Design Considerations for Ubiquitous Learning Environment

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Abstract:

The implementation of ubiquitous learning continues to be being developed, along side the issues that regularly rise up from the software of digital and online larning, consisting of alienating college students from the actual world, the problem of college students specializing in studying goals, giving college students possibilities to spend their studying time with entertainment, to the hassle of growing the cognitive load of college students. As a continuation of electronic learning and mobile learning, ubiquitous learning gives extra than simply the cutting-edge academic thoughts or methods. To find out some considerations in designing a ubiquitous learning environment, the method used is a literature review. The literature review process begins with determining the concepts to be developed, identification and tracing of previous research results, mapping and classification of research results, analysis of classification and theme determination, analysis of relationships between themes, and conclusions. Based on the literature review process, several themes were found in the discussion, namely: 1) the emergence concept of ubiquitous learning, 2) learning theory that underlies ubiquitous learning, 3) characteristics of ubiquitous earning environment, 4) prinsiples of ubiquitous earning environment, 5) mobile devices as tools in ubiquitous earning, 6) moodle learning management system, 7) program mapping, and 8) criteria for ubiquitous learning system quality.

Keywords: Instructional design Ubiquitous learning, Learning management system.

INTRODUCTION

The development of information and communication technology has supported various human activities, including in the field of learning, such as providing a variety of learning resources that can be accessed anytime and anywhere. The current technological development leads to devices that can be carried anywhere such as cellphones / smartphones. Mobile devices are one of the tools that are very close to lecturers and students. Hwang, Wu, Zhuang, & Huang (2013) stated that the popularity of mobile and wireless communication technology has a great influence on the concept of learning design. Mobile devices with a high level of portability have played an important role in learning activities outside and classroom activities. Mobile devices can be integrated with digital resources and authentic learning contexts, such as learning environments that not only allow students to learn in real environments but also provide support from virtual environments in the right place and time.

Meanwhile, many students bring mobile devices but they hardly use them for learning activities (Kukulska-Hulme & Traxler, 2005). Mobile devices such as smartphones and tablets have become familiar friends to many people. The presence of products such as electronic devices (gadgets), smart phones, cloud computing, and wireless networks has become a promoter and accelerator of the application of learning concepts that can be done anywhere, anytime, and in any way (Vlădoiu, 2012). Mobile technology offers a new paradigm in terms of communication, collaboration, connectivity and is a very important requirement of everyday life. This allows someone to use it whether in the office, home, or while on the move. Thus, mobile technology can be used everywhere with a wireless connection (Harfoushi, 2017). In the field of education, the presence of this mobile technology offers great opportunities in providing an interesting and relevant learning experience (McQuiggan, Kosturko, McQuiggan, & Sabourin, 2015).

Ubiquitous learning is a new learning innovation (Suartama et al., 2021). This learning approach is right here to respond to the improvement of information and verbal exchange era, specially mobile era, which could be very speedy these days (Suartama, Setyosari, Sulthoni, & Ulfa, 2020). The concept of ubiquitous learning is strongly influenced by the flow of cybernetism, humanism psychology, and connectivism which characterizes learning with two approaches, namely: 1) thru human exploration of diverse getting to know sources to be had in a huge environment independently; and 2) through interactions with parties that are relevant to the knowledge learned either directly or indirectly (Vlădoiu, 2012). Ubiquitous learning is characterised via way of means of dimensions: 1) it isn't restricted via way of means of bodily space, plans or schedules however is pervasive and takes place anywhere, anytime, and 2) as a result of its distributability and direct get right of entry to to more than one reassets of statistics can mirror reports in interactions with others, ubiquitous gaining knowledge of is characterised via way of means of the transformation of information and the capacity to discover reports and statistics (Goh, 2010).

