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Lessons Learned from Conducting Design-Based Research Studies

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Design-Based Research (DBR) focuses on developing key principles of interventions to advance both theory and practicalities of dissemination (Brown, 1992), yet its methodological details have not been quite established. Thus, the purpose of this paper is to address the pragmatics of DBR by sharing the researcher's reflections on conducting a longitudinal DBR project for five years. In an attempt to advance college teaching practices as well as theories related to student plagiarism, the project focused on refining "humble" theories on how and why college students engage in plagiarism to design classroom interventions for promoting academic integrity. Similar to the Integrative Learning Design (ILD) framework proposed by Bannan-Ritland (2003), but conducted in a much simpler and less formal format, this study followed DBR cycles from initial conceptualization to design and enact instructional interventions in authentic contexts while collecting both quantitative and qualitative data from each phase. Finally, the paper addresses some challenges encountered throughout the DBR project as well as the lessons learned from this experience. Like many previous DBR studies whose practical relevance is limited to local context, the findings from this study may not be easily generalized for other contexts.

Keywords: Design-Based Research (DBR), Integrative Learning Design (ILD), student plagiarism, academic integrity, higher education

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Introduction

Design-Based Research (DBR) approaches research in education by using intervention to provide insight into learning in real-world contexts (Brown, 1992; Collins, 1999). Most researchers who are actively engaged in DBR would agree with Bielaczyc (2012) that the ultimate goal of conducting DBR is to study interventions in practice, with the dual goal of progressively refining the design of an intervention itself and the theories of teaching and learning that inform the design. Such commitments to bridge a gap between education research and practice have attracted many interested researchers to the ideology of DBR but they soon encounter some serious challenges when putting the ideas into action.

The first problem is that DBR is a relatively new approach and the exact components and process of DBR are under ongoing discussion and negotiation. As a research methodology, DBR has not been fully articulated and how DBR works on a day-to-day level in various research contexts are still not clear to the level of agreement (Bielaczyc, 2012; Joseph, 2004). For those who get manage to figure out the first problem, the next huddle awaits: how do we "finance" the long, iterative design cycles which are resource-intensive and time-consuming? The "publish or perish" climate in academia puts great pressures on tenure-track faculty to produce more papers with limited time and resources. So how can we stay productive while going over the iterative 'design-and-redesign' cycles? For those who venture to conduct a DBR study for the first time, these problems can be overwhelming yet the literature does not provide much information to the level of details that they need.

Edelson (2002) and Joseph (2004) urged that we could provide more useful and rigorous guidance to articulate DBR methodology only by engaging and conducting DBR research. In the same spirit, this paper describes the ways design, research, and context interacted in one design-based trajectory and addresses the pragmatics of conducting DBR. Thus, the purpose of this paper is to address the pragmatics of

DBR by sharing the researcher's reflections on conducting a longitudinal DBR project for five years.

The Research Design & Context

With advances in information and communication technologies widely available to college students, the tremendous proliferation of student plagiarism has caused great concerns for many researchers and practitioners alike in higher education. Through online paper mills such as Happy Campus and Report World, students can easily access and download other students' term papers or various "ready-made" course assignments and submit them as their own. According to a survey conducted by Lee and Lee (2008), about 73% of 435 participating undergraduate students admitted that they had engaged in one or more instances of "cut and paste" plagiarism while completing course-related assignments.

To respond to this seemingly increasing and on-going problem of student plagiarism, this study adopted a DBR approach and attempted to intertwine research, design, and pedagogical practice to promote academic integrity in college courses. The goal of DBR project was to design and implement course interventions for college instructors to prevent course-related plagiarism and promote academic integrity.

Dolmans and Tigelaar (2012) summarize the characteristics of DBR as following: a) contributing toward both testing and refinement of theories and improving educational practice; b) maintaining a close interaction among practitioners, designers, and researchers; c) using a mixed-methods approach to understand underlying the processes or factors; and d) leading to design guidelines that specify which characteristics are crucial for a particular intervention in a specific context. The DBR project reported in this study has adopted these characteristics as guiding principles and focused on testing and refining theories as well as advancing practice

by collecting both quantitative and qualitative data from an authentic real-life learning setting.

Similar to the Integrative Learning Design (ILD) framework proposed by Bannan-Ritland (2003) shown in Figure 1, but conducted in a much simpler and less formal format, the project followed DBR cycles from initial conceptualization (or brainstorming "humble theories") to design and enact instructional interventions (and testing/refining humble theories) in real-world learning environment. The Figure 2 illustrates the DBR cycles adopted in this study in a nutshell.

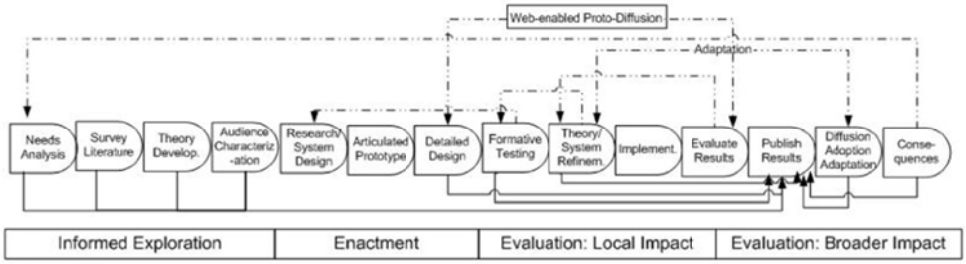

Figure 1. The original Integrative Learning Design framework (Bannan-Ritland, 2003)

