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# A design-based research approach for creating effective online higher education courses

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This paper discusses how a design-based research approach is being used to explore how to design and develop authentic e-learning within the higher education sector. Like action research, design-based research is accomplished at the coal face, however, it involves an ongoing iterative process to monitor the effectiveness of a specifically designed artefact “to provide immediate (and accumulating) feedback on the viability of its ‘learning theory’ or ‘hypothetical learning trajectory’ ”(Kelly, 2004, p. 105).

Design-based research consists of four connected phases: analysis, development of solutions, iterative cycles of testing and refining solutions and reflection and production of design principles (Reeves, 2006). This paper focuses on phase one of the research process. It identifies some of the challenges educators face when designing and delivering student-centred learning environments and provides examples to demonstrate how technology is currently being used to support student learning in authentic online environments. It proposes one possible solution for improving the quality of online learning in higher education and outlines the intended qualitative methodologies and processes for the following phases of the research project.

**Keywords:** constructivism, authentic e-learning, higher education

## **Introduction**

Over the past few decades there has been a massive swing among educational theorists and practitioners towards a more constructivist approach to learning. However, research indicates there is a significant gap between the preferred constructivist online teaching approaches and actual practises in higher education (Kim & Bonk, 2006; Maor, 2003; Oliver, 2005).

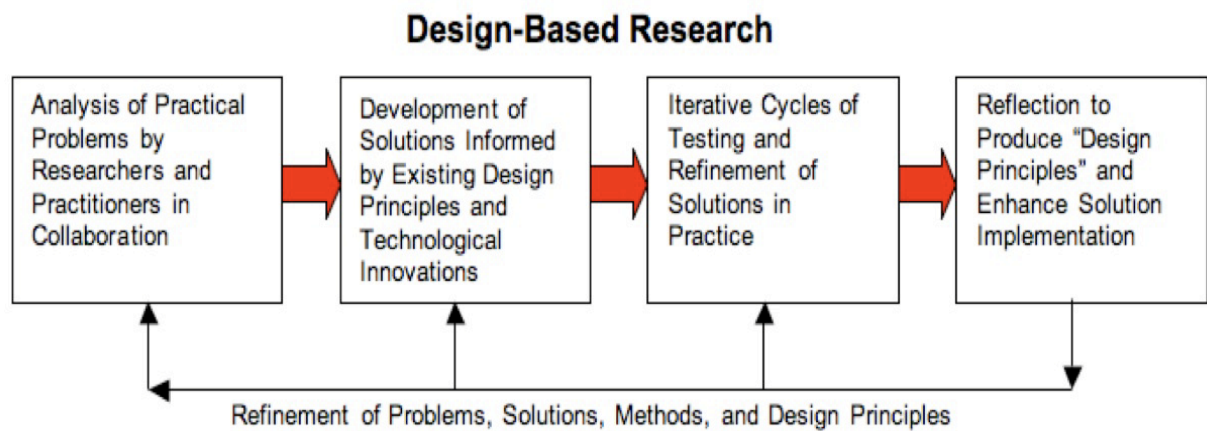
This paper discusses how a design-based research approach is being used to design and implement an online course based on authentic learning principles to create a more interactive and engaging online learning experience for higher education students. Like action research, design-based research is accomplished at the coal face, however, it involves an ongoing iterative process to monitor the effectiveness of a specifically designed artefact “to provide immediate (and accumulating) feedback on the viability of its ‘learning theory’ or ‘hypothetical learning trajectory’ ” (Kelly, 2004, p. 105).

## **Design-based research**

Design-based research is also commonly known as *design research*, *development research*, and *design experiments* (van den Akker, 2006). It is an iterative research process which Reeves (2006) described as four connected phases, (Figure 1).

It is a research approach that is being used more and more in education—particularly to investigate innovation using technology-based initiatives —because it “embraces the complexity of learning and teaching and adopts interventionist and iterative posture towards it” (Kelly, 2004, p. 105).

Key elements of this approach include: addressing complex problems in collaboration with practitioners, integrating design principles with new technologies to develop practical solutions to the problem and conducting effectiveness evaluations to refine the proposed solution and identify new design principles (Reeves, 2006).



**Figure 1 - Four phases of design research (Reeves, 2006, p.59)**

In this paper, I describe how each of these phases is enacted in a research study designed to investigate and improve online learning, specifically through the use of more authentic learning designs and tasks.

### **Phase 1 – Analyse the problem**

Phase 1 addresses three key areas: the problem, the literature review and practitioners' experiences. During this phase, the researcher clearly articulates the problem and investigates what work has already been done in the same or related fields. By the end of Phase 1, the researcher should be able to create preliminary research questions to guide the research (Herrington, Reeves, & Oliver, 2010).

