Developing Web Prototypes for Mobile-Learning Design Research

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ABSTRACT

This paper explores the challenges in developing prototypes for mobile app development and explains how a web-based prototype addresses these challenges and can assist designers in both the design and testing process. The authors explored issues around prototype development by studying a prototype created for iAdvocate, an educational mobile application. Using data from the process of developing and implementing iAdvocate, the authors explore the criteria and requirements regarding the prototype development in mobile-learning design.

Keywords: Education, Design-Based Research, iAdvocate, Mobile Learning, Prototypes

INTRODUCTION

It has been argued that the proliferation of educational research in the past few decades has failed to help educators bring much progress in students’ performance. For example, a 2005 National Assessment of Educational Progress study (Perie & Moran, 2005) revealed that no measurable differences in reading performance were found between 1971 and 2004 for 17-year-old students in the U.S. Many researchers and practitioners agree that educational research is often divorced from the problems and issues of everyday practice (National Research Council, 2002); merely examining the effect of an intervention in a strictly controlled setting has a limited impact in informing its actual use in a real context. As a result, forms of applied design research such as design-based research (Design-Based Research Collective, 2003; Rowland, 2007), design and development research,” (Richey & Klein, 2009) and formative evaluation research (e.g., usability tests, audience analysis) (Cross, 2007) have been gaining attention from educational researchers.

A design-based research (DBR) approach was utilized to research the development and use of a mobile informal learning application. DBR is an empirical technique that involves designing interventions with specific goals or objectives, testing them, evaluating the results, then refining or adjusting the intervention (Cobb, Confrey, diSessa, Lehrer, & Schaeuble, 2003). At its core, DBR is about transforming

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educational practices in authentic situations, in this case refining and improving a mobile application called iAdvocate.

DBR can be defined as the systematic study of designing, developing and evaluating educational interventions. This approach not only focuses on the summative effect of an educational intervention, as most “traditional” research does; but also aims at advancing knowledge about the characteristics of such intervention, as well as the process of design and development (van den Akker, Bannan, Kelly, Nieveen, & Plomp, 2007). Such a shift in research emphasis helps to generate more “usable knowledge” (Design-Based Research Collective, 2003, p. 5) that speaks directly to the problem of practice.

A DBR project seeks to better understand how an intervention operates in an authentic situation through a process of problem identification, theory development, intervention design, iterative implementation and coordination with participants, feedback, revision, evaluation and reflection. DBR intends to narrow the gap between education research and actual practice by conducting research in situ, where hypotheses and interventions may be observed and data collected in a situated environment, rather than in a laboratory setting. The benefit of this practice is to advance the relevance and authenticity of “what works” in an environment where research controls are nearly impossible to replicate in a laboratory and then transfer to practice (Walker, 2006).

As a research process, DBR is interactive, iterative and flexible. It requires interactive collaboration among researchers and practitioners, and without such collaboration, interventions are unlikely to affect changes in the real world context (van den Akker, 1999; Wang & Hannafin, 2005). DBR is often time-consuming because theories and interventions tend to be continuously developed and refined through an iterative design process from analysis to design to evaluation and redesign. However, the ongoing, recursive nature of the design process also allows greater flexibility than do traditional experimental approaches.

Prototyping plays a critical role in DBR (van den Akker et al., 2007) in which a sequence of prototypes are constructed, tried out and revised in an iterative and formative fashion. Although there are no articulated criteria for what makes a good prototype, guidelines for constructing and utilizing prototypes to design educational interventions have been discussed implicitly in many studies. Most of such interventions can be categorized as “traditional” educational products, such as instructional video (Appleman, Pugh, & Slantz, 1995), instructor-led training (Lange & Shanahan, 1996), computer-based courseware (Yang, Moore, & Burton, 1995), and electronic Performance Support Systems (Law, Okey, & Carter, 1995). However, there are few studies on how to develop a good prototype for mobile-learning systems, where instruction is delivered through hand-held devices such as smart phones. It is unclear whether the same guidelines regarding prototyping can be applied to mobile-learning contexts; do the unique features of mobile-learning systems exert additional requirement on their prototypes?

This paper explores the challenges in developing prototypes for mobile app development and explains how a web-based prototype addresses these challenges and can assist designers in both the design and testing process. We explored issues around prototype development by studying a prototype created for iAdvocate, an educational mobile application. Using data from the process of developing and implementing iAdvocate, we explore the criteria and requirements regarding the prototype development in mobile-learning design.

The Role of Prototypes in Design-Based Research

Prototypes in the field of instructional design take various formats: they can be shells that simply demonstrate the appearance of the final product, or they can be more advanced models that possess partial or all key features of the final product (Jones & Richey, 2000). Regardless of their formats, prototypes allow instructional designers to put concepts, features and func-
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