Ubiquitous learning can be defined as a daily learning environment that is supported by mobile devices and integrated wireless networks in our daily lives. (Ogata, H., Matsuka, Y., El-Bishouty, M. M., & Yano, 2009). Ubiquitous learning aims to provide students with content and interaction anytime, anywhere (Hwang, G.-J., Tsai, C.-C., & Yang, 2008). The studying manner consists of real-lifestyles reports supplemented with digital facts and tailored to the student's nvironment. Objects/content, activities, and interactions with the gadget and with different humans (consisting of teachers and peers) are adjusted consistent with studying objectives, pursuits and preferences, cognitive traits, records and modern capabilities withinside the issue be counted studied, traits and region requests, era used as a media and facilitator for studying, and the context of the state of affairs wherein studying takes place. Thus ubiquitous learning may be described as studying that mixes cell era that lets in studying to be done seamless, anytime, anywhere, and in any way (consistent with the context of studying) primarily based totally at the traits, needs/goals of students. Each teaching-studying interest includes pre-elegance activities (online), face-to-face (offline/onsite), and after-elegance activities (online).

Sharples, Taylor, & Vavoula (2007) stated that learning theory for the mobile generation focuses on communicative interactions between technology and humans for the advancement of knowledge. The learning process is seen as a conversation that takes place in various contexts in a system where people and technology are in a dynamic environment. According to them, conversation is needed by students to describe themselves, their actions, and also to explore, extend, communicate, and externalize which can describe or to understand future activities. Goh (2010) stated that the learning theory that underlies ubiquitous learning is Socio Constructivist learning theory and Computer Supported Collaborative Learning (CSCL) learning theory. In social constructivist theory, it is stated that the learning process involves interactions with other individuals where culture and society will influence learning. Interaction or socialization is not only limited to interactions between teachers and students. Interaction between students is very important in helping students to build knowledge. The social aspects of learning can be supported by technology such as mobile devices and online management systems (WebCT, Blackboard or Moodle) which are theoretically supported by CSCL.

CSCL learning theory explains how collaborative learning that is supported by technology can facilitate the sharing and distribution of knowledge and expertise among members in the community to increase peer interaction and group work. Through discussion of materials with others, CSCL supports collaborative learning for shared knowledge building. Central to knowledge building in CSCL is an immersive social learning environment where students create virtual communities with peers and cognition mediation teachers enabling them to construct knowledge in interactive and iterative processes across the dimensions of conceptualization and construction (Ng & Nicholas, 2007).

Based on the explanation above, the purpose of this study is to find, determine, and map several considerations in designing ubiquitous learning.

1. RESEARCH METHOD

1.1. Research Design

This type of research is a literature study. The literature study method is a series of activities related to the method of collecting library data, reading and taking notes, and managing research materials (Zed, 2008). Literature study is an pastime this is required in studies, particularly instructional studies whose primary goal is to increase theoretical factors in addition to factors of realistic benefits. Literature observe is achieved with the primary goal of locating a foundation for acquiring and constructing a theoretical foundation, a framework of thought, and studies objectives.The activity stages consisted of grouping, allocating, organizing, and using a variety of libraries in the field of ubiquitous learning. By conducting a literature study, a broader and deeper study was obtained of the problem to be researched (Darmadi, 2011).

1.2. Data Collection

The data used comes from textbooks, journals, scientific articles, literature reviews which contain several considerations in designing ubiquitous learning.

1.3. Data Analysis

Data analysis begins with classifying the material resulting from data collection which is considered sequentially from the most relevant, relevant, and sufficiently relevant. Another way is done by looking at the research year starting from the most recent, and gradually moving backward to a longer year.

Read the abstract of each study first to provide an assessment of whether the problems discussed are in accordance with the research objectives.

Take notes on important parts that are relevant to the purpose of the research, then make notes, quotations, or information that are arranged systematically.

