

# UBIQUITOUS LEARNING ENVIRONMENT

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## Abstract

*As the pace of change in the 21st century continues to increase, the world is becoming more interconnected and complex, and the knowledge economy is craving more intellectual property. In this environment, it is critical that we shift our focus from education to life-long learning. Fortunately, the increasing availability of learning resources on the internet is coinciding with the growing importance of continuous learning. If we are willing to view learning from a new perspective, we are no longer resource constrained.*

*Traditional E-Learning systems developed for laptop and desktop computers were based on stand-alone software application or through websites and lack the ability to provide a comprehensive ubiquitous learning environment. The ability to provide a comprehensive ubiquitous learning environment on mobile device will offer Opportunities to enhance learning by exploring the edge are presenting themselves as well. It is at the edge that most innovation occurs and where we can discern patterns that indicate new kinds of opportunities and challenges. In this context, the research work is to develop an interactive mobile learning application based on Web Services in Android base mobile devices to facilitate the ubiquitous learning. This paper deals with the prototype development of Web Service and application for android mobile phones.*

**Keywords:** E-Learning, M-Learning, Web Services, Android

## 1. INTRODUCTION

Ubiquitous learning is often simply defined as learning anywhere, anytime and is therefore closely associated with mobile technologies. The portability of computers and computing devices has blurred the traditional lines between formal and informal learning. Ubiquitous learning is also considered to be learning that is situated and immersive, and thus could take place from the traditional classroom in a virtual environment.

U-learning provides the learner the freedom from learning environments, learning devices and learning content format and rather emphasize on the constructivist learning process and cognitive development among learners. Using portable computing devices (such as laptops, tablet PCs, PDAs, and smart phones) with wireless networks enables mobility and mobile learning, allowing teaching and learning to extend to spaces

beyond the traditional classroom. The evolution of today's mobile devices increases the number of mobile applications developed, and among them the mobile learning applications. Recent 3G mobile hardware and software platforms allow running of faster and richer applications. Web services facilitate the ubiquitous learning environment by providing the unified interaction irrespective of the request originates from a Portable computer, a mobile phone or from a tablet PCs.

To define:

Ubiquitous = pervasive, omnipresent, ever present, everywhere  
Learning = educational, instructive, didactic, pedagogical  
Environment = surroundings, setting, situation, atmosphere.

So, a ubiquitous learning environment (ULE) is a situation or setting of pervasive (or omnipresent) education (or learning). 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. They just have to be there. The ULE resides within the physical environment. Microprocessors are embedded in objects, or devices. The use of wireless and mobile technology makes them easily accessible and contributes to educational functionality. The wireless and mobile devices include mobile phones and PDAs. A ULE can provide the props and stimuli needed to easily encourage student involvement but without needing the active attention of the student.

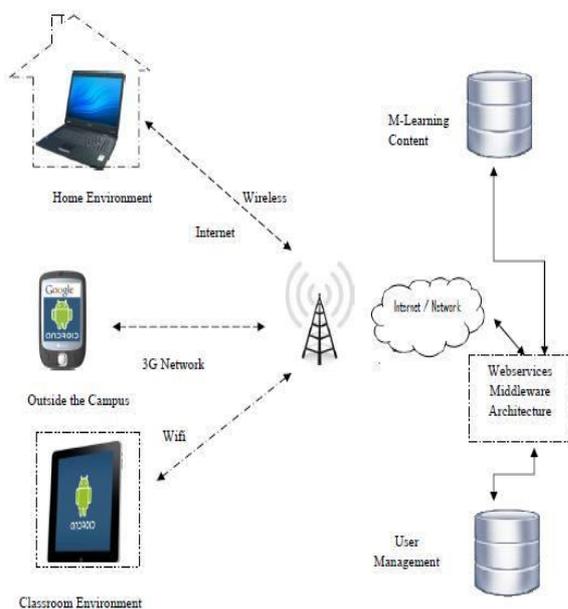
The benefits of the many to one relationship found in u-learning include the potential for one ULE (of many devices) to service an unlimited number of individuals at once. Essentially, the many to one relationship exists for every one of the students within the environment.

