Asynchronous Discussion Activities and Design-Based Research: An Annotated Bibliography

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Abstract

This annotated bibliography explores the existing body of design-based research related to asynchronous discussion activities. This literature review was conducted to inform the design of a future design-based research study on the instructional design of asynchronous, artifact-based discussion activities in 100 percent online courses. This review also serves to increase the depth of the author’s knowledge of design-based research as an approach to conducting exploratory research. Articles were chosen for their relevance to the topic or their potential as exemplars for documenting a design-based research study for publication. A selection of three methodological chapters and five empirical articles are analyzed for their contributions to the design of a future study.

*Keywords*: asynchronous discussion, design-based research, online education

INTRODUCTION

In this annotated bibliography, I focused my reviews on articles that offered promising insights into how I could organize my own design-based research study. For my own research, I hope to propose an educational design research project that explores how an online art studio environment can improve the studio-based learning experience for undergraduate distance learners. This area of focus helped me choose methodological chapters and empirical articles that I felt would support my endeavor by either contributing substantial tools to the design-based research community, or empirical articles that documented studies of phenomena that could potentially appear in my own study.

I chose methodological chapters to review with the intention of broadening my own understanding of design-based research as a field. I specifically examined my selections for the authors’ contributions towards the rigor and acceptance of design-based research in the research community. I also chose works that offered in-depth analyses of existing design-based research projects so that I could learn from these examples about how to prepare my own study. I was also interested in learning about investigators’ reasons for the design choices they made and the strategies they followed while conducting their research.

When choosing empirical studies, I looked for articles that would help me achieve the following:

1. Provide proof of concept for methods that could be applicable to my own study
2. Examine phenomena I may encounter when conducting my study
3. Support or offer foundational knowledge for what I hope to accomplish

As I set out to review the articles I had chosen, I used some guiding questions to align my analysis of each empirical study.

1. What interventions or theories did the researchers investigate?
2. How did the authors describe their design-based research for publication?
3. Do these studies highlight a clear gap in the study of asynchronous discussion activities?

As I reflect on the articles and chapters I included here, I believe I was successful in adding to my understanding of design-based research as an approach. The empirical examples I discovered have helped me shape the kind of project I hope to complete.

PART 1: METHODOLOGICAL CHAPTERS/ARTICLES

1. Bannan-Ritland, B. & Baek, J. Investigating the Act of Design in Design Research: The Road Taken. In Kelly, A. E., Lesh, R. A., & Baek, J. Y. (Eds.), *Handbook of design research methods in education: Innovations in science, technology, engineering, and mathematics learning and teaching* (pp. 299-319). London; New York: Routledge.

Bannan-Ritland & Baek focus their chapter on the design process in design research in response to the “lack of agreement on the processes and procedures” (p. 300) in design research methodology. Specifically, they aim to communicate how decisions made throughout the research process are influenced not only by the complex environments the research takes place within, but also by the people conducting the research. Through this analysis, they also hoped to uncover general themes regarding designing and carrying out this type of study that may help move the field toward agreement on processes and procedures (p. 300). In their chapter, the authors conduct a retrospective analysis of the processes and procedures used in their design research case of the LiteracyAccess Online (LAO) project to augment the discussion.

The authors proposed two broad themes based on their analysis, the first being “decision-evaluative spaces, problem states, and design moves” (p. 315). Bannan-Ritland & Baek introduced the concept of “problem states” (p. 314) based on research by Doblin (1987), and surmise that as an investigation moves through these various problem states, each could require different methods, analysis, and overall treatment. They suggest that identifying these problem states and the conditions of each in comparison with the design decisions or moves at those points could be one way to evaluate design researchers’ processes.

The second theme presented was “design is an interpretive, social, and multidimensional process” (p. 315). In this section, the authors highlight that framing a research problem is an act of “interpretation and social negotiation” (p. 315), particularly when the research involves a team, which then impacts design decisions from the very beginning ahead of other issues related to the setting in which the study is conducted. A useful takeaway from this discussion is that it is helpful to identify and document the perspectives of the research team when framing the research problem.

Ultimately, the authors conclude that design research is an immensely complex, multi-tiered process with many layers, and each of those layers is an opportunity for justification of design choices (p. 317). Design decisions are not just influenced by the conjectures driving the study, but also by practical factors regarding the setting and the interpretations of those carrying out the research. They advise that it is just as important to recognize the reasons behind choices that were made as it is to communicate reasons for the choices that were not selected in order to produce a valid research output.

