Mobile 2.0 learning: Empowering mobile learning with socialized context sharing

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Abstract: With an experience in the development of web-based learning, mobile learning, and web 2.0-based learning, we have seen an emerging trend in the integration of web 2.0 technology into mobile learning, so called Mobile 2.0 Learning. By analyzing previous studies with the model of social cognitive theory, we reveal that their integration is not in conflict with each other; in contrast, Mobile 2.0 Learning may reframe the relationship between environments inside and outside of school. The social interactivity of Web 2.0 can improve students' sense of community and collaboration in mobile learning. Mobility and context capturing facilities can support learners to exchange information in daily life and further develop context-specific competences in an informal social community. This study first introduces the components of Mobile 2.0 learning and its unique characteristics. Next, the key elements driving Mobile 2.0 were illustrated by an example to show their processing flow. Finally, further research issues of Mobile 2.0 learning were proposed. It is hoped to provide readers a potential research blueprint by this study.

Keywords: Mobile learning, Web 2.0, Mobile 2.0, social networking

1. Introduction

In recent years, researchers have focused on the use of mobile devices to facilitate students' learning, called mobile learning. For example, (Y. S. Chen, Kao, & Sheu, 2003) demonstrated that embedding an encyclopedia of ecology in mobile devices might help students to better understand animals they may encounter. Smordal and Gregory (2003) also showed that use of mobile devices could provide learners more immediate and relevant knowledge, and might help their problem solving. In addition, a mobile device supporting a guide agent could suggest students an effective path when visiting certain wetlands (Tan, Liu, & Chang, 2007). In short, one benefit of mobile learning is to help learners to understand content immediately and efficiently (Hsiao, Lin, Feng, & Li, 2010).

The other major advantage of mobile learning is to connect students to nature, which is a knowledge-enriching experience (Maldonado, Pea, Spikol, & Milrad, 2010). As noted by Wan and Lam (2010), students perceived authentic objects or examples can acquire a deep understanding of concepts. Roschelle (2002) also pointed out that mobile learning could effectively motivate learning by augmenting physical space, leveraging topological space, and aggregating coherently across all students. In other words, mobile learning helps encourage students to explore the outdoors and learn actively.

While considerable attention paid to either mobile learning or web 2.0-based learning, the current development still has much room to advance (Frohberg, Gothe, & Schwabe, 2009). For example, Frohberg et al. (2009) found that most mobile learning projects occur in independent and formalized contexts, but hardly in a socializing context. Similarly, Hughes (2009) noted that there was high use of Web 2.0 tools for playful activities, but low use for collaborative knowledge construction. To cope with these limitations though involving an experience in the development of both technologies, we have seen an emerging trend in the integration of web 2.0 technologies into mobile learning, so called Mobile 2.0

learning (M2L). Our main goal thus is to introduce educators an innovative instructional tool and provide researchers a potential research blueprint.

2. The components of Mobile 2.0 Learning

In recent years, we have seen mounting evidence of the usefulness of educators' incorporating E-learning systems into their teaching, but we also noticed a shift in patterns of E-learning systems. The ensuing section describes each type of environment that configures M2L. Figure 1 shows the relationships among Mobile learning, Web 2.0-based learning, and M2L.

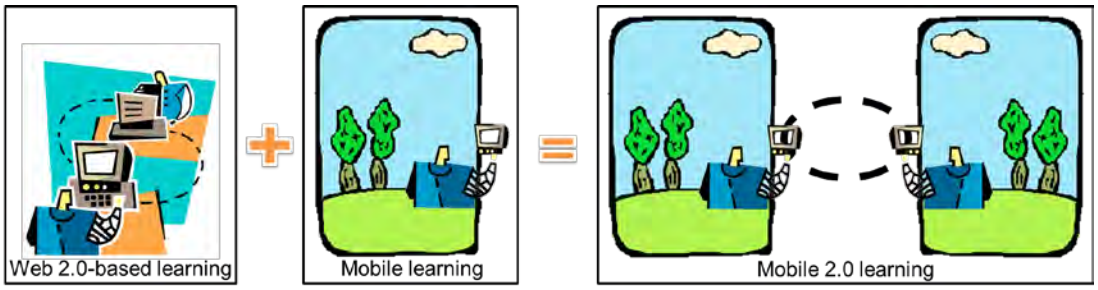

Figure 1. Relationships among web 2.0-based learning, mobile learning and "Mobile 2.0 learning"

Nowadays, many students are used to communicating with each other through voice or short messages by mobile phones. Traditionally, students used mobile devices mainly to *pull* resources passively from web-based contents (Sharples, 2002). Contrary to passively accessing traditional web-based contents, most students are now willing to actively use Web 2.0 technologies to create, *push* and share information. For example, students can actively upload learning content or a lecture video in a blog system. Peers can immediately access the information just uploaded and then post their responses to it. However, these prompt *pull* and *push* actions are foiled by using desktop computer facilities (Y. M. Huang, Jeng, & Huang, 2009).

