

## XR technologies and experience-based learning: A new tech for education?

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### Abstract

Since the first industrial revolution, a specific mechanical paradigm of teaching and learning has dominated western education tradition, known as concept-based teaching and learning. This paradigm has reverberated and affected research, curriculum design, and teaching practices since the early 1960s, as well as nourishing important ideas for current discussions on the importance of factual information in curricula (Medwell et al., 2019). However, one of the issues with the mechanical paradigm is that it has a reductionist and linear mindset, which leads to disconnected knowledge generation, and additionally, misses on transferring tacit knowledge and any knowledge with 'qualia' (i.e. 'subjective') quality on it (Crane, 2012; Jackson, 1982, 1986). The conventional roles of the student, the instructor, the learning environment, and the learning tools and technologies must be rethought in the twenty-first century. On the other hand, cognitive philosophers such as Andy Clark and David Chalmers describe technology as a kind of scaffolding of the mind, operating as instruments that we use to extend our mind (Clark & Chalmers, 1998). We are tool-making animals that have been in a symbiotic/reciprocal feedback loop with technology since the beginning of stone tools. If technology is the real skin of our species and the extension of our nervous system and human cognition, then it should work for us and help us grow and have a better understanding of the world around us. Yet the tendency in education today under the concept-based teaching paradigm is rather the opposite, as technology can easily make learners more distracted and less aware of the surrounding subjective and experiential world (Kurniawan et al., 2021).

One way of overcoming the deficit of integrated knowledge generation and of tacit and qualia knowledge transfer inherited from the concept-based teaching mechanical paradigm is to adopt an experience-based learning approach, along with revisiting the role and potential of new immersive learning technologies such as mixed reality (XR). In the past, knowledge was seen to be a 'whole' obtained via journeys throughout people's lives, where individuals learned by doing and experiencing every facet of knowledge (Yazdi, 1992). Not all knowledge was thought to be transferable by teaching concepts; profound understanding of the world was only conceivable if one embarked on a long journey in life while learning (Netton, 2013). Today, education ought to once again become interdisciplinary, founded on strong critical ethics and philosophical study of new alternative educational paradigms. XR in education can be designed grounded on new epistemologies and technologies reflecting humanity's process of change and transition, facilitating the reconnection with old and ancient knowledge and methods of doing by means of real-to-virtual environments, affordances and experiences (Taheri & Aguayo, 2021).

We suggest that education ought to embrace experience-based learning as a reacting paradigm to the dominant reductionist concept-based teaching paradigm. We see XR technologies in education having the potential to facilitate experience-based learning, where learners and XR technologies can become 'one entity' together, to explore, understand, and experience the learning process in self-determined ways. Such an approach requires new educational design epistemologies centered on the body and the embodiment of the experience within real-to-virtual learning environments. Here, the epistemology from the Santiago school of cognition (Aguayo, 2021; Maturana & Varela, 1980), which includes concepts like embodiment, embodied cognition, and enaction, may inform and drive the development of an experience-based type of immersive learning design based on an enactive, self-led user experience. As the philosopher Marshall McLuhan famously said: "We shape our tools and thereafter they shape us" (Culkin, 1967, p. 53).

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