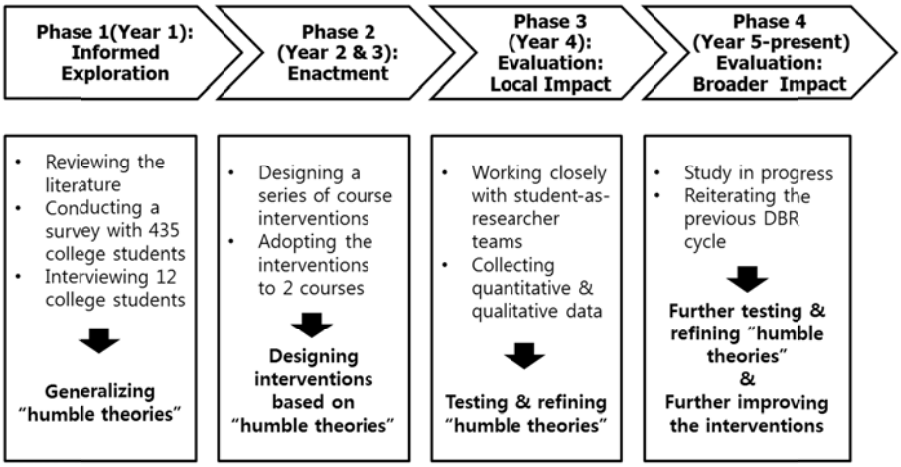

Figure 2. Simplified DBR framework in this study

Phase 1: Informed Exploration

During the Year 1, Informed Exploration phase, a survey with 435 college students and in-depth interviews with 12 college students was conducted to answer the following two questions: how (and how often) do college students conduct plagiarism while completing their course assignments?; and what are the main factors that influence on their act of plagiarism? As reported in Lee and Lee (2008) with more statistical details, the survey and interview results indicate that (a) there are limited instructional opportunities available to inform college students on proper use of various information resources; (b) regardless of the participants' years in college, major, or the type of course assignment, the most commonly misused source of information while completing course assignments was various types of open contents on the Internet; (c) lack of confidence was the most frequently reported reason contributing to college students' plagiarism while completing course assignments; and (d) instructor's teaching style seems to affect plagiarism. These findings, respectively, led the researcher to generate matching "humble theories" as following: (A) providing explicit, specific guidelines for completing course assignments will have a positive impact on decreasing the level of course-related plagiarism; (B) assigning homework that is difficult to copy will have a positive impact on decreasing the level of course-related plagiarism; (C) providing feedback and evaluation rubrics on assignments will have a positive impact on decreasing the level of course-related plagiarism; and (D) having the instructor to continuously express sincere concerns about student plagiarism will have a positive impact on decreasing the level of course-related plagiarism.

Phase 2: Enactment

Based on the four humble theories generated from the exploratory investigation described previously, new course interventions were developed and implemented in two different courses taught by the researcher. The first intervention was course

portfolio assignment replacing the typical pencil-and-paper tests or reports from the previous semesters. According to the assignment guidelines specified by the instructor, the purpose of course portfolio is to "provide with a capstone experience, one that demonstrates the breadth and depth of what students have learned throughout the semester and integrates them into a whole to represent the abilities students are taking with them from this course (<Educational Technology> syllabi in Spring 2009)." Following the iteration cycles frequently found in previous DBR studies, the design details of course portfolio and its implementation has changed and progressed subsequently from year 2 to year 3.

The second intervention was a series of modules developed specifically for explaining the definitions and types of course-related plagiarism as well as the consequences of such misconducts (for examples, plagiarism detection programs and university policies). The modules also addressed the impact of recent information and communication technologies on student plagiarism and ways to integrate various digital references without committing plagiarism. Like course portfolio intervention, the contents of modules and student activities followed after each module expanded as the semesters progressed.

Figure 3. Examples of Course Portfolio

Both interventions were based on the four humble theories described earlier and some examples of these interventions are illustrated in Figures 3 and 4 below.

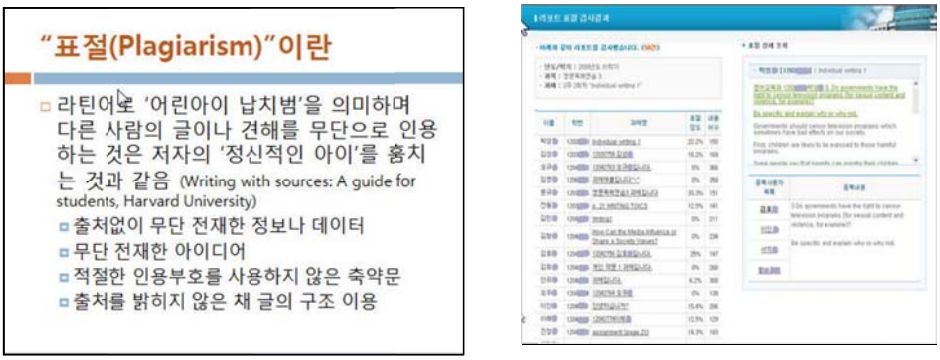

Figure 4. Examples of Modules on Student Plagiarism

Phase 3: Evaluation of Local Impact

During the Year 4, Evaluation of Local Impact phase, a cohort of 27 students who had previously completed the two course interventions from Years 2-3 were trained as student-researcher in another course entitled "Education Research Methods." As their instructor for the course, the researcher supervised the student-as-researcher teams to collect various quantitative and qualitative data regarding student plagiarism in college courses.

The overall findings suggest that student plagiarism in college courses is indeed a common practice and multiple contextual factors contribute to the problem. Among many influencing factors such as students' grade, major, peer pressure, and the type of assignments, the instructor variable seems to be the most important and interesting