

# Deep and Meaningful E-Learning

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Contributor: Stylianos Mystakidis

Deep and meaningful e-learning should be an essential outcome of quality education.

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## 1. Introduction

In a constantly changing information society where knowledge organizations and educational institutions support a knowledge-based economy and the citizens' well-being, there is a social need to continuously improve the quality of all modes of learning. The quality improvements should aim to enhance or at least bring about meaningful reforms to all levels of formal education, supporting the learners' styles of learning and their personalized learning needs. Higher education (HE) is often the most turbulent domain of externally or/and internally or time-driven changes. Such rapid or slow changes are, for instance, the current coronavirus pandemic or various socio-economical changes from financial crises, which most often define the needs for a specific type and mode of learning, re-shaping pedagogic purposes of state-based or other formal education. For learning processes to be both effective with desirable results (learning outcomes) and also efficient regarding the performance of instructors and learners, long- and short-term educational objectives must be clearly outlined and smoothly streamlined. In return, the learning procedures must be thoroughly (re-)considered and often re-designed or adapted to address the newly risen pedagogical, socio-cultural, or socio-economical needs.

The learning procedure itself is a complex mental phenomenon involving cognitive processing, taking place in a social and cultural setting through direct and indirect contact with other human actors <sup>[1]</sup>. This procedure generates feelings and is influenced by the learner's affective states and predispositions <sup>[2]</sup>. Hence, personal learning processes broadly encompass three essential elements: content, social interaction, and incentives, where each element is linked to its respective dimension (cognitive or logical; emotional or affective; and social or intrapersonal) <sup>[3]</sup>. The augmentation of all aforementioned dimensions has the intended result of quality learning that resonates, is durable, carries personal meaning, is integrated cognitively, and can be applied in different contexts. It can be argued by the authors that this description is summarized via the concept of deep and meaningful learning (DML). The latter should be rich and polymorphic as well as multileveled, by its very nature, as explained next.

Deep learning stems from the research carried out by Marton and Säljö <sup>[4][5]</sup> on the processing approaches of students while executing cognitive tasks. A learner who uses deep learning approaches and takes control of his or her learning attempts to essentially understand the learning content and process and tries to make sense of and transform the organization of the self <sup>[4]</sup>. Ohlsson defines deep learning as the capability for fundamentally radical cognitive growth, that he calls non-monotonic <sup>[6]</sup>. He particularly distinguishes three types of non-monotonic change in cognition, briefly mentioned next:

(1) Capacity for novel solution generation and creative insights; Otherwise stated, deep learning occurs when  
(2) Modification of cognitive skills by trial and error; students/learners are actively involved in the learning process and are  
(3) Conversion of beliefs through critical reflection <sup>[6]</sup>. given opportunities to construct meaning <sup>[7]</sup>. Deep learning is linked to manifold (i.e., creative, critical, reflective, and caring) thinking <sup>[8]</sup> and problem-solving processes and capabilities <sup>[9]</sup>.

Meaningful learning, according to Ausubel <sup>[10]</sup>, should be the goal of formal higher education, which is achieved through sustained critical discourse. Learning itself becomes meaningful when it exhibits five descriptive characteristics: active, constructive, intentional, authentic, cooperative <sup>[5][11]</sup>.

The two previously explained concepts—deep learning and meaningful learning—have been combined and unified into the term deep and meaningful learning, as there are correspondences in their conceptualization and construction <sup>[12]</sup> that can encompass enhanced quality learning in reality.

How could DML be facilitated in reality? Both deep learning and meaningful learning theories confirm that quality learning experiences activate students' minds, hearts, and interpersonal communication skills <sup>[13][14]</sup>. DML achievement is a challenge in all educational settings considering that the key stakeholder of the learning process is each and every learner with his/her unique characteristics and mental and emotional capacities <sup>[15]</sup>. Educational institutions and knowledge providers, through their teaching and administrative staff, need to design and implement multi-faceted quality learning experiences that enable deep learning. Information and communication technology could support meaningful learning when it is used for knowledge construction, conversation, articulation, collaboration, and reflection <sup>[11]</sup>.

Creating and supporting DML in e-learning settings is even more challenging. Many research projects <sup>[16][17][18]</sup> appeared to study many challenges that arose for learners and instructors from the increased and sudden use of e-learning facilities as a quick "must be" adaptation to new modes of open and distance learning. In particular, learners' emotions and motivational complexities have sometimes been neglected and it is often difficult to draw observations in distance education. For example, some affective aspects of learning such as interest and motivation are crucial as they have a direct impact on the cognitive learning procedures <sup>[19]</sup>.

