

U-Learning Scheme : A New Web-based Educational Technology

Hye-jin Kim^{1*}

¹Continuing Education Center, Jeonju University

U-Learning 스킴 : 새로운 웹 기반 교육 기술

김혜진^{1*}

¹전주대학교 평생교육원

요약 본 연구는 언제 어디서나 교육이 가능하도록 하는 유비쿼터스 컴퓨팅 기술의 개념에 기반하여 유비쿼터스 학습 환경의 모형을 제안한다. 유비쿼터스 학습 환경은 환경 친화적 학습 스킴이며, 지리학적으로 떨어져있는 환경에서 디지털 매체를 사용하여 학생의 학습을 지원하는 것이다. U-Learning 모형은 웹 기반의 E-Learning 시스템이며, 학습자들이 유비쿼터스 학습 환경 및 시스템과의 상호작용을 통해 지식과 기술을 습득하도록 하는 것이다. 교육은 학생 중심이지만, 학생은 학습 프로세스를 인지하지 못할 수도 있다. 소스 데이터는 내재된 객체로 존재하게 되지만, 학생들은 학습하기 위해 아무것도 할 필요가 없으며, 학생들이 움직이거나 학습 환경에 접할 때 장비 및 임베디드 컴퓨터들은 통신을 통해 학습 자료를 제공하게 된다.

Abstract This paper presents a model of ubiquitous learning environment system based on the concepts of ubiquitous computing technology that enables learning to take place anywhere at anytime. This ubiquitous learning environment is described as an environment-friendly learning scheme that supports students' learning using digital media in geographically distributed environments. The u-learning model is a web-based e-learning system that could enable learners to acquire knowledge and skills through interaction between them and the ubiquitous learning environment. Education is happening all around the student but the student may not even be conscious of the learning process. Source data is present in the embedded objects and students do not have to do anything in order to learn. The communication between devices and the embedded computers in the environment allows learners to learn in an environment of their interest while they are moving, hence, attaching them to their learning environment.

Key Words : Ubiquitous Learning, U-Learning Community, Web-Based E-learning System, Learning Environment

1. Introduction

Learning is lifelong and lifewide. It is everywhere. It is not just confined in the four walls of the classrooms, it can be in the home, the workplace, the playground, the library, museum, and even in our daily interactions with others. There are new things that don't need to be learned in formal classrooms, these can be learned at user-friendly interfaces. And people are eager to become educated, professional per se even without attending formal school, and a new

innovation in educational technology would be paramount to their goals, aims and needs.

Educational technology is constantly evolving and growing, and it is inevitable that this progression will continually offer new and interesting advances in our world. The instigation of ubiquitous media for the delivery of education will help people access education in any form or mode in any place and time they are in.

A ubiquitous learning environment is a pervasive set of education or learning. Education is happening all around the

*Corresponding Author : Kim, Hye-jin(hyejinaa@daum.net)

Received October 18, 2011

Revised November 22, 2011

Accepted December 13, 2011

student but the student may not even be conscious of the learning process. Source data is present in the embedded objects and students do not have to do anything in order to learn. They just have to be there. Students in the ubiquitous classroom move around ubiquitous space and interact with the various devices.

The development of a ubiquitous learning environment combines the advantages of an adaptive learning environment with the benefits of ubiquitous computing and the flexibility of mobile devices. Students have the freedom to learn within a learning environment which offers adaptability to their individual needs and learning styles, as well as the flexibility of pervasive and unobtrusive computer systems.

U-learning has the potential to revolutionize education and remove many of the physical constraints of traditional learning. Furthermore, the integration of adaptive learning with ubiquitous computing and u-learning may offer great innovation in the delivery of education, allowing for personalization and customization to student needs.

Ubiquitous learning is a new educational paradigm characterized of providing intuitive ways for identifying right collaborators, right contents and right learning services in the right place and the right time based on student's surroundings. That is, who are the learning collaborators that could provide the student's needs, what are the learning resources and services available, and when and where should the learning take place.

