Preface

Mobile learning has become common practice among universities and schools. Numerous research results confirmed that learning and teaching can be extended to anywhere and anytime. Mobile learning goes beyond the limit of computer desks, classrooms, and campuses. Researchers show that mobile learning is very popular among students. More and more courses have adopted the mobile learning platform to enhance learning. A well established mobile learning infrastructure is the lifeline for situation based teaching and learning. For classes that require field trips, mobile learning is a platform that can get the job done. Mobile learning is the platform that can greatly enhance collaboration and group activities. Due to the special features that no other learning platforms can offer, mobile learning continuously attracts attention from educators.

The 3G mobile network has adopted the IP technology so that a 3G mobile device such as a smartphone can access the Internet. The forthcoming 4G mobile network will be the all IP based network. The trend indicates that the mobile network technology is moving towards to the all IP-based wireless network. This trend means that the computer technology will be more and more integrated into the mobile network. As the improvement of mobile networks and mobile devices, many new smart phones can have the functionalities usually handled by personal computers.

Due to its stability, flexibility, security, availability, and low cost, the Linux based mobile operating system has been gaining support from well-known technology companies. Google initiated the well known Android project, which is a combination of an operating system with the Linux kernel and an application development platform. Similarly, Intel introduced the Moblin project and Ubuntu introduced the Ubuntu Mobile project to the mobile computing community. There are a large number of open source tools and plug-ins available for the Linux based mobile operating system. For example, the open source Web 2.0 based mobile learning 2.0 technology has been widely accepted by the mobile learning society. These open source products have a significant impact on the mobile learning community.

Therefore, the open source approach in mobile learning has generated a great deal of interest. Researchers and practitioners in various academic fields have been using open source products in mobile learning for years. The open source products have been used for developing mobile learning course materials and for implementing mobile learning infrastructures. However, these experiences with the open source approach in mobile learning have not been systematically and comprehensively summarized and published for the mobile learning society to share. Although a large number of articles and books about mobile learning itself have been published in recent years, a few of them are about the open source approach in mobile teaching and learning. To enrich the mobile learning theory and practice, this book is aiming to collect the experiences of researchers and practitioners in open source based mobile learning. The book includes research studies about the mobile learning that is supported by open source
software, the open source mobile technologies used to implement the mobile learning infrastructure, the class management with open source products, the implementation of mobile learning with open source games, and the development of mobile learning course materials with open source tools. The topics covered in this book will help readers better understand the open source solution in mobile learning.

THE CHALLENGES

Mobile network technology advances rapidly. When you look around, new ideas, new concepts, new theories, new devices, new software, new architecture, and new terminologies pop up every year or even every month. A mobile network system is not only updated rapidly, it is also a complex and versatile system. There are dozens of different types of mobile network systems. Different mobile networks follow different technology standards. Each mobile network system includes a telephony network, IP network, mobile devices, radio equipment, computers, operating systems, security protection, application software, and so on. It may consist of hundreds of or thousands of hardware devices and software products. The rapid growth in mobile technology as well as the complexity and versatility of mobile network systems create a great challenge to everyone who is involved in mobile learning.

Unlike personal computer systems where the software created for PCs are compatible with the computer systems produced by most of the computer manufacturers, the software developed for one type of phone is usually not compatible with other types of phones. Users may not be able to download the software on a Web site and run it on their phones. They may not be able to install and run the software created by themselves on their smart phones. The compatibility issue may cause concerns for some mobile learning projects. The course materials created for one type of smart phone may not work on other types of smart phones. It is difficult to require all the students to use one type of smart phone.

In most cases, the expenditure on mobile learning will increase dramatically. In addition to the complexity and compatibility issues, a mobile learning system that handles course material distribution, mobile learning service hosting, and mobile learning class maintenance can be very expensive. It costs money to upgrade and maintain the system. On the other hand, to keep up with the mobile industry’s trends and to teach students the knowledge that is not obsolete, a mobile learning system needs to be upgraded frequently. However, the cost for adding additional hardware and software, reconfiguring the system, and providing training to users can take a significant portion of the annual budget. The shortage of funding often hinders the effort of improving a mobile learning infrastructure. The cost of developing a mobile learning infrastructure prevents many small universities from implementing their mobile learning projects. It can also be time consuming to upgrade and maintain the system.

Many educational institutions may not be aware of the open source solution for mobile learning. Some of them may not have the personnel with the knowledge and skills to support the open source based mobile learning system. Due the fact that there is little marketing effort on open source products, the open source products are less known among administrators, instructors, students, and mobile learning support staff members. Although many of the open source products are compatible with proprietary products, the decision makers may not be fully aware of these facts.
THE ANSWERS

Using the open source solution can be one of the solutions to overcome the difficulties in implementing mobile learning. The Linux based open source mobile operating system, Web based mobile service, and Java based mobile applications can potentially resolve the compatibility issues and reduce the cost.