Thus, the integrated M2L cannot be defined simply as extending the Web 2.0 services to mobile learning. What is more, through the convergence of the social interaction and situated learning, M2L should reshape a new paradigm of educational experience for instructors and learners.

3. The key elements driving Mobile 2.0 learning platforms

The analysis in the former section showed that the purpose of MW2 is to create higher levels of interaction and value-added outcomes through the integration of learning contents and contextual information. As follows, aggregation, dynamics, sensors and alerts are the key elements in driving M2L:

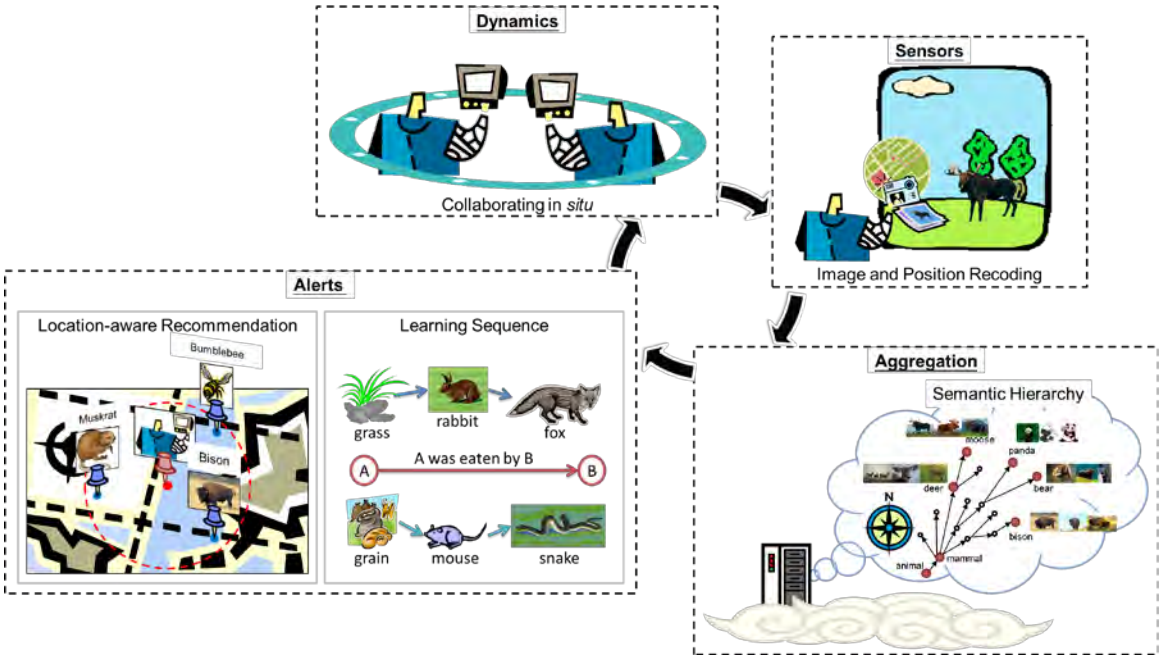

Figure 3. Illustrative example of the processing flow of the four key elements supporting the mobile 2.0-based ecological learning

Aggregation is a key interface element for M2L. The functionality of an aggregation is to harness collective intelligence (Bosse, Jonker, Schut, & Treur, 2006). Thus, it is necessary to create content, represent it with the current context, and publish it to the web. For example, G. D. Chen and Chao (2008) developed a web-based discussion forum for collecting students' contextual messages from traditional paper textbooks, and then to facilitate collaboration among community members and offer timely, contextual assistance in students' study based on their reading status.