## 2. THE ULE MODEL

The two main factors in this design are the 'what' and the 'how'. The 'what' is the model itself which resembles an interactive learning gallery and uses a wireless network with both Bluetooth and WiFi technologies. The 'how' is the inclusion of pedagogical information which is based on constructivist theory, allowing students to create knowledge from what they see, hear, read and perceive. Students using the ULE will intuitively interpret their

surroundings and construct their own knowledge.

The ULE model is not unlike the interactive guides currently being produced and implemented in large museums. Electronic museum guides provide an information service to aid museum culture and tend to mimic or replace human guides; however, this model is designed for use in the education sector rather than entertainment or enrichment. Also, the source information is meant to be both adaptable and flexible, allowing updates and amendments to be applied through the network's database. In this way curriculum changes can be easily achieved.



**Figure 1:** M-Learning Application for Ubiquitous Learning

Environment Components of the ULE include:

1. Microprocessors with memory will be embedded in every object/device. The information each microprocessor will hold will be about the object. When a student approaches, the sensor detects their presence and will start relaying information to the student's PDA.
2. ULE Server Module will include the Server, the Educational Strategies Unit and a Database: The ULE server manages the network resources; The Educational Strategies Unit allows for the application of strategies to reinforce and aid student understanding through interaction and feedback. It analyses student responses to short quiz questions and returns more information or information in a different form when needed; DataBase – stores all the data about the 'objects/devices', the users and the interactions that occur.
3. Wireless technology – this will be in the form of Bluetooth and WiFi: Bluetooth has weak signal strength,

uses little power and covers a relatively short distance. Its low power consumption and ability to communicate with many devices is extremely beneficial when using handheld devices. WiFi, based on the IEEE 802.11 specification, has a range and speed which surpasses that of Bluetooth. It is compatible with any brand of Access Point and client hardware built to the WiFi standard (Brevard User's Group, 2002)

4. Sensors will be used to detect any changes in surroundings. These will be placed adjacent to the objects/devices and will be used to recognize the presence of students. The sensors used will include proximity, to detect movement, and light, to detect changes in light intensity.

### 3 THE UBIQUITOUS LEARNING CENTRE

The In the Ubiquitous Learning Centre each student will carry a wireless device (PDA or mobile phone) fitted with headphones. The ULE Server Module tracks and locates each student within the u-space by the use of sensors. When a student approaches an object, sensors wirelessly access the intranet and ULE Server Module and transmit information about the object. The data is then transmitted from one of the objects in the Ubiquitous Learning Centre to the student's handheld device.

Seamless interaction between one student and the system. Adjacent sensors detect the student's presence and send data about the object to the student's PDA. This can be transferred to the student in the form of images, text, sound or other format. At the same time, the object will access the ULE Server Module and request information about the student. However, being capable of both networked and independent operation, the object can function alone and transmit data. Information about the student, such as whether the student has accessed the data previously and what format is most suitable for this particular student is sent by the ULE Server Module. If the student has responded well to verbal or visual information in the past, this information will be transmitted.

A discreet quiz by way of a game or other entertaining method may be sent to the student's handheld device and then on to the student. The student's responses are transmitted to the ULE Server Module and the results analyzed by the Educational Strategies Unit. If the student requires some additional help in understanding the topic or some reinforcement, then this is sent back to the student via the PDA. Information about all students is held in the ULE Server Module, whereas information about an object is held by the object as well as the ULE Server Module.

#### **4 COMMUNICATION BETWEEN OBJECTS / DEVICES**

Suppose the student, Student1, approaches and observes Object1. A number of points relevant to Object1 are conveyed, possibly in the form of text, images or sound delivered to the student's handheld device. When the system receives a response from Student1, it can review the information and unobtrusively 'test' the student's understanding. Once this is analyzed, Object1 relays this information to the other objects, in this case, Object2 and Object3, within the u-space. This allows the ULE Server Module and the objects to download relevant information to the student.