2. Ejersbo, L. (2008). Balancing Product Design and Theoretical Insights. In Kelly, A. E., Lesh, R. A., & Baek, J. Y. (Eds.), *Handbook of design research methods in education: Innovations in science, technology, engineering, and mathematics learning and teaching* (pp. 149-163). London; New York: Routledge.

Ejersbo et al. state that often in the design research process, an “unbalance” (p. 149) can occur which results in a focus that leans too heavily on the design process or the theory development aspects of the research. The authors introduce their model for balancing the two sides of the design research process, which they call the “Osmotic” model (p. 149), and utilize three cases of design research to illustrate a design process or “product” (p. 150) emphasis project, a theory emphasis project, and a project that aimed to strike that balance. As each case is discussed, the authors map where that case lies in their model. In addition to understanding the differences based on the model, readers can identify specific elements that either help or hurt the balance between product design and theory development by comparing structures and qualities of the situations surrounding each case.

One of the key takeaways from this chapter is that those “environmental factors” (p. 159) are going to have the largest impact on study design, and as a result, the biggest impact on whether the study tilts toward product design or theory development. Ejersbo et al. conclude that researchers ultimately need to be “pragmatic” (p. 159) when considering the choices they make regarding what is and is not feasible to do in a given study.

The authors also point out that while theory development is important, they would like to see design research outputs as “deployable artifacts” that at some point made available to “the open market” (p. 160) and argue that such a shift would make a positive impact on design research as a methodology. They identify two main outcomes from such a shift. The first is that the research result would be available to a wider audience, and the second is improved communication “throughout the entire research process” (p. 160). When positing how to introduce one’s outputs to a wider audience, the authors recommend scalability, replicability, and sustainability as important to consider in the research design as well (p. 161).

3. Sandoval, W. A. (2004). Developing learning theory by refining conjectures embodied in educational designs. *Educational Psychologist, 39*(4), 213-223. doi:10.1207/s15326985ep3904\_3

Designed learning environments embody conjectures about learning and instruction, and the empirical study of learning environments allows such conjectures to be refined over time. The construct of embodied conjecture is introduced as a way to demonstrate the theoretical nature of learning environment design and to frame methodological issues in studying such conjectures. An example of embodied conjecture and its history of empirical refinement are presented to provide a concrete example of how the effort to design instructional change can lead to a productive shift in view of the underlying learning issues at hand. This example is used to suggest some general features of embodied conjectures and to raise methodological issues for refining them. (p. 213)

In this article, Sandoval (2004) defines embodied conjectures and discusses how embodied conjectures can lead to methods that provide a blueprint for how design-based research outputs can become useful knowledge. Ultimately, Sandoval proposes that the idea of embodied conjectures illustrates that the activity of designing an instructional intervention is a theoretical task, and this lens provides a method for examining the validity of design-based research outcomes.

Sandoval argues that there are two defining features of embodied conjectures. First, they are “derived from extant knowledge of learning in particular domains” and second, refinement of conjectures can improve learning environment design as well as “potentially lead to refinements in learning theory” (2004, p. 215). Sandoval cites diSessa and Cobb’s ontological innovations (2004) as an example. The author proceeds with a narrative analysis of the conjectures that guided the BGuILE project. Conjectures were articulated after a review of literature surrounding the topic of students’ ideas about science and how experiments relate to science. First, the investigators made a theoretical conjecture, and that lead them to a design conjecture (p. 216). Then, they embodied the conjecture within the materials developed to support the learning environment design, such as the software tool (p. 217).

Sandoval highlights that the refinement of conjectures is not a traditional test in the way that hypotheses are tested in the scientific method. Instead, the goal of design-based research is typically to show that the design “is the best possible design for achieving its intended outcomes” (p. 217) and understand how the design works in the specific setting it is deployed in. It is because the design is based on those theoretical conjectures that investigators are able to discover whether the actual outcomes align with the predicted outcomes and then trace those discoveries back to the conjectures that informed the design, or alternatively, investigators may adjust the design and re-evaluate to learn whether the changes lead to the predicted outcomes. It is the series of changes and reflections on why those changes were made that leads to refinement of conjectures (p. 217).

