CONTEXT AWARE UBIQUITOUS LEARNING MILIEUS IN DISTANCE LEARNING

Res. Assist. Hakan KILINC
Anadolu University, Open Education Faculty
Department of Distance Education
Eskisehir- TURKEY

Prof. Dr. T. Volkan YUZER
Anadolu University, Open Education Faculty
Department of Distance Education
Eskisehir- TURKEY

ABSTRACT

Problems such as temporal and spatial limitations imposed by traditional learning environments can be overcome by distance learning environments. Thanks to e-learning environments, in particular, learners can access learning resources anywhere and anytime they like without being subjected to the limitations of time and space. Orientations in e-learning environments can also change in parallel to the developments in information and communication technologies. As a result of the technological advancements, which have been being accelerated since the first quarter of the 20th century, detection technologies such as radio frequencies have also begun to be used in learning environments. Thanks to detection technologies, it is possible to detect locations of learners in the spatial dimension and provide them with the necessary learning contents simultaneously. It is seen that context-aware ubiquitous learning (u-learning), which engages detection technologies, encompasses mobile learning (m-learning) and e-learning environments. This study, which is based on context-aware ubiquitous learning environments, aims to examine and explain the contributions of context-aware ubiquitous learning environments to distance education systems and learners. In accordance with this aim, qualitative interviews were made with specialists of the relevant fields to get their opinions regarding how context-aware ubiquitous learning environments could be used, and some suggestions regarding the use of context-aware ubiquitous learning environments in learning processes were made based on the themes that emerged as a result of these interviews.

Key Words: Context-aware Ubiquitous Learning, Ubiquitous Learning Technology, Internet-based Learning Environments.

INTRODUCTION

In traditional learning environments, learners are often limited to formal (intramural) learning activities. This orientation causes learners to remain passive in the learning processes and to lose some motivation for learning (Wang and Wu, 2011). Insufficient motivation towards the learning process on the part of learners, in turn, can be seen as a factor which could adversely affect their academic achievements. In traditional learning methods, educators often have to guide tens of learners (Hwang and Chang, 2011; Lin, Hsieh and Chuang, 2009; Wu, Hwang, Su and Huang, 2012). Specialists of this domain emphasize that educational problems can arise in such an educational environment. One of those problems is the lack of individual learning and of getting sufficient feedback because educators face tens of learners in traditional learning environments and some learners can have difficulty keeping pace with the learning process (Shih, Chuang and Hwang, 2010). Another problem is a lack of tools which could engage learners in the learning process more effectively and efficiently in traditional learning environments (Hwang and Chang, 2011).

Thanks to information and communication technologies, which advance further each passing day, it has become possible to gradually overcome such problems as temporal and spatial limitations caused by traditional learning environments (Wang and Wu, 2011; Tsai, Tsai and Hwang, 2011; Vladoiu and Constantinescu, 2011; Hwang, Shi and Chu, 2011). Rapidly progressing technological developments have led to a review of learning environments. As a result of the fast advancements in information technologies, different learning approaches have been developed such as e-learning, mobile learning and blended learning, by which global-scale education can be provided (Brew, 2008; Harrison, Kostic, Toton and Zurek, 2010; Nichols and Levy, 2009). Newly conceived learning environments adopt the paradigm of "lifelong education". Thanks to the distance learning and e-learning environments, which have emerged as a result of the developing information in communication technologies and which embrace the lifelong learning paradigm, it is ensured that learners are more motivated towards learning processes and participate individually in the learning process (Rashid, 2012). Studies show the importance of creating a learning environment which is integrated with technology in order to actualize the goals of education (Yang and Wu, 2012). It can be said, therefore, that e-learning environments are essential for an effective learning process. Consequently, the temporal and spatial limitations imposed by traditional learning environments are eliminated thanks to e-learning environments. By e-learning environments and through an Internet access, learners can reach learning contents anywhere and anytime they like.