##### **The sequence would be as below:**

1. Object1 is approached by Student1
2. Information is sent to Student1
3. Object1 analyses the student's responses and hence understanding of the topic
4. This information is relayed to all other objects in the u-space e.g. 'Student1 understands 6/10 points on this topic'

When the student approaches the next object, that object is 'aware' of what the student already knows and will only attempt to explain some of the remaining four points of the original ten. Throughout this procedure the ULE Server Module is only accessed as required by the objects. A student's interaction with objects during the session can also be tracked and stored on the server. On the student's next visit, the ULE system is 'aware' of the student's accumulated knowledge and can assist learning constructively by building on this knowledge. In this way the student's learning experience can be enhanced and a deeper understanding may be attained.

The type of content suitable to be taught within the ULE includes knowledge based disciplines such as History, Geography and the Sciences, which require knowledge transfer, reflection and active (physical or mental) participation. This may also be referred to as museum, or gallery, style learning which caters for the primary learning styles of visual, aural, and kinesthetic/tactile learning. Students are encouraged to create their own knowledge from their surroundings as they move around in u-space and interact with various objects and devices. Constructivist theory is used to allow students to build knowledge from what they see, hear, read and perceive.

##### **M-learning Application**

An m-learning application can be designed as a dedicated stand-alone application that can run on individual mobile device, a client-server model which requires a client application running on mobile device and a server application runs in a remote-server or on mobile web browser that requires back-end application-server connectivity while sending requests from the

mobile device [Metcalf II D. S et.al (2006)]. The roles of different users in the m-learning applications designed for ubiquitous learning environment based on the Web Services architecture discussed as follows:

The roles of a trainer/instructor in the m-learning are to Design and develop the content for a course  
Prepare tests, Quizzes and assignments for students/learners evaluation  
Assess the tests, assignments and projects submitted by the students/learners  
Send Feedback on the assignments and projects submitted by the students/learners interacting with students/learners using communication tool provided in the learning management system.

The roles of the learner/students in the m-learning are to  
Take the course  
Take Tests on the learnt content  
Work on Assignments and Projects related to the course  
Send Feedback and Queries Related to the course  
Interact with the trainer and fellow learner/student concerned with the course.

The roles of the Application Developer in the m-learning are to Develop a framework where the content designed by the trainer can be presented in a pre-formatted manner to the learner when they launch the application  
Provide Pre-defined templates for framing the tests and assignments.

Design the Pervasive User Interfaces for accessing the content and tests related to that course .

Provide the communication platform for trainer – learner interaction messaging from the application itself.

Android Platform provides the necessary tools and packages for designing the desired m-learning application for mobile devices in the u-learning environment.

#### **5 CONCLUSION**

Education is happening all around the student but the student may not even be conscious of the learning process in the ULE. A wide range of platforms are available to choose to develop m-learning applications.

The Ubiquitous Learning environment emphasizes the learner-centric curriculum and content. Among the wide range of choices the open-source nature and rich user interface that even supports sensor hardware and multitasking makes Android a desired platform for designing m-learning application. This prototype is a part of an m-learning system that will also be developed for other mobile platforms in order to cover a wide area of mobile devices and users.

## References

- [1] Alier, M., Casany, M., & Casado, P. (2007). A Mobile extension to a web based Moodle virtual classroom. In P.Cunningham & M. Cunningham (Ed.), *Expanding the Knowledge Economy: Issues, Applications, Case Studies: Vol. 4* (pp.1169-1176).
- [2] Burnette, E. (2009) *Hello, Android: Introducing Google's Mobile Development Platform*, 2nd Edition, The Pragmatic Bookshelf.
- [3] Google Inc. ANDROID developers User Interface. Last checked on January 10, 2011, from <http://developer.android.com/guide/topics/ui/index.html>
- [4] Hansen, F. and Bouvin, N., (2009). "Mobile Learning in Context — Context aware Hypermedia in the Wild",

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