

ROLE OF UBIQUITOUS TECHNOLOGY IN ADAPTIVE TEACHING SYSTEM

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ABSTRACT

Adaptive teaching systems recommend the best places to start new content and when to review old content. They also provide various tools for monitoring one's progress. They build on longstanding learning practices, such as textbook reading, and add a layer of computer-guided support. Data such as time spent reading and self-assessment scores can form a basis for guiding each learner through educational materials. Adaptive teaching can either be applied to classroom activities or in online environments where learners control their own pace of study.

INTRODUCTION

All learners are different. However, most educational presentations and materials are the same for all. This creates a learning problem, by putting a burden on the learner to figure out how to engage with the content. It means that some learners will be bored, others will be lost, and very few are likely to discover paths through the content that result in optimal learning. Adaptive teaching offers a solution to this problem. It uses data about a learner's previous and current learning to create a personalized path through educational content.

Education has undergone major changes in recent years, with the development of digital information transfer, storage and communication methods having a significant effect. This development has allowed for access to global communications and the number of resources available to today's students at all levels of schooling. After the initial impact of computers and their applications in education, the introduction of e-learning and m-learning epitomised the constant transformations that were occurring in education. Now, the

assimilation of ubiquitous computing in education marks another great step forward, with Ubiquitous Learning (u-learning) emerging through the concept of ubiquitous computing.

UBIQUITOUS COMPUTING

Mark Weiser, a researcher at Xerox PARC, coined the term 'Ubiquitous Computing' in the late 1980s. It refers to the process of seamlessly integrating computers into the physical world. As we move towards a more ubiquitous computing environment, the presence of computers is becoming less conspicuous and will eventually blend into our everyday lives. When using a PC the user's attention is, in general, focused on the screen. As computers become ubiquitous they will cease to be the focus of activity, allowing them to fade into the background. As well as personal computers (PCs), ubiquitous computing includes computer technology found in microprocessors, mobile phones, digital cameras and other devices.

THE UBIQUITOUS LEARNING ENVIRONMENT

A ubiquitous learning environment is any setting in which students can become totally immersed in the learning process. To define:

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.

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.

THE ULE MODEL

In designing the ULE model, the application of learning theories is an important consideration. Jacobs (1999) states that using learning theories in educational design helps to create a relationship between the information, the learner, and the environment. Gersten and Baker (1998) explain that when this relationship does occur there is a greater chance that the student will retain the information within their own knowledge base. For example, if a student can understand *why and how* something happens in nature, such as why and how a seed will sprout in soil and not in rocks, rather than just being told that it is true; the information has more relevance and therefore more meaning.

There are, of course, a number of learning theories that have been presented over the years. However, for this ULE model the theory of constructivism is applied. 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.

COMPONENTS OF THE ULE MODEL

Wireless technology - this will be in the form of Bluetooth and WiFi:

ULE Server Module will include the Server, the Educational Strategies Unit and a Database: The *ULE server* manages the network resources:

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.

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

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.

A BIRD'S EYE VIEW

Ubiquitous computing is reported to be both pervasive and persistent, allowing students to access education flexibly, calmly and seamlessly. U-learning has the potential to revolutionise 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 personalisation and customisation to students needs.

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.

CONCLUSION

The concept of ubiquitous computing and u-learning goes beyond portable computers. As new technologies evolve and more pervasive forms of technology emerge, computers will become 'invisible' and will be embedded in all aspects of our life. They will be seamlessly integrated into our world in a phenomenon referred to as calm technology. Wearable computers and embedded microchips are not as unbelievable or mind boggling as they were when first depicted in early science fiction novels and movies. Many technologies have become integrated into our lives over the years, for example: the telephone; television; PCs; the Internet and mobile phones. These innovations may have appeared strange and futuristic at first but, over time they blended into our everyday lives. In this age of progress and great change, we tend to easily adapt to the technologies and pedagogies that emerge. Ubiquitous

technology and u-learning may be the new hope for the Adaptive teaching system in future education.

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