As a result of the advancements in wireless communication technologies and mobile technologies, the concept of mobility has been included in e-learning environments. Thus the attention on e-learning environments has shifted towards mobile learning environments (Hwang, Tsai and Yang, 2008; Wu, Hwang and Tsai, 2013; Wang, and Wu, 2011; Lin, 2013). The studies which have been being carried out in the field of e-learning since the beginning of 2000s have begun to concentrate on mobile learning and wireless communication due to such technologies (Wu, Hwang and Tsai, 2013). As a result of the increasing interest in wireless communication technologies, the rate of utilization from wireless applications in our daily life has also begun to increase. Various devices functioning in wireless environments and various software enabling those devices have been developed and their connection to the Internet environment has been made (Hwang, Tsai and Yang, 2008). So, by their mobile devices such as cellular phones and laptop PCs, learners are able to access learning environments more flexibly, more rapidly and more efficiently anytime and anywhere they like (Lin, 2013). Portability of mobile devices and their communication abilities enable them to be used as more flexible and more effective learning tools. Moreover, mobile devices influence the interaction among learners, access to resources and the transfer of the accessed resources in a significantly positive way (Chen, Chang and Wang, 2008).

E-learning environments which have generally oriented towards mobile learning environments as a result of the developments in wireless communication technologies and mobile technologies have gained a new orientation towards context-aware ubiquitous learning environments which enable learners to learn in the right place and in the right time as detection technologies such as radiofrequency have begun to be used in education (Hwang, Tsai and Yang, 2008; Hwang, Shi and Chu, 2011, Shih, Chu, Hwang and Kinshuk, 2011). By context-aware ubiquitous learning environments, it is possible to identify where learners are located and thus to simultaneously transfer the relevant information from the primary source to where the learners are. In this way, context-aware ubiquitous learning environments equipped with such a technology enable an individualized learning process. Thanks to such learning environments, learners are able, with the mobile devices they possess, to access learning contents anytime and anywhere without any limitation all time or space, in an individualized way. They can continue their learning processes in learning environments which are flexibly designed in all respects.

Within the scope of this study, distance education specialists were interviewed to get their opinions regarding context-aware ubiquitous learning environments, then the themes emerging as a result of these interviews were examined and the benefits offered by such environments were taken into consideration. Besides, again based on these interviews, it was explained how context-aware ubiquitous learning environments could be utilized in a more efficient way, and some suggestions were made in this regard.

Ubiquitous Learning Environments and Ubiquitous Learning Technologies (U-Computing)

Ubiquitous learning environments are formed when ubiquitous learning systems, wireless communication, mobile devices and context-aware technologies, which can be used in educational environments, come together (Hwang, Tsai and Yang, 2008). Ubiquitous learning is similar to mobile learning systems which enable learners to access learning contents anytime and anywhere. What distinguishes ubiquitous learning from mobile learning is that it identifies the identities of learners and their locations and provide them with immediate feedback and guidance. It is, therefore, possible to obtain more information in ubiquitous learning environments compared with other e-learning environments. From the time Mark Weiser, who is one of the founders of ubiquitous learning environments, suggested ubiquitous learning for the first time as a "calm technology", ubiquitous learning method has been attracting gradually more attention (Dey, 2011; Weiser, 1991). Ubiquitous learning environments, which enable learners to access their learning resources in the right place and time being capable of providing them with immediate feedbacks and guide them, are also defined as a learning environment which is based on ubiquitous learning technologies. The most important role of ubiquitous learning technologies within the frame of ubiquitous learning environment is the fact that it enables learners to access these learning environments aware and anytime (Yahya, Ahmad and Jalil, 2010).

Context-Aware Ubiquitous Learning Environments

Context-aware learning environments have become one of the key elements in ubiquitous learning environments thanks to those technologies which enable context-awareness (Kang, Suh and Yoo, 2008). Through the detection technologies like radio frequencies utilized in context-aware learning environments, users can be located and it is ensured that the resources in learning environments are adapted to the environments where users are located. In this way, users can be provided with fast and uninterrupted content supplication services and guidance (Bolchini, Schreiber and Tanca, 2007; Kwon, Choi and Kim, 2007; Yang, Cheng and Dia, 2008; Zhu, Mutka and Ni, 2005; Shih, Chu, Hwang and Kinshuk, 2011). As a result of the opportunities offered by this service, an integration between the actual life and the virtual life becomes possible and this is a significant point in e-learning environments (Hwang, Shi and Chu, 2011). Where the real life and the virtual life could be integrated together, learners can deal with their learning problems in the real life with the help of the virtual life anytime and anywhere, and this can be considered to be a development which can increase the efficiency of the learning process.

