

Chapter 1

Online Learning Support in a Ubiquitous Learning Environment

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ABSTRACT

The ubiquitous learning environment (ULE) is both an ontological and epistemological problem. For most scholars, ULE provides an interoperable, pervasive, and seamless learning architecture to connect, integrate, and share three major dimensions of learning resources: learning collaborators, learning contents, and learning services. Furthermore, ULE is described as an educational paradigm that mainly uses technology for curriculum delivery. Through reflection and exploration, this chapter argues that online learning support has a symbiotic relationship with ULE because the student, at some point, should move beyond the “text” level into concepts and conceptual organization schemes (ontologies). In line with this viewpoint, this chapter problematizes the gap created by real-world and digital-world resources—and argues that online learning support for teaching and learning processes have not yet emulated ULE as an important pedagogical resource.

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INTRODUCTION

The Ubiquitous Learning Environment (ULE) has become a central issue for curriculum delivery in the 21st century and remains most instrumental in the digital world. Notwithstanding the fact that ULE enables learning at any time and place, it is a pre-condition for the student to be familiar with languages like Hypertext Markup Language revision 5 (HTML5), Structured Query Language (SQL), Resource Description Framework (RDF), and Web Ontology Language (OWL), to name a few. Furthermore, the student at some point should move beyond the ‘text’ level into concepts and conceptual organization schemes (ontologies). Once the student has moved into the conceptual processing realm (Artificial Intelligence), very important and exciting functionalities like knowledge inference (reasoning) can then be provided—functionalities which will mark a true technological turning point in the student’s learning (Mikelloydtech, 2013).

Against this background, it can be argued that ULE places varying demands on delivery and feedback methods and relies on different levels of knowledge and skills. That being the case, this chapter aims to

1. Delineate the importance of planning online learning support when managing and designing online courses in the ULE;
2. Explore the prominence of online learning support in the ULE; and
3. Reflect on the symbiotic relationship between online learning support and ULE in order to close the gap created by real-world and digital-world resources.

BACKGROUND

The ULE is described by Calimag, Miguel, Conde, and Aquino (2014: 119) as “being any setting wherein students can become totally immersed in the learning process”. Researchers with a similar view include Chin and Chen (2013), who consider ULE as being a complementary teaching technique that reduces both time and location constraints within the learning environment. Previous studies (such as Jones & Jo, 2004; Calimag et al., 2014) have considered ULE as being a new hope for the future of education. Nevertheless, as new technologies have evolved—and as more ubiquitous forms of technology have emerged—the need for online learning support has become evident in order to achieve core capabilities of ULE. There are six core capabilities of ULE (as described by Kwon, 2011):

1. Cognitive capability,
2. Relational capability,
3. Emotional capability,
4. Adaptability,
5. Technology literacy, and
6. Effective learning ability.

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The aforementioned capabilities can be realized, provided the following identified challenges can be addressed:

- Gaining and retaining the motivation of the students (Calimag et al., 2014);
- Identifying when and how technologies are best deployed, including the appropriate matching of devices with students and learning outcomes in the effective design of learning activities (Agarwal & Nath, 2011); and
- Limited access for marginalized communities in the African continent (Letseka, Letseka, & Pitsoe, 2018).

This section has demonstrated that in the ULE, some students may need to balance different capabilities mentioned above. For example, balancing cognitive capability with technology literacy, will improve the limitations of students' (created by barriers which are discussed in the next section) cognitive capabilities such as memory, thinking and problem solving capabilities, and to transfer some of the low level tasks such as calculations, storage and information retrieval to the computer.

The following section explores the barriers to students' ubiquitous learning and the importance of planning online learning support when managing and designing online courses in the ULE is outlined. The chapter further presents the prominence of online learning support in the ULE followed by the different types of online learning support in the ULE. It has commonly been assumed that most of the students in the ULE breeze through the online learning programs on their own. However, it was later shown by several researchers (such as Hwang, Yang, Tsai, & Yang, 2009; K.-Y.; Chin & Chen, 2013) that there are those students who require ongoing assistance throughout the entire ubiquitous learning experience. With that in mind, it is worth noting that regardless of the students' learning style in the ULE, they should always have access to online learning support. It is now necessary to present some of the barriers to students' ubiquitous learning.