**The problem:** Many online higher education courses are primarily information delivery vehicles rather than effective online learning environments. Lack of time, online pedagogical competency and technical skills has caused many teachers to simply dump large tracts of information into online courses. This information delivery model (Miller, 2000) has led to student boredom and isolation, resulting in high dropout rates and pleas for richer and more engaging learning experiences (Kim & Bonk, 2006; Maor & Volet, 2007; Reeves, Herrington, & Oliver, 2002).

**Literature review:** The design of the learning environment plays an important role in successful online learning as “pedagogy and software design are closely intertwined in online learning - the ‘shape’ of the software can help or hinder the teacher in what they are trying to do” (Pedagogy, 2010, p. 1). Therefore linking learner needs, pedagogy and technology is a challenge educators need to resolve to order to create effective online learning environments (Kim & Bonk, 2006).

#### *Learner needs: 21st century learning*

To thrive in our emerging global society, learners will need expert thinking and complex communication skills (NETS for students, 2007). Just as the industrial revolution radically changed the education system in the 19<sup>th</sup> century the current knowledge revolution is starting to have a profound impact on the way we learn. People want more control over where they learn, what they learn and how they learn and more opportunities to interact with their peers and other supports (Collins & Halverson, 2009). But, emerging research indicates that many students lack the required skills for independent learning (Lombardi, 2007).

### *Pedagogy: Constructivist learning theories*

Constructivist learning theories are based on the premise that knowledge is constructed in the mind of the learner (Bodner, 1986) and that learning happens best when students are active participants in the learning process. Constructivists believe learning is strengthened, deepened, and made more effective when it is social, engaging, relevant to students, and offers learners multiple paths (M. Brown, 2007).

Situated learning theorists believe learning is a process of enculturation and argue that knowledge is “a product of the activity and situations in which they are produced” (J. S. Brown, Collins, & Duguid, 1989, p. 33). They define authentic activities as “the ordinary practices of the culture” (p. 34) and believe that learners need to experience the activities and culture of the community in order to build an implicit understanding of how to act effectively within the community.

Authentic learning is founded on the theory of situated learning and is a process involving the dynamic interactions between the learner, the task and the environment (Herrington, 1997). Authentic tasks that encourage and support student engagement and immersion in a cognitive real environment can facilitate self-directed and independent learning (Herrington, 2006), encourage confidence, and cultivate “portable skills” such as judgement, patience, synthetic ability and flexibility that most learners have difficulty in grasping (Lombardi, 2007).

Emerging cognitive research indicates authentic learning principles align with “the way the human mind turns information into useful, transferable knowledge” (Lombardi, 2007, p. 7). Contemporary society uses the Internet to perform all kinds of knowledge based activities in their everyday life (Allen, 2009) and many researchers believe that authentic tasks supported by the affordances of new technologies that enable people to communicate and collaborate have the potential to improve student engagement and knowledge construction (Carmean & Haefner, 2002; Herrington, Reeves, & Oliver, 2006; Lombardi, 2007).

### *Technology*

E-learning developers and researchers suggest Web 2.0 technologies have the potential to revolutionise the education sector moving it from a hierarchical teaching approach to a more networked approach (Allen & Long, 2009; Kop, 2008) but in order to take advantage of the affordances of the Internet, higher education needs to provide learners’ with easy access to the wealth of knowledge and sophisticated tools already available to society (Allen & Long, 2009).

The major challenge for instructional designers and practitioners for implementing authentic online learning is aligning the critical components of authentic tasks with effective learning principles (Herrington, et al., 2006). Other challenges are: determining how authentic learning theories and characteristics can be implemented effectively within rigid learning management systems (Agostinho, Meek, & Herrington, 2005; Carmean & Haefner, 2002), and how to provide support to teachers to assist them to use and implement new technologies (Oliver, 2005).

Maor (1999) suggests teachers need to experience new learning environments as learners themselves in order to implement changes to their teaching approach. Therefore online professional development programs that assist practitioners to learn and use pedagogically sound technology could reduce the tension between pedagogy and technology and improve the quality of online learning (Maor, 2006).

**Practitioner experiences:** Design research emphasises the knowledge of practitioners and seeks to use their insights in the design of the research and potential solutions to educational problems. Face to face informal discussions with peers revealed that professional development plays an important role in encouraging the use of constructivist e-learning approaches.

