

U-러닝시스템의 통합교육에의 적용을 위한 제언

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A Suggestion for Adaptation of U-Learning in Inclusive Education

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요 약

최근 들어 디지털 정보전송, 저장 및 통신방식과 같은 정보기술의 발달과 더불어 교육환경 또한 비약적인 향상을 거듭해오고 있다. 기존의 E-Learning 학습을 넘어서 현재는 언제 어디서나 원하는 학습을 할 수 있는 유비쿼터스 러닝(U-Learning)이 차츰 그 무게를 더하고 있다. 유비쿼터스의 기술을 이용한 U-Learning의 핵심은 일상생활을 하면서 빈 시간을 활용, 장소에 구애 받지 않고 학습할 수 있게 함으로써 학습자들의 학습 효율성 및 효과성을 극대화할 수 있다는 데 있다. 특히 장애 학생들의 경우 그 장애의 형태에 따라 다소 다를 수는 있지만 일반 학생들에 비해 교육환경에 접근하기가 상대적으로 어려운 것이 현실이다. 이들 장애학생들을 일반 학생과 함께 수용하는 교육환경 즉, 통합교육의 경우 이러한 U-Learning 학습 환경을 조성하여 교육함으로써 훨씬 효율적인 교육이 이루어질 수 있을 것으로 판단된다. 이 논문에서는 이러한 U-Learning 시스템을 적용하기 위하여 요구되는 기자재, 교육 콘텐츠 및 통신 인프라 등의 제반 여건들을 살펴보고, 보다 나은 결과를 얻기 위한 교수자의 현실적인 자기관리 방법 등도 사례를 가정하여 함께 제시해 보고자 한다.

Abstract

The environment of education has been undergoing dramatic developments in recent years with the development of information technology such as digital information transfer, storage and communication methods. Education and training technology is constantly evolving and growing. Because we continually meet the new and interesting advances in our world. The evolution in education and training at a distance can be characterized as a move from traditional learning to u-learning. This paper concerns with the application of u-based education methodology for people with disabilities targeting to empower them. Instead of the classic educational support such as extended time to take exams, a reader and/or scribe to assist with exams and note taking services. In this paper, we introduce the definition of inclusion and disabilities which does not been fully understood what they mean and then possible implementing materials which can empower the students with disabilities with accomplishments. We would like to point out that we concentrate on the aspects of instructional science particularly related with inclusive classes.

▶ Keyword : U-Learning, Ubiquitous computing, Inclusion, people with disabilities, CDMA

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I. INTRODUCTION

E-learning refers to on-line network base education. Most of countries the e-learning has been developed by government in 1990. As a result e-learning is being used cyber university, and education business[1]. By the advanced technology mobile communities, the mobile learning has been introduced late. In this paradigm, concept of mobile communication in emphasized. By this u-learning, Society of present is used with mobile technology. Recently, the concept of ubiquitous has been introduced to education. It is integration of ubiquitous and learning. As a result it makes a u-learning. Consequently it is possible at anywhere, at anytime in education. In the future, with ubiquitous, it will expect technology of u-learning. In this paper we propose developed learning environment using u-learning system for the inclusive class where students with and without disabilities study altogether. This paper consists of the follows. First, we explain definition of inclusion, disabilities, and then current u-learning related technology. After that, we will discuss the necessary materials and infrastructures for the class. Finally we will ask how staff should be ready to do the appropriate training for them.

II. UNDERSTANDING INCLUSION

2.1 People with disabilities

There are many people with disabilities who desire to access the Internet but do not have the appropriate technology or support. Under 10% of people with visually impaired are Internet users today[2]. The use of cellular phones however has shown an increasing number of users with hearing

impairments. In general divide among users with disabilities is widespread and oppressive. To slowly and effectively relieve this current situation, relative organizations have begun to develop more assistive technology and accessible web sites. However there are many individuals with disabilities who use IT for their equality of opportunity, freedom of choice, independent living and full participation in the society. As mobile users, people with disabilities did a big contribution to industry and society. For example, people with hearing impaired use cellular phone every day, any time. They use e-mail systems as a chatting tool. For the people with visually impaired, they use cellular phone with video camera as a navigator. A professional guide or a family member can tell the person with visually impaired, where he or she is, what he or she can select at the shop, by watching the video image shot that sent by the visually impaired person. Using this kind of cellular phone, people with visually impaired can achieve more freedom because they can obtain support form people even at remote site. This is a quite new way to use a cellular phone that developers have not expected. People with disabilities will cut the edge in new technology by their needs. And these idea or experience will contribute to all people.

