

Hybrid Learning and Ubiquitous Learning

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Abstract. Ubiquitous learning (U-Learning) has an increasing trend as the coming forth of more new media and instructional ideas. U-Learning focuses on the combination of learning environment and substance space, emphasizing the learning can be happen as seeing, hearing, reading, or apperceiving whenever the learner wanted. Hybrid learning, sometimes called “blended learning”, emphasizes to maximize student’s learning within different learning environments (traditional and digital). It also means that learning requires students to meet for face to face classes while providing much of the learning content and interaction online via delivery software and instructional tools. This paper will discuss concept and characteristics of U-learning and H-learning, the different between the H- and U-learning, and their relationship.

Keywords: U-learning; Hybrid learning; Learning environments

1 Introduction

With the development of digital information transfer, storage and communication methods having a significant effect, education has undergone major changes in recent years. This development has allowed for access to global communications and the number of resources available to students at all levels of schooling. After the initial impact and applications of computers in education, the introduction of e-learning and mobile learning epitomized 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 based on the concept of ubiquitous computing. It is reported to be both pervasive and persistent, allowing students to access education flexibly, calmly and seamlessly. U-learning has the potential to revolutionize education and removes many of the physical constraints of traditional learning. Sometimes, it can be viewed as the integration of M-learning and E-learning, allowing for personalization and customization to student’s real needs. Simply, U-learning means “everywhere learning” (the internet or learning content follows people around). Core “knowledge pots” (work-related content, personal knowledge, internet) hold content and information. Various devices plug in and retrieve the information in the appropriate format (PDA, cell phone, laptop, or any

other appliance). It fulfills e-learning's promise of "anytime, anywhere, and any context"[1].

H-learning provides the best opportunities for learning transition from classroom to e-learning. It involves classroom (or face-to-face) and online learning. This method is very effective for adding efficiency to classroom instruction and permitting increased discussion or information review outside of classrooms.

2 Concept of U-learning

Mark Weiser coined the term 'Ubiquitous Computing' in the late 1980s. He introduced the idea of ubiquitous computing: a world in which computers and associated technologies become invisible, and thus indistinguishable from everyday life[2]. He also further indicated that Ubiquitous computing is the method of enhancing computer use by making many computers available throughout the physical environment, but making them effectively invisible to the user [3]. Based on the Weiser's view, UC refers to the process of seamlessly integrating computers into the physical world, in which the presence of computers is becoming less conspicuous and will eventually blend into our daily lives.

Of course, the computing and communication technologies required to achieve Weiser's vision did not exist around the late 1980s. But now, presented aspects of a ubiquitous (or pervasive) computing environment in which instances of Weiser's ubiquitous computing world could be explored, given the maturity of computing/communication technologies, such as wireless LANs, portable and wearable computers, and sophisticated embeddable sensors. Briefly described, a ubiquitous computing environment is a well-defined area, open or enclosed, that incorporates a collection of embedded systems (computers, sensors, user interfaces, and infrastructure of services).

From the system point of view, physical integration and spontaneous interoperation are two main characteristics of ubiquitous computing systems. Physical integration means that it involves some integration between computing nodes and the physical world. And spontaneous interoperation means the system must spontaneously interoperate in changing environments. A component interoperates spontaneously if it interacts with a set of communicating components that can change both identity and functionality over time as its circumstances change. From the user's point of view, in such an environment, anyone can make use of computers that are embedded everywhere in a public environment at any time. A user equipped with a mobile device can connect to any of them and access the network by using wireless communication technologies. Moreover, not only can a user access the network actively, but computers around the user can recognize the user's behavior and offer various services according to the user's situation, the mobile terminal's facility, the network bandwidth, and so on. User assistance via ubiquitous computing technologies is realized by providing users with proper decisions or decision alternatives.

That is, a ubiquitous computing technology-equipped system supplies users with timely information and relevant services by automatically sensing users' various context data and smartly generating proper results. So the characteristics of a

pervasive computing environment can be mainly concluded as the following: User mobility, Resource and location discovery, Context awareness (user/time/location), Collaborative interaction, Ambient information, Calm technology, Event notification, Adaptive interfaces, Invisibility object augmentation, and Anytime/anywhere. An U-learning environment shows as Fig. 1.

