Supporting Awareness in Ubiquitous Learning

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ABSTRACT

This article focuses on awareness in computer supported ubiquitous learning environments. In ubiquitous learning, awareness is a key process in individual and/or collaborative learning. Awareness is structured into social, task, concept, workspace, knowledge, and context. This article introduces four systems for supporting various kinds of awareness and concludes with some discussion and proposals for future work.

Keywords: Knowledge awareness, Ubiquitous learning, RFID

INTRODUCTION

Ubiquitous learning implies a vision of learning, which is connected across all stages of our lives. Learning occurs not only in classrooms, but also in the home, the workplace, the playground, the library, museum, and nature center, and in our daily interactions with others. Moreover, learning becomes part of doing. Therefore, it makes sense for us to consider what type of ubiquitous computing is necessary for this kind of ubiquitous learning, and what the requirements are to make it possible.

Ubiquitous learning (or u-learning) is related to some aspects of mobile learning, that is, learning environments can be accessed in various contexts and situations. There are a number of different definitions of ubiquitous learning. However, according to Ogata and Yano (2004a) the main characteristics of ubiquitous learning are:

1. **Permanency**: Learners never lose their work unless it is purposefully deleted. In addition, all their learning processes are recorded continuously every day.
2. **Accessibility**: Learners have access to their documents, data, or multimedia recordings from anywhere. That information is provided based on their requests. Therefore, the learning involved is self-directed.
3. **Immediacy**: Wherever learners are, they can get any information immediately. Thus, learners can solve problems quickly. Alternatively, the learner can record their questions and look for the answers later.
4. **Interactivity**: Learners can interact with experts, teachers, or peers in the form of synchronous or asynchronous communication. Hence, the experts are more reach-

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able and the knowledge becomes more available.

5. **Situating of instructional activities:** Learning can be embedded in our daily lives. The problems encountered as well as the knowledge required are all presented in their natural and authentic forms. This helps learners be aware of the features of problem situations that make particular actions relevant.

6. **Adaptability:** Learners can get the right information at the right place in the right way.

In this article, we take account of this definition, but also define ubiquitous learning from a technological perspective as being learning that is enhanced by embedded and mobile computers in everyday life. Ubiquitous learning environments integrate high mobility (using mobile devices) with pervasive and ambient learning environments. While learners are moving with their own mobile devices, a system can dynamically support their individual learning by communicating with embedded computing devices like RFID tags and sensors in the environment. Embedded computing devices also support context-awareness in order to provide learners with the right information at the right place in the right way. However, even in such learning environments, learners may miss learning opportunities unless they are made aware of the chances to learn.

This article focuses on awareness that initiates individual or collaborative learning in ubiquitous learning contexts. According to computer supported cooperative work (CSCW) and computer-supported collaborative learning (CSCL) research, five types of awareness have been proposed: social, task, concept, workspace and knowledge. Also context awareness is important to provide personalized information to the learner. Ubiquitous learning takes place in many contexts, such as in a library, in a kitchen, and so forth. This article describes how awareness helps to enhance ubiquitous learning.

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**AWARENESS IN UBQUITOUS LEARNING**

In CSCW, a collaboration process is led from four processes (Malone, Lai, & Fry, 1992): co-presence, awareness, communication, and collaboration. Co-presence gives the feeling that the user is in a shared workspace with someone else at the same time. Awareness is a process where users recognize each other’s activities on the premise of co-presence, for example, “what are they doing?”, “where are they working?” With communication and collaboration, the user works on the specific task with other users and accomplishes the task and common goals. Awareness, in particular, is one of the most interesting aspects of achieving cooperation and collaboration and increasing communication opportunities. Dourish and Bellotti (1992) defined awareness as an “understanding of the activities of others, which provides a context for your own activity.” This context is used to ensure that individual contributions are relevant to the distributed group’s activity as a whole, and to evaluate individual actions with respect to group goals and progress. This information, then, allows groups to manage the process of collaborative working.

In CSCL, awareness is also very important for effective collaborative learning and it plays a part in how the learning environment creates collaboration opportunities naturally and efficiently. Goldman (1992) identified three types of student awareness: social, task, and conceptual. Social awareness provides information on social relationships within the group carrying out the task, for example, the roles in the group. Task awareness shows how the learners accomplish the task. Concept awareness is the awareness of how a particular activity or knowledge fits into the learner’s existing knowledge or contributes to the task. Gutwin, Stark, and Greenberg (1995) also proposed workspace awareness—up-to-the-minute knowledge about other learners’ interactions within a shared workspace. Gutwin et al. (1995) implemented this awareness using GroupKit (Roseman & Greenberg, 1992). However, these concepts have not yet included
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