BARRIERS TO STUDENTS' UBIQUITOUS LEARNING

Much of the current literature on ULE pays particular attention to what the ULE can offer to students—such as its ability to improve collaborative learning, accessibility, and other fundamental concepts in education. Despite the fact that the students can participate and grow with the lifestyle challenges or personal issues in the ULE, there are some barriers to learning that require proper learning support. Muilenburg and Berge (2005) gave a comprehensive review on the underlying constructs that comprise barriers to students' ubiquitous learning. The focus of their review was on the following eight factors:

1. Administrative issues,
2. Social interaction,
3. Academic skills,
4. Technical skills,
5. Learner motivation,
6. Time and support for studies,
7. Cost and access to the Internet, and
8. Technical problems.

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Administrative Issues

The findings from Muilenburg and Berge's (2005) study revealed that students in the ULE perceive barriers emanating from administrative issues as: course materials not always being delivered on time, a lack of sufficient academic advisors online, and a lack of timely feedback from the instructor. In a different study, (Alhassan, 2016) found out that students were concerned about the lack of rules regulating how to use the mobile phone text messages, especially in the ULE. Some of the students' barriers to ubiquitous learning were found to be encountered due to administration policies, budgets, or online program development. To specify some of the specific factors relating to the aforementioned factors, as highlighted by Ebritchi, Lipschuetz, and Santiago (2017), these include a lack of online learning support; a lack of incentive when designing the online program; and instructors who demonstrate unwillingness to design and implement an online courses.

Against this backdrop, it is worth noting that students who are affected by the administrative issues might have poor performance due to a lack of support. The instructors seem not committed when designing and implementing the online courses (which is affected by a lack of incentive) could lead to poorly developed programs—ones which do not address the relevant outcomes or needs of the students.

Social Interactions

There is some evidence to suggest that some of the students' barriers to ubiquitous learning are caused by a lack of student online collaboration, the lack of social context cues, or their being afraid of feeling isolated in online courses. With regard to social interactions, it is a widely held view that when students in the ULE experience boredom, and eventually drop-out. It is the responsibility of the program designers to create relevant and relatable ubiquitous learning experiences that solve real-world challenges. In addition, develop personal learning paths that allow ubiquitous students to be flexible in their learning activities. It should also be noted that online boredom may be prevented by recognizing different learning styles of the students (such as visual, audio and kinesthetic) when designing the online learning material.

The research conducted by Nir-Gal (2002) discovered that there are students who finds it difficult to learn in an environment without a social framework, and that there are those who are not inclined toward group learning. Nir-Gal also alluded to the student's sense of isolation on the Net, while others can be overwhelmed by the sheer magnitude of material and tremendous diversity of content on the Internet. On the other hand, Kebritchi et al. (2017) depicted that students may have inappropriate expectations (such as expecting instant feedback on their online comments and assignments) or may appear rude and demanding in their emails. Furthermore, some students were reported to be struggling with identification and adopting learning styles and skills required to participate in the ULE. Different learning styles required to participate in the ULE are explained in the following section of students' experiences of learning through the ULE.

Academic Skills

The research study by Muilenburg and Berge (2005) also found that lack of academic skills in areas such as writing, reading, or communication were perceived barriers to online learning. This chapter outlines these academic skills as students' barriers to ubiquitous learning.

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Writing

It is believed that much of professional communication is done in writing. For the students in the ULE, the inability to write might make it difficult to seek out information, explore subjects in-depth, and gain a deeper understanding of the world around them. It is likely that students with writing difficulties won't be able to express their knowledge to their tutors/peers or to the people who are making the big decisions in their studies or careers. In the ULE, students need to be able to express themselves in writing for effective communication with the tutors and peers. Since students are studying towards their future careers, there is a proverb that says: "The inability to write makes for a stillborn career."