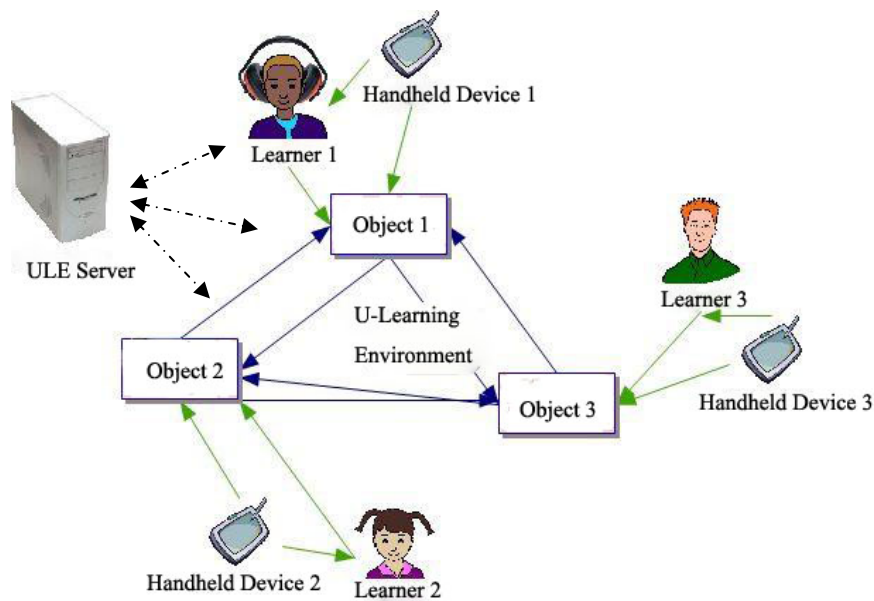


Fig. 1. Ubiquitous learning environment

Based on the characteristics of a pervasive computing environment, a number of higher education institutions have begun extensive research projects aimed at investigating with respect to what are a pervasive learning environments. These projects involve new learning spaces, class/instructor/student collaborative interactions, context-aware applications, event notification, enhanced collaboration and decision-making support for administrators and researchers, and more efficient facilities learning. Though not reaching a clear definition until now, it is a more general view that a ubiquitous learning environment 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 [4].

Essentially, U-learning is the extend and advance of E-learning, and also can be viewed as a combination of the advantages of E-learning and M-learning 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. According to Chen [5] and Curtis [6], the major characteristics of ubiquitous learning are the following:

Permanency: Learners never lose their work unless it is purposefully deleted. In addition, all the learning processes are recorded continuously everyday.

Accessibility: Learners have access to their documents, data, or videos from anywhere. That information is provided based on their requests. Therefore, the learning involved is self-directed.

Immediacy: Wherever learners are, they can get any information immediately. Thus, learners can solve problems quickly. Otherwise, the learner can record the questions and look for the answer later.

Interactivity: Learners can interact with experts, teachers, or peers in the form of synchronies or asynchronous communication. Hence, the experts are more reachable and the knowledge becomes more available.

Situating of instructional activities: The learning could be embedded in our daily life. The problems encountered as well as the knowledge required are all presented in their natural and authentic forms. This helps learners notice the features of problem situations that make particular actions relevant.

Adaptability: Learners can get the right information at the right place with the right way.

3 Concept of H-learning

Hybrid learning, sometimes called "Blended learning," provides the best opportunities for learning transition from classroom to e-learning (now could be to U-learning). It refers to learning that require students to meet for face to face classes while providing much of the learning content and interaction online via content delivery software and learning tools. It provide students with an option of taking some learning materials fully online and some in class, or hybrid.

Currently, the term "hybrid learning" has evolved to encompass a much richer set of learning strategy "dimensions." A blended learning program may combine one or more of the following dimensions, although many of these have over-lapping attributes [7].

- Blending offline and online learning
- Blending self-paced and live, collaborative learning
- Blending structured and unstructured learning
- Blending custom content with off-the-shelf content
- Blending work and learning

The most common reason that an instructor, a learner, or a trainer might pick hybrid learning over other learning options is that hybrid learning combines the best of both worlds. Based on this, hybrid learning provides various benefits over using any single learning delivery type alone, such as pedagogical richness, learning effectiveness, access to knowledge, cost-effectiveness, ease of revision, etc. In fact, Hybrid learning brings a more natural way to learn and work. A blend is an integrated strategy that involves a planned combination of approaches, such as coaching by a supervisor; participation in an online class; reference to a manual and participation in seminars,

workshops, and online communities, forums, chat etc. Table 1 presents some possibilities of what can constitute a blended learning approach.

