

Module two: Design and Methods

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Design-Based Research Approach (DBR)

A design-based research is a common framework for many research in the field of instructional technology. According to Brown (1992), design-based research (DBR) is a framework to consider when researching design and improvement for learning environments. This framework is interchangeably known as design research, design science, and design and development research (Ellis & Levy, 2010). Regardless of the differences of names of DBR all of them share a common and scientific theme of creating knowledge that can be applied to solve real world problems in order to improve professional practices (Andresen, 2007). DBR is an attempt to combine the empirical exploration of researchers' understanding of learning environments with the designs of those environments and how they interact with students and teachers (Hoadley, 2004). It aims to improve the design of pedagogical learning environments and their affects on learners. DBR follows the approach of a progressive refinement because it places the design in a real world context to evaluate how it works and then revises the design based on the evaluation in order to be improved (Collins, Joseph, & Bielaczyc, 2004). In addition, DBR is described as the integration of proposed and known design principles with technology to produce acceptable solutions for complex problems of learning environments (Reeves, Herrington & Oliver, 2005). According to Revees (2006), DBR approach has four main principles and Figure.1 represents them. In the first phase, DBR approach determines problems in a learning environment. Second phase is developing appropriate solutions based on the current design for a learning environment and innovated technologies for the educational problems. Third phase is conducting reflective cycle of a study in order to evaluate and refine the proposed solutions that developed in the previous phase. Lastly is producing new design principles in order to guide practitioners to deal with future problems within their learning environments.

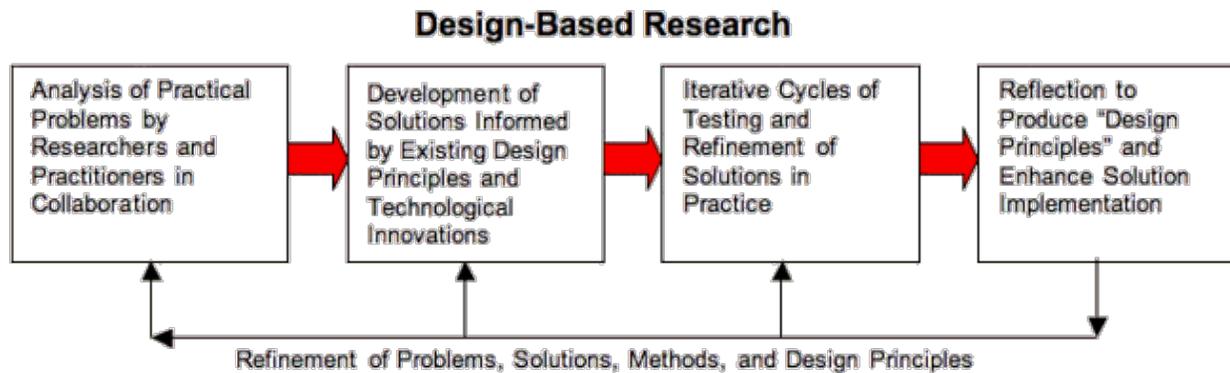


Figure 1. Design Based Research (Reeves, 2006)

Therefore, DBR is an appropriate methodology for research on designing and improving of technology-based learning environment. According to Seeta and Herrington (2006), Design based research (DBR) is a research approach that is particularly appropriate to explore learning environment problems and technology-based solutions. Therefore, the use of DBR could produce a suitable solution for learning environment problems. DBR results from the need to address pedagogical concerns in learning contexts, the need to explore the real learning environments and to go beyond the limitations of formative evaluation of learning (Collins, Joseph & Beilaczyc, 2004). Furthermore, DBR approach moves beyond simply observing the learning contexts to generate and to improve solutions for the learning environment problems (Barab & Squire, 2004). This means that DBR approach has the possibility to bridge the lack of connection between learning environments and research theory (Collins, Joseph & Beilaczyc, 2004).

According to Brown (1992), DBR approach enhances the understanding of learning environment complexities, while laboratory research cannot capture the reality of classroom scenarios. Therefore, a research in a mobile learning (m-learning) environment is unpredictable and requires involving participants not only to capture their perspectives, but also to give them

the opportunities to reflect on what they have learned; moreover, the unpredictable nature of m-learning requires a flexible methodology (Kukulka-Hulme, 2008). Hence, I see that the flexibility of DBR approach makes it an appropriate methodology to investigate the nature of a m-learning environment. Besides the flexibility of DBR, Wang and Hannafin (2005) classified four more essential characteristics of DBR based on various researches. First, DBR is an active research and has practical objectives that could develop theory and improve practices. In addition, DBR uses many research methods, so it is an integrative approach as in this research, DBR approach will be used with qualitative methods. Moreover, DBR is based on a specific context in which a study is conducted. This means that research findings are based on the design process and the study context. According to Wang and Hannifin (2005), the purpose of DBR is to design particular interventions and understand how these interventions work in a particular context. Indeed, Al-Ismaiel (2013) states that applying DBR approach can address problems in learning environments in collaboration with participants and a researcher. Additionally, it can create or develop solutions based on a current design as well as innovative technologies in order to solve complex problems for learning environments. Finally, it will test and refine the innovative solutions through a reflective analysis until reaching appropriate outcomes. Therefore, the design for this study will be guided by the main four phases of DBR that are shown by Reeve's outline.