Reading

It is a widely held view that engaged reading leads to engaged learning. Learning in the ULE requires of the students to engage with the learning material mainly through reading. If the students experience difficulties in reading effectively, they run a risk of failing to grasp important concepts and, ultimately, fail to meet educational milestones. There is some evidence such as the study conducted by Aliponga (2013) to suggest that ability to read increases concentration and discipline which are fundamental requirements for successful learning in the ULE. Reading skills allow students to learn with ease. When they cannot read well, they become discouraged and frustrated.

Communication

Communicating online requires computer-mediated communication systems such as computer conferencing systems, audio recording software, email, and video recording devices, to name a few. The students' inability to use the aforementioned systems in the ULE might drop out or feel the sense of isolation. It should be noted that the goal of online communications is the same as the goal in face-to-face communications: to bond; to share information; to be heard; and to be understood. There is a possibility that poor online communication can discourage a sense of community in the ULE and will make the learning experience more difficult for students. The ability to communicate clearly and effectively forms the foundation of modern life. The online course designers and managers should make the point that learning materials are designed in such a way that effective communication is encouraged to foster a sense of community within the ULE and to promote support and a good learning experience.

Technical Skills

There is some literature such as Hysong (2008) that recognizes the importance of technical skills such as knowing how to use email, upload files, and navigate and search the web, when learning through the ULE. Muilenburg and Berge (2005) attest that a lack of technical skills—such as those related to fearing new tools for online learning; having a lack of software skills; or being unfamiliar with online learning technical tools—creates barriers to ubiquitous learning. The barriers that are encountered as a result of lack of technical skills are, among others, the inability to comment within a discussion forum, to upload

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an assignment file, to display hidden toolbars, and to insert images. Students experiencing barriers to ubiquitous learning as a result of a lack of technical skills are viewed as not having digital competence¹, as they will be lagging behind. According to Welsh Government (2016) digital competence is the set of skills, knowledge and attitudes that enable the confident, creative and critical use of technologies and systems.

Motivation

Previous research findings (from studies such as Hartnett, George, & Zealand, 2011; and Muilenburg & Berge, 2005) have revealed that poor motivation has a detrimental effect on online courses because some of the dropout rates in the ULE are attributed to it. Muilenburg and Berge (2005) further maintained that signs of lack of motivation in the ULE are procrastination and choosing easier aspects of an assignment to complete. It has conclusively been shown that students in the ULE are mostly motivated when they are the ones in control of the situation—for example, when they are given the opportunity to be autonomous.

Time and Support for Studies

It is now well established from a variety of studies such as Fry, H., Ketteridge, S., and Marshall (2015) and Dunlosky, Rawson, Marsh, Nathan, and Willingham (2013) that studying through the ULE gives students “the maximum possible control over the time and pace” of their learning. It should, however, be noted that some of the students opting to learn through ULE are adults with jobs and families as well as certain public responsibilities, which certainly affects their learning process. That being the case, it is safe to conclude that students with that background would require support from family, friends, or people in the workplace/employer. Lack of such support might result in the difficulty to manage the study time, which would cause barriers to their online learning. Pozdnyakova and Pozdnyakov (2017) reflected on the European Union framework which was studied in Latvia and recognized that work and family commitments were considered as being one of the main barriers that prevent adult students from participating in educational activities.

Cost and Access to the Internet

According to the Internet Society (2017) internet has immense potential to improve the quality of education, which is one of the pillars of sustainable development. The Sustainable Development Goal (SDG) 9: Industry, Innovation and Infrastructure ascertains that the world is becoming ever more interconnected and prosperous due to the internet (Ono, Iida, & Yamazaki, 2017). However, there is an inconsistency with this argument, because it is reported that about four billion people in the developing countries have not yet accessed the internet. In some areas where the internet is accessible, it is too expensive for students to use frequently. The study conducted by Muilenburg and Berge (2005) also revealed that students find the internet very expensive for them, while some raised a concern regarding having limited access to the internet. The most interesting finding about barriers to ubiquitous leaning in the Muilenburg and Berge’s study was the students’ fear for the loss of privacy, confidence, or property rights when studying through the ULE. Against this background, it is worth concluding that the cost, limitedness, and slow internet connections may make accessing course materials in the ULE frustrating.