The ubiquitous learning environment is very apt and conducive for this purpose. People can learn anywhere and in any time convenient for them without any hassles to their routine works and activities.

In this paper, the concepts of ubiquitous computing technology is presented to create a ubiquitous learning environment that enables learning to take place anywhere at any time. Various e-learning environments, architectural designs, and implementations are examined and considered to include the elements of m-learning extending it to create a new u-learning environment.

This new ubiquitous learning environment is described as an environment that supports student's learning using digital media in geographically distributed environments. This learning environment will be the basis for the design of a U-Learning Community model where learning takes place between students within campus/home and teachers as facilitators in u-space.

The U-Learning Community is a web-based e-learning system that could enable learners to acquire knowledge and skills through interaction between them and the defined ubiquitous learning environment. Students are allowed to be in an environment of their interest. The communication between devices and the embedded computers in the environment allows learner to learn while they are moving, hence, attaching them to their learning environment.

2. Background/Rationale

E-learning services evolution began since computers were first used in education. There is a trend to move towards blended learning services, where computer-based activities are integrated with practical or classroom-based situations.

E-learning is essentially the computer and network-enabled transfer of skills and knowledge. E-learning applications and processes include Web-based learning, computer-based learning, virtual classroom opportunities and digital collaboration. Content is delivered via the Internet, intranet/extranet, audio or video tape, satellite TV, and CD-ROM. It can be self-paced or instructor-led and includes media in the form of text, image, animation, streaming video and audio – Summarized from Wikipedia [1].

E-Learning enable learners to learn when and where they want at their own pace by using Information and Communication Technology to guide their learning. It has been a trend use in the educative process since its discovery where learners are able to learn conveniently, faster and in an easy way. But the present learners are still aiming for a learning scheme which is more convenient and easy for them to access whenever available and wherever they are.

Learning occurs in different places, both formal and informal mode, thus, a paradigm shift from traditional learning environments to a digital format of ubiquitous learning.

U-learning involves creating learning activities, tasks, projects and resources that encourage students to discover learning themselves without consciously realizing they are learning, so that they learn automatically and independently.

“Ubiquitous learning is ideas without barriers, inspiration without limits, innovation without boundaries”. “Ubiquitous learning requires no less than a fundamental reinvention of the science of education for our modern society” [2].

Tony Stockwell author of *Accelerated Learning in Theory and Practice* and *The Learning Revolution* says, “To learn anything fast and effectively, you have to see it, hear it and feel it”. This means the learners need to have mental links (pictures, sound, videos, actions, etc...) to help them visualize learning fast and effectively [3].

U-learning system is an environment supporting student learning using digital media in a geographically distributed environment. This environment proposed the implementation of student learning between students within campus/at home and teacher of content producer in u-space, which is not limited to traditional learning system [4, 5].

3. U-Learning Scheme

U-learning is a learning paradigm which takes place in a ubiquitous computing environment that enables learning the right thing at the right place and time in the right way. It is an expansion of previous learning paradigms as we move from conventional learning to electronic learning to mobile learning and now to ubiquitous learning (thus, the meaning of “e” not just limits with “electronic” but expands to “everywhere”, “extending”, “enhancing” and “enabling”).

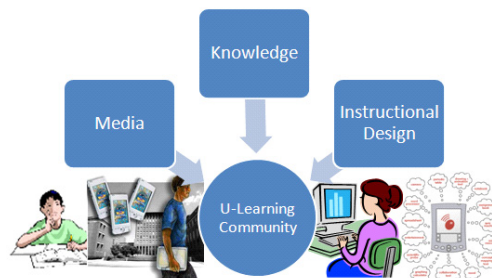
U - Learning enables us to change our current learning processes to be more efficient and more effective. If done right, u - learning becomes a critical force to improve the performance of our workforce and our organization as a whole.

3.1 What is u-Learning Scheme?

The u-learning as an interactive social learning model designed in consideration of some factors that mainly influence the learning process of a learner – member of the net generation. Management systems and structures, competencies, culture, and technology have a direct impact on the learning process of the learners. The Media influence in learning plays a big role in the advancements of the learning processes. Media evolved from print to non-print that could direct attention, arouse motivation, increase student’s concentration, and could help them actively involved in the learning process.