2. RESULTS AND DISCUSSION

2.1. Characteristics of Ubiquitous Learning Environment

Yang, S.J., Okamoto, T., & Tseng (2008) discover 8 traits of surroundings for ubiquitous learning, namely: 1) adaptability, 2) mobility, 3) interoperability, 4) pervasiveness, 5) seamlessness, 6) area awareness, 7) situation awareness, and 6) social awareness. Chen, Kao, Sheu, & Chiang (2002) and Curtis, Luchini, Bobrowsky, Quintana (2002) give an explanation for the principle traits of u-Learning, namely: 1) interactivity, 2) accessibility, 3) permanency, 4) immediacy, and 5) situating of tutorial activities. Meanwhile, Tan-Hsu Tan, Min-Sheng Lin (2012) create ubiquitous learning as a device that has traits of: permanency, interactivity, accessibility, adaptability, immediacy, immersion, state of affairs, calmness, and seamlessness. Virtanen, Haavisto, Liikanen, & Kääriäinen (2018) discover 4 standards of gaining knowledge of surroundings for u-Lerning, namely: 1) interactivity, 2) flexibility, 3) personalization, and 4) context-awareness,.

The context-cognizance studying surroundings can use a web-primarily based totally Learning Management System, selling diverse procedures and functions. Context-cognizance helps college students so that you can get right of entry to particular studying resources, content material or interactive sports primarily based totally on their very own region, time and sports. Context-cognizance helps character studying in addition to content material and facts management, at the same time as training and comments are primarily based totally on college students' very own time, region or sports. Context-cognizance is an genuine studying surroundings with the guide of personalised virtual technology. This permits college students to have a look at or classify real-global gadgets in studying sports thru virtual guidance (G.-J. Hwang, Chu, Shih, Huang, & Tsai, 2010). The context-cognizance gaining knowledge of surroundings allows limitless gaining knowledge of from one region to some other inside a given area (Hwang, G.-J., Tsai, C.-C., & Yang, 2008). The context-attention is a box of ten contexts, particularly private context, venture context, tool context, social context, spatial-temporal context, person interface, infrastructure, strategic context, environmental context, and historical-context.

The interactivity of studying surroundings helps diverse styles of interactivity among instructor and college students, college students and college students, and pupil and peer assistance. A asynchronous and synchronous web-primarily based totally method may be used to guide interactivity. Personalization and versatility are supposed as possibilities for studying and studying each time and anywhere, primarily based totally on college students' personal schedules, in addition to studying goals or studying needs.

The ubiquitous mastering surroundings permits seamless mastering everywhere and anytime. Students are capable of study uninterruptedly whilst transferring from one area to another (Chiu, Kuo, Huang, & Chen, 2008). The ubiquitous getting to know surroundings can connect, integrate, and percentage getting to know sources withinside the proper region on the proper time via interoperable, pervasive and seamless getting to know environments (Yang, 2006). The ubiquitous gaining knowledge of surroundings includes numerous additives particularly gaining knowledge of objects, gaining knowledge of tasks, gaining knowledge of expositions, gaining knowledge of verbal exchange and administrative functions (Dochev & Hristov, 2006).

2.2. Principles of Ubiquitous Learning Environment

To create an effective ubiquitous learning environment, various components of ICT can be used to aid college students withinside the getting to know process, namely: 1) stimulation in a virtual environment, 2) flexibility in virtual platforms, 3) bendy dialogue platforms, 4) scholar agree with in verbal exchange virtual, and 5) motivation and getting to know creativity (Lau, 2006).

Cochrane & Narayan (2016) stated in the development and use of ubiquitous learning there are a number of principles that must be considered. The principles are:

1) Enables students to engineer content
   a) provide the use of multimedia production tools
   b) provide the use of media for communication and collaboration
2) Allows students to create their own learning environment
   a) facilitating student projects and negotiating assessment activities
   b) facilitating student creativity and changing the role from passive to active in reconstructing knowledge
   c) provides the use of contextual sensors in an integrated manner
   d) provide the use of e-portfolio that adapts to the learning environment

3) Allows for an authentic learning experience
   a) promote the use of social media to participate in global networks and communities
   b) designing a resource environment to support authentic learning and stimulate students to produce learning content and contexts
   c) using social media to foster the development of collaborative skills in project-based group work

2.3. Mobile Devices as Tools in Ubiquitous Learning

In education, cellular gadgets provide the capacity to comprehend ubiquitous getting to know thru new methods of getting access to records and questioning both in my view and in networked communities, in which college students collaborate to aid the improvement of latest understandings and speak new solutions. Mobile devices are classified into four types namely: Personal Digital Assistants (PDA), mobile or cell phones, smart phones, tablet PCs and notebooks (Dochev & Hristov, 2006). Mobile devices and features that support ubiquitous learning are presented in Table 1.