2.2 Inclusion

Inclusion is part of a much larger picture then just placement in the regular class within school. It is being included in life and participating using one's abilities in day to day activities as a member of the community. It is being a part of what everyone else is, and being welcomed and embraced as a member who belongs. Inclusion can occur in schools, churches, playgrounds, work and in recreation.

Human beings, regardless if they happen to have a disability or not, have basic needs that must be met in order to feel fulfilled. The basic needs of food, water and shelter are necessary for us to exist. It's also easy to see that when you don't eat right or

exercise it can adversely effect your health and capacity to function in other areas of your life. Having meaning and purpose to what you do and who you are, provides inspiration. Feeling useless or doing things that are meaningless, decreases motivation and self-esteem. A sense of belonging, being loved, having relationships and friendships with others enriches our lives. Feelings of loneliness and alienation can have a negative impact in all areas of our lives. Education helps meet the need to learn and grow and not remain stagnant, but as with any of our needs, if we focus on one at the expense of the others it does not maximize the overall quality of life. When all these needs are met in an integrated way, each area adds strength in the ability to achieve fulfillment in the other areas. Inclusion is about meeting all those needs, and maximizing a person's overall quality of life.

In school, inclusion does not occur by placement in the regular class alone, rather it is a desired end-state. It must be created with proper planning, preparation and supports. The goal of inclusion is achieved only when a child is participating in the activities of the class, as a member who belongs, with the supports and services they need. Inclusion is "not" a trade-off of supports and services for placement in the regular class and is not a trade-off of achievement of individual goals. No matter where a child with a disability is placed, an Individualized Education Plan (IEP) must be developed around the child's needs. The IEP objectives must continue to be met in the regular class. The same applies to the related services a child needs, they must continue to be provided for in the regular settings.

The fundamental principle of inclusive education is the valuing of diversity within the human community. When inclusive education is fully embraced, we abandon the idea that children have to become "normal" in order to contribute to the world.

III. U-LEARNING

3.1 Definition

U-learning is integration of ubiquitous and learning. u-learning refers to an environment where remote education and cyber experiences are available due to computers, networking and mobile communications technologies. In the u-learning environment, education is not confined to physical classrooms, but can take place at anytime, at anyplace. 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 is another new approach now emerging[3].

The most profound technologies are those that disappear. They weave themselves into the fabric of everyday life until they are indistinguishable from it. 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.

3.2 Related Technology

With mobile devices, u-learning is integration Radio frequency identification(RFID), Digital Multimedia Broadcasting(DMB) technology, which is become free education to human. Ubiquitous issues is

RFID and DMB technology. u-learning means to use RFID to all things with mobile meaning. RFID is a system that can identify vehicles at long distances, high speeds and in demanding environments. For example, by collecting context-aware information from the sensors, analyzing and sharing the information through a sensor network, providing adaptive, situation-aware RFID services[4][5]. Another example the most comprehensive application of RFID technology in libraries can be found in Singapore[6]. The concept of DMB was introduced to satisfy the consumer need for mobile multimedia broadcasting that provides quality audio and video services anytime anywhere. This Figure1 below is diagram of learning environments. It is ascending from e-learning to ubiquitous learning. Like this, the study that integrated ubiquitous and learning, is more upgrading than other learning, is expected to grow much more with e-learning.

3.3 U-learning as an assistive technology

We, hereby, explore the accessibility issues around mobile devices, focusing on Personal Digital Assistants (PDAs) and mobile phones. Mobile learning can extend the benefits of e-learning (eg, access to information, access to assistive software, personalized interface) to a much wider range of teaching and learning contexts. u-Learning can also create entirely new opportunities for learners - both disabled and non-disabled.