Table 1. Possibilities of a blended learning approach [8]

Live face-to-face (formal) <ul style="list-style-type: none"> ● Instructor-led classroom ● Workshops ● Coaching/mentoring ● On-the-job (OTJ) training 	Live face-to-face (informal) <ul style="list-style-type: none"> ● Collegial connections ● Work teams ● Role modeling
Virtual collaboration/synchronous <ul style="list-style-type: none"> ● Live e-learning classes ● E-mentoring 	Virtual collaboration/asynchronous <ul style="list-style-type: none"> ● Email ● Online bulletin boards ● Listservs ● Online communities
Self-paced learning <ul style="list-style-type: none"> ● Web learning modules ● Online resource links ● Simulations ● Scenarios ● Video and audio CD/DVDs ● Online self-assessments ● Workbooks 	Performance support <ul style="list-style-type: none"> ● Help systems ● Print job aids ● Knowledge databases ● Documentation ● Performance/decision support tools

The up to the present day available research provides proof that hybrid learning can be equally or more effective and efficient compared with the model of entire e-learning and with the model of entirely traditional education. The students participating in programs of hybrid learning achieve the same or better learning results besides being more contented with the combining process [9] (Garrison & Kanuka, 2004). Rich, blended learning environments are giving learners greater control over their learning journeys and making learning more effective. The concept of hybrid learning is rooted in the idea that learning is not just a one-time event, but is a continuous process. Generally, the main characteristics of H-learning can be concluded as:

Mixed Mode: H-learning combines the socialization, group learning and hands-on opportunities of the classroom (face to face) with the learning possibilities of the online environment (also can call the U-learning environment).

Student Centered: Learning shifts from lecture to student-centered instruction. Faculty reconsider teaching strategies, becoming facilitators.

Communications Important: The key element underpinning a hybrid learning environment is the scope and nature of the communication channels provided to support learners.

Access flexibility: Blending is used to provide a balance between flexible learning options and knowledge access.

Cost-effectiveness: Hybrid learning provides an opportunity for reaching a large, globally dispersed audience in a short period of time with consistent, semi-personal content delivery.

4 Research focus of the U- and H-Learning

Currently, the researches on U-learning are still at its early stage, especially the systematic theories and practice modes researches. But the academic circles have put great emphasis on U-learning and many countries have stepped into the practical applications. Theoretically, the researches on U-learning are carried in the following directions:

- Ubiquitous pedagogy
- Classroom-centered U-learning mode
- Specific curriculum-centered U-learning mode
- Faculty education for the implementation of U-learning
- Development standards of U-learning resources
- Development of U-learning instructional management system

Researches in the higher education have also been carried in many countries. Some representative projects are showed in Table 2.

Table 2. U-learning projects

University	Project	Network environment	Service content
UCSD	Active campus Active class	Mobile Device (GPS)	Navigation Service, Collaboration work in class
Honnover Univ. (Germany); VTT (Finland)	Ubi-campus	Mobile Devise IR	Navigation Service, Lecture note, Task Assignment
Thokoshima Univ. (Japan)	TANGO/JAPEL ES/CLUE	Mobile Devise (RFID)	learning service, Information exchange between learners
MIT	Oxygen	Tangible Interface, AR, Image based Sensor, RFID	Intelligent Laboratory

The current research is at the transitional stage of from mobile learning to ubiquitous learning. Most of the research, not focusing on the frame-work of U-learning instructional mode, is just the application of ubiquitous technology through the link of ubiquitous computing and education.

Last five years, the research was emphasized in both academic and business literatures on hybrid learning. Hybrid learning is dominant in higher education, in corporate and in governmental training settings. It is seen in the linkages between instructors, learners, and classrooms located in different areas. Some researches in hybrid learning have been carried at places such as Microsoft, IBM, Thomson, the University of Pretoria, the University of Glamorgan, National University in California, and the Open University of Malaysia. According to our survey, the current researches are carried around the following questions:

- Does hybrid learning produce better learning outcomes than face-to-face

instruction or e-learning alone?

- What models of hybrid learning are most effective?
- What channels of delivery are used to facilitate learning in hybrid mode?
- What are learner and instructor experience and perceptions of hybrid learning?
- What infrastructure and support is needed to support hybrid learning?
- What are the primary barriers associated with hybrid learning?

As online environments push into more extensive use in education, the forms and formats of hybrid learning will be extended as well. Hybrid learning has really come into its own and we are seeing a huge trend for integrating different forms of learning to provide real choice for learners. Some predicted trends in hybrid learning include mobile hybrid learning; greater visualization, individualization, and hands-on learning; self-determined hybrid learning; increased connectedness, community, and collaboration; linking work and learning; hybrid learning course designations; and the emergence of hybrid learning specialists (Bonk and Graham, 2005). Of course, there are still many challenges facing the hybrid learning, among of which, creating a formal faculty development program for teaching hybrid courses, allocating the necessary time for instructors to redesign traditional courses into hybrids and preparing students to learn effectively in hybrid courses are most challenging.

5 Relationship between U-learning and H-learning

It is clear that hybrid learning is a mixture of online and face-to-face learning using a variety of learning resources and communications options available to students and lecturers. In other words, hybrid learning mixes U-learning with traditional type (Classroom-based) of learning. The relationship between them shows in Fig. 2.

