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Designing a constructivist M-learning environment for Saudi Higher Education students to

support their learning

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Statement of Problem

In 2011, The International Telecommunication Union stated that the subscriptions to mobile network worldwide reached 5.9 billion with 79% of users in developing countries including Saudi Arabia. In addition, a study by Arab News (2013) shows that the mobile phone penetration rate in Saudi Arabia stands at 181.6 % of the population. This is because users subscribe to more than one mobile network provider. Another study indicates that Saudi Arabia is the third biggest country in the Arabic world regarding using IOS, while it has the largest number of BlackBerry users around the world (Al-shehri, 2012). Therefore, the wide acceptance and familiarity with mobile devices among young Saudi users make promising future for it to be adopted for educational purposes.

In addition, more than 80% of Internet users around the world are accessing the Internet via mobile devices (Johnson, Adams & Cummins, 2012). This means that mobile devices can be used to support students learning, access specific learning materials, and benefit from campus services. According to Richter, Brown, and Delport (2007), 88 Higher Education Institutes from 27 countries were survived to examine expectations of mobile learning. 64 % of responses show that mobile learning would be very helpful to enhance learning that is independent of time and space. However, they do not have an optimal guide to adopt Mobile device to enhance learning. Moreover, current research of Mobile learning in Saudi Arabia highlighted the need for greater understanding of mobile learning adoption and design based on a pedagogical view.

Literature Review

Mobile Learning

The mobile learning history seems as mobile technologies just gained the ability to be an educational tool. However, in the late 1960s, Alan Kay established the concept of a mobile educational device. He envisioned a portable device for learners that capable of displaying graphic and text similar to books (Najmi & Lee, 2009). In addition, in (1972) Kay presented a paper that described an educational device that looks like the new tablet devices such as iPad. In the years that followed the vision of Kay, a computer turned to be less cost and more personal. In the 1990s, the rapid advancement in technology resulted in a generation of wireless devices such as phones and PDAs. Therefore, mobile device sizes and efficiency became manageable. The cost-efficient for mobile devices also enabled many people to own wireless devices such as cell phone.

In addition, Kukulska-Hulme and Shield (2008) stated that mobile learning devices as any devices that are small and autonomous to carry any place and anytime. Ally (2009) also indicated that the Mobile Learning is the process of using mobile devices to study, learn materials and communicate with other students, teachers, or schools. In general, Mobile learning devices refer to any portable devices that help learners through the use of formal or informal (apps) at anytime and anywhere (Almasri, 2012).

Mobile Learning in Saudi Arabia

As a result of the global pedagogical shift from an objectivist learning approach into a constructivist learning approach, the Saudi Ministry of Education has substantially progressed in the adoption of more learner-centered learning approach. According to Al-shehri (2012), the Saudi government has established different projects to encourage the implementation of distance

and mobile learning such as The Saudi Electronic University, The Saudi Digital Library, and The National Center for E-learning and Distance Education. In addition, several studies were conducted to capture and investigate the current practices of M-learning in Saudi Arabia. According to Al-Shehri (2012), King Khalid University launched Mobile Blackboard to implement iPads for learning and assessment. The university administration considered the familiarity of social media mobile apps among its students. Therefore, students were introduced to how Facebook can be synchronized with Blackboard for them to be informed of Blackboard announcements while using Facebook. Furthermore, Students' attitudes towards M-learning in Saudi university were studied by several researchers. For instance, in King Saud University, the perceptions and attitudes of female arts and medicine school students' towards the use of mobile technology for learning purposes were investigated (Al-Fahad, 2009). The study indicates that the future of M-learning in Saudi Arabia is promising since almost every student owns a smartphone with cutting-edge technologies. However, some participants were caution about M-learning due to the expensive cost of data plans.

In addition, another study was conducted by Chanchary and Islam (2011) at Najran University to explore the perceptions of students towards M-learning. The study reveals that the majority of students are not ready for M-learning and would like their instructors to implement a blended learning approach in which mobile learning will be blended with face-to-face classrooms. Furthermore, Nassuora (2012) studied the factors affecting the use of mobile learning at Al-Faisal University by adopting a Unified Theory of Acceptance and Use of Technology model. The study indicates that the majority of students were not familiar with the concept of M-learning; however, they have good perceptions and acceptance of M-learning. Therefore, Saudi students are professional users of mobile devices with cutting-edge

technologies; however, they are not well prepared to use the mobile devices for learning

purposes (Seliaman & Al-Turki, 2012).

