Chapter 27
Inquiry-Based Learning on the Cloud

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ABSTRACT

Cloud Learning Environments (CLEs) have recently emerged as a novel approach to learning, putting learners in the spotlight and providing them with the cloud-based tools for building their own learning environments according to their specific learning needs and aspirations. Although CLEs bring significant benefits to educators and learners, there is still little evidence of CLEs being actively and effectively used in the teaching and learning process. This chapter addresses this issue by introducing a European initiative called weSPOT (Working Environment with Social, Personal and Open Technologies for Inquiry-based Learning) for supporting and enhancing inquiry-based learning in STEM education via a cloud-based inquiry toolkit. The chapter presents evidence of using this toolkit within a case study that investigates how a secondary education community of students / co-learners selects information sources on the web and identifies factors associated with the reliability of information sources during their collaborative inquiry (co-inquiry) project in online environments.

INTRODUCTION

Learning Management Systems have dominated e-learning for several years. They have been widely used by academic institutions for delivering their distance learning programmes, as well as for supporting their students outside the classroom. They have also been established in the business sector as the mainstream platform for delivering training services to employees. A Learning Management System (LMS) is an online software application offering facilities for student registration, enrolment into courses, delivery of learning materials to participants, student assessment and progress monitoring. Popular examples of LMS used by the academic as well as the business world include Blackboard[1], Moodle[2], and CLIX[3].

However, the advent of Web 2.0 has altered the landscape in e-learning. Learners nowadays have access to a variety of learning tools and services on the web. These tools and services are usually provided by different vendors and in many cases are open and free. Repositories like Wikipedia[4], YouTube[5], SlideShare[6] and iTunes U[7] offer access to a wide range of learning materials for free. Augmenting and configuring the diverse and distributed Web 2.0 tools and services in order to address the needs and preferences of individual learners are a significant challenge for modern online learning environments.

The transition from the traditional e-learning approach of LMS to Web 2.0 e-learning solutions bears significant benefits for learners. It puts emphasis to their needs and preferences, providing them with a wider choice of learning resources to choose from. The European project ROLE (Responsive Open Learning Environments)[8] has explored this transition within a variety of learning contexts and test-beds (Kroop, Mikroyannidis, & Wolpers, 2015). One of the these test-beds has been provided by the Open University[9] and concerns the transition from formal learning, where courses are exclusively prepared and delivered by educators, towards informal learning, where the learner is in control of the whole learning process. This transition is being implemented within the Open University test-bed as a transition from the LMS towards the Personal Learning Environment (Mikroyannidis & Connolly, 2015).

The Personal Learning Environment (PLE) is a facility for an individual to access, aggregate, configure and manipulate digital artefacts of their ongoing learning experiences. The PLE follows a learner-centric approach, allowing the use of lightweight services and tools that belong to and are controlled by individual learners. Rather than integrating different services into a centralised system, the PLE provides the learner with a variety of services and hands over control to her to select and use these services the way she deems fit (Chatti, Jarke, & Frosch-Wilke, 2007; Mikroyannidis, Kroop, & Wolpers, 2015).

The Cloud Learning Environment (CLE) extends the PLE by considering the cloud as a large autonomous system not owned by any educational organisation. In this system, the users of cloud-based services are academics or learners, who share the same privileges, including control, choice, and sharing of content on these services. This approach has the potential to enable and facilitate both formal and informal learning for the learner. It also promotes the openness, sharing and reusability of learning resources on the web (Malik, 2009).

The CLE is enabled by the technological infrastructure of Web 2.0, employing popular and established technologies such as HTTP, XML, and SOAP. This makes it an ideal platform for the easy sharing of online resources, thus benefiting not only learners, but also those who design, produce, and publish creative digital works for educational purposes. This is a critical requirement for achieving a sustainable knowledge community, as not only consumers but also active producers are essential (Hu & Chen, 2010).

The web services employed by the CLE have made a significant impact on the design and delivery of e-learning resources (Vossen & Westerkemp, 2003). Unlike the traditional approach to courseware delivery followed by the LMS, where the focus is on the aggregation of learning objects, the CLE sup-

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