Internet-based Learning Environments and Context-Aware Ubiquitous Learning Environments

A context-aware ubiquitous learning environment is a learning paradigm which provides learning contents in the right place and time and which, by doing so, moves ahead of Internet-based learning that requires computer technology, provides learners with uninterrupted information and, at the same time, enables them to access learning contents anywhere and anytime (Yang, Okamoto and Tseng, 2008; Casey, and Mifsud, 2005; Shih, Chuang and Hwang, 2010). Drawing on the detection technology, context-aware ubiquitous learning environments can access information on the current space and time of learners, and this characteristic distinguishes this type e-learning environments from others. Components of a context-aware ubiquitous learning environment, which is a learning environment composed of several elements, can be listed as below (Hwang, Tsai and Yang, 2008).

1. *Detection technology*: It is used to detect the location of learners.
2. *Server*: It is a structure which saves contents and which provides learners with active or passive support in their learning processes.
3. *Mobile Learning Devices*: Each learner has to possess relevant mobile learning devices in order to be able to receive the support coming from the server and to access information over the Internet.
4. *Wireless Network*: Wireless networks are necessary to enable communication among mobile learning devices, detectors and the server.

Features of Context-Aware Ubiquitous Learning Environments

In a study they carried out, Yang, Okamoto and Tseng (2008) referred to eight features of context-aware ubiquitous learning environments.
1. *Mobility*: Learners are able to continue their learning processes while moving from one position to position.
2. *Location Awareness*: Locations of learners are detected by the system.
3. *Interoperability*: Different standards such as learning resources, learning services and learning platforms can be set to work together.
4. *Seamlessness*: The services offered to learners are maintained uninterruptedly as long as learners have the required device and connection.
5. *Situation Awareness*: It is identified which information, and where and when, is to be provided to learners.
6. *Social Awareness*: The existing information about the social relationships of learners is linked with what they do and what they know
7. *Adaptability*: Learning materials and services can be adapted to the preferences and current needs of learners.
8. *Pervasiveness*: Learning contents and services are accessed openly. Thus a pervasive learning environment is provided.

In summary, context-aware ubiquitous learning environments are formed as a result of utilizing mobile devices, wireless communication and sensor technologies in learning environments (Hwang, Tsai and Yang, 2008). The term "ubiquitous" does not only mean to access information anywhere and anytime but it also means to access information in the right time and place (Allison, Cerri, Ritrovato, Gaeta and Gaeta, 2005). Ubiquitous learning environments can be used in various educational environments. Touristic trips and museum trips, however, are where the ubiquitous learning environment is primarily used. For instance, a person visiting a museum can receive information about an object through a pre-supplied earphone when they wonder and draw closer to that object (Bomsdorf, 2005).

Although there are not sufficient studies in the literature on context-aware ubiquitous learning environments (Chen, Chang and Wang, 2008), existing studies suggest that context-aware ubiquitous learning environments increase learner motivation and thus improve the efficiency of the learning process (Shih, Chu, Hwang and Kinshuk, 2011; Wu, Hwang and Tsai, 2013). It can be shown as one of the important factors in the learning process for keeping the motivation of learners high in learning environments. When learners use mobile devices to engage in the learning process, they might feel a strong interest to the learning process however, they might also get disappointed along the learning process if no proper assistance or guidance is provided subsequently and thus lose their motivations (Hwang, Shi and Chu, 2011). Drawing on detection technologies such as radio frequency, a context-aware ubiquitous learning environment is capable of collecting information about the situation of learners and provide them with the necessary guidance in a context aware way (Chen and Huang, 2012). It can be concluded, therefore, that context-aware ubiquitous learning environments have a positive contribution to the learner motivation. An increased motivation of learners towards the learning process can be considered as an element which can increase their economic achievements.

In addition to all these features that they possess, context-aware ubiquitous learning environments can also gain learners the analysis and assessment skills listed in Bloom's Taxonomy in its learning purposes section (Wu, Hwang and Tsai, 2013). Equipped with such skills, learners can be expected to reach academic achievement in the learning process.

