) that are at the core of this transformation are charting a path that is different from all previous technological developments (Haleem et al., 2022): they offer various means to shape knowledge creation and transfer (Dragičević et al., 2022), aspiring to the role of the teacher, or they can provide means for teaching or its administration (cf. Ullrich et al., 2022). Even if the powerful AI required for this is still a vision of the future, recent developments like Chat GPT and metaverse already give a good preview of the potential to be expected for teaching and learning.

In a world that is becoming increasingly digitized, there is a temptation to focus predominantly on technical developments. Digitalization, however, demands technical skills from individuals and those that help them adapt to the changing demands, e.g., in the workplace (Ahmad et al., 2013; Carnevale and Smith, 2013). Collaboration, communication, digital and data literacy, citizenship, problem-solving, critical thinking, creativity, and productivity are increasingly important (Voogt and Roblin, 2012). These skills are referred to as 21st century skills to relate to current economic and social developments (Van Laar et al., 2017). Creativity, in particular, plays a crucial role in the ability to innovate. It starts at the individual level and is central to the success of organizations (Anderson, 2008). Therefore, facilitating and stimulating students' creativity is essential (Chu et al., 2021). Design thinking capabilities are thus becoming more and more important in teaching and promoting creativity, complex problem-solving, collaborative working, innovation, and entrepreneurship (Lee, 2019; Coco et al., 2020; Vallis and Redmond, 2021).

In addition to the competencies to be imparted and the value of knowledge, digital transformation also changes the framework for imparting content. Taking education outside of traditional settings to provide alternative learning pathways has long been critical for increasing societal equity. Considering how open educational practices can (re-)configure teaching and learning vis-a-vis (new) technologies, such as AI, is an essential aspect of conversations focused on technology's social impact. These impacts shore up not just on the side of innovation and increased equity but also on potentially biased algorithms, increased student and teacher surveillance, and opaque decision-making in the educational context. Empirical research and theory-building are essential for forging new pathways for considering the complexity of the intersection of technology, open education, and equity.

Since the COVID-19 pandemic took hold, digital education has lost its previously abstract character. Almost everywhere in the world, there has been an abrupt shift from physical classroom instruction to a virtual space (Crawford et al., 2020; Karalis and Raikou, 2020). In this process, critical experiences were gained concerning the technical and competence dimensions and general acceptance. It has been shown that even digital natives, for whom interactions in the real to virtual world should not be a challenge (Jones et al., 2010), wish to return to in-person classroom teaching. This makes at least a blended teaching approach advisable in the future (Vladova et al., 2021).

These issues and challenges are addressed in the Research Topic. In each of the six papers, recent theoretical and empirical research is presented addressing the complex changes and current and future needs of education in the context of formal and informal learning processes.

Brandenburger devotes her paper to participatory approaches to teaching and learning. Drawing on the findings of a representative literature review and focus group research, she develops an analytical framework for enabling researchers and practitioners to assess the form of participation in formal, collaborative teaching and learning practices.

Haase and Hanel present the results of their online experiment on the effects of games on creativity and emotion. Divergent and convergent thinking, pure mental arithmetic, and passive control conditions were each used in different conditions. Based on their research, they draw practical implications for digital learning and application situations.

Paaßen et al. focus on creativity with a different methodological approach and goal. Since creative performance in the classroom depends on numerous factors and their interactions, it is difficult for individual teachers to consider them in a structured way at the level of individual students. Here, AI techniques prove helpful. In their paper, the authors review the existing literature on creativity and distill their findings into a novel, graph-based model of creativity with three target audiences: Educators, educational researchers, and AI researchers.

Dragičević et al. conduct a bibliometric analysis to investigate the value of design thinking in the digital world. They provide a holistic retrospection and unveil the intellectual structure of design thinking literature related to capabilities relevant to the digital world. They highlight current trends and suggest further studies to advance theoretical and empirical underpinnings.

Fink et al. compare in an experiment 3D modeling and photogrammetry-created elements in virtual educational environments to identify beneficial characteristics of VR environments and individual variables that trigger and explain learners' interest development. They identified that the authenticity of objects is not perceived differently in both approaches and that VR can foster interest in learning content.

Kamaludin and Sundarasen employ a qualitative approach to investigating the extent to which students' learning experience is perceived as meaningful and satisfying, as well as their sentiment on online distance learning during the COVID-19 pandemic. They analyze the content of social media comments following a video post on students' frustration about online distance learning and identify numerous pedagogical, technological, and social challenges.

The articles in this Research Topic demonstrate how new challenges arise for practice and research in the context of education. They illustrate the relationships between teachers and learners and show the need for empirical investigations and theory development. They also show that for exploring the role of technology in the learning process, examining approaches from various disciplines such as psychology, computer science, education, and social sciences, as well as interdisciplinary research, are necessary.

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