Other key issues that emerged from the practitioner discussions were: the need to respond to student demand for quality online learning experiences; the importance of providing ready access to discussion opportunities and forums; the need to provide more flexible learning options for students, difficulties with educating students to take more responsibilities for their learning, constrictions

imposed by the LMS, lack of recognition for providing quality online teaching, lack of time to learn about new technologies, interface design principles, and online pedagogies.

All practitioners agreed that the quality of the online discussions were better than face-to-face in-class discussions and that one of the most valuable methods for teacher learning was peer networking.

The literature review and informal peer discussions suggest an authentic learning framework that incorporates the affordances of new technologies has the potential to create rich online learning environments that foster deeper student learning and engagement.

**Research question:** How can an authentic learning framework be implemented within a learning management system (LMS) to provide effective and sustainable online learning experiences for higher education students?

**Secondary questions** will contribute to the investigation of the primary question:

1. How effective is an authentic learning framework for designing and delivering e-learning courses using a learning management system (LMS)?
2. How important to participants is each of the critical components of authentic e-learning for effective learning within an online environment?
3. What support do practitioners feel are most important for using and implementing new technologies?

## **Phase 2 – Design and develop potential solution**

Phase 2 of the design research approach focuses on designing and developing solutions to the problem. During this phase a more targeted literature review will be conducted. Relevant theories, design principles and existing frameworks will be explored in depth to develop a framework for the course design (Herrington, et al., 2010).

**One possible solution** for improving the quality of online learning in higher education—that will be tested in the proposed research—is to create an online professional development course based on an authentic learning framework where practitioners can experience online learning via a learning management system from a student’s perspective, learn how to use an authentic learning framework for designing and implementing their own authentic learning courses and have the opportunity to network with their peers.

**The following guidelines derived from phase one will inform the course design:**

1. Select existing design principles that can be used to guide the design of an authentic online course for delivering a sustainable and effective professional development for higher educational practitioners.
2. Develop online pedagogies that are appropriate to achieve the desired learning outcomes.
3. Choose technologies to support online communication and collaboration.
4. Choose technologies that can be used as cognitive tools by students to demonstrate their learning.

Existing online learning design principles, frameworks, pedagogies and technologies are currently being explored. Pre-service teachers participating in two authentic online courses have been surveyed about their learning experience and use of technologies such as: LMS discussion forums, Skype, Diigo, and Google Docs to determine the most effective tools for communicating, collaborating and creating in an online environment. Data obtained will be used to guide the course design and results will be published in future papers once the final analysis has been completed.

## **Phase 3 – Implement and evaluate**

In Phase 3, the course developed in Phase 2 as a potential solution to the problem will be implemented and evaluated twice to determine the effectiveness of the framework. It is in this phase that data is collected and analysed. Four major issues identified by Reeves and Hedberg (2003) will be used to

guide the evaluation design: anticipated evaluation decisions, the questions that need answering in order to make the decisions, the information needed to answer the questions and data collection instruments required to obtain the information.

The iterative implementations and evaluations will endeavour to answer the secondary research questions:

1. How effective is an authentic learning framework for designing and delivering e-learning courses using a learning management system (LMS)?
2. How important to participants is each of the critical components of authentic e-learning for effective learning within an online environment?
3. What support do practitioners feel are most important for using and implementing new technologies?

#### **Phase 4 – Reflect and report**

Phase 4 of the study is where the researcher will reflect on the entire project and disseminate information to the broader educational community. The culmination of this work will be the final learning design principles comprising guidelines for the design of effective e-learning environments in higher education.

#### **Conclusion**

Conducting research at a practitioner level where teachers are immersed in the theoretical environment they are learning about has the potential to change existing online teaching practises using a bottom up approach (Oliver, 2005). Design-based research contributes substantially to such change through the publication of principles and guidelines for other educators in similar situations. The processes and results of this study are expected to contribute to knowledge about the effectiveness and sustainability of authentic e-learning approaches.

