

EDITORIAL

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Focus on: Smart, Ubiquitous and Massive Learning Environments

This special issue originates from the first edition of the *International Workshop on Semantic Technologies in Ubiquitous, Massive and Smart Learning (STUMS-2014)* held in conjunction with IEEE INCoS 2014¹. STUMS, in its discussions, reflects the needs for a TEL (Technology Enhanced Learning) Framework able to integrate both formal and non-formal learning experiences, which are currently considered to be almost entirely separate worlds. Thus, the main idea of the above mentioned workshop and the present special issue is to: i) start from three research fields, Ubiquitous Learning (u-Learning), Massive Open Online Courses (MOOCs) and Smart Learning Environments (SLE), which propose both formal and non-formal TEL solutions, ii) abstract relevant elements, and iii) use such elements, together with other consolidated results, like personalized and adaptive learning principles, to accomplish the goal of integrating and aligning heterogeneous learning activities, from both methodological and technological viewpoints.

Ubiquitous Learning allows people to learn anytime and anywhere, thus it is considered as the next generation e-learning. Ubiquitous Learning potentially overcomes the limitations of e-learning by building serendipitous, seamless, creative, novel, high degree of autonomy and learner-centered learning environments which are not subject to the constraints of space and time and exploit Context and Situation Awareness to improve the learning process. So, ubiquitous learning environments are settings for pervasive learning, where the learning experiences “immerse” learners who are involved in formal as well as non-formal activities.

MOOCs (massive open online courses) are, typically, free courses deployed over the Web that are away from the traditional classrooms and support a huge number of enrolled students (even thousands of students per course). In successful MOOCs, we can find authentic strong communities, including learners

¹ STUMS 2014 is the in these days, the second edition (2015) of STUMS is in definition. The 2015 edition will be held in September at Tamkang University, Taipei, TAIWAN.

who desire to master content and instructors (teachers, tutors, coaches, etc.) who help learners to succeed in their challenges. A MOOC usually provides a course syllabus, a set of video lectures (possibly associated with transcripts), weekly activities, quizzes, Q&A sessions, links to many of the freely available resources that are needed and projects. Coursera, edX, Udacity, Khan Academy and Udemy are just a few among the existing MOOC Platforms. In this context, some drawbacks emerge: MOOCs are also very expensive to create (e.g. costs of video lectures, tutoring, etc.), MOOC dropout rate is 90%, there is no real interoperability among different MOOC Platforms and among MOOCs and formal University Curricula.

Smart Learning Environments represent a new frontier for educational systems, which aim at achieving the effective synergy among pedagogy, technology and their fusion in order to improve learning processes. A learning environment can be considered smart when the learner is supported, for instance, by “adaptive” and “intelligent” technologies, which follow the learner from childhood to their adult life, at work, through formal, non-formal and also informal learning activities. Among the most important features of a smart learning environment it is important to underline that it offers a high degree of autonomy, adapts itself when context changes, and communicates with learners by means of natural interfaces.

We strongly believe that our goal can be achieved only by lavishing interdisciplinary efforts synergistically. Thus, we would like to consider at least the two main viewpoints we have previously indicated.

First of all, from the **methodological viewpoint**, as indicated in the invited work, “*the overcoming of approaches, behaviorist and constructivist, seems to foster a vision that came after the advent of the new millennium that could be defined post-constructivist that puts the teaching-learning process at the centre*”. Hence, there is a need to redefine the educational processes of “attunement” in order to exploit the space and time of educational mediation.

Secondly, from the **technological viewpoint**, we need a framework, based on Semantic Technologies and Computational Intelligence, able to guarantee at least interoperability, integration, knowledge modelling, knowledge extraction, knowledge harmonization, adaptivity, personalization and context awareness. It is our opinion that the aforementioned features could provide the concrete chance to sustain heterogeneous learning activities and align them in order to support continuity and the capability to monitor and adapt the whole lifelong learning experience in all its components.

In order to prepare this special issue, we have collected a set of very in-

teresting papers covering several aspects related to the definition of the TEL Framework for the integration of formal and non-formal learning activities. The research results we are proposing act at different abstraction levels with respect to the goal of the issue. In the following paragraphs, we would like to provide the readers with one of the possible reading keys.

In particular, the themes of adaptivity, personalization and attunement which are crucial for the whole learning experience (made of both formal and non-formal experiences) and provide common methodological building block for MOOCs (e.g. the need to provide one-to-one tutoring), Smart Learning Environments (e.g. the capability to opportunely react to the contingent needs and the specific behaviors of learners) and Ubiquitous Learning (e.g. the capability to enable context-aware applications) are analyzed in the invited work of Rossi and Fedeli. Moreover, personalization in on-line learning, in the domain of Mathematics, is also discussed in the work of Albano, Miranda and Pierri.

The issues related to the Learning Objects management (analysis, sharing, annotation, etc.) are discussed in two works of this special issue. Learning Objects enable to retrieve, reuse and assemble learning contents effectively and efficiently, and they can be shared across heterogeneous activities in formal and non-formal settings. In particular, Miranda and Ritrovato face the problem of extracting metadata from learning contents. Moreover, Fiore, Mainetti and Vergallo provide methodological considerations for building tools to collect and share educational resources.

The theme of assessment, that is crucial also for supporting adaptation, is discussed in two papers. In the first one, Marzano and Notti provide an ontology for the Educational Assessment domain. Computational Ontologies provide a useful tool to share knowledge among different and heterogeneous agents (both humans and software). In the second one, Senthil Kumaran defines a framework for self-assessment and personalized assistance to m-learners, i.e. learners adopting mobile devices to interact with their learning environments.

Lastly, the paper of Gaeta, Gaeta, Guarino and Miranda deals with specific Smart Learning Environments and, in particular, proposes an approach to sustain *narrative experiences* in Smart Museums.

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