It is appropriate to ask the question "How accessible is u-Learning?", but the answer is not necessarily simple: it needs to be understood in the context of the alternatives. For the inclusive class with various types of students with disabilities, u-learning may involve adult learners peering at small screens, and grappling with cramped keypads; but it may be the only way of engaging the learners with video and audio clips. The accessibility issues of the kit may be more than counterbalanced by the value added to the learning experience - compared to a traditional didactic lesson. In the next step, we

explore the issues and opportunities afforded by u-learning, both as an individual assistive technology tool and as a tool for creating rich teaching and learning experiences. Mobile devices offer great new opportunities but enhanced opportunities for some may be increased barriers for others. Nonetheless it is neither ethical nor sensible to work on a "value subtracted" approach where resources are banned unless all can access them equally. More effective by far is a value added model where the tutor's repertoire of tools and techniques is used to add value to different learners in different ways.

3.4 U-learning over traditional approaches

U(E)-learning offers many distinct advantages over traditional paper based resources[7]. These include the ability to

- personalize font type and size
- personalize colours
- change magnification
- personalize the pace of learning by accessing materials outside the classroom/lecture room
- personalize routeways through materials using hyperlinks
- personalize access to support/extension materials using hyperlinks

A very effective way of moving the accessibility agenda forward in an organization is to ensure sufficient time and resources are being invested in upskilling staff in the use of e-learning. This involves more than simply improving staff IT skills. A much more teaching and learning focussed approach is recommended. Resources listed below take a holistic approach to e-learning and can be very good sources of ideas and inspiration.

Instructional technology for ubiquitous learning can base its theoretical background on empirical as well as scientific knowledge. The judgement procedure of planning, designing, developing and implementing the course materials depends on the

teachers' empirical laws, describable in the form of a figurative presentation of images and models of learning situations and judgemental propositions. Fig. 1 depicts these procedures symbolically.

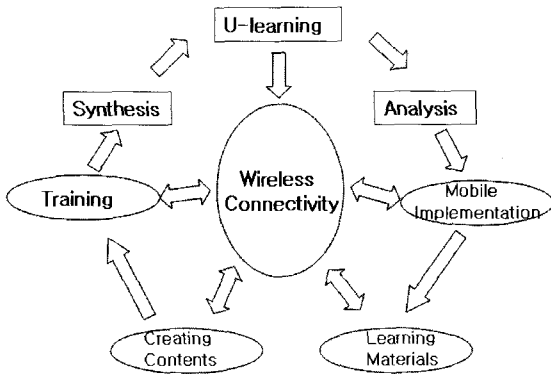


그림 1. U-러닝 기반 교육훈련 기술 과정
 Fig. 1 Procedure of Instructional Technology Based on U-learning

IV. ADAPTATION OF U-LEARNING

4.1 Mobile Implementation

Development of applications for mobile and wireless networks is a broad area and the benefits can be realized in the education domain. Although some work has been researched in this area, some notable issues have been omitted. Specifically, implementation issues and experiences of developing a mobile u-learning environment need further examination particularly specific the tools that are required. Web applications development technologies, such as ASP.NET, allow both desktop and mobile web applications to built with a great degree of flexibility. ASP.NET applications are commonly built with the Visual Studio.NET development environment which provides a "drag and drop" development mode, facilitating relatively straight forward prototyping and development[8].

4.2 Locating learning materials

Many of the learning materials located on the classes are supplemented by streaming audio to assist student learning. Previously, the Real Media file format was used streaming audio. As a result, students accessing learning environments via Pocket PC were unable to take advantage of media streaming as the real media format is not supported by the default media player. We assume students would not want to purchase or download extra software unnecessarily, thus the audio streaming system was revised. The system streams Windows Media Audio (WMA) using Windows Media Services (WMS)[9]. WMA files are audio files that are compressed for listening on the Internet. WMS uses expert functionality to determine if the Internet connection is becoming congested and will adjust automatically so the quality of audio is not affected. It is important to highlight that the audio is streamed as opposed to downloaded. Mobile devices generally do not have generous amounts of storage space and therefore downloading media files is not always possible. Streaming involves progressively downloading sections of the media file, playing them and then discarding them. This is similar to the First in First out (FIFO) methodology used in queuing theory. The size of the queue is the memory buffer WMS dynamically adjusts to ensure successful audio playback. Thus far the design and implementation issues have been complete managed by the Walkabout authors. If modifications are required, then they can be made easily. However, access to Walkabout requires some dependence on infrastructure that cannot always be controlled and therefore some discussion is provided for different means of accessing Walkabout.