#### **References**

- Agostinho, S., Meek, J., & Herrington, J. (2005). Design methodology for the implementation and evaluation of a scenario-based online learning environment. *Journal of Interactive Learning Research*, 16(3), 229-242.
- Allen, M. (2009). Improving student outcomes using Web 2.0 concepts and a knowledge-networking approach Retrieved May 2010, from Link - ALTC Fellowship Learning in Networks of Knowledge website <http://altc-link.wikidot.com/start-project>
- Allen, M., & Long, J. (2009). *Learning as knowledge networking: conceptual foundations for revised uses of the Internet in higher education*. Australian Learning and Teaching Council.
- Bodner, G. M. (1986). Constructivism: A theory of knowledge. *Journal of Chemical Education*, 63, 873-878.
- Brown, J. S., Collins, A., & Duguid, P. (1989). Situated cognition and the culture of learning. *Educational Researcher*, 18(32), 11. doi: 10.3102/0013189X018001032
- Brown, M. (2007). Mashing up the once and future CMS. *EDUCAUSE Review*, 42(2), 8-9.
- Carmean, C., & Haefner, J. (2002). Mind over matter: Transforming course management systems into effective learning environments. *Educause Review*, 37(6), 27-34.
- Collins, A., & Halverson, R. (2009). *Rethinking education in the age of digital technology*. New York: Teachers College Press.
- Herrington, J. (1997). *Authentic learning in interactive multimedia environments*. Doctor of Philosophy, Edith Cowan University, Perth, Western Australia.
- Herrington, J. (2006). Authentic e-learning in higher education: Design principles for authentic learning environments and tasks. In T. Reeves & S. Yamashita (Eds.),

- Proceedings of World Conference on E-Learning in Corporate, Government, Healthcare, and Higher Education 2006* (pp. 3164-3173). Chesapeake, VA: AACE.
- Herrington, J., Reeves, T., & Oliver, R. (2006). Authentic tasks online: A synergy among learner, task, and technology. *Distance Education*, 27(2), 233-247.
- Herrington, J., Reeves, T. C., & Oliver, R. (2010). *A guide to authentic e-learning*. New York: Routledge.
- Kelly, A. E. (2004). Design research in education: Yes, but is it methodological? *Journal of the Learning Sciences*, 13(1), 115-128.
- Kim, K.-J., & Bonk, C. J. (2006). The future of online teaching and learning in higher education: The survey says... *EDUCAUSE Quarterly Magazine*, 29(4), 22-30.
- Kop, R. (2008). *Web 2.0 technologies: Disruptive or liberating for adult education?* Paper presented at the Adult Education Research Conference 2008, St. Louis, Missouri. <http://www.adulterc.org/Proceedings/2008/Proceedings/Kop.pdf>
- Lombardi, M. M. (2007). Authentic learning for the 21st Century: An overview: ELI White Papers, EDUCAUSE Learning Initiative.
- Maor, D. (1999). Teachers-as-learners: The role of multimedia professional development program in changing classroom practice. *Australian Science Teachers Journal*, 45(3).
- Maor, D. (2003). Teacher's and students' perspectives on on-line learning in a social constructivist learning environment *Technology, Pedagogy and Education*, 12(2), 201-218.
- Maor, D. (2006). Using reflective diagrams in professional development with university lecturers: A developmental tool in online teaching. *The Internet and Higher Education*, 9(2), 133-145.
- Maor, D., & Volet, S. (2007). Interactivity in professional online learning: A review of research based studies. *Australasian Journal of Educational Technology*, 23(2), 269-290.
- Miller, T. W. (2000). Marketing research and the information industry Retrieved 22/09/2010, from [http://59.72.0.99:8000/yuhongyan\\_jpk/uploadfile/200701/20070114143106970.pdf](http://59.72.0.99:8000/yuhongyan_jpk/uploadfile/200701/20070114143106970.pdf)
- NETS for students. (2007) Retrieved August 11, 2010, from international society for technology in education, (iste) website: [http://www.iste.org/Content/NavigationMenu/NETS/ForStudents/NETS\\_for\\_Students.htm](http://www.iste.org/Content/NavigationMenu/NETS/ForStudents/NETS_for_Students.htm)
- Oliver, R. (2005). Ten more years of educational technologies in education: How far have we travelled? *Australian Educational Computing*, 20(1), 18-23.
- Pedagogy. (2010) Retrieved June 2010, from Moodle.org website <http://docs.moodle.org/en/Pedagogy>
- Reeves, T. C. (2006). Design research from a technology perspective. In J. van den Akker (Ed.), *Design methodology and developmental research in education and training*. The Netherlands: Kluwer.
- Reeves, T. C., & Hedberg, J. G. (2003). *Interactive learning systems evaluation*. Englewood Cliffs, NJ: Educational Technology Publications.
- Reeves, T. C., Herrington, J., & Oliver, R. (2002). *Authentic activities and online learning*. Paper presented at the Research and Development in Higher Education: Quality Conversations: 25th HERDSA Annual Conference, Perth, Western Australia. <http://www.herdsa.org.au/wp-content/uploads/conference/2002/papers/Reeves.pdf>
- van den Akker, J. (2006). Principles and methods of development research. In J. van den Akker, K. Gravemeijer, S. McKenney & N. Nieveen (Eds.), *Educational design research*. Abingdon, Oxon: Routledge.