The author then proposes the idea of mapping design conjectures to their theoretical conjectures as a methodology for addressing the criticism that design-based research lacks rigor (p. 220). Sandoval concludes that specifying conjectures from the beginning of a design-based research undertaking and then using those conjectures to guide the iterative process can lead to more accepted research practices among the educational research community (p. 222).

PART 2: EMPIRICAL ARTICLES

1. Ada, M. B. (2018). Using design-based research to develop a mobile learning framework for assessment feedback. *Research and Practice in Technology Enhanced Learning, 13*(1), 1-22. doi:10.1186/s41039-018-0070-3

Students’ lack of engagement with their assessment feedback and the lack of dialogue and communication for feedback are some of the issues that affect educational institutions. Despite the affordance that mobile technologies could bring in terms of assessment feedback, research in this area is scarce. The main obstacle for research on mobile learning assessment feedback is the lack of a cohesive and unified mobile learning framework. This paper thus presents a Mobile Learning Framework for Assessment Feedback (MLFAF), developed using a design-based research approach. The framework emerged from the observation of, and reflection upon, the different stages of a research project that investigated the use of a mobile web application for summative and formative assessment feedback. MLFAF can be used as a foundation to study the requirements when developing and implementing wide-scale mobile learning initiatives that underpin longitudinal practices, as opposed to short-term practices. The paper also provides design considerations and implementation guidelines for the use of mobile technology in assessment feedback to increase student engagement and foster dialogic feedback communication channels. (p. 1)

This article explores the ways in which design-based research was used to study and develop a framework for assessment feedback via a custom mobile learning tool. I was interested in this article because the authors note that utilizing mobile technology could result in increased student engagement with feedback and “foster dialogic feedback communication channels” (Ada 2018, p. 1), and the following research question, “what pedagogical strategies can best be deployed to enhance student engagement with their assessment feedback?” (Ada 2018, p. 6). In addition, this study describes how the research team utilized a different model of DBR to develop a mobile application, and I believe some of those insights could be relevant to my exploration of design qualities of virtual discussion environments.

The investigators set up their study around the belief that providing feedback to students enhances learning, and that mobile technology can be a valuable tool in providing easier access to feedback (Ada 2018, p. 2-3). The study follows the phases of McKenney and Reeves’ generic model for design research (Ada 2018, p. 6-7). The research team deployed their tool to a significant number of users from varied backgrounds throughout the project, with participants from nursing, business, and information technology schools of study (Ada 2018, p. 7). Throughout the cycles of the study, data was collected from students about their use of the tool, and the team also looked at what was being done within the tool to inform the refinement of their framework (Ada 2018, p. 12-14).

The authors summarized their work by providing an overview of their initial draft of a framework that resulted from literature review and interviews with students and faculty surrounding their needs. The authors then described how, through the various cycles of use, the different categories of their framework were changed or updated based on evidence collected during observations and analysis. I found this to be a very helpful way to communicate exactly how the DBR process impacted the changes the team made to the framework.

2. Chen, D., Wang, Y., & Hung, D. (2009). A journey on refining rules for online discussion: Implications for the design of learning management systems. *Journal of Interactive Learning Research, 20*(2), 157.

Research on asynchronous online discussions has primarily focused on their efficacy in relation to learning outcomes. Rarely are there investigations on how the design of online learning activities or how discussions could be incorporated into student learning experience. We contend that successful online activities need careful and meticulous design. We are particularly interested in how the design of 'rules' or protocols for group interactions contributes to the quality of student learning experience. This article reports a three-year study on designing and refining such rules for online discussions. Specifically, we studied how rules support or inhibit online discussions. Reported in the article are the processes and rationales for each refinement of the rules based on real interactions. We argue that existing learning management systems still fall short in supporting various learning activities afforded by these rules. Therefore, various tools are proposed based on our findings. These tools should be integrated into existing learning management systems such as Blackboard or Moodle. (p. 157)

The researchers in this study utilize a design research approach and provide a description of their methods citing Wang & Hannafin (2005) and the DBRC (2003). In their rationale for selecting design research methods, the authors state they were interested in the partnership aspects of designing interventions for established environments (2009, p. 159).