4.3 Infrastructure for ubiquitous classes

Learning environments are accessible both from conventional desktop/laptop/tablet PCs and mobile devices such as a pocket PC. These mobile devices

differ from conventional desktop pc in that they are designed to be carried around and Internet access is achieved through a wireless connection. Wireless connections differ from standard cable connections as they usually have less bandwidth and can be unreliable. A student has few options to access learning environment via their PDA. When on campus, a wireless LAN (WLAN) connection is available almost everywhere. Access is not possible if a student moves out of a WLAN zone. If a student is not within close proximity to a WLAN connection then bandwidth will decrease. In this scenario, downloading images and streaming the audio is not possible. Thus, other wireless connections should be considered.

CDMA is possible if the PDA is capable of making telephone calls and therefore is not restricted to the zoning limitations of a WLAN[4]. However, CDMA at best is expensive and does not offer the high bandwidth required for a multimedia web application. With the restrictiveness of WLANs and cost and performance issues of CDMA, we perceive integrated types of technologies will contribute to the ongoing success of u-learning Environment.

4.4 Creating contents

Accessibility is often a balance between contrary tensions. A text based resource accessible to screen readers may be inaccessible to a dyslexic learner, a deaf learner or somebody with cognitive difficulties. An interactive media rich resource which suits the latter groups may be inaccessible to a blind student using a screenreader. "Design for all" applies more readily to passive content on websites than it does to active learning experiences in an educational setting.

Most teachers and lecturers work with a limited IT skill set to tightly constrained timescales and in these circumstances it is reasonable to consider how low tech approaches to e-learning can enhance accessibility for target groups. Many of the techniques outlined in the links below will improve

accessibility for one target group but not necessarily all groups. The notes give suggestions as to who might benefit from different approaches and how the needs of other learners might be accommodated. These approaches can give teachers flexibility to adapt resources to many different types of learner needs without needing a high degree of IT skill[10].

The links below are geared to teachers or lecturers wanting to extend their repertoire of accessible teaching approaches without having to learn new software or develop much technical expertise.

We will be developing other areas of this site with case studies and "How to" articles aimed at technically experienced developers. Meanwhile follow the links below to explore a wide range of approaches to accessible teaching and learning.

V. APPROPRIATE TRAINING WITH SKILL LEVEL

Within an organization there is a wide spectrum of staff IT confidence. For those at the novice end of the spectrum it is important to demonstrate how u-learning can add to the accessibility of teaching and learning. This may involve simplifying some of the accessibility advice in order to make progress achievable. Case 1, below gives an example of this in action. Alternatively, some staff need much more rigorous accessibility guidelines as in case 2[7].

Case 1: Ms. Kim teaches geography level I. She has limited IT skill but is enthusiastic about supporting her learners in as many ways as she can. Her teaching groups include several students with dyslexia, others with low confidence in reading and several disaffected learners. With a geography fieldcourse imminent Ms. Kim decides to get some training in using a digital camera to produce short video clips. On the fieldcourse she talks through key field locations with the students and allocates a different student in each location to make a short video clip explaining the key features of the scene.

Back in the college she learns how to load the raw video clips into the virtual learning environment (VLE) and during the fieldwork write up the learners are encouraged to refer back to the video clips.

Reviews on case 1: A specialist in the college spoke with Ms. Kim before the fieldcourse and gave her training in using the camera and uploading video to the VLE. Although he had recently been on a video captioning course he decided not to mention this to her for three reasons: first, there were no learners in this year group for whom the video clips would be inaccessible. Second, Kim's approach was in response to a real accessibility need in her existing groups. Third, given Kim's lack of IT confidence, it was important to avoid overloading her - she could easily have decided that videoing was too complicated if he insisted on her subtitling the student's commentaries. This resource is very time sensitive - after the two week follow up work nobody will look at it again so it is highly unlikely to discriminate against any future learner. The specialist's accessibility advice to Ms. Kim was limited to the videos would be an accessibility aid to many of her current learner. When she loaded them on the VLE, she needed to give a reasonable description of what the video showed and why it was worth looking at.