Mobile Learning benefits

According to Liu (2014), the mobile devices have been developed to be mini computers

that used by educators and learners for personal applications. Recently, the technological

developments of mobile devices garnered the attention of educators for the benefits that these

devices would offer to education and learning. These smart mobile devices can provide a

combination of accessibility, flexibility, and interactivity with many online resources different

than other traditional technologies such as the computer.

In fact, the most advantages of mobile devices are their portability and wireless

connectivity. Their ability to be taken anywhere and then connect to the Internet will lead users

to not only gain information from the Web, but also allows them to create, manage, organize, and

share information at anytime anywhere (Chen & Huang, 2010, p. 70). Inside classes also students

will have the ability to access information from their devices to assist their participations in class

activities and discussions (Brown, 2011). In addition, learners who are outside classes can use

their devices on the bus or at the mall; because of that students will extend their learning

experience beyond the regular classroom (Sha, Looi, Chen, Seow &Wong, 2012).

The fast access feature to the Internet through mobile devices will support the learning context

by relevant information during the time of learning (Liu & Chu, 2010). The combination of

accessibility and mobility provides the opportunity to learners to connect to previous

information, gain new information and knowledge, and to improve the skills of problem-solving

(Liu, Tan, & Chu, 2009).

Guazzaroni (2013) stated that keeping the learners interested in what they are studying and learning is an obvious concern for many educators. Advanced mobile devices allow students to access to an interactive multimedia tool that leads to engage students and improve their learning (Guazzaroni, 2013; Looi et al., 2011). Smart mobile devices are currently having many features of digital production such as an audio and video recorder, as well as a professional camera. In addition, there are countless attractive applications available on the Internet, with an increasing number of educational applications. These multimedia characteristics of mobile devices provide learners with interactive and collaboration practice materials with just a few touches. Therefore, learners can enjoy reading and studying materials, recording audio, and watching a video. They can independent control the materials and receive the information at their own paces. For instance, students can stop, play, and fast-forward based on their learning process (Banister, 2010). These advantages provided by smart mobile devices allow educators to motivate their students to improve and practice knowledge and to personalize the learning of students. This style of learning gives students a sense of responsibility and ownership for their learning (Crouch & Johnson, 2011).

Mobile learning challenges

While there are several advantages of using mobile devices, there are some challenges in the use of mobile devices in educational fields. The integration of mobile devices into any learning system requires particular strategies and plans from all partners to achieve the administrative and pedagogical goals (Wang, Wiesemes, & gibbons, 2012, p.575). Mobile technologies that were designed specifically for educational setting aren't facing any difficulties. The small size of the screen makes the view of documents and creating multimedia quite difficult

(Brown, 2011). The personalized feature and small size of mobile devices can also help students to turn easily from the assigned tasks without any detection. Educators and developers should develop ways to monitor the use of mobile devices to ensure learners are on tasks (Banister, 2010). Moreover, to effectively incorporate students into the lesson, educators have to take the part of devices manager, to ensure that students' devices are updated and charged to run appropriately (Banister, 2010).

Furthermore, teachers and students are facing some challenges in finding appropriate materials to enhance and improve learning because there is a continuous growth in educational applications. This enormous number of applications complicates the task of finding the appropriate applications that suit and help the context (Liu, Navarrete, & Wivagg, 2013). Following this further, the future of M-learning in Saudi Arabia might be affected by some other factors. According to Al-Shehri (2012), students still have a concern over the expensive cost of data plans. He also indicates that Saudi mobile phone companies might ban some of the online services that affect their profits such as Viber and Skype. In addition, another important factor that might be considered when adopting or designing any intervention in Saudi Arabia is regulations of culture and religion in the country (Almarwani, 2011).

Constructivism

Constructivists see the truth as subjective. They believed that the world is lived experiences where meaning results from the interactions between individuals and actions, and among people themselves in contexts. Denzein and Lincoln (2005) state that the researcher's beliefs about how the world should be studied and understood guide his or her research. Therefore, many factors including the investigator's experience, background and motivations

determine how researchers know the truth. The researchers would investigate various details of a particular context and then reflect based on their understanding of the truth. According to Kim (2003), constructivists believe that truth has multiple meanings because it is affected by the cultural and social situation in which it happens. They refuse the claim that truth is uniform even if it occurs in different times and places. Cohen and Manion (1994) illustrate that reality is complex and has several interpretations. Hence, research findings within the constructivist paradigm would be influenced by the context in which the phenomenon occurs.

