M2Learn framework: How to facilitate the development of mobile collaborative context-aware applications

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Abstract

It is our belief that advances in mobile and communication technologies provide a means of driving pedagogical change in traditional educational systems. A prime emerging advantage of these technologies lies in context-aware learning applications which contextualize acquired knowledge and act according to users’ educational and personal circumstances, technologically scaffolding both in-class and out-of-class learning experiences [1]. Mobile devices are becoming increasingly ubiquitous essential companions in our daily endeavours, and integrate various sensors (e.g. GPS, camera, motion sensors). Furthermore, these devices are well connected due to the proliferation of mobile broadband connections [2].

Collaborative learning has become an indicator of educational change, in line with the influence of Social Constructivist learning theory [3]. School and university curricula are being changed to seamlessly embedded collaborative activities into existing classrooms, therefore creating not only novel classroom organization, but systematically changing the classroom culture [3]. As this process progresses, we witness implementations in all subject areas ranging from mathematics to biology, electronics, to history, both in primary and secondary schools, as well as at universities.

To systematically utilize the power of this new technology in learning and to provide adequate mobile technological support for collaborative learning, we propose a programming framework called M2Learn. It should facilitate the development of mobile learning (m-learning) applications focusing on ubiquitous technologies with its following main features:

- **Support for plug-and-play communication and collaboration** (e.g. forum, chats, and blogs). Within the framework, there are connectors built against services in existing e-learning platforms, so that these services can be easily integrated in new m-learning applications providing a valuable added-value almost without effort. Connectors to other services on these platforms are also developed, such as Assignments. This feature allows reusing not having to rebuild these services for m-learning applications again and aggregating student activity information (e-portfolio), including a record of the quantity and quality of their peer interactions, coming from e-learning or m-learning applications.

- **Provision of context-aware services.** Developed mobile applications are free to incorporate and use:
  - geo-location - useful for personalizing services logging user spatial activity;
  - motion recognition: - useful for implementing novel ways of interacting with the technology;
- academic profiles – useful for personalizing different services and
- history of activities (logs) - useful for inferring users’ actions and activities.

- Promoting community building via open source initiative. On-line community is built around the framework to collaboratively improve it.

The M2Learn framework encapsulates a set of APIs [4] that can be utilized to develop mobile collaborative applications, such as mobile wikis or blogs, through which students collaborate anytime, anywhere. The collaboration can be established around different kinds of content, such as a virtual puzzle or the mathematical concept of learning fractions through a challenge-based application [5], and can be supplemented and contextualized with the use of M2Learn’s location-aware services.

The ways of utilizing the presented infrastructure are numerous, limited only by human imagination. As an example, a mobile collaborative application aimed at supporting both formal and informal learning scenarios is presented in this paper. The mobile client-side part of the application is used to render LOM resources [6] and provide a communication endpoint towards the system. Web application, on the other side, is used to connect users’ mobile contributions with the contents of an existing e-learning system (Figure 1).

![Figure 1. Mobile collaborative client-side application built on top of the M2Learn system together with its collaborative counterpart within an existing e-learning system.](image-url)

References