Because mobile devices generally suffer from limited resources, the usability of an aggregation is a vital element driving the usability of M2L. Therefore, the interactive means provided by mobile devices must be short and make learners willing to communicate more frequently and instantly in a natural environment (Counts & Fisher, 2010). The learning management system (LMS) could be modified to achieve this goal. Environment implementers need to take responsibility for the usability of the aggregation, not just by easily gathering content, but also by representing content according its context. Summarization methods serve as an intermediate agent to build effective aggregation for interchanging content on different mobile devices (Carpineto, Mizzaro, Romano, & Snidero, 2009).

Dynamics refers to the capability of M2L to create a host of collaborative environments caused by both the mobility of devices and the varied contextual information of individuals. M2L environments will create dynamic grouping techniques. These techniques can group learners based on the instantaneousness of their context (N. S. Chen, Kinshuk, Wei, & Yang, 2008; El-Bishouty, Ogata, Rahman, & Yano, 2010; J. J. S. Huang, Yang, Huang, & Hsiao, 2010). On the one hand, learners can provide their knowledge according to its contextual information and get a deeper understanding of concepts through a merged view of context. On the other hand, learners will interact with each other in a heterogeneous group because this kind of grouping will have a higher variety within a group (Hooper & Hannafin, 1988).

Sensors provide the rich situated contexts for M2L experience. Besides location, sensors will capture more of the learners' surrounding information such as data-logger, audio recording, photo, camera, physiological signals, and so on. A true M2L application will integrate these sensor data to know the exact context of your surroundings as well as your profile of preferences and then match them with relevant learning services and learning contents. For example, Hsiao et al. (2010) offer a location-based service to present the learning materials and activities related to the learning zone to the students automatically.

Alerts let you know what you need to know. Many mobile learning applications are already taking advantage of alerts, which can notify learners of a variety of events, such as moments of vocabulary learning (C.-M. Chen & Chung, 2008) and recommendations for peer mentors depending on one's schedule (G. D. Chen, Chang, & Wang, 2008). Nevertheless, as learning becomes Mobile 2.0, new opportunities for motivation enhancement will emerge: for example, noticing near learning companions (J. J. S. Huang et al., 2010), guiding a student to the target learning object (Hwang, Kuo, Yin, & Chuang, 2010), or recommending a learning task according to a learner's context (Ogata, Saito, Paredes, Martin, & Yano, 2008).

Figure 3 depicts an illustrative example of a hypothetical learning process driven by the four key elements of Mobile 2.0 tools. Consider the "Identification of Animals" task in a natural science course of an elementary school. First, the students discuss the characters of the deer family in their own micro-blog, which can be grouped by their instant interests. Students can temporarily collaborate to understand the similarity and differences among the deer family's animals. This can be done even with students who are not in the same city or country. Next, students can visit zoos, villages, or wildlife parks to investigate the species of deer near their places. If students meet a Moose in the field, they can take a picture of the moose as well as embed the contextual information such as the original geographic position and the moose's voice in the image. Moreover, students can use a data-logger to collect environmental information such as temperature, humidity, or the pH of water and soil. The sharing of *in situ* behavior could facilitate students to contribute their personal knowledge to the learning community. Third, when students finish the animal tour, they can send the surveyed data to update the knowledge aggregation on the cloud-based server. This aggregation can represent the deer family with a hierarchical knowledge structure. The hierarchical knowledge structure can summarize the tree items into a compact tree according to the students' context. Finally, during the next tour, the students can request and receive information about the other nearby animals. With the support of semantic technology (e.g., the feeding relationships between animals), it is possible to recommend an adaptive learning sequence and students will be able to acquire a deep understanding of the concept of feeding relationships in an ecosystem.

4. Conclusions

M2L can create a learning environment that is authentic, collaborative, communicative, engaged, and effective. It also can provide improved collaboration efficiency, enhanced learner communication, increased content contextualization, and continuous interactivity. Current implements are already demonstrating the effect of collaborative context sharing with mobile devices, even though they are pilot investigations and affective in orientation. However, a great deal of research effort is required to realize the complete idea of M2L and to understand its pedagogical implications.

Finally, it is worth emphasizing that M2L is not a replacement of other types of learning environments, but an extension of them since the M2L concept is complementing the features of web-based learning, mobile learning and Web 2.0 concepts. In the ideal situation, M2L will be expected to support a real-situated collaborative learning, where the feature of context-awareness comes from the portability and flexibility of mobile devices, and the feature of collaboration comes from the people's interactivity of the Web 2.0. Before such situations can be achieved successfully, we need to address these challenges and further research issues explored in this study.

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