The Linux kernel used by these mobile operating systems is designed to be compatible with a wide range of mobile devices and network equipment. This feature allows mobile devices to share the software. For example, over two dozens of Android based mobile devices produced by different manufacturers can share the software downloaded from Android Market. Java is the programming language supported by most of the application development platforms. The application developed with Java is known for its portability. The Web is an open source based service that runs on the Internet. It provides the interconnected hypertext which can be remotely accessed by mobile learners through their mobile devices. Documents provided by the Web generally can be handled by any 3G or 4G mobile devices.

By using an open source based mobile learning system, schools and universities can significantly reduce the cost of developing and supporting online classes while improving reliability and performance. Open source software and utilities such as those supported by a Linux based mobile operating system are free and powerful enough to handle tasks such as hosting mobile learning service and developing mobile learning applications. The open source solution is a great way to reduce the financial burden.

For a mobile learning system to keep up with the trends in mobile technology and to teach students the up-to-date knowledge, open source products provide a viable solution by allowing the user to add new components whenever they are available. With proprietary products, one has to wait for the new version to be made available on the market. The user of an open source product can update the mobile learning infrastructure as soon as the new product is available. Users also have the freedom to decide which part of the product should be upgraded instead of upgrading the entire package.

TARGET AUDIENCE

To teach courses based on mobile learning, instructors, mobile learning support staff members, and students need to understand and learn how to use new mobile technology. Instructors need to develop new pedagogies to adapt to the new teaching environment. They also need to create new teaching methodologies and new teaching materials that can utilize the new technology. It is also necessary for the instructors to come up with new course assessment methods to evaluate new teaching materials. New mobile technology creates new opportunities for the instructor to improve the existing teaching and research.

Students also need to get familiar with new mobile devices so that they can use them for learning. They should adjust their learning behavior and develop new ways to learn. They need to be more proactive, more collaborative, and more self-disciplined.

It is important for technicians to keep up with the new mobile technology. They need to develop and maintain the new mobile learning infrastructure. They need to know how to detect the vulnerability of a mobile network and enforce security measures. They must make sure that the qualified people can access the mobile course materials at anytime and from anywhere. They need to provide technical support for the hands-on practice in mobile labs. It is also required that they handle troubleshooting and training.

For the administrators of educational institutions, it is important closely follow the development of new mobile technology and new mobile teaching methodology so that they can make right decisions on
when and how to implement the new curriculum. The administrators need to understand the cost and benefit of a mobile learning project. They should be actively involved in the development of mobile learning, which depends on their encouragement and financial support.

In response to the above needs, this book is designed for people who are involved in mobile learning. It is especially useful for the people who are involved in providing mobile learning services such as administrators, IT managers, instructors, m-learning support staff, and IT service personnel. This book also helps mobile learning decision makers on policies, planning, and strategies. Students can also benefit from this book on the open source mechanisms of accessing mobile learning services.

ORGANIZATION OF THE BOOK

Nineteen chapters are included in this book. The chapters are categorized into three main sections, Mobile Learning and Its Technical Foundation, Mobile Learning in Open Source Setting, and Open Culture and Ubiquitous Education. The following is a brief description of each section.

Section 1: The chapters included in this section describe the technical and structural background of open source based mobile learning.

Chapter 1 provides an overview of three key components of open source mobile learning, mobile learning, mobile technology, and the open source approach. Open source products can be used to implement the mobile infrastructure, support mobile learning, and create course materials. To help readers get a general picture of the book, this chapter provides a section about the book’s framework.

Chapter 2 discusses the availability of open technologies for mobile learning. The issues and standards of adaptation mechanisms for mobile learning resources are explored. The authors provide some information about the existing projects and software tools that are available to mobile learning. Readers can also find some case studies and the analysis of open trends in this chapter.

Chapter 3 is about Linux based mobile operating systems. This chapter first investigates the requirements by a mobile learning system. To fulfill the requirements, this chapter introduces the Linux based mobile operating systems used by mobile devices. The architectures of various Linux based mobile operating systems are discussed. This chapter investigates what the Linux based mobile operating systems can do in mobile learning. It also provides recommendations on the selection of Linux based mobile operating systems for different mobile devices.

Chapter 4 reveals the role of openness, specifically standardization, in the mobile cloud technology. The topics such as mobile communications, global collaboration, transition from 3G to 4G mobile network technology, and mobile cloud are covered in this chapter. The author considers the mobile cloud the cornerstone for an open, inter-operable realization.

Chapter 5 introduces the mobile phone system (mLearning/MPs) which has been used in mobile learning in Japan. This chapter describes the barriers, such as the psychological, pedagogical, and technological issues that mLearning/MPs had to overcome. The author proposes open source-based mobile services as a way of overcoming barriers faced by mLearning/MPs and as an effective model for English language learning using mobile phones. This chapter demonstrates the implementation of four projects carried out in the teaching of the English language by mobile phones.

