Expanding Approaches for Research: Design Research

By Norman A. Stahl, James R. King, and Jodi P. Lampi

ABSTRACT: In this second column regarding research approaches, we continue our discussion of qualitative and quantitative research focusing on the specializations of developmental education, learning assistance, and student success. Whereas the previous column discussed mixed methods as an underutilized method, similarly, design research has the potential to promote impactful reform or innovation. With the current trends in the fields regarding higher education reform, we use this foundational discussion on design research as an introduction to its use and purpose, as well as a means of encouragement to build research teams between practitioners and researchers and publish promising practices and reforms by our own.

It is not uncommon to hear a practitioner say researchers do not understand the realities of the everyday world of the classroom and that much of the tightly controlled research presented in journals cannot be easily incorporated into the classroom routine. This is a problem endemic to the field. Still, there may be an answer to such a quandary. In this issue of Journal of Developmental Education we focus on design research or design-based research, also known as formative experiments, design experiments, and Japanese lesson studies. Design-based research (DBR) often employs qualitative methods, or mixed-methods approaches (see Stahl, Lampi, & King, 2019), and it has great potential for both improving instruction and generating theory for practitioner-oriented fields such as developmental education and learning assistance. Although design-based research directly results in praxis, or research results that incorporate practice, it remains an underutilized research method in the fields of particular interest. Specifically, design-based research studies have been largely absent from related journals and the programs for the fields' conferences.

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Although design-oriented research has historical roots in fields such engineering, artificial intelligence, and aeronautical sciences, it essentially crossed the borders into educational research with the seminal works by Brown (1992) and Collins (1992). These researchers, as well as others, were not satisfied with conventional research designs as a mechanism for classroom research. When Brown discussed her personal movement from a focus on strictly controlled laboratory experiments to design research she stated, "As a design scientist in my field, I attempt to engineer innovative educational environments and simultaneously conduct experimental studies of those innovations" (p.141). Brown came to understand, in part through her pioneering work with metacognition, that classroom instructional research was "messy" as it included hundreds of variables impacting the learning situation on a daily if not hourly basis. Therefore, active classrooms were not the proper environments for controlled experiments. The control of impactful and often unknown variables in such a complex system was quite impossible.

If one carefully considers Brown's position, it becomes clear how easily this situation transfers to doing research and even evaluation in classrooms where professionals teach composition, college reading and learning strategies, and basic mathematics. It applies as well in the various learning assistance services whether these be tutoring, supplemental education, focused workshops, and so forth.

What, then, is design-based research? An early look at the possibilities provided by design-based research was put forth by the Design-Based Research Collective (DBRC, 2003). The DBRC proposed that design-based research provides: (a) a mechanism for exploring the possibilities for novel learning and teaching environments, (b) development contextualized theories of learning and teaching, (c) construction of design knowledge, and (d) greater human capacity for innovation. In an era of reform in higher education and particularly across practitioner-oriented fields, these four constructs proposed by the DBRC can and should be the bedrock operation for any redesign of curriculum, instruction, or academic support service. Design research can provide a systematic implementation of proposed curriculum with data that reports on its effectiveness. Furthermore, the four provisions of design research serve as guidelines for examining and then potentially revising widely adopted innovations such as corequisite classes, IRW programs, and Integrated Education and Training focused instruction. Useful discussions of foundational frameworks for the method can be found in models from Brown (1992) and Newman (1992) as well as explicit frameworks authored by Reigeluth and Frick (1999), Gravemeijer and Cobb (2006), Bannan-Ritland (2003), and Bradley and Reinking (2011).