This model aims of accommodating learners in their learning style by providing adequate information at anytime

and anywhere as they wish for it. To promote a more effective application of u-learning, a model for the design of an online learning environment is presented.



[Fig. 1] A Model of the u-Learning Scheme

Knowledge Repository refers to a wide range of knowledge domains across various subject areas including math, physics, biology, social science, language, etc. it is being interacted upon by goal analysis, task analysis, learner characteristics and other semantic rules to provide a design for knowledge representation for learners.

Media Repository represents the different media to support the knowledge representation in u-Learning. For example, learners can use multimedia tools to create a learning object that contains the new knowledge created by the learner and post it to the web to share with others. Media refers to the use of one medium (e.g., video) or a combination of several media (e.g., video, audio, textbook, etc) in instruction.

Instructional Design Repository consists of all the design components in instructional design. This is the basis for the design and modality of the learning modules in the u-learning model.

U-Learning Community presents information in an interactive and informative way. This may include courses, student’s information, teacher’s information, etc. The development of the learning content is based on the instructional designs applied to the information stored on the knowledge repository.

Based on the inputs from the instructional design component and domain knowledge analyses in the knowledge repository, the knowledge representation is formed. Various learning modules are formulated to represent the knowledge identified and at the same time the rules of reusability and sharability are applied to the design and development of instructional modules. Unlike the traditional design,

knowledge representation enables learners to experience the construction and creation of knowledge through multiple venues, thus promoting a learning process that focuses on the understanding of “how do people know it” rather than “what do people know.”

An online instructional program is created to facilitate dynamic knowledge acquisition and creation as well as promote learners’ self-initiation and collaboration in learning. In the design of the instructional program, the current state and needs of the learner are determined, the end goal of each instruction is defined, a learning intervention to assist the acquisition of new skills, knowledge or expertise is developed.

Learners are offered the opportunity to increase the implements using the latest multimedia technology, equipment and testing.

Characteristics of u-learning scheme [6]:

- *Permanency*: The information remains and learners can never lose their work unless the learners purposely remove it.
- *Accessibility*: The information is always available whenever the learners need to use it. Learners have access to their documents, data, or videos from anywhere.
- *Immediacy*: The information can be retrieved immediately by the learners wherever they are.
- *Interactivity*: The learners can interact with peers, teachers, and experts efficiently and effectively through different media in the form of synchronous or asynchronous communication.
- *Adaptability*: Learners can get the right information at the right place with the right way.
- *Context-awareness*: The environment can adapt to the learners real situation to provide adequate information for the learners.
- *Theory-based* – contents of the learning modules are based on contemporary approaches to teaching and learning.
- *Innovative and relevant* – contents of the learning modules are designed based on the learning objectives.
- *Emergent* – allowing (where appropriate) the interactions between course participants and enable them to actively explore the relevance and application of the course content.
- *Personalized* – participants are able to apply their own

context and situation to the learning outcomes. The learning could be embedded in learner’s daily life.

The u-learning community was designed and developed considering the two major areas.

- *Resources* – students needed one place to find both internal (forms, FAQs, course offerings, etc.) and external information (RSS Feeds, bookmarks, etc.).
- *Community* – students needed a place to collaborate, communicate, and share information such as ideas, photos, videos, news, etc.

3.2 u-Learning Scheme Functionalities

Some of the major features and functionality of the u-learning scheme include:

- *Dynamic Content* – user generated content can appear throughout the website in addition to automatically generated content such as RSS feeds of news, journals, blogs, etc.
- *Forums* – registered users can create discussion threads about courses, research, administration or just about anything.
- *Projects* – registered users can create and manage all aspects of a project and invite others to join the project through an online project management tool. This function could be found on the user’s profile.
- *Profile* – registered users are automatically given a profile that can be edited and updated with personal and profession information.
- *Messaging* – registered users are allowed to send and receive private messages within the community.
- *Administration* – allows admin users to maintain courses or instructional modules provided for students. This function is provided for teachers to allow them for some administrative functions of the e-learning system.
- *Friends* – registered users can connect and create friendship networks by accepting and requesting friends within the u-learning community.
- *Groups* – allows users with similar interests - or perhaps users as part of a research groups or a course/class – to have a more structured setting to share content and discuss ideas. Users can create and moderate as many groups as they like. Group activity could be kept private to the group or the 'make public' option can be used to disseminate work to the wider public. Each group produces granular RSS feeds, so it

is easy to follow group developments. Each group has its own URL and profile, and each group comes with a file repository, forum, pages and message board.

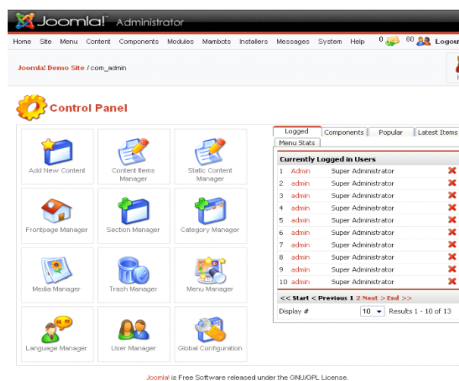
- Blogs – users is allowed to publish entries of commentary, descriptions of events, or other material such as graphics or video.
- Photo Gallery – allows users to manage and organize their photo collections by adding titles, rating, captions, and custom metadata tags to photos. Users can also see pictures that their friends have uploaded, or see pictures attached to a group. Clicking into an individual file shows a larger version of the photo.
- File Repository – allows users to upload any kind of file. The uploaded files can be filtered by tag and restrict access so that they're only visible by the people you want them to be. Each file may also have comments attached to it.

Users of the u-learning community include students, teachers, and other learners. Teachers and students differ in privileges upon logging in.

3.3 Development

The development of the u-learning scheme web-based e-learning system is focused on open-source technology solutions with flexibility and scalability. Various e-learning implementations are analyzed and identified the important features and elements needed to accommodate the learning process of the net generation learners. Then, the different technology solutions are reviewed and as suggested by the current trends in technology developments while looking at new open-source options available to determine the best solution for the development needs. Technology options were eliminated based on compatibility, having the required features, time and skill required for implementation, flexibility, ease of use, and future scalability.

After the reviews, it is suggested to use Joomla as the content management (CMS) solution which has a strong administrative focus that allows non-developers to quickly install and manage the system. It also offered a large number of modules that can be easily installed to meet the needs of the community [7].



[Fig. 2] Joomla CMS Platform

Joomla as an open source content management system is useful for:

- Managing Web links
- Managing FAQ (Frequently Asked Questions)
- Managing News Flashes
- Managing multimedia Flash, .jpg, gif, bmp and .png images
- Managing News Feeds, from different news source
- Managing Contact and email form pages
- Managing Users with special access levels
- Managing Archive pages
- Managing 3rd party developer's Components, Modules and Templates. For example: E-commerce, forums, image galleries, calendar and agenda components, help desk etc.

The integration to this content management solution of Moodle, an open source learning management system (LMS), allow even non-technical teachers to set up and maintain where students can log in, access course information, interact, share, and teach others. Moodle's main focus and purpose is for managing learning activities and users, but it has also a built-in functionality for blogging, and wiki's and many other applications similar to Joomla.



[Fig. 3] Moodle LMS Platform

Moodle also known as Course Management System has several features typical of an e-learning platform, plus some original innovations (like its filtering system). Moodle can be used in many types of environments such as in education, training and development, and business settings [8].