Phase 1: Analysis of Problems

The main phase of my study is to identify and analysis a pedagogical problem within a Saudi HE context. According to Al-Ismaiel (2013), the use of new technologies for learning purposes in many HE contexts is passive and inefficient. There is a limited adoption of constructivist and collaborative learning activities. Studies have illustrated that most of research

of technology-based environments in Saudi Arabia have focused on perceptions and attitudes of teachers who are using new technologies to facilitate Students' learning (Alaugab,2007; Al-Ismail, 2013). In addition, the discussion of new technology-based learning environments such as mobile-learning (m-learning) is centered on developed countries and there is a shortage of studying the uses of m-learning in developing countries (Traxler, 2009). Thus, there is a need for research in HE contexts in Saudi Arabia as a country of the developing world to examine the constructivist and collaborative features of a technology-based environment that would involve students' voices.

Phase 2: Development of Solutions

The main purpose of this phase is to develop an appropriate solutions to the primary problem that is shown in the first phase. The social constructivist theory by Lev Vygotsky guides the design of this phase due to the social nature of m-learning that highlights collaboration and communication. According to Baharom (2013), the attributes of social constructivist m-learning environment are contextual, reflection, collaboration, and multiple based learning activities. This influences the creation of online version of the introductory course for instructional technology that is taught face-to-face at Jazan University in Saudi Arabia. Two main features of the he course will be changed. First one is that the course will be delivered through m-learning environment. Second, the course will include collaborative learning activities.

Phase 3: Practical Testing and Refinement for Proposed Solutions

This phase is focusing on the implementation of the proposed solutions. This phase has two iterative cycles to test and refine the solutions within the real context, which is an instructional technology class for HE students. Data will be collected through observing the

classroom and interviewing participants. In addition, students' products such as blogs, discussions, emails, questions and answers, and produced mobile apps will be collected and analyzed. The deep analysis of the collected data will help to understand the possibilities of adopting constructivist learning environment in HE contexts in Saudi Arabia.

Phase 4: Reflection to improve the implementation of solutions and produce design principles.

The reflective analysis of collected data from the third phase will be documented in this phase in order to produce a guideline for similar problems in other contexts.

Design-Based Research (DBR) and Qualitative Methods

DBR researchers can employ another methods such as qualitative, quantitative, or mixed methods in their studies in order to design and develop an effective learning environment. However, researchers might debate which research approach is the most suitable for a design-based research (DBR) (Denzin & Lincoln, 2010). As DBR approach is descriptive and empirical, it should be combined with another method that is capable to deeply understand relations between outcomes and participants' performances. According to Sandoval (2004), a qualitative approach is able to demonstrate the relationships between the process of performance and outcomes. In order to connect qualitative approach to this study, an action research will be used to pursues outcomes and research actions for future learning environment design. According to Stringer (2004), the purpose of action research methodology is to gain new knowledge that lead to develop educational practices. Mertler (2005) identified four main phases for action research as shown in Figure.2. These stages are including observations, taking actions, developments, and reflections. To align the stages with this study, observation is based on identifying what is

happening within the study context as provided in the first phase. This process lead to create a plan for designing constructivist m-learning environment. The actions that will be taken in the first cycle of the study are informed by the collected data from class observations, participants' interviews, and reflections.

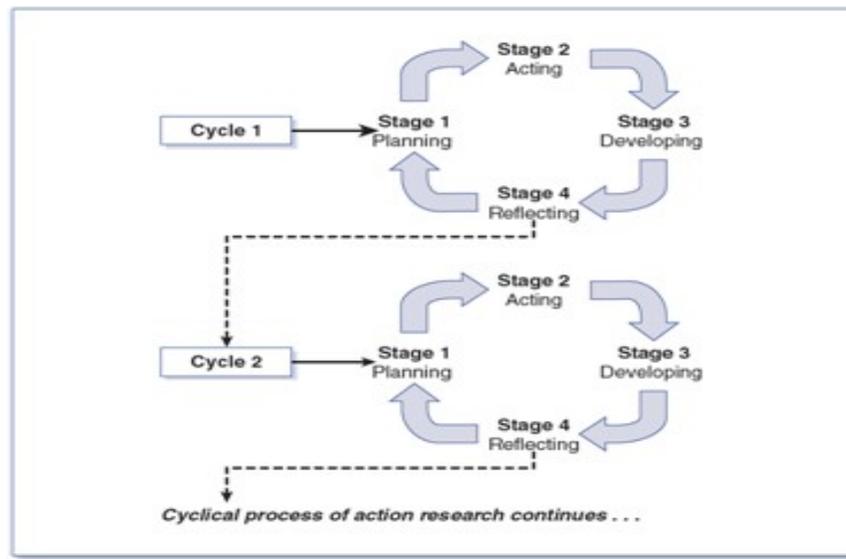


Figure.2 Action research process within a DBR framework (Mertler, 2005)