Constructivists believe that meaning is constructed and researchers should emphasize specific actions (Denzin & Lincoln, 2008). In other words, researchers should focus on making meaning during the research process to fully understand the research topic or phenomena under investigation. Therefore, the interaction between the researcher and participants of the study is essential to make meaning of actions. My project is to explore and understand the perceptions of Saudi students regarding M-learning, and then to design a constructivist M-learning environment that supports their learning. Therefore, the voice of participants regarding the need and use of M-learning is important and essential for my research. Cohen and Manion (1994) illustrate that the world is made up of human experiences and it is vital for a researcher to understand them. Researchers personally experience the knowledge rather than imposed from external sources. Nevertheless, participants' points of view are essential alongside the researcher's perspective to interpret the phenomenon under investigation (MacKenzie & Knipe, 2006). This means that understanding the values and attitudes of participants is fundamental for the study. It will not only show the acceptance of m-learning activities, but will show the effective methods to design and implement future learning technologies. Thus, the constructivism paradigm seems to be more appropriate.

Social Constructivism and Mobile Learning

There are various considerations that researchers and learning technologists should consider when introducing or designing a complex learning environment. According to Naismith (2004), the future researchers and learning designers will face some challenges to find a learning environment that supports collaboration, personalization, and student-centered learning (p.36). However, m-learning environments have some values that attract both learners and educators including individual feedback and support the collaborative activates. Therefore, M-learning environment and the theory of social constructivism can fit together. M-learning is a learner-centered activity; however, it also serves as a social connection. According to Kukulska et al. (2009), the features of m-learning technologies support learning that is rooted in collaborative, social, and constructivist principles (p.16). Besides that, the social constructivism theory offers an opportunity for learners to engage in the process of dialectical learning such as discussion activities among students (Shih & Mills, 2007). In addition, M-learning supports the student centered-learning. Students can create particular contents and start to collaborate with other students outside the classroom. Cobcroft (2006) illustrated that extending the learning beyond the classroom through mobile technologies would assist students to construct and make meaning within their real lives contexts.

According to Wilson (1996), the environment of social learning provides a variety of tools and resources for learners to collaborate and work together to solve problems and achieve the learning goals (p.5). This means that the social constructivist learning environment should promote learning activities such as collaboration, arguments, and discussion among students to engage them in the learning process. However, these learning activities cannot be limited to classrooms, they must go beyond that, and m-learning provides such learning environment.

In addition, the theory of social constructivism assumes that the knowledge is gained from social experience (Hannafin & Land, 1997). Learners construct their knowledge based on their interaction with subjects, and they use tools to connect their experiences (Baharom, 2013). This means that the use of mobile technologies as assisted tools leads students to experience and make meaning of M-learning activities. They share and express their internal conceptualization and experiences about the topic through the assistance of m-learning activities.

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Principles of Social Learning Environment

Creating a learning environment that promotes learners to construct knowledge is the main educational purpose of social constructivism (Brown, Collins & Duguid, 1998). According to Baharom (2013), there are four main principles for creating and implementing m-learning activities for higher education students through the lens of social constructivist theory. These principles are contextual learning, collaborative learning, multiple perspective learning, and reflective learning. The use of these four categories will guide the implementation or design of M-learning activities. However, the students' points of view should be considered alongside with these four principles.

Contextual learning. There are various ways in which learners construct meaning from given contexts (McRobbie & Tobin, 1997). Designers and teachers should take the advantages of different learning contexts to extend the learning beyond the class times. According to Duffy and Jonassen (1992), learning activities must provide assistance and contexts to aid learners in making senses of environments as they are encountered (p.5). In other words, learning activities should be designed to take the advantages of learners' multiple contexts. In addition, multiple contexts should provide authentic learning environments. According to Ryu and Parsons (2006), authentic learning environments support the combination of the real world activities with a digital representation of information. This means that m-learning links associated information or contexts to learning activities in digital representation forms. Thus, students would be able to explore the phenomenon and recognize concepts via combined digital and physical objects. According to Traxler (2009), Authentic learning is a learning environment that contains problems of the real world and learning activities that are interesting and important to students (p.18). Activities of authentic learning enable learners to use their representations of the world in a formal learning environment. Thus, the authentic learning environment enhances students' learning by bringing meaningful and realistic activities to them.

Therefore, I understand that multiple contexts and cultural settings of Saudi students should be used in designing or implementing M-learning environment for the learning to occur. M-learning can engage students across different contexts, and it can support learning activities in different space and time. It provides an opportunity to link the learner's prior experience to many contexts. The context for M-learning environment should also be authentic to support the construction of knowledge.

Collaboration learning. The core principle of a learning environment of social

constructivism is collaboration. According to Dunlap and Grabingre (1996), group activities for learning is essential for learners to build their knowledge. They enhance their knowledge and share the meaning of the context through argument and mutual learning. Students learn from their peers alongside their teachers. The collaboration with peers allows students to test their information and build new knowledge (p.56). Thus, social interaction with others will be encouraged through collaborative activities.