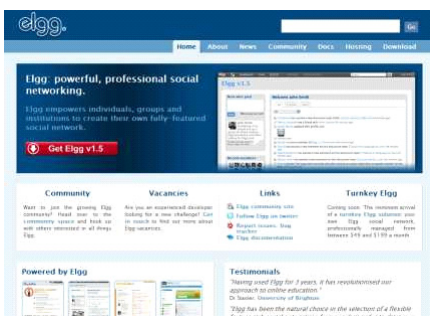
Some typical features of Moodle are:

- Assignment submission
- Discussion forum
- Files download
- Grading
- Moodle instant messages
- Online calendar
- Online news and announcement(College and course level)
- Online quiz
- Wiki

Developers can extend Moodle's modular construction by creating plugins for specific new functionality. Moodle's infrastructure supports many types of plug-ins:

- activities(including word and math games)
- resource types
- question types(multiple choice, true and false, fill in the blank, etc)
- data field types(for the database activity)
- graphical themes
- authentication methods(can require username and password accessibility)
- enrollment methods
- content filters

By integrating a CMS with the LMS – both web applications, making a single sign-on solution for the u-learning community realistic. Another web application yet to integrate is the Elgg social networking platform with support for blogs, wikis, communities, and other things that could be associated with the CMS.

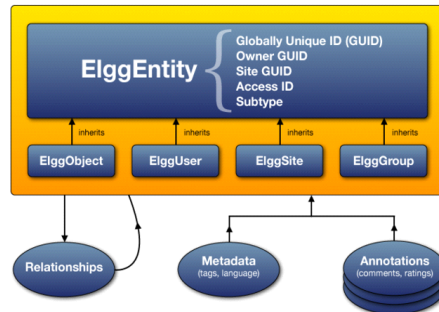


[Fig. 4] Elgg Social Networking Platform

Elgg provides the necessary functionality to allow you to run your own social networking site, whether publicly (like Facebook) or internally on a networked intranet (like Microsoft Sharepoint) [9].

Some of the features of Elgg includes:

- Avatar
- Dashboard
- Friends
- Groups
- Profile
- Widgets
- Blogs
- Bookmarks
- File repository
- Message board
- Private messaging
- Pages
- Activity
- Microblogging



[Fig. 5] Elgg Data Model

Based on the analysis of the user’s needs, we developed content in two major areas. One is the resources for the process of an academic study. These include the academic calendars, the program descriptions and requirements, various forms for portfolio reviews, advance to candidacy, and graduation, etc. The community provides one place to access all these materials.

The other resource is for the social needs of learners, which can help to develop a learning community. These include access to forums, sites with RSS feeds, blogs, alerts, journals, research threads, etc. this is the place where learners collaborate, communicate, and share information such as ideas, photos, videos, news, etc.

Most of the content are either from the user’s input or the

RSS feeds and other dynamic links. We expect the content to grow vigorously as the user community grows.

5. Conclusion

The concept of u-learning goes beyond portable computers. As new technologies evolve and more pervasive forms of technology emerge, over time these technological innovations will be embedded and blended into our everyday lives. They will be seamlessly integrated into our world in a phenomenon referred to as calm technology. In this age of progress and great change, we tend to easily adapt to the technologies and pedagogies that emerge.

U-learning is a learning paradigm which takes place in a ubiquitous computing environment that enables learning the right thing at the right place and time in the right way. It is an expansion of previous learning paradigms as we move from conventional learning to electronic learning to mobile learning and now to ubiquitous learning.

The development of a ubiquitous learning environment combines the advantages of an adaptive learning environment with the benefits of ubiquitous computing and the flexibility of mobile devices. Students have the freedom to learn within a learning environment which offers adaptability to their individual needs and learning styles, as well as the flexibility of pervasive and unobtrusive computer systems.

U-learning scheme is an interactive social learning model that aims at accommodating learners in their learning style by providing adequate information at anytime and anywhere as they wish for it. Hence, u-Learning Scheme model is web-based and incorporates e-learning, m-learning, and the ubiquitous environment to provide mobility and flexibility to learners as well as the teachers.

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Hye-jin Kim

[Regular member]



- Feb. 2002 : Woosuk University, Child Welfare, B. A.
- Aug. 2007 : Woosuk University, Child Education, M. Edu
- April. 2007 ~ current : Continuing Education Center, Jeonju University

<Research Interests>

E-learning, U-learning, Security application for education system, privacy issues for teachers and students