Cycle One

The main purpose of this cycle is to identify weaknesses and strengths regarding the use of m-learning environment in Jazan University. In addition, it will inform any future design for m-learning activities. The collected data from this cycle will assist the refinement of the second cycle of the study. This cycle of the study will take sixteen weeks to be conducted. The participants in the cycle are students who are enrolled in the course of Introduction of Instructional Technology at Jazan University. Consent forms will be given to all students and sixteen students will be selected randomly from the class to be interviewed. All students are asked to complete collaborative learning activities over the sixteen weeks and to collaborate with

each other face-to-face besides the use of Blackboard mobile in their smartphones.

Cycle Two

The second cycle of the study will take another sixteen weeks. The participants are another sixteen students who will be enrolled in the course for the second academic semester. Participants will be selected by the same method that is mentioned in the first cycle. The learning activities and the technology that will be used in this cycle will be refined based on the reflection and analysis of collected data from the first cycle. The results of this cycle will provide a guideline for designing effective m-learning activities in the future.

Methods of Collecting Data

According to Merriam (2001), data collection allows a researcher to answer research questions, draw a conclusion, and produce informative recommendations. Qualitative methods will be used to collect data for this study. The use of observations, interviews, and students' works will capture participants' perspective regarding the use of mobile technologies for learning purposes. The interviews and observations will be used before and during the study process.

Observation

Erlandson, Harris, Skipper and Allen (1993) defined observation as a methodical description of behaviors and events that could happen in a social context that is selected for conducting a particular study. The researcher's role is to balance the internal and external roles by observing and participating in some of the activities (Mertens, 2014). The most important feature for an observation as a method of data collection is the ability to observe facts that are previously unseen or ignored (Kellerhear, 1993). Therefore, to examine the students' activities in

the mobile learning environment, I will collect data from different tools that are provided to students including emails, comments and questions on blogs, personal reflections, and discussion forms. In addition, the observation will focus on the interaction among students and between students and teachers. Students will be observed in their classrooms based on the involvement in learning activities.

Interviews

Al-Ismail (2013) defined an interview as conversations between interviewee and interviewer for a purpose of collecting information from interviewee. In the same way, Berg (2001) illustrated that an interview is a series of procedures that are used to gather oral information from particular individuals. Thus, the direct interaction during interview session will allow interviewers to gain rich information of issue that is examined and deep understanding for the context. According to Elliott (1991), interviews are an essential part for qualitative research because they enable a researcher to gather useful data about participants and a context in which the study occur. The interview process in this study will allow me to collect information that would not be gained form observing participants' activities and the study context. I will conduct three semi-structured interviews with selected participants. The interviews will take place before the beginning of one academic semester, during the course, and at the end of the semester. The purposes of first interviews is to obtain the participants' perspectives, background, and experience regarding the use of technology to support their learning process. The second interviews will capture the difficulties that participants will face with their use of technology. Finally, the last interviews allow me to deeply capture difficulties that participants will face during the entire course, and to describe the preferred learning activities.

Students' Products

According to Mertler (2008) students' products are any recorded or written materials that are produced for a particular reason such as work samples, documents, or artifacts. Thus, collecting work products for students can increase understanding of the topic that is examined. Lincoln and Guba (1985) illustrated that analyzing collected artifacts and documents that are created by participants enhances the researcher's knowledge about his/her research topic. The participants of this study are required to develop to tasks. First one is to create a mobile application that can be used for educational purposes. They have to examine the effectiveness of delivering courses using m-learning environment in order to evaluate strengths and weaknesses of m-learning. In addition, the other task is to produce an educational video about mobile technologies and education, and can be run on mobile devices. Each group of participants is required to plan and discuss their tasks using mobile learning tools for Blackboard and during class times. Therefore, collecting students' works help to abstract students' discussions and meaning-making.

Data Analysis

Data analysis processes are a critical component for all different types of research. Researchers often interpret and examine data during many stages in their research. According to Erlandson et al. (1993), the analysis of collected data are supplementary and continuing simultaneous process. In this study, all transcripts of observations, interviews, and the analysis of students' works will be used to perform analysis on the data. In the first cycle of the study collected data will be examined using open coding. According to Maxwell (2013), open inductive coding is used first to detect any new ideas or nuances. The inductive codes will be

both descriptive in nature and in Vivo (Saldaña, 2009). The first inductive codes will be examined to reveal themes. Then codes will be reassembled in a matrix to examine patterns across the participants.

In the second cycle in the research collected data from interviews, observations, and students' works will be analyzed deductively. The source of deductive categories are the four principles of social and constructivist learning environment that detailed in the first module paper.

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