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Technical Problems

Very often in the ULE, there are compatibility issues with operating systems, browsers or smartphones. This adds to the frustrations of the students, because their learning experience is disrupted. As a result, they might (or probably will) abandon the course. This statement can be aligned with Gillett-Swan's (2017) reflections on the challenges in the online space where technical problems are viewed as being limitations to the learning process. It can be seen from the aforementioned variables that technical assistance is required in the ULE to reduce the students' barriers to ubiquitous learning. Having discussed the students' barriers to the ubiquitous learning, it appears that different students might have various experiences in the ULE. What follows is an account of students' experiences of learning through the ULE from different contexts.

STUDENTS' EXPERIENCES OF LEARNING THROUGH THE ULE

This section presents some review of studies which identified some gaps created by real-world and digital-world resources in the ULE. Chiou, Tseng, Hwang, and Heller (2010) cautioned that in order to situate students in a real-world learning environment (a term which refers to direct experiences that take place within the context of practice), it is important to place the students in a series of learning activities that combine both a real-world environment and ULE. As the nature of ULE was explained in the introduction, Agarwal and Nath (2011) corroborate that learning material in the ULE is not semantically related to the physical environment. To give an example: Students who are learning through ULE may feel the urge to learn everywhere they can find some time such as while waiting in a doctor's waiting room or at the airport. They further advised that students will not only learn by means of desktop and mobile PCs but also by means of a set of diverse local and mobile devices based on ubiquitous technology.

The study conducted by Hwang, Yang, Tsai, and Yang (2009) theorized that it is almost impossible for the students to learn complex science experiments that involve problem-solving skills in the ULE without observing and practicing in the real world. They proposed an online learning support which is adaptive and which is able to sense the students' personal and environmental contexts. Taking into account the findings from Hwang et al. (2009)'s study, it is worth noting that online learning support is required to improve the performance of training complex problem-solving skills in the real world.

Similarly, Chiou et al. (2010) have analyzed the students' own and environmental-related parameters for the ULE. They found out that there are a number of students experiencing navigation problems in the ULE, especially in a very large learning area, such as a national park or a palace museum. Some of their recommendations include the development of the ULE that provides students with real-world experiences and knowledge. Agarwal and Nath (2011) shared the same sentiments and attest that supporting students in the ULE can be of great help.

The study conducted by K. Y. Chin, Lee, and Chen (2018) displayed a possibility of bridging the divide between real-world and digital world resources. They explored the use of interactive ubiquitous learning system to enhance students' authentic learning experiences in a cultural heritage course. For K. Y. Chin et al (2018), authentic learning activities include the use of role-playing exercises, problem-based

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activities, and participation in virtual communities of practice. They also view authentic learning activities as part of real-world complex problems and solutions. The digital resources (interactive ubiquitous learning system) yielded positive results for students in the liberal arts education. The most striking result from this study was that the interactive ubiquitous learning system increased students' motivation and overall interest in learning the course content. That led to the increase in students' performance without discrimination regarding the cognitive-style students identified with.

From the students' experiences gathered, one can uncover the unique situations students might find themselves in the ULE. It should be noted that the students' experiences in the ULE discussed in this chapter are not exhaustive. Only a few were selected for the purpose of this chapter and to exhibit a need for an online learning support in the ULE. Thus far, the chapter has argued that students in the ULE require some online learning support in one way or another. Nevertheless, the section that follows goes on to consider the importance of planning the online learning support when managing and designing the online courses in the ULE.

THE IMPORTANCE OF PLANNING ONLINE LEARNING SUPPORT WHEN MANAGING AND DESIGNING ONLINE COURSES IN THE ULE

Before discussing the importance of planning the online learning support when managing and designing the online courses in the ULE, it is necessary to explain the reasons for the development of online courses. Some reasons why online courses were developed, as put forward by (Calimag et al., 2014) among others, include distance learning. The term *distance learning* according to Srichanyachon (2014) has been applied to many instructional methods such as an interactive DVD-ROM instead of a simple textbook, videotaped lectures, and audiotapes with lessons sent through the mail. In contrast, Gerber (2013) describe distance learning as a correspondence learning that takes place off campus with limited channels to break the students' barriers to learning. Gerber advocates for Open Distance Learning (ODL), which she views as being learning that is open and accessible to everyone regardless of age, race, economic position, class, disability, and criminality.