Anderson and Shattuck (2012) have provided a useful organizational scheme and detailed discussion of six parameters for a quality design-based research investigation:

1. The study is situated in a real educational context so as to measure, inform, and improve practice within that context (if not others).
2. The purpose is to design and then test a significant intervention (e.g., activity, classroom assessment, technology) crafted by the researcher and/or the practitioner(s) with the goal of overcoming a localized problem or creating an improvement in the local context.
3. The choice of methods typically involves a mixed-research approach utilizing a range of research techniques and tools.
4. The process is undertaken in an authentic context requiring multiple iterations through steps of testing the prototype, refinement/improvement, and continuous evolvement.
5. The model calls for a collaborative partnership between researchers and practitioners through ongoing negotiations on the identification of the problem, the literature review, the design and development of the intervention, the implementation of the intervention, the assessment of the product, and the creation and publication of theoretical and design principles working together through what could be multiple iterations of the steps.
6. Designs evolve from and lead to contextualized principles or grounded theories that promote an understanding the context and the intervention.

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A recent publication by Easterday, Lewis, and Gerber (2014) posited that there is no accepted or encompassing definition for the design-based research process or product at the same level of specificity as found for experimental design or grounded theory. Given this premise, these authors posited that there is uncertainty about the design-based research process as it tends to differ depending upon who conducts the research. Necessarily, then, those employing the method must be clear in defining the various phases of the research. Exemplar models of design-based research processes include the integrative learning design framework (ILDF) with its phases of exploration, enactment, local impact evaluation, and broader impact evaluation (Bannan, 2007); the Instructional Systems Design (Dick, Carey, & Carey, 2008); and ADDIE (analysis, design, development, implementation, evaluation; Molenda, 2003). Easterday, Lewis, and Gerber (2014) do provide their own formal definition of the design-based research process consisting of six iterative phases: (a) focusing with the identification of the audience, topic, and scope of the project; (b) understanding where the researchers study the learners, the domains, the contexts, and existing solutions; (c) defining which goals and assessments are delineated; (d) conceiving the plan for reaching a solution; (e) building where to implement the planned solution; and (f) testing the efficacy and effectiveness of the solution, often successively (also see Anderson & Shattuck, 2012; Barab & Squire, 2004).

In agreement with Easterly et al. (2014), Reinking and Bradley (2008), in their useful text for anyone wishing to undertake such a study, stated that there is no single, agreed-upon methodological framework for conceptualizing, planning, conducting, and reporting formative and design experiments. Yet, they do provide a practitioner friendly description of the process, one that they noted is essentially a more systematic and intense data-driven approach to undertaking what is done in the classroom (and we would include the LAC as well). Reinking and Bradley suggest: (a) setting educational goals, (b) taking instructional actions to achieve the chosen goals, (c) determining what approaches promote or hinder the achievement of the goals, (d) making appropriate adjustments in the curriculum and the instruction, and then (e) reflecting upon what has been accomplished through the process (p. 3). We can see a commonality with the design-based approach in that design-based research allows the researcher and the practitioner to determine jointly how an instructional approach, grounded in theory, can be implemented successfully in a real-world setting and to determining the factors that support or hinder the intervention's effectiveness, efficiency, and appeal and then modify the approach and the underlying theory. The outcome: Researchers and practitioners together achieve the greater pedagogical good at the local level and possibly add to theoretical knowledge.

A single individual would be most unlikely to use such a method to its full potential.

Undertaking design-based research requires concerted and persistent effort, as the method requires a mindset that allows for iterative cycling across the model where it can seem that the process might never end. Furthermore, the strength of and synergy from the design-based research process arises from a cooperative and productive partnership between the researcher(s) and practitioner(s) that must be nurtured throughout the duration of the research. Academic needs may take second seat to pragmatics.

Conclusion

Since design-based research utilizes a range of research methods and likely pedagogical competencies, the team approach is imperative; therefore, a single individual would be most unlikely to use such a method to its full potential. Furthermore, with the research arm of the work, many of the cautions put forward for those undertaking mixed research apply here: the selection of methodologies will cross many borders particularly as they are used to promote forms of objectivity, reliability, and validity.

As was stated, this approach to inquiry has yet to appear in the primary journals for practitioner-oriented fields. Still readers may learn much about the approach by reading exemplar texts that have focused of other avenues of education such as exemplar works by Fisher, Frey, and Lapp (2009), Hall (2016), Howell, Butler, and Reinking (2017), Ivey and Johnston (2013), and Reinking and Watkins (2000).

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