Case 2: Mr. Lee is the media technician at the same college with responsibility for developing and maintaining the media department's significant resource bank on the VLE. Working with several of the media staff, Lee has put together a video on compositional techniques in filming including excellent narrative content explaining the emotional, symbolic and perceptual impacts of filming from different angles. He has spent time making a very professional looking video complete with transitions, fades and background music. The ILT champion has seen the video clips on the VLE and asked Lee to redo them with subtitles. Lee is not happy about this because there is no deaf student in the media department and suggests including a link to the script as a compromise.

Reviews on case 2: There are a number of important elements in this scenario. This is a core media studies resource with a long lifetime. It is designed as a primary source of content (by contrast Ms. Kim's clips were reminders of an alternative experience). Whilst there are no deaf learners in the department at the moment the nature and longevity of the resource could seriously disadvantage future deaf learners. Furthermore, with Lee's level of technical skill he is very capable of adding subtitles and this should have been a higher priority than stylish transitions and background music. Finally, since much of the content is in the narrative, students working at machines without sound cards will be seriously disadvantaged. Lee's offer to add a link to the script is a cop out because the nature of the resource is such that the narrative is highly time dependent on the visual effects. A transcript might have been perfectly acceptable with a "talking head" video cutting to one or two well defined scenes but in this case it would be a largely inaccessible substitute. The specialist would be advised to stick his ground!

VI. CONCLUSIONS AND FUTURE WORKS

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. In this age of progress and great change, we tend to easily adapt to the technologies and pedagogies that emerge especially for the people with disabilities. Ubiquitous technology and u-learning may be the new hope for the inclusive education. Developing u-learning without limited places and time imported the notions e-learning, which can help learning everywhere if people have PCs.

It is now possible for students who cannot always attend lectures in the traditional learning mode to access courseware via a mobile web browser on their PDA in so many reasons. And it also makes possible that every students study all together in the same class whether they have any type of disabilities or not. Access is not restricted with the materials with accessibility to common web pages, but to streamed media as well. This paper has highlighted the technological requirements of making materials available from ubiquitous locations via mobile devices. This ensures that we instructors can provide u-learning environments that suit the needs of the modern student. But still, there are some limitations to the people with disabilities with u-learning solutions suggested above. Not all features of a desktop web site can be replicated for mobile web browsers. In particular, students cannot download a copy of the whole site for home use as they can with a desktop web browser. This is not a useful feature for PDAs, as these devices have memory constraints and lack a required web server. Similarly, other features such as chatting to others students using the related software available for PC users cannot be used. This will be part of future investigations.

참고문헌

- [1] J. Choi, e-learning system of new economy city, March 2001.
- [2] Francesco Co lace, Models for e-learning environment evaluation a proposal, SSGRR2002,L' Aquila, July August.
- [3] K. Lyytinen, and Y. Yoo, Issues and Challenges in Ubiquitous computing, communications of ACM, Vol.45,2002.
- [4] S. Yau and et al., Reconfigurable Context-Sensitive Middleware for Pervasive Computing, IEEE Pervasive Computing, Vol.1, No.3, sep. 2002, pp.33-40.
- [5] S. Yau, Y. Wang, and F. Karim, Developing Situation-Awareness in Middleware for Ubi-comp Environments, Proc. 26th Int'l Computer Software and Applications Conference, 2002, pp233-238.
- [6] Raising an RFID Ruckus, Steve Ulfeder, October 7, 2003, <http://www.newsfactor.com/>
- [7] Accessibility perspectives on e-learning, <http://www.techdis.ac.uk>
- [8] Dr. Trent Mifsud, E-learning to U-learning, Adapting Learning Environment to Mobile Devices, 2006
- [9] C. savill-Smith, & P. Kent, 2003, The use of palmtop computers for learning: A review of the literature' Retrueved 4 May 2004 from http://www.m-learning.org/docs/the_use_of_palmtop_computers_for_learning_sept03.pdf
- [10] B. Chapman, B. Hall, Learning content management systems <http://www.brandon-hall.com/>

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