Notwithstanding the fact that ODL is viewed as a flexible tool that caters to the diverse needs of students, some researchers such as Ngubane-Mokiwa and Letseka (2015) saw a need to shift from ODL to Open Distance and e-Learning (ODEL) in order to optimally support the students by modern electronic technologies and other digital facilities. Although this chapter focuses on the online learning support in the ULE, this journey of distance learning need to be highlighted—because most students in the ODEL institutions learn through the ULE.

This chapter emphasizes that for the ODEL students to cope in the ULE, it is imperative to a that the presence of the teacher is inbuilt in the material and in the activity as recommended by Agarwal and Nath (2011). The questions that one should ask are:

1. To what extend can the students learn in this increasingly informal and opportunistic mode?
2. How can one keep the students motivated enough to not only complete the online courses created, but also to actually enjoy learning the skills and knowledge that is set before them?
3. What should be done to help the students beyond the formal delivery of content and development of skills?

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To answer these three questions, one should look at the difference between traditional classroom learning and ubiquitous learning—because previously, the ULE students have been learning through traditional classroom learning. Traditional classroom learning requires one to be at a specific place and time for teaching and learning to take place. By contrast, ubiquitous learning requires one to set aside some time to study and time to go through the lessons on one's own. This requires discipline and a real understanding about how to wisely use one's time throughout the day. It is quite clear that there are crucial differences between the ULE and traditional classroom learning. Nevertheless, some researchers such as Egbert (2009) advise that ULE should support content standards and learning goals in the same ways that the traditional classroom does.

Fry, Ketteridge, and Marshall (2009), who hold to a view similar to that of Egbert, base their argument on the fact that students learn in different learning styles which they classified as follows:

- Activists are students who learn by doing and responding most positively to learning situations that offer challenges. They like to brainstorm, and they're open to group discussions and problem-solving sessions.
- Reflectors are students who learn best by watching people and thinking about what is happening. They respond most positively to structured learning activities where they are provided with time to observe, reflect, and think; and where they are allowed to work in a detailed manner.
- Theorists are students who seek to understand the theory behind the action; and they respond well to a logical, rational structure and clear aims. They enjoy following models (and reading up on facts) to better engage in the learning process.
- Pragmatists are students who experiment with theories, ideas, and techniques and who take the time to think about how what they've done relates to reality. They respond most positively to practically based, immediately relevant learning activities—which allow scope for practice and the use of theory

Things to Consider When Planning the Online Learning Support in the ULE

Planning for the online support may reduce the limitations in the access which might decrease the environment usage by the students. Piovesan, Passerino, and Medina (2012) ascertain that not considering the different students' net contexts in the ULE can reflect in the resistance to, or even in the abandonment of, using the environment, which can also negatively affect the course. This chapter argues that learning in the ULE can sometimes be lonely, severe, and difficult—especially if the learning material does not match the diversity of the students. Barbosa, Barbosa, and Rabello (2016) demonstrated that the ULE serve the needs of students to achieve continuous integration between technology and the environment. Given this background, it is sound to recommend that the diversity of students needs to be considered when planning an online learning support for students in the UEL.

Secondly, guided by Agarwal and Nath (2011)'s views, it is vital to also consider the following:

1. The deployment of the technologies;
2. The appropriateness of the devices with students and learning outcomes; and
3. The frequency of access to learning materials.

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Reflecting on these views, it is worth recommending that students' age, culture, socioeconomic background, personal interests, experience, and level of education—especially the level of mastery of the technological tools—should also be taken into account. Lastly, as maintained by Benson and Morgan (2013), one should take into account the compatibility of the ULE materials and the security of the data.

In summary, it has been shown from this section that planning the online learning support will assist in designing activities which provide opportunities for personalized learning in the ULE. For example, lecturers or course designers or ODEL practitioners will be able to base their online learning support on the cultural/geographical contexts of student and on their frequency of access to learning materials. In the section that follows, the importance of reflecting on students' experience in order to provide relevant online learning support is illustrated.