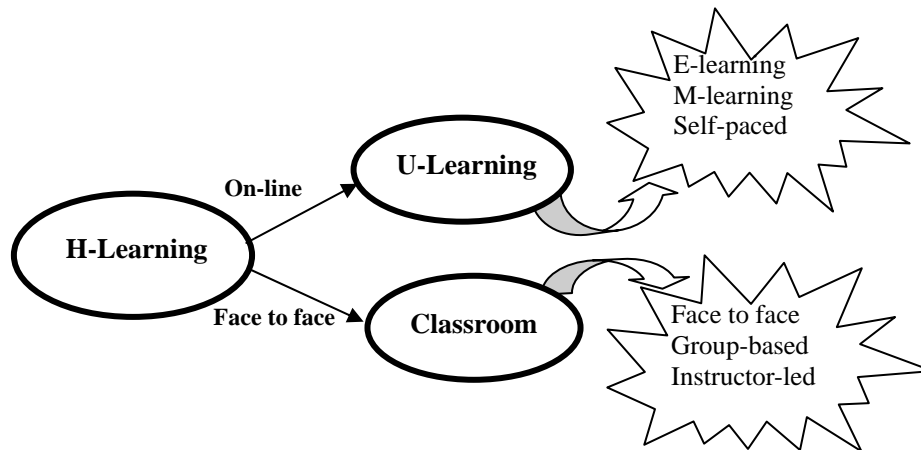


Fig. 2. Relationship between U-learning and H-learning

As illustrated in Fig.2, the traditional learning type is classroom-based and offers

the learner face-to-face contact and support, in which the major learning modes are instructor-led and group-based. Ubiquitous learning, which can be delivered anywhere, anytime through mobile and handheld devices, provides the online program or resources for learners, in which the main learning modes are self-paced and peer-to-peer. Of course, ubiquitous learning also has the affects that learners may feel isolated that sometimes may affect motivation and student retention. Hybrid learning offers some of the best of both worlds: face-to-face tutor support and contact with peers through the ability of online mobile communication. By practicing hybrid the conveniences of online courses and mobile learning are gained without the loss of face-to-face contact. So a learning environment is created that is richer than either a traditional face-to-face environment or a fully online environment. However, it is important to establish the equilibrium between face-to-face education and online mobile environments during the process of organizing hybrid learning environments.

When developing a hybrid learning experience we need to contemplate the whole spectrum with learning opportunities that are appropriate to the learner and the situation. It does involve very careful planning and preparation for it to be successful. It is necessary for us to look beyond the traditional boundaries of classroom instruction by augmenting their current best practices with new advances in learning and collaboration technologies to maximize results. More importantly, we should seek to empower every learner to become an active participant in the learning and collaboration process. Anyway, not today also tomorrow, hybrid learning will be the best solution for learning.

References

1. George S., , Categories of E-learning, <http://www.elearnspace.org/Articles/elearningcategories.htm>.
2. Weiser M.: The Computer for the Twenty-First Century. J. Scientific American. Sep., pp. 94--104 (1991)
3. Weiser M.: Some Computer Science Problems in Ubiquitous Computing, J. Communications of the ACM, July 1993, (reprinted as "Ubiquitous Computing". Nikkei Electronics). December 6, pp. 137--143 (1993)
4. Jones, V., Jo, J.H.: Ubiquitous learning environment: An adaptive teaching system using ubiquitous technology. In R. Atkinson, C., McBeath, D., Jonas-Dwyer, R. Phillips (eds.) Beyond the comfort zone: Proceedings of the 21st ASCILITE Conference, pp. 468--474. Perth, 5-8, December (2004)
5. Chen, Y.S., Kao, T.C., Sheu, J.P., Chiang, C.Y.: A Mobile Scaffolding-Aid-Based Bird - Watching Learning System, Proceedings of IEEE International Workshop on Wireless and Mobile Technologies in Education (WMTE'02), pp.15--22, IEEE Computer Society Press, New York (2002)
6. Curtis, M., Luchini, K., Bobrowsky, W., Quintana, C., Soloway, E.: Handheld Use in K-12: A Descriptive Account, Proceedings of IEEE International Workshop on Wireless and Mobile Technologies in Education (WMTE'02), pp.23--30, IEEE Computer Society Press, New York (2002)
7. Harvi, S., Chris, R.: A White Paper: Achieving Success with Blended Learning, <http://www.centra.com/download/whitepapers/blendedlearning.pdf>.
8. Rossett, D., Frazee, H.: Strategies for Building Blended Learning. <http://www.Learning-circuits.org/2003/jul2003/rossett.htm>.

9. Garrison, D.R., Kanuka, H.: Blended learning: Uncovering its transformative potential in higher education. *J. Internet and Higher Education*. 7, pp.95--105 (2004)
10. Bonk, C. J., Graham, C. R.: *Handbook of blended learning: Global Perspectives, local designs*. Chapter 8.3, future directions of blended learning in higher education and workplace learning settings. Pfeiffer (2005)