

# Revisiting the Link between Teaching and Learning Research and Practice: Authentic Learning and Design-Based Research

Jan Herrington

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**Abstract** — It has often been argued that research in teaching and learning has only a weak link to practice. Much educational research is criticised for having little relevance to the day-to-day learning experience of students in K-12 and higher education. This criticism is particularly relevant in relation to educational technology research. In this field, many researchers conduct studies that are designed to test the effectiveness of the delivery medium—to prove that one medium is better than another—rather than exploring ways to improve instructional approaches and tasks. With the current proliferation of exciting and innovative technologies that are likely to become more and more common in classrooms (such as cell phones, tablets, and other mobile devices), research needs to move beyond simple comparisons of these devices with each other or with the ‘traditional’ approach. In this presentation, I argue that educational technology research has largely failed to change educational practice and outcomes because of the predominant aim of such research to *prove* rather than *improve*. Online and mobile technologies afford the design and creation of truly innovative authentic learning designs, where the technology is both a *tool* and a *platform* for presentation of genuine products, and the focus is on learning *with* technologies rather than *from* them. Instead of comparative research, a more powerful and appropriate approach is design-based research, where researchers and practitioners work hand in hand to iteratively refine innovations until they get the results they seek. A description of the characteristics of design-based research is given, together with an argument for the more widespread adoption of this approach to enhance the quality and impact of research in teaching and learning

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## 1 AUTHENTIC LEARNING AND NEW TECHNOLOGIES

Researching the proliferation of new technologies that are used more and more in classrooms is often confined to studies that assess the merits and affordances of the devices themselves. This leads to a tendency to conduct comparative studies that seek to determine whether online learning is better than face to face, for example, or whether video-conferencing of lectures works better than audio alone, and so forth. In my presentation, I argue that such research is ultimately futile, as it does not seek to understand how and why instruction works with these technologies, only *that* it works. For example, Reeves [1] found that such comparison studies are often flawed by problems such as specification error, lack of linkage to theoretical foundations, inadequate literature reviews, poor treatment implementation, major measurement flaws,

inconsequential learning outcomes for research participants, inadequate sample sizes, inaccurate statistical analyses, and meaningless discussions of results. The results of such media comparison research studies have usually reported ‘no significant differences’ [2].

A better approach is to focus on a pedagogical model that is not purely dependant on the delivery aspects of technologies, but where they are used as ‘cognitive tools’ [3], [4], principally by the students to create realistic products of learning, rather than the teacher to deliver content. One such approach is authentic learning [5], where learning environments are created to reflect real-world contexts with active roles for students. The framework of authentic learning [5:19-40] is based on the proposal that useable knowledge is best gained in learning settings that feature the following characteristics:

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▪ J. Herrington is with School of Education, Murdoch University, Australia.

1. *An authentic context that reflects the way the knowledge will be used in real life*

In designing technology-based learning environments with authentic contexts, it is not enough to simply provide suitable examples from real-world situations to illustrate the concept or issue being taught. The context needs to be all-embracing, to provide the purpose and motivation for learning, and to provide a sustained and complex learning environment that can be explored at length (e.g., Brown, Collins, & Duguid [6]).

2. *Authentic tasks*

The course needs to provide ill-defined tasks that have real-world relevance, and which present a single complex task to be completed over a sustained period of time, rather than a series of shorter disconnected examples [6], [7].

3. *Access to expert performances and the modelling of processes*

In order to provide expert performances, the learning environment needs to provide access to expert thinking and the modelling of processes, access to learners in various levels of expertise, and access to the social periphery or the observation of real-life episodes as they occur [6], [8], [9].

4. *Multiple roles and perspectives*

In order for students to be able to investigate a problem or task from more than a single perspective, it is important to enable and encourage students to explore different perspectives on the topics from various points of view, and to 'criss cross' the learning environment repeatedly [10], [11].

5. *Collaborative construction of knowledge*

The opportunity for users to collaborate is an important design element, particularly for students who may be learning at a distance. Tasks need to be addressed to a group rather than an individual, and appropriate means of communication need to be established. Collaboration can be encouraged through appropriate tasks and communication technology (such as discussion forums, chats, wikis, etc.) (e.g., Brown, et al. [6]; Collins, et al. [8]; Hooper [12]).

6. *Reflection*

In order to provide opportunities for students to reflect on their learning, the learning environment needs to provide an authentic context and task, as described earlier, to enable meaningful reflection. It also needs to provide non linear organisation to enable students to readily return to any element of the site if desired, and the opportunity for learners to compare themselves with experts and other learners in varying stages of accomplishment (e.g., Boud, Keogh, & Walker [13]; Kemmis [14]).

7. *Articulation*

In order to produce an e-learning course capable of providing opportunities for articulation, the tasks need to incorporate inherent—as opposed to constructed—opportunities to articulate, collaborative groups to enable articulation, and the public presentation of argument to enable defence of a position [9].

8. *Coaching and scaffolding*

In order to accommodate a coaching and scaffolding role principally by the teacher (but also by other students), the learning environment needs to provide the opportunity for more able partners to assist with scaffolding and coaching, as well as the means for the teacher to support learning via appropriate communication technologies [15].

9. *Authentic assessment*

In order to provide integrated and authentic assessment of student learning, the design should include: the opportunity for students to be effective performers with acquired knowledge, and to craft polished, performances or products in collaboration with others. It also requires the assessment to be seamlessly integrated with the activity, and to provide appropriate criteria for scoring varied products (e.g., Bain [16]; Linn, Baker, & Dunbar [17]; Wiggins [18]).

While such authentic approaches are intuitively appealing, the approach is often misinterpreted. Many educators begin with the belief that to be authentic, such learning opportunities must be real [19]. Our research has provided principles to guide the development of realistic and complex online learning environments that are not real but *cognitively real*, that is, they provide opportunities to think and act as an expert

would [20], [21], [22], and are much more readily implemented in education classes [23].