Across a period of three years, the researchers studied how instructional design choices (referred in the article as pedagogical design) impacted the quality of online discussions in courses they were teaching and in others. In their narrative, the authors cite research that praises discussion as a way to encourage higher-order thinking in students (p. 158), acknowledge other bodies of research that point out problems and challenges with discussion as a learning activity. Their investigation aims to test whether certain instructional design choices can “maximize the benefits” of online discussions (2009, p. 159).

This study took place in existing face-to-face courses where online discussions were already part of the course design, which is similar to the science lab case that I hope to examine in my own project. Many of the task design choices the investigators made in this study were to guard against what they term “superficial messages” (p. 162), which is an ongoing issue in the cases I am hoping to explore.

The authors included a table that summarized the various design choices and the rationale behind each, along with the resulting impact on the discussion (p. 167), which was useful for an at-a-glance look at the way the study progressed. When tested with a graduate course of 20 students, the researchers were pleased with the results of their last refinement. What I found most valuable from this article is the design suggestions for learning management systems, which I believe can be translated to the discussion environment design I hope to study, especially the suggestion to include some kind “body language system” that allows participants to react to each others’ responses without necessarily composing a reply (p. 170).

3. Johnson, C., Hill, L., Lock, J., Altowairiki, N., Ostrowski, C., Luciano da Rosa dos Santos, & Liu, Y. (2017). Using design-based research to develop meaningful online discussions in undergraduate field experience courses. *International Review of Research in Open and Distance Learning, 18*(6)

From a design perspective, the intentionality of students to engage in surface or deep learning is often experienced through prescribed activities and learning tasks. Educators understand that meaningful learning can be furthered through the structural and organizational design of the online environment that motivates the student towards task completion. However, learning engagement is unique for each student. It is dependent on both how students learn and their intentions for learning. Based on this challenge, the design of online discussions becomes a pedagogical means in developing students’ intentionality for the adoption of strategies leading to deep learning. Through a Design-Based Research (DBR) approach, iterative design of online learning components for undergraduate field experience courses were studied. For this paper, the focus of the research is on examining factors that influenced deep and surface levels of learning in online discussion forums. The results indicate that design factors (i.e., student engagement, group structures, and organization) influence the nature and degree of deep learning. From the findings, two implications for practice are shared to inform the design and scaffolding of online discussion forums to foster deep approaches to student learning. (p. 36)

I selected this article by Johnson, et al. (2017) because the investigators explored ways to encourage deep learning and engagement through asynchronous online discussion using the theoretical frameworks of learner-centered instruction and Universal Design for Learning. In their study, the authors concluded that factors such as the level of attention given to generating discussion questions, developing discussion activities via scaffolding, and asking students “probing questions” (Johnson et al. 2017, p. 50) are strategies instructors can employ to promote deeper learning through asynchronous discussion activities, which can be achieved through “purposeful planning” (2017, p. 50).

The authors cited Reeves (2000) as the source for their design-based research methodology. In this study, Johnson et al. conducted semi-structured interviews and issued online surveys to students to collect data. With instructors, they conducted semi-structured group interviews (2017, p. 42). The team also performed a content analysis of the discussion posts of both students and instructors. Henri’s (1992) Five Dimensions of Content Analysis served as a framework for the analysis of discussion content (Johnson et al. 2017, p. 40). To me, this approach seems to fit the goals and also seems appropriate when considering the framing of this study. There were ~20 students in each iteration, which each lasted four weeks, and the volume of data appears appropriate given the research problem.

The authors oversaw three iterations across a two-year period, which seems appropriate for a design-based research study. First, they provided model discussion posts that illustrated the type of responses the instructors would be looking for. In the second round, the team added “a course tour video” (Johnson et al. 2017, p. 42) to help students locate the discussion area. In the third iteration, the team supplied documentation that assisted students in creating multimedia responses, such as recording audio or video to add to their posts. While it was helpful to understand what the interventions were, there was no stated reasoning as to why the team chose these interventions based on the data analysis provided. It would seem that the authors chose instead to focus on the research’s contributions to theory instead.