Humans can have multiple extrinsic and intrinsic goals and motives at the same time <sup>[20]</sup>. Their own learning objectives can vary a lot. HE students sometimes enter into learning with the objective to perform well and not to fail the summative assessment tests. Often, corporate employees participate in a training program with the objective to secure a monetary reward. These are examples of extrinsic goals associated with education <sup>[15]</sup>. Of course, extrinsic motivation leads to surface processing, anxiety and attrition <sup>[21]</sup>. In other times, the same or other students can adopt intrinsic incentives associated with the joy of engaging with the studied subject itself <sup>[5]</sup>. High dropout rates in e-learning can often be attributed to emotional factors and conditions such as frustration, confusion, isolation, and lack of intrinsic motivation <sup>[22]</sup>. Educational practitioners and instructors do not necessarily possess the knowledge and/or the skills to motivate their audience and somehow engage them in learning, e.g., by incorporating relevant cooperative or collaborative group activities <sup>[23]</sup>.

## **2. Social Virtual Reality Environments**

A social virtual reality environment (SVRE) appears to be a promising technology for learners' engagement due to the (learning) environment's potential to facilitate DML in virtual learning settings. Yet, this remains an idea and needs to be investigated in its application and practice. SVREs constitute three-dimensional computer-generated virtual reality spaces that are instrumental for social or psychological immersion <sup>[5]</sup>. In the research literature, SVREs are also called immersive virtual worlds <sup>[24]</sup> or multi-user virtual environments (MUVES) <sup>[5]</sup>. SVREs are accessible through computer technology while some of them can also be experienced through the use of head-mounted displays or mobile, hand-held devices <sup>[25][26]</sup>.

A comparison between SVREs with two-dimensional (2D) learning environments yields significant differences related to context and interaction <sup>[27]</sup>. SVREs also elicit an enhanced sense of self in users through the avatar, a learner-controlled, personal, digital agent <sup>[28]</sup>. The embodied representation creates a feeling of belonging to a similar group and desire for being in a space where a strong co-presence could be experienced when meeting with other agents/avatars <sup>[29]</sup>. Essentially, SVREs appear to provide practitioners with the capacity to address, to some extent, two often neglected aspects in open and distance learning: social discourse and intrinsic motivation <sup>[5]</sup>. These aspects along with the learners' (cognitive) engagement are three vital (yet often missing) dimensions to enable DML <sup>[30]</sup>.

## **3. Recommendations for E-Learning Practice**

Attendance-based education is, potentially, a privileged context for learning, as educators can employ any teaching method and medium within institutional and organizational constraints. Distance teaching in 3D virtual immersive reality "appears to require yet another set of skills in addition to the skills required for teaching in 2D environments" <sup>[31]</sup>. By combining and perusing the outcomes from the included studies, we further propose the following recommendations for DML in SVREs: meaningful contexts, purposeful activation, learner agency, intrinsic emotional engagement, holistic social integration, and 360° obstacle removal.

Technology alone cannot cause learning to happen but its affordances can make specific activities possible where learning takes place <sup>[32]</sup> within usable contexts. Learning environments and activities in an SVRE have to be designed in an appropriate context, aligned with the program's learning outcomes and the learners' goals <sup>[31]</sup>. This context can be authentic, realistic, or completely fictional, but should be cognitively related to the intended learning outcomes (e.g., through metaphors or storytelling) <sup>[33][34]</sup>. It should serve a specific need and purpose that learners will embrace voluntarily to be active and work toward a main educational goal, a purposeful target, or learning-centered challenge.

Active learning enhances metacognition skills and helps students to build mental models of the studied discipline [35]. Therefore, they must be emotionally engaged. Being in the SVRE should be a positive, desirable experience, even when it has to do with obligatory study duties and learning tasks such as a professional training [36]. The latter is often an obligation and perhaps not a knowledge priority in the learners' point of view. Educators should be instrumental in cultivating the ethos of the shared environments toward trust building [37]. Learners, on the other hand, should be encouraged to exercise agency, with the freedom to make choices in their engagement with the content, objects, the artificial intelligence entities such as non-player characters in the environment, and especially with teachers and peers. Exercising control over their experience is beneficial for students' learning [38].

The SVRE should not merely be a "virtual classroom" where course meetings take place. The different spaces could be the students' locker rooms, cafés, workshops, or alternative places for online social formal and informal peer interactions [39][40][41], but not to the detriment of learning. Creating the conditions for students to discuss and exchange their opinions enables them to explore and encourages an attitude of inquiry [29]. Finally, at the operational level, one prerequisite is that all technological, psychological, or other obstacles should be removed meticulously, creating comprehensive, 360°, friction-free experiences.

As already stressed, a recommended plan is to provide users with sufficient opportunities with supportive personnel in onboarding and experimentation sessions so that they can become familiar with the available SVRE platform [5]. One way to combine all these attributes is by using game-informed approaches or other instructional methods that intrinsically motivate learners to assert cognitive effort.

In the long run and witnessing the rapid developments in virtual reality (VR) and the significant rise in usage of this technology in other regions of the globe, e.g. [42], the stakeholders of higher education should establish projects to proactively address the evolving digital skills gaps that learners and learning agents are increasingly facing.

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