Authentic learning is appealing as a pedagogical approach on five counts:

1. Authentic learning situates knowledge in realistic work-related contexts, thereby preparing learners for the activities of a professional working life;
2. Realistic tasks cognitively challenge learners to solve problems and think in the same ways as professionals working in real world contexts;
3. Complex tasks require the creation of real products and artefacts, and are more worthy of the investment of time and effort than decontextualised tasks.
4. Technology-based cognitive tools (such as computer software and mobile devices) can be used both in the processes and products of the online learning environment.
5. Innovative learning environments created are readily researched in real classrooms using design-based research.

## 2 RESEARCHING AUTHENTIC LEARNING ENVIRONMENTS WITH DESIGN-BASED RESEARCH

There is a need for ongoing research in authentic learning to provide guidelines across a range of discipline areas and contexts in education. Design-based research (also known as design research, design experiments and formative research) provides a useful approach because of its emphasis on realistic contexts and practitioner involvement, as well as its focus on iterative cycles of improvement. Van den Akker [24] provided a useful definition of design-based research:

*More than most other research approaches, [design-based] research aims at making both practical and scientific contributions. In the search for innovative 'solutions' for educational problems, interaction with practitioners...is essential. The ultimate aim is not to test*

*whether theory, when applied to practice, is a good predictor of events. The interrelation between theory and practice is more complex and dynamic: is it possible to create a practical and effective intervention for an existing problem or intended change in the real world? ... An iterative process of 'successive approximation' or 'evolutionary prototyping' of the 'ideal' intervention is desirable. Direct application of theory is not sufficient to solve those complicated problems. [24:8-9]*

The theoretical foundations are crucial to the design of solutions. Cobb, Confrey, diSessa, Lehrer and Shauble [25] said 'the theory must do real work' (p. 10). Theory informing practice is at the heart of the approach, and the creation of design principles and guidelines enables research outcomes to be transformed into educational practice. Design research:

- focuses on broad-based, complex problems critical to education,
- involves intensive collaboration among researchers and practitioners,
- integrates known and hypothetical design principles with technological affordances to render plausible solutions to these complex problems,
- conducts rigorous and reflective inquiry to test and refine innovative learning designs as well as to reveal new design principles,
- requires long-term engagement that allows for continual refinement of protocols and questions, and
- maintains a commitment to theory construction and explanation while solving real-world problems [5:176].

Design-based research can be a lengthy process but it is logical and very rewarding to implement. Reeves [26] proposed that it can be viewed as four connected phases (Figure 1).

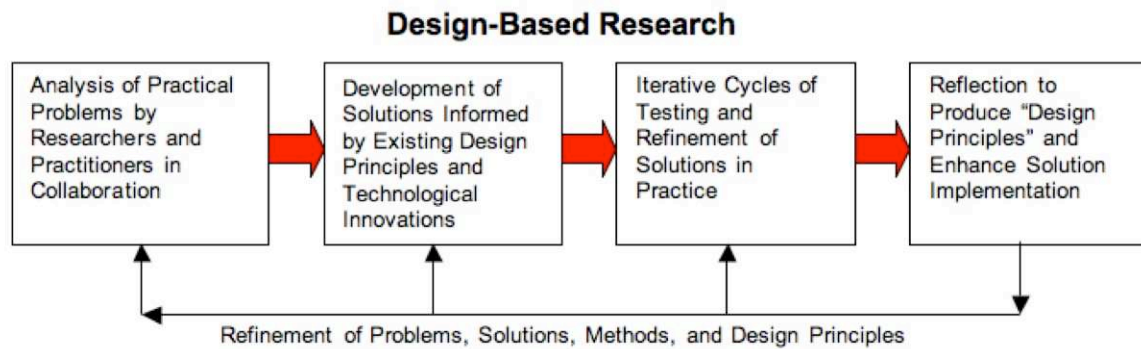


Fig. 1. Four phases of design research [26:59].

Design-based research offers a means towards more significant and socially responsible research. It requires that researchers in education explore significant educational problems, rather than conduct research for its own sake, emphasizing content and pedagogy rather than technology. It requires the teacher/researcher to continually modify the learning design until the pedagogical outcome is reached, and to reflect on the process to reveal design principles that can inform other teachers and researchers, and future development projects (Herrington, et al., 2010).

Using pedagogical models such as authentic learning, together with research approaches such as design-based research, the strong link between research and practice can arguably be restored in education, and impact the quality of teaching and learning throughout educational sectors.

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A website to accompany this presentation (with links and downloadable papers) can be found at: <http://web.me.com/janherrington/IASK2010/>.



**Jan Herrington** is a Professor of Education at Murdoch University in Perth, Western Australia. The last 20 years of her professional life have been devoted to the promotion and support of the effective use of educational technologies in learning in schools and universities.

Jan's work involves research and teaching in the undergraduate and post-graduate programs in the School of Education and her current research focuses on authentic learning, the design of effective Web-based learning environments in higher education, and the use of authentic tasks as a central focus for Web-based delivery of courses. She is also researching in other ICT-related areas such as: computer games in early childhood, authentic learning in museums, design-based research and mobile learning. Jan has published over 130 refereed journal articles, conference papers and chapters, and co-written several books including *A Guide to Authentic e-Learning* (2009) and the online co-edited book on mobile learning *New Technologies, New Pedagogies* (2008). She was a Fulbright Scholar in 2002 at the University of Georgia, USA, and has won many awards for her research including the Association for Educational Communication and Technology (AECT) Young Researcher of the Year Award, and several Outstanding Paper awards at international conferences, most recently at EdMedia in 2008.