THE PROMINENCE OF ONLINE SUPPORT IN THE ULE

The debate about the ULE has gained fresh eminence with many arguing that without online learning support, students who are not self-reliant might not take the online learning seriously. More recently, literature that considers the prominence of online learning support in the ULE has emerged from the researchers such as Barbosa et al. (2016) and Piovesan et al. (2012). Barbosa et al. (2016) detected that the “user interface could be improved, including the use of techniques such as affective computing”. They argue that online learning support could enhance the experience of interaction between students (given the different characteristics of individual students and the fact that they learn in different learning styles). Piovesan et al. (2012) affirmed that the ULE should be made adequate to the students by considering the uniqueness of the learning environment. In this chapter making the ULE adequate is viewed as providing the necessary and relevant online learning support.

Apart from the fact that ULE is dynamic, online learning support can provide the possibility of personalizing the environment for each student. It could also be argued that the online learning support serve as the student's accompaniment process in the ULE context. Drawing from Piovesan et al. (2012)'s views, this chapter maintains that online learning support serves as enablement and adaptive process focusing on the specific student's reality. In the same vein, Egbert (2009) theorized that the students in the ULE could participate in other ubiquitous learning activities including communicating with external experts, accessing remote resources, mentoring and tutoring students at other sites, and working in projects where students collaborate with external peers or other audiences.

Against the background of students' barriers to ubiquitous learning, the experiences of students learning through the ULE and the importance of the online learning supporting it could be noted that supporting students in the ULE cannot be made “one size fits all.” As a result, the section below presents a few types of online learning support that were employed in different contexts of the ULE.

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DIFFERENT TYPES OF ONLINE LEARNING SUPPORT IN THE ULE

There is evidence from researchers (such as K.-Y. Chin & Chen, 2013; and Zahrani, 2010) that online learning support plays a crucial role in enhancing learning in the ULE. This evidence also suggests that online learning support can be offered for different aspects in different levels of learning. In this section, several types of online learning support are discussed; and they are summed up in Table 2 to illustrate their benefits and challenges in the ULE.

A Mobile Learning Support System

A Mobile Learning Support System (MLSS) for ULE is in the form of GPS and 2D-code barcodes technologies that have been used to enable students to organize information by interacting with their environment. As explained in K.-Y. Chin and Chen's (2013) study, this online learning support is effective in the sense that when students are supported through MLSS, there is no need to input text; they just scan 2D barcode tags and gain immediate access to various online materials. Apart from that, the low technical barrier of reading 2D barcode tags makes it possible for students to incorporate these tags into their real-world learning environment to make learning in the ULE easy and accessible.

Radio Frequency Identification

Another online learning support one which is in the form of wireless communication that incorporates the use of electromagnetic or Electrostatic Technology Integrated (ETI) with Radio Frequency Identification (RFID)—was used to enhance teaching and learning activities in the ULE. This learning support was implemented with consideration of potential vulnerabilities in mind—vulnerabilities which, according to (Zahrani, 2010), are not limited to identity theft and network sabotage. For Zahrani, the possibilities were considered, because there is a likelihood of there being an unwilling exchange of information and the potential for academic dishonesty across the network. Despite the few challenges illustrated in Table 1, Zahrani (2010) found out that this form of online learning support has the potential to optimize and maximize effectiveness and efficiency in the ULE.

Mobile-Assisted Language Learning

Most of the previous studies, including those discussed in this chapter, established the importance and benefits of the ULE in different fields of learning. However, it is essential to highlight that there are some barriers experienced by students as suggested by (Alhassan, 2016). Some of the barriers were identified by (Cui and Bull, 2005; Tan and Liu, 2004) respectively, in relation to English language learning. Cui and Bull's (2005) study revealed that students who are English as a foreign language speakers tend to experience difficulties with the use of tense and articles during their learning activities; whereas Tan and Liu's (2004) study was about providing students with online learning support in order to increase their interest in learning English. This section could be linked with the question asked in the fourth section of this chapter as follows: "What should be done to help the students, beyond the formal delivery of content and development of skills?"