In a study, De Casey (2005) offers the following formula: "ubiquitous learning = e-learning + mobile learning". Therefore, ubiquitous learning environments form as a result of a union between e-learning and mobile learning.

Table 1 shows four learning environments according to Ogata and Yano (2004). As seen in the table, the desktop computer aided educational system provides less mobility and it is more embedded. Therefore, these learning systems are immobile. It is seen when desktop computer aided education is compared with mobile learning that mobile learning is ahead in terms of mobility and that learners are able to work more collaboratively when they are not limited to a certain space. In diffuse Internet environments, too, learners can

obtain information from their own learning environments through the communication between embedded devices and the learning environment, but this situation localizes the usability of diffuse learning environments and makes it limited. Such limitations can be eliminated by ubiquitous learning environments where devices with higher mobility are included in the learning environments. Even if they are in motion, learners are able to access ubiquitous learning environments. This characteristic of ubiquitous learning environments are embraced by learners. And this increases the usability of ubiquitous learning environments. As is seen, mobility versus immobility of the devices used in educational environments is an important factor (Kang, Suh and Yoo, 2008).

Table 1: Classification of Learning Environments. (Ogata ve Yano, 2004)
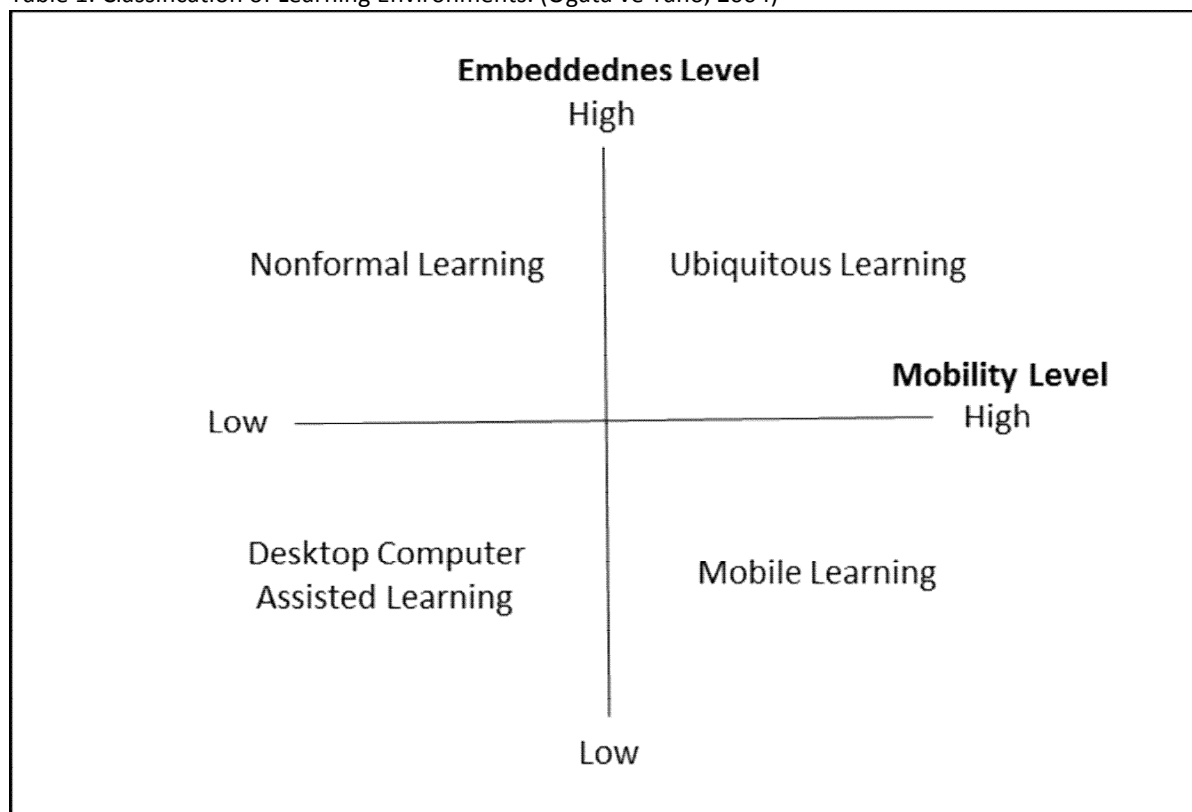
METHOD