Chapter 6 introduces a popular mobile open source server project, Funambol. The chapter provides the background information about the Funambol project and how it applies to mobile learning in three specific areas, the impact of mobile open source software on mobile learning, the challenges that are...
confronting mobile software developers and content, and the benefits of using open source software for mobile learning systems.

Section 2: Ten chapters are included in this section. Each chapter in the section deals with a specific case of mobile learning in the open source setting.

Chapter 7 illustrates the development of a mobile network laboratory with a set of open source software. The mobile network laboratory allows students to conduct their hands-on practice in the networking class. The students can either work as an individual or as a group at anytime and anywhere.

Chapter 8 introduces game based learning (GBL). This chapter demonstrates the use of an open source based simulation game platform to enhance the learner’s experience. The Yet Another Telephony Engine (YATE) server was used for the interactive mobile learning. This chapter provides the analysis on the effectiveness of the game platform. The authors suggest some new directions for further research in this area.

Chapter 9 presents the Augmented Reality (AR) library developed for mobile phones. The authors demonstrate the use of such a system in teaching. They demonstrate how ARToolKit can be used in mobile learning on Nokia N95 phones. The evaluation of the teaching with ARToolKit and games is also given in this chapter.

Chapter 10 discusses collaboration in mobile Learning Management Systems. The authors propose a collaborative game for students to improve their collaboration. This chapter provides details on the implementation of collaboration with open-source technologies.

Chapter 11 introduces the open source software, OpenLaszlo Presentation Server. Students can run the software on any device with the applications that blend to perfection a user-centered design. The software is used to facilitate the development of forms, menus and other components for a website as well as a full management back office or a trip booking site. As pointed out by the author, the open source software is comparable to proprietary software.

Chapter 12 exploits the potentialities of the 2.0 web tools and the advantages of the Open Source software to guide students towards effective linguistic competence and autonomy. In this chapter, the author describes the use of Web 2.0 in teaching to support the learning of English in an Italian secondary school. In the conclusion, the author presents the achievements and the drawbacks of the integration of e-learning 2.0 with classroom teaching.

Chapter 13 describes the use of mobile devices with the Web 2.0 technologies to improve collaboration, participation, knowledge sharing and construction. The author lays out the theoretical framework, which sustains learning with mobile devices. The author also describes the potential of Mobile Web 2.0 for the development of informal learning and the construction of personal learning environments. At the end of the chapter, the author presents mobile learning scenarios of using Web 2.0 tools, in particular, those made possible using Twitter and m-Flickr.

Chapter 14 explores the potential of Mobile Web 2.0 to enhance tertiary education today. It outlines both research-informed principles and case study examples which summarize Mobile Web 2.0 participants’ experiences of using Mobile Web 2.0 within a pedagogical framework. It illustrates that the use of Mobile Web 2.0 has transformed both students’ and lecturers’ conceptions of teaching and learning.

Chapter 15 investigates the opportunity to teach computer programming courses on an open source based mobile learning platform. Based on the behaviors of novices in learning programming, the method of pair programming is adopted in the programming classes to improve the learning of computer programming. This chapter provides the information of the open source mobile technologies used to implement pair programming with mobile devices.
Chapter 16 discusses accessing remote laboratories through mobile devices. The authors present the main strategies for adapting a remote laboratory to mobile devices. The remote laboratory, WebLab-Deusto, is used to demonstrate the adaption. The strategies are analyzed and compared in order to decide which strategy is more suitable for which situation.

Section 3: Three chapters are included in this section to address issues related to open culture and ubiquitous education in general.

Chapter 17 aims to identify the theoretical and technological underpinnings for delivering mobile learning to the distance learner. It also discusses the possible learner communities that can benefit from mobile learning technology, with regard to their unique learning requirements and features.

Chapter 18 defines the virtual world concept and the m-learning scope. It distinguishes the different types of virtual worlds and makes a comparative analysis between them in order to bring out the features aimed at helping teachers to adopt them in their classes. This chapter also considers the choice of virtual world environments on open source platforms.

Chapter 19 explores a variety of issues, technologies and challenges associated with implementing mobile learning at open universities. The chapter begins with an investigation into open universities’ common mandate and their nature. Then, the author explains the urgency and advantages for implementing mobile learning in their course and program delivery. This chapter also explores the technical requirements of mobile learning and presents some strategies for mobile learning implementation. The author also explores some of the challenges one may have to face when implementing mobile learning at an open university.

To help readers better understand the application of the open source solution to mobile learning with the open source approach, this book is designed to provide the information of open source products used in each phase of the mobile learning. Comparison of popular open source products and their usability in a mobile learning system is also given in selected chapters. In this book, readers will find design strategies and implementation methods of mobile learning systems. The book presents some possible solutions to the challenges encountered in the mobile learning system construction, management, and course material development.

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