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Table 1. MALL activities on different mobile devices

Device	Activity	Medium	Learning
Mobile phone	SMS Administration SMS vocabulary SMS quiz Email Video clip Coaching Media board	Text Text Text Text Video Audio material/text/graphics	Tutor-learner Learner-tutor
Mobile phone and interactive TV	Informal language learning through SMS/WAP/iTV	iTV Text	iTV-learner
Handheld Computer (iPad/ Tablet)	Grammar drills Synchronous chat Reading poems Listening to poems	Text Text Text Listening material	Web-learner Tutor-learner Learner-tutor Web-learner
MP3 player	Listening to songs Listening to podcasts Listening to native speakers of English Listening to feedback on work Recording work	Audio material	Web-learner Learner-web-learner

Source: (Kukulka-Hulme & Shield, 2007)

Table 2. Benefits and challenges of different Online Learning Support in the ULE

	Benefits	Challenges
MLSS for ULE	<ul style="list-style-type: none"> Combining real-world and digital-world resources Interpretation and organization of personal knowledge Can overcome the difficulties of mobile learning that exist in traditional text input methods <ul style="list-style-type: none"> Can allow students to gain knowledge through interactions with their environment Automatically share or summarize the key information for students A suitable cooperative function for students to team up with peers 	<ul style="list-style-type: none"> Cannot run on many computer-assisted ULE programs Challenges in text typing and editing capabilities
RFID	<ul style="list-style-type: none"> Increased accessibility for real-time chats between students and teachers Provide flexibility and accessibility to programs such as ODEL Some applications include real-world functions Provide the students with a variety of superior services through the integration of an effective ULE. Improves user-friendliness across some services. 	<ul style="list-style-type: none"> Vulnerability to intrusion High-budget program development
MALL	<ul style="list-style-type: none"> Available through numerous devices Implemented to aid English learning Can significantly increase students' interest in learning English <ul style="list-style-type: none"> Peer-assisted learning system for collaborative, early English First Language, reading Enhance vocabulary ability Enables the access of mobile content and YouTube videos. 	<ul style="list-style-type: none"> Cannot be applied widely to train students in listening to and speaking a language.

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To address the barriers experienced in the learning of English in the ULE, Kim, Ruecker, and Kim (2017) suggested Mobile-Assisted Language Learning (MALL) to keep up with students' desires to study anywhere and anytime. For Kim et al. (2017) MALL can also be used to ignite a passion for ULE experiences among students while improving their contextual language learning experiences. There are a variety of activities related to language learning that can be supported by MALL—activities such as (though not limited to) vocabulary, reading, writing, reading comprehension, listening, speaking, describing a picture or a scene, and roleplaying situations. Table 1 illustrates how MALL can be used to support students' different language activities.

Table 1 shows various learning activities that can be done with different devices which can be used within the ULE. The table also indicates types of media which can be used to deliver the activity to students: text, audio, or iTV. Drawing from the “anytime; anyplace” ULE principle of learning, Kukulska-Hulme and Shield (2007) theorize that MALL is an online learning support that is cost-effective and which is worth consideration not only for language activities. With that in mind, it is worth summing up the benefits and challenges of the three types of online learning support discussed in this chapter.

It could be seen from Table 2 that the benefits of providing online learning support are higher than the challenges identified. The most common benefit in the three types of online learning support is enabling access to students. While it is clear that the challenges are different in the three types of online learning support, the author wish to highlight one of the challenges identified for supporting students with MLSS. It is evident from Table 2 that when supporting students with MLSS, one may run the risk of having limited computer memory and restricted broadband transmission of PDAs prevent this online learning support from running many computer-assisted ubiquitous learning programs. In addition, when K.-Y. Chin and Chen (2013) piloted, the use of MLSS on mobile phones the small touchscreen interface posed a major challenge in terms of text typing and editing capabilities.