During the collaboration activities, students share their viewpoints and ideas. They also collaborate to build new knowledge and solve problems (Duffy & Cunningham, 1996). As a learning technologies designer, I should provide students with varieties of learning activities that support collaboration and peer teaching. According to Dabbagh (2005), there are three different categories of activities for collaborative learning including collective knowledge construction, collective negotiation such as argumentation and debate, and reliance on other students and teachers as resources (p.36). Therefore, discussion and writing ideas with peers is an essential feature of collaborative learning (McRobbie & Tobin, 1997, p.199). This highlights the importance of collaborative activities for learning such as writing and discussion. As a researcher and designer, I should think about learning activities that encourage collaboration and interaction among students to maximize the learning capacity for them. Activities should allow students to share knowledge, reflect on contents, and solve problems that can be done in project-based form or peers activities.

Multiple perspectives learning. The theory of social constructivism assumes that students' learning is based in several contexts. Constructing complex knowledge requires multiple recourses and contexts. Complex conceptions are ill-defined and then need several illustrations and representations (Baharom, 2013). Therefore, if students are supported to connect

related knowledge through multiple representations, they will construct knowledge from concepts that are being studied (Spiro, 1991). Students will be able to expose different perspectives, and m-learning activities can provide such opportunity. According to Hannafin and Land (1997), technology supports access to multiple tools and resources that lead to construct meaning by connecting new knowledge to prior understandings and conceptions (p.170). Moreover, Jonassen (1992) stated that using available tools to promote multiple views on reality in the learning environment is one aim of the social constructivist theory. This means that information doesn't come from a single source in social learning environments, but it comes from multiple resources through different medias.

Designing effective learning activities for M-learning environments require providing learners with multiple sources for knowledge. According to Lefoe (1998), learning activities for the social constructivist environment should encourage learners to look to others' perspectives. This is because exposure to multiple perspectives can help students to make meaning from knowledge being studied. Therefore, there are two major features for social constructivist learning environments including providing multiple means of representations and giving access to multiple perspectives. Providing Saudi students with M-learning activities that present multiple views of the concepts set in an authentic context is one of my research goals.

Reflective learning. Successful learners have the ability to analyze and evaluate their learning process (Dunlap & Grabinger, 1996). According to Dabbagh (2005), reflection on learning is the thinking process of what has been learned as a way of giving meaning to events or situations. This process includes understanding and applying the new knowledge in different contexts. Thus, providing students with learning activities that enable them to reflect on their learning process is essential in M-learning environments. These learning activities can increase

students' awareness of their learning process to apply gained knowledge in different contexts (Dabbagh, 2005). I believe that m-learning technologies could assist the reflective learning process through display, review, or model social interaction among learners.

According to Baharom (2013), social constructivist learning environments include learning activities that allow students to reflect on their experience and prior knowledge, and to restructure new knowledge. Moreover, m-learning environment gives the opportunity to provide self-evaluation, and immediate reflection (Traxler, 2009). Thus, a learning technology designer should provide a space for reflection within the activities of M-learning. For instance, the integration of SMS mobile application could allow learners to comment, discuss, or support the ideas of other students.

Research Questions

1- How prepared are Saudi students in a Saudi university to accept activities of M-learning as part of their course?

2- How can constructivist assumptions be integrated into the design of M-learning in a Saudi Higher Education course?

3-What are the challenges in implementing M-learning constructivist activities in a higher education course?

Study Approach

This study will introduce a constructivist M-learning environment for Saudi Higher

Education students to support their learning by utilizing the integrated learning design (ILD)

framework applying an iterative approach to answering the research questions. This framework

is composed of four integrated phases, informed exploration, enactment, local impact, and broad

impact. ILD framework allows for a flexible design that allows me to refine theories and