Table 1. Mobile Devices and Features that Support Ubiquitous Learning

Mobile Devices	Features that Support Ubiquitous Learning
Personal Digital Assistant (PDA)	Computing capabilities: Word and Excel processing, PowerPoint editing and display; internet access via WiFi; send files via Bluetooth or infrared; record sound and video; shooting; display multimedia using Flash and Media Player; other software that supports learning
Cell Phones	Communication devices: voice or text messages; the stronger ones can access the Internet
Smartphones (combination of PDAs and cell phones)	Combined capabilities of PDAs and Cell Phones
Tablet PCs, laptops and notebooks	A portable device that is larger than a PDA with a greater processing capability and a larger memory

2.4. Moodle LMS

In education, getting to know structures the usage of cell gadgets provide the capability to recognise ubiquitous getting to know via new methods to get admission to statistics and assume each for my part and in community communities, wherein college students collaborate to guide the improvement of recent expertise and dialogue for brand spanking new solutions. Haryono (2011) shows that there are 3 one of a kind approaches to offer a web mastering system, namely: 1) growing with the aid of using self, 2) shopping an current system, 3) the usage of open supply mastering control system (LMS), and 4) customization.

Moodle is an open supply software program that helps the implementation of on line gaining knowledge of with an incorporated paradigm wherein various gaining knowledge of guide capabilities can effortlessly be accommodated in a web gaining knowledge of portal (Suartama, Triwahyuni, Sukardi, & Hastuti, 2020). Moodle on line mastering systems may be changed as wanted. Research has demonstrated that using Moodle mastering management device can decorate learnig outside thelecture room and has a wonderful affect on college students' questioning and innovation skills (Chootongchai & Songkram, 2018; Georgouli, Skalkidis, & Guerreiro, 2008; Govender, 2009; Henderson, 2011). Moodle studying control device has a variety of functions that may be used to guide the software of ubiquitous studying. Courses on Moodle are regions in which a lecturer will upload sources and sports to be finished with the aid of using students (Suartama, Setyosari, Sulthoni, & Ulfa, 2019). Resources and activities offered on Moodle are presented in Table 2.

Table 2. Resources and Activities in Moodle LMS

Resource	Activities	
Label	Chat	Lesson
Page	Forum	(LTI) External Tool
File	Assignments	SCORM
Folder	Choice	Survey
Book	Database	Wiki
IMS Content Package	Quiz	Workshop

URL	Feedback	Glossary

2.5. Program Mapping

To create ubiquitous learning course, it is necessary to put together getting to know fabric in virtual format. Learning fabric can be withinside the shape of presentations (ppt), documents (pdf, doc, txt, xls), images (gif, jpg, png), sounds (mp3, wav, au), videos (mpg, wmv), and animations (gif, swf). These documents want to be prepared in this kind of manner as a application mapping in order that they're easy to find out and make use of while growing ubiquitous learning system. Program mapping is a desk that includes getting to know fabric for one semester; in which in every component, there's a hyperlink this is linked to the entire fabric (Suartama et al., 2020).

The formulation of knowledge refers to the knowledge taxonomy of the revised taxonomy by Bloom (Anderson & Krathwohl, 2001), such as; faktual knowledge, conceptual knowledge, procedural knowledge, and metacognitive knowledge. Type of lerning material consist of document, presentation, picture, animation, video, multimedia. Next section describes the utilization of Moodle LMS features (Mob App) including resources and activities. The final section contains a description of the principles of u-Learning that are applied. The program mapping of ubiquitous learning is presented in Table 3.