SOLUTIONS AND RECOMMENDATIONS

This chapter has identified and described students' barriers to ubiquitous learning. It has affirmed that there are more complex issues to consider when managing and designing online courses in the ULE. The chapter also depicted that most ULE is viewed as an opportunity to learn from anywhere, at any time, for anyone. It may, however, be noted that the ULE, like any other learning environment, requires a means of being as inclusive as students would need. It appears from the description of students' barriers to ubiquitous learning that one of the barriers emanates from the students' inappropriate expectations. This chapter recommends that the managers and designers of online courses in the ULE should clearly communicate their course rules and policies at the beginning of the course so as to minimize the barriers resulting from the inappropriate expectations indicated in this chapter.

The other important note to the managers and designers of the online courses in the ULE is to recognize and support the nature of students' participation inclusively. The students' participation should not be judged by the quantity or length of their online postings (Kebritchi et al., 2017). The section on the experiences of students in the ULE exhibited there being a need to include online learning support when managing and designing online courses in the ULE. Although the studies reviewed in the section on the experiences of students in the ULE were taken from different contexts, proved the significance of the importance of supporting the students in the ULE. That brought to light the importance of planning such support, due to the uniqueness of the students' barriers to ubiquitous learning.

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The most striking finding from the types of online learning support was the increased motivation of students who were supported through the interactive ubiquitous learning system. That being the case, this chapter suggests that students' motivations (consideration of the different types of motivation) should be regarded as being an important ingredient for the initial engagement as well as for retention in ULE. Hartnett (2016) declared that motivation play an important role in determining whether a student persists in a course. Online learning support is recommended in this chapter for all students involved in the ULE for ease of access, flexibility, and motivation to complete the online courses. By supporting students in the ULE through providing online learning support, will be contributing towards the delivery of quality education—particularly for the poor and underserved.

FUTURE RESEARCH DIRECTIONS

It was shown in the section on students' experiences of learning in the ULE that more and more institutions of higher learning are encouraging programs or online courses that are suitable for the ULE, with the aim of reducing costs for students and of expanding recruitment in the face of rising competition. This calls for an extensive research to explore the institutions' readiness in ensuring appropriate systems to promote online courses and relevant online learning support for the students.

Another future research direction should include the full execution of an empirical study designed to explore and determine the effects of online learning support in the ULE. The study should include the role of online learning support in enhancing students' performance in the ULE.

CONCLUSION

This chapter has attempted to characterize online learning support as being an instrument that can close the gap in the ULE (addressing barriers to ubiquitous learning) created by real-world and digital-world resources. It has reflected on the students' barriers to ubiquitous learning and has unpacked the reasons why online learning support should be planned alongside the managing and designing of the online courses in the ULE. Drawing from the challenges and benefits of the different types of online learning support in the ULE, this chapter pronounces that online learning support has the potential to make the ULE a most accessible and inclusive learning environment. It is also worth noting that online learning support in the ULE has the important role of students' learning and, ultimately, in assisting them to realize their final outcome of their educational achievement. It is the view of the author that providing students who are learning through the ULE with online learning support will reduce the drop-out rate and increase access and participation.

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KEY TERMS AND DEFINITIONS

Artificial Intelligence: The ability of a computer to perform tasks normally requiring human intelligence, such as, speech recognition and translation between languages.

Digital World: The articulation of the dominance of the use of technology in the modern-day society.

Learning Styles: The way a learner or students acquire knowledge and skills during the teaching activities.

Mobile-Assisted Language Learning: An online learning support that uses smartphones and other mobile technologies in language learning.

Open Distance and e-Learning: A distance learning where the academic community uses technology to achieve the learning outcomes.

Pedagogical Resource: Resources used to enhance the teaching and learning activities.

Radio Frequency Identification: The process whereby electromagnetic fields are used to automatically identify and track tags attached to objects.

Traditional Classroom: A classroom which do not cater for innovation and creativity because its main resource is a teacher.

ENDNOTE

- ¹ Digital incompetence was the term introduced in 2011 by Ilomäki, Kantosalo, & Lakkala (2011) as the concept describing technology-related skills not limited to confident and critical usage of the full range of digital technologies for information, communication and basic problem-solving in all aspects of life.