methodologies based on the previous phase. Within each phase, there will be multiple formative
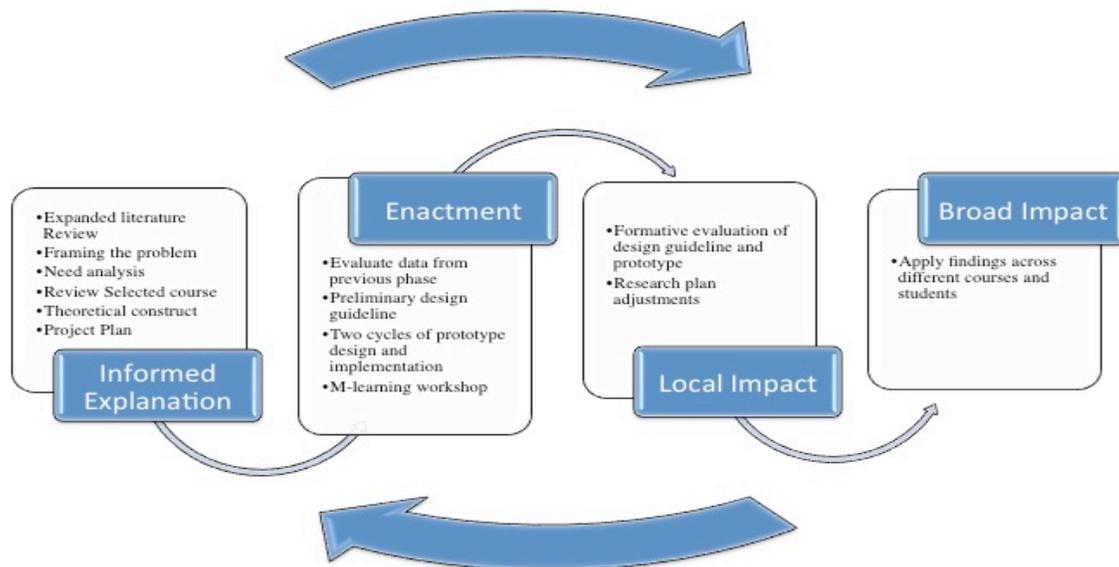
evaluations providing scaffolding to the design.

Figure 1. DBR Cycles

Phase 1- Informed Exploration

This phase will be informed by conducting an in-depth examination of research of

principles and models of designing M-learning environment, constructivism, and existing

projects of M-learning in developing countries. Additional data will be gathered by conducting a

need analysis to explore and understand the study context, target audience, their needs, background, resources, and technology available to them. Moreover, the selected course "Introduction to Educational Technology" will be reviewed and modified to find topics that can be blended with authentic learning activities. Methods of collecting data in this phase include a student focus group, observation, expert interviews and meetings, and attending regular faculty meetings. The collected data will be analyzed carefully and then validated by a comprehensive review of comparable M-learning design frameworks and relevant literature. In addition, results will reveal readiness level for M-learning interventions in a Saudi context. Thus, I will be able to gain a better understanding of mobile devices, awareness and knowledge of virtual features, and current practices of mobile devices among Saudi students. Therefore, findings of the Informed Exploration and my insights as the researcher will guide the necessary refinement for the study plan. They will also provide the base for the conceptualization of the theoretical construct to guide the design in the Enactment phase.

Phase 2- Enactment

The purpose of this phase is to design and develop the first prototype of M-learning environment. The implementation of this phase will be conducted across two cycles to ensure the trustworthiness of the data, and each cycle will last for one academic semester. Each cycle will start with a face-to-face workshop to introduce participants to the concept of M-learning and to allow them to practice some M-learning meaningful activities. At the end of the workshop participants will be asked to reflect on their first experience of M-learning practices. The purpose of this workshop is to introduce participants to M-learning concepts, activities, applications, and tools. In addition, it will inform the conceptual model of M-learning design by integrating participants' ideas regarding M-learning activities and tools.

After reviewing and evaluating the conceptual model by the researcher and experts, a functional prototype of the selected course will be developed and delivered through JUMP, a customized LMS for Jazan University in Saudi Arabia, to be accessed by participants. This course prototype will be evaluated through the following cycle of next phase to provide feedback for additional refinements of the course design. Feedback to support the design and development of the course will be collected through different methods including a review of experts, observations, and students' reflections and interviews.

Phase 3- Local Impact

After completing the design for the first-course prototype, data necessary for local impact evaluation will be gathered through implementing the first prototype course. Data will be collected through project meetings, interviews of students and experts, students' reflections, and researcher's observation and memos. Based on the received data, the second course prototype will be modified, and design guideline will be adjusted accordingly.

Phase 4- board Impact

After the second cycle of course design and development, the designed course and guideline design would be evaluated and modified at various points of the study. However, to evaluate the findings from the previous phases using a larger scale, the guideline of M-learning design should be used and applied in different classes across several disciplines with different students and different grade level.

Limitations

The study has two potential limitations. The first one is the sample that will be used is only male participants from Jazan University in one region of Saudi Arabia. Choosing mixed gender students from different universities would enable me to reach a deeper understanding of the design of m-learning environments. The second limitation would be that the findings of the study might have been influenced by students' preferences for the use of mobile technologies for learning. Students might not be familiar with using mobile technologies as the primary tool for academic learning purposes and collaboration. Therefore, research results could be affected by preferences of students.

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