Table 3. Program Mapping for Ubiquitous Learning Environment

The Knowledge Dimension	**Type of Learning Material**	**Moodle LMS Features**		**Application of u-Learning Principle**
		Resource	**Activities**	
Factual Knowledge Basic elements used to communicate, understand, organize a subject: terminology, scientific terms, labels, vocabulary, jargon, symbols or representations; and specific details such as knowledge of events, people, dates, sources of information	Presentation (ppt) Document (pdf)	File Page URL	Forum Assignments (online text) Feedback	Permanency Mobility Accessibility
Conceptual Knowledge Knowledge of classifications and categories, principles, theories, fashions or systems of a subject.	Presentation (ppt) Picture (png, jpg) Document (pdf, doc)	File URL Book	Assignments (file submission) Chatting Feedback	Immediacy Interactivity Flexibility
Procedural Knowledge Knowing a way to do something: acting skills, algorithms, strategies or methods.	Presentation (ppt) Document (pdf) Animation (swf) Video (MP4) Multimedia (exe)	URL File IMS content package	BigBlueButtonBN (web conference) Messages	Seamlessness Pervasiveness Context-Awareness: • social context • environmental context • task context
Metacognitive Knowledge The method or method of gaining knowledge of and thinking; an attention of one's very own cognition, and the capacity to control, monitor, and adjust one's very own cognitive method.	Document (pdf) Presentation (ppt)	File URL Label Page	Lesson Assignments (file submission) Feedback Workshop	Immersion Context-Awareness: • historical context • personal context • device context

• task context

2.6. Criteria for Ubiquitous Learning System Quality

To develop a quality online learning system, Newby et al. (2000) said that the developer must consider three criteria, namely: 1) method, is the technique and procedure used in learning (cooperation, games, presentations, or discussions), 2) media, is a tool used in learning to attract student interest. (video, text, images, and animation), and 3) material, is the content of learning which includes: motivation, orientation, information, application, and evaluation.

In line with that, Walker & Hess (Arsyad, 2009)), stated that first-rate on line getting to know have to meet the subsequent criteria: 1) first-rate of content material and objectives, which include: accuracy, importance, completeness, balance, attractiveness, fairness, and suitability to the state of affairs of students, 2) educational first-rate which includes: imparting getting to know opportunities, imparting help for getting to know, motivating first-rate, educational flexibility, relationships with different coaching programs, first-rate of exams and assessments, may have an effect on students, may have an effect on instructors and getting to know, and 3) technical first-rate, which includes: readability, ease of use, first-rate of display / impressions, first-rate of pupil reaction handling, first-rate of software management, and first-rate of documentation.

Furthermore, Debattista (2018) argues that the quality of the online learning system can be seen from 8 aspects, namely: 1) course opening, 2) technology design, 3) instructional resources for teaching and learning, 4) interaction and community, 5) learner support, 6) assessment of learning, 7) course closing, and 8) instructional design cycle. Another opinion put forward by Songhao, Saito, Maeda, & Kubo (2011) emphasizes that there are five principles of learning in e-Learning, namely: 1) encouraging independent learning, 2) using appropriate learning resources and materials, 3) assessing learning outcomes , 4) there is collaboration and participation, and 5) there is a feedback mechanism for important information.

3. CONCLUSION

The improvement of facts and verbal exchange era has introduced a wonder and modern undertaking to the concept and exercise of conventional education. Mobile net era has end up the primary promoter and accelerator to use the idea of ubiquitous learning. To plan a ubiquitous learning system is to start from making a program mapping. The ideas of ubiquitous getting to know capable of be applied the usage of numerous capabilities (sources and activities) contained in Moodle LMS. The utilization of Chat, File, Forum, URL, Video Conference (BigBlueButtonBN) capabilities can realise the ideas of permanency, immediacy, accessibility, and interactivity. Using the Assignment function (on-line text & report submission) can realise the precept of context-cognizance in phrases of mission context, environmental context, and social context even as the Lesson function is used to use the precept of historic context. To produce a quality ubiquitous learning system, several criteria need to be considered, namely method, media/ instructional resources, material/content, interaction and community, technology design, learner support, and assessment of learning.

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