4. Gašević, D., Adesope, O., Joksimović, S., & Kovanović, V. (2015). Externally-facilitated regulation scaffolding and role assignment to develop cognitive presence in asynchronous online discussions. *The Internet and Higher Education, 24*, 53-65. doi:10.1016/j.iheduc.2014.09.006

This paper describes a study that looked at the effects of different teaching presence approaches in communities of inquiry, and ways in which student–student online discussions with high levels of cognitive presence can be designed. Specifically, this paper proposes that high-levels of cognitive presence can be facilitated in online courses, based on the community of inquiry model, by building upon existing research in i) self-regulated learning through externally-facilitated regulation scaffolding and ii) computer-supported collaborative learning through role assignment. We conducted a quasi-experimental study in a fully-online course (*N* = 82) using six offerings of the course. After performing a quantitative content analysis of online discussion transcripts, a multilevel linear modeling analysis showed the significant positive effects of both externally-facilitated regulation scaffolding and role assignment on the level of cognitive presence. Specifically, the results showed that externally-facilitated regulation scaffolding had a higher effect on cognitive presence than extrinsically induced motivation through grades. The results showed the effectiveness of role assignment to facilitate a high-level of cognitive presence. More importantly, the results showed a significant effect of the interaction between externally-facilitated regulation scaffolding and role assignment on cognitive presence. The paper concludes with a discussion of practical and theoretical implications. (p. 53)

The authors ground this study in the community of inquiry model and investigate how motivation and self regulation can increase the educational outcomes of asynchronous discussion activities, and whether role assignment can increase the effectiveness of discussion (2013, p. 55). In their narrative, the researchers discuss their style of design-based research and clearly define the interventions they intend to explore (2013, p. 56). It is clear from reading the article that the research team is interested in not only testing their interventions, but also in refining and contributing back to the community of inquiry theory.

An interesting deviation from other design-based research is the way these authors attempted to match their phases of design-based research to a more traditional research method. They called their first iteration the “control” from which they established a baseline for improvement, and the following cycles the “treatment” (2013, p. 56). The researchers also utilized quantitative measurements when analyzing the data they collected, such as discussion response compositions. Their study contained 82 participants, which appears to be low in comparison to some of the other projects included here.

I believe this article contributes valuable information to the design of asynchronous discussion tasks, however, I feel that the narrative of the study is slightly less exemplary than some other articles I have read. It was unclear exactly how the results of the first iteration informed design choices for the subsequent iterations, though a lose structure resembling what we have discussed in class did exist. Ultimately, this article does provide useful information that I may utilize when designing my own study.

5. Parmaxi, A., & Zaphiris, P. (2015). Developing a framework for social technologies in learning via design-based research. *Educational Media International, 52*(1), 33-46. doi:10.1080/09523987.2015.1005424

This paper reports on the use of design-based research (DBR) for the development of a framework that grounds the use of social technologies in learning. The paper focuses on three studies which step on the learning theory of constructionism. Constructionism assumes that knowledge is better gained when students find this knowledge for themselves when engaging in the making of concrete and public artifacts. In an attempt to implement theoretically designed learning environments in real-world classrooms, DBR was employed as an overarching framework of inquiry. The three cycles of DBR inquiry provide deep insights into the use of social technologies as social constructionist tools and inform a novel framework for their use. The implementation of the framework is specified along with further implications for researchers and practitioners. (p. 33)

In addition to clearly defining what constructivism means to the investigators within this domain, the authors provide a robust overview of design-based research. They clearly articulate why they chose design-based research and are forthcoming about the challenges of this approach in their narrative (p. 36-37). Based on the methods described, their particular style of DBR was not an iterative development of one intervention, but rather, the way social technologies were utilized was the intervention across three slightly different contexts (p. 37). The investigators were focused on refining their framework of social technology use in second language learning, and because that was their stated goal, I think the application of DBR in these three related contexts makes sense. The first case the authors used had a small number of participants, but the subsequent cases had what I would consider more average numbers, with 27 and 43 participants (p. 39). The researchers did collect artifacts from the students in each cycle, which holds up their framework of constructivism. In their narrative, the authors discuss how each cycle helped them adjust or prove their framework of social technology use.

What drew me to this study was that the investigators studied students who were using social technologies to collaboratively develop artifacts for their coursework. While the domain of second language learning might not be directly related to the domain I plan to study, I hoped I could identify some takeaways from this piece about how to structure the theory aspect of a DBR study focused on a collaborative task. Overall, I think this work is a quality exemplar of what DBR can be and how it should be written about. The breakdown of the findings is well organized and clearly explains where conclusions were drawn from, and this is something I would like to strive for in my own work.