As this study dealt with how context-aware ubiquitous learning environments could be utilized in distance learning environments, it was designed as a qualitative case study. Based on the idea that science is not a process of producing objective knowledge and the scientific process grounds on the relativity of the world, qualitative studies are approaches which inductively focus on describing events and facts within their natural environments, and understanding and reflecting the perspectives of the participants (Çokluk, Yılmaz and Oğuz, 2011). Unlike quantitative research which is based on statistical data analysis, qualitative research seeks to answer the question what kind of meanings people ascribe to events, that is, how they describe events (Dey, 1993).

In this context, face-to-face interviews were made with four distance education specialists, who were selected by purposeful sampling in the study process, to get their opinions about context-aware ubiquitous learning environments.

Participants of the Study

Usability of context-aware ubiquitous learning environments in distance educational environments was researched in this study. Therefore, distance education specialists are asked their opinions regarding context-aware ubiquitous learning environments. Participants interviewed are listed in Table 2.

Table 2. Participants of the Study

Distance Education Specialists (Nickname)	Experience in the Field
Gonca	30 Year
Nejla	13 Year
Gülizar	5 Year
Murat	7 Year

The following questions are asked to the distance education specialists (participants) in the interviews.
1. What is the importance of context-aware ubiquitous learning?
2. Where can context-aware ubiquitous learning environments be used?
3. Why are context-aware ubiquitous learning environments used?
4. How can context-aware ubiquitous learning environments be used in a national (local) level?

FINDINGS AND DISCUSSION

What Is the Importance of Context Aware Ubiquitous Learning?

Integration of steadily increasing technologies in learning environments enables learning processes to be applied more efficiently and effectively. Information obtained from specialists also confirmed this. Learning process has become a learner oriented process thanks to context-aware ubiquitous learning environments with their technological integration feature. Therefore, the skill of individual learning which learners should possess can improve through context-aware ubiquitous learning environments. This environment, which provide learners with the opportunity to learn simultaneously from the primary resource anytime and anywhere, brings along flexibility, as well. At this point, the statement made by the person named Gonca also emphasizes how flexible such environments are: "*Ubiquitous learning is to provide the learner with the opportunities of learning, that is, it is a process of putting information at the disposal of the learner.*" Another aspect of flexibility can be considered to be putting context of the disposal of learners. Thanks to these systems, learners are able to access the context from anywhere. The suggestion of the person named Nejla also shows how important it is to make the context accessible learners: "*We tried to prepare learners to life by providing them with education in classrooms which were completely away from the context and this was actually a very erroneous method because most learners have failed to adapt to real life after they were graduated.*" Besides, context-aware ubiquitous learning environments, which help learners gain the skills of the 21st century, can be used as a lifelong learning tool, as well, as they eliminate the temporal and spatial limitations. It can be concluded in this context that the inclusion of ubiquitous learning environments in learning environments is significant for an efficient and effective learning.

Where Can Context Aware Ubiquitous Learning Environments Be Used?

Those environments which incorporate technology and are designed for education can be used anywhere where the education process continues, because those learning environments which are blended with technology eliminates limitations such as time and space and provide flexible learning environment. Thanks to the ubiquitous learning systems, which put information at their disposal of learners, learning occurs simultaneously from the first resource and therefore learners can learn more permanent. This is exemplified by Nejla's statement that, "*Assume that you encounter a sculpture that you don't know about in a museum trip with learners, and that you scan the sculpture with a special application and receive information about it. Now*

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this can lead to a more permanent learning because you access the information instantly and you experience it on site." Such systems have reached a level where they can be used within the scope of lifelong learning as also explained Gülizar: "*Ubiquitous learning environments can be used in all educational levels, I mean from primary to postgraduate education.*"

Why Are Context Aware Ubiquitous Learning Environments Used?

By their flexibility and benefits, context-aware ubiquitous learning environments enable learners to access the most proper information anytime from the primary resource as explained by Gonca: "*Of course, from the democratic point of view, this means offering the most updated and most accurate information from the primary source to the individualized learning environments of learners.*" This constitutes an important factor in the learning process. Nejla's statement also suggests that context-aware ubiquitous learning environments enable providing learners with the most reliable information simultaneously and from primary resource: "*There might be posters hanged on many locations of a campus, and those learners who want to learn the details might scan QR codes on them to instantly reach such details.*" It can be said based on Murat's argument, "*These systems help learning, and this is the most important reason because they make learning easier*", that context-aware ubiquitous learning environments should be integrated in learning environments. After all, environments which offer more effective, permanent and efficient learning should be utilized in the learning processes.

How Can Context Aware Ubiquitous Learning Environments Be Used in a National (Local) Level?

Based on Gülizar and Murat's statement that "*Ubiquitous learning environments can be used at each level from primary to postgraduate education*", it is concluded that such systems can be utilized in the lifelong learning process. In this context, the existing education institutions in the nation level can use these learning environments blended with technology at each level of their educations. Efforts should be taken to close the gaps in this field as suggested by the common view of the interviewed specialists: "*Context-aware ubiquitous learning environments is new in our country and the necessary steps have not yet been taken, and there is a great gap to close in this field.*" From this point of view, joint efforts to be taken by academicians along with the institutions assuming an active role in the national level in terms of educational process will both close the gap in this field and also make a very positive contribution to the education process.

CONCLUSION AND SUGGESTIONS

The study findings show that distance education specialists have positive opinions about context-aware ubiquitous learning environments. The fact that ubiquitous learning environments, which draw on detection technologies such as radio frequencies, enable learners to access learning contents from the primary resource anytime and anywhere means that these environments are flexible, democratic and reliable. In order to fulfill the goals of education, a learning environment integrated with technology is an effective element (Yang and Wu, 2012). In this context, it can be said that the learning environments which incorporate technology assume a significant part in rendering the learning process effective and efficient. Ubiquitous learning environments, which also eliminate such restrictions as time and space involved in traditional learning environments, provide learners with lifelong learning opportunity.

Ubiquitous learning environments, which simultaneously provide learners with learning contents in the lifelong learning process, ensure that learners are individually included in the learning process. It can be said, in this way, that ubiquitous learning environments contribute to the improvement of the 21st century skills such as relational technology and individual learning. Consequently, context-aware ubiquitous learning environments, which are well designed by also taking the principles of educational design into consideration, offer lifelong learning by removing temporal and spatial limitations. Additionally, as a result of the utilization of technology in learning environments, violations of learners will increase in efficiency of the learning process will raise. In this context, those applications which are designed by considering the principles of educational design, in particular, can enable learning processes to get more efficient and effective. If educational institutions can provide their learners with such sensitive contents by taking their audiences in consideration and acting in

accordance with their own missions and missions, commitments of learners to their institutions can increase. This will probably take academic achievements to higher levels.

BIODATA AND CONTACT ADDRESSES OF AUTHORS

Hakan KILINC is currently working as a research asistant at the Distance Education Department of Anadolu University. He graduated from Computer Education And İnstructional Technology Department of Anadolu University. His professional interests include educational technology, distance education technology and personalized learning environments.

Res. Assist. Hakan KILINÇ
Anadolu University, Yunus Emre Campus
Eskişehir- TURKEY
E. Mail: hakankilinc@anadolu.edu.tr

T. Volkan YUZER is professor in Distance Education at College of Open Education, Anadolu University. He undertook graduate studies at Anadolu University, Turkey. His research interests are new communication technologies, synchronous, asynchronous and interactive communications and transformative learning milieus in distance and online education. He has over seventeen years' experience in exploring additional distance learning media and providing communication and technological support for distance learning programs as well as develop online learning courses. Dr. Yuzer has participated in projects related to distance learning, online synchronous learning, and virtual classroom. Dr. Yuzer is the Head of Distance Education Department of College of Open Education, Anadolu University. He has been teaching courses in distance learning, communication and information technologies.

Prof. Dr. T.Volkan YÜZER
Anadolu University, Yunus Emre Campus
Eskişehir- TURKEY
E. Mail: vyuzer@anadolu.edu.tr

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