

Chapter 1.11

Environments for Mobile Learning

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INTRODUCTION

As we enter the electronic age, technologies enabling e-learning have increased flexibility of learning location. Wireless communication technologies further increase the options for learning location (Johnson & Maltz, 1996; Wu, Huang & Chao, 2004). Advances in wireless communication technologies have recently provided the opportunity for educators to create new educational models. With the aid of wireless communication technology, educational practice can be embedded into mobile life without wired-based communication. With the trend of the educational media becoming more mobilized, portable and individualized, the learning form is being modified spectacularly. The mobile learning environment

possesses many unique characteristics (Chen, Kao & Sheu, 2003):

- **Urgency of learning need:** The wireless applications can be used for an urgent matter of learning, such as linking problem solving and knowledge. Otherwise, the learner may record the questions and look for the answer later in the library, on houseline with a computer or from the experts.
- **Initiative of knowledge acquisition:** Frequently, information provided by wireless applications are based on the learners' requests; that is, information on demand. Being based on the learners' requests, together with the help of current state-of-the-art I/O devices, such as Radio Frequency

Identification (RFID), Voice Extensible Markup Language (VXML) and so forth (Page, 1993; Andersson, 2001), interactive personal information can be communicated between learners and the databases so that the wireless application can provide closely related information in time and in need.

- **Mobility of learning setting:** Wireless devices are developed to be more and more portable. Therefore, the educational practice can be performed at any time and any place and always on, such as on a tour bus, camping area, exhibit room, and so forth. All kinds of field trip situations can be facilitated. This kind of learning setting can be preplanned or be opportunistic in nature.
- **Interactivity of the learning process:** Through the interfaces of voices, pointing, mails, icons, even videos, the learner can communicate with experts, peers or other materials effectively in the form of synchronous or asynchronous communication. Hence, the expert is more reachable and the knowledge is more available.
- **Situating of instructional activity:** Via wireless applications, the learning could be embedded in daily life. The problems encountered, as well as the knowledge required, are all presented in authentic context, which helps learners notice the features of problem situations that make particular actions relevant.
- **Integration of instructional content:** The wireless learning environment integrates many information resources, and supports learners to do non-linear, multidimensional and flexible learning and thinking. It especially facilitates complex and ill-structured learning content, such as cross-subject, theme-based learning activities.

WIRELESS TECHNOLOGY

Next-generation wireless networks (2.5G, 3G, B3G, 4G) offer the promise of high-speed access to mobile hosts along with IP-based data services, the General Packet Radio Service (GPRS) communication network that can transmit data and speech sounds at the same time with limited bandwidth and third generation of mobility communication network (Khan, 2001). The powerful third-generation mobility network, 3G, has much larger wireless bandwidth capabilities and more multi-media services than the Global System for Mobile Communications (GSM)/GPRS cell-phone system. 3G features a bandwidth of 2M bits/second when users are motionless, a bandwidth of 384k bits/second when users move in a low speed, and a bandwidth of 144K bits/second when users move at a high speed (Andersson, 2001). More than that, GSM can combine Wireless Local Area Network (WLAN) to accomplish a double network with WLAN and a cellular network (Wang, 2001). The bandwidth offered by a double network with WLAN and a cellular network enables learners to enjoy all kinds of service on the Internet, anytime, anywhere.

While these technologies are enabling mobile e-learning options, there are problems, including bandwidth, Internet Protocol (IP) and roaming limitations. Bandwidth problems can be solved simply by Internet Service Providers (ISPs) developing the backbone of broader bandwidth.

NEXT GENERATION INTERNET PROTOCOL—IPv6

Providing enough IP addresses for worldwide use is presenting challenges, given the limitations of the current Internet Protocol, version 4 (IPv4). With universal access and use of the Internet, IP has to offer the capability for worldwide use of Internet resources. In the early 1990s, the

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