A Framework of MLaaS for Facilitating Adaptive Micro Learning through Open Education Resources in Mobile Environment

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ABSTRACT

Micro learning becomes popular in online open learning and it is effective and helpful for learning in mobile environment. However, the delivery of open education resources (OERs) is scarcely supported by the current online systems. In this research, the authors introduce an approach to bridge the gap by providing adaptive micro open education resources for individual learners to carry out learning activities in a short time span. They propose a framework for micro learning resource customization and a personalized learner model, which are supported by education data mining (EDM) and learning analysis (LA). A service-oriented architecture for Micro Learning as a Service (MLaaS) is designed to integrate all necessary procedures together as a complete Service for delivering micro OERs, providing a platform for resource sharing and exchanging in peer-to-peer learning environment. Working principle of a key step, namely the computational decision-making of micro OER adaptation, is also introduced.

KEYWORDS
Micro Learning, Open Education Learning Resource, Open Learning, Service Oriented Architecture, Software as a Service

1. INTRODUCTION

As more and more universities open up online access to their courses, open education resources (OERs) become more popular in the whole education sector, particularly in tertiary and vocational sectors. According to the latest statistics, millions of people attend the virtual classroom of online open learning (OL) to access such OERs every day, the massive open online course (MOOC) being a famous associated product of OL. In fact, the number of students who are enrolled in a single course at the same time could be up to tens of thousands (Baggaley, 2013; Pappano, 2012).

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OL is recognized as a novel and affective learning way that can lead to a revolution to the traditional way of learning. Nevertheless, delivery effectiveness of OERs to eLearners in diverse learning environments remains a challenge to OL. For example, studies showed that MOOC are currently suffering from low completion rate (Nawrot & Doucet, 2014). Most learners who enroll in MOOC courses eventually dropped out, due to various reasons.

Although educational professionals have strived to the utmost extent on exploring OL, OERs and MOOC format as a regular are barely a complementary pedagogical approach for mobile learning (Warrd et al., 2011). Having studied the existing literature and development of OL and OERs, we are motivated to carry out a research to provide learners adaptive OERs in terms of micro learning. In other words, we are dedicated to tailor OERs into chunks with relatively short time length and allocate the chosen chunk(s) to learners for the right time span. This approach will be realized by Micro learning as a Service (MLaaS) in the SaaS manner. Following such an optimal way, learners could easily complete the learning process of each unit within fragmented pieces of time. For example, travelling by train on his/her way home from work for 15 minutes, he/she would be able to use mobile devices to learn a piece of OL course within this time. In this case, an ideal course module delivered to him/her should be limited within the time span (e.g. 15 minutes) to ensure a micro but complete learning experience.

The rest of this paper is organized as follows: Section 2 discusses the background of OERs and MOOC and elaborates the research challenges that we are facing; Section 3 introduces the categorization and customization of OERs in the micro learning context; a personalized learner model for micro learning will be demonstrated in Section 4, with associated schemes for discovering patterns and rules for the model construction by leveraging the educational data mining (EDM) and learning analysis (LA); the MLaaS architecture will be shown in Section 5, working principle of the micro OER delivery can be found in Section 6; and finally Section 7 will conclude this paper.

2. BACKGROUND

2.1. Nature of OERs and MOOC Delivery in Mobile Environment

OL performs quite differently from on-campus e/m-learning mode. OERs are “digital learning resources offered online freely and openly to teachers, educators, students, and independent learners in order to be used, shared, combined, adapted, and expanded in teaching, learning and research” (Hylen, Damme, Mulder, & D’ Antoni, 2012). OL is the combination of informal learning and formal learning. Learners enjoy high flexibilities in online OL because there is no strict time constraint for joining and quitting. Learners engaged in OL are across age groups and culture background with a wide range of geographic distribution.

Generally OERs can be differentiated from MOOC and open courseware (OCW). Contrary to MOOC, OCW only offers course materials rather than entire courses. In other words, OER can be either structured (MOOC content) or unstructured (i.e. OCW), even both of them. OER providers and instructors have tried to promote their courses and affiliated educational products at full stretch. They have leveraged mobile learning (m-learning) for learners to easily participate in learning activities regardless of restrictions in time and location.

From another aspect, mobile learning activities in OL normally consist of two sections: online learning and offline learning (Trifonova & Ronchetti, 2006). Since mobile learners can freely download materials into their mobile devices for viewing offline, they do not often stay with OL platforms and attend virtual classrooms (Attewell, 2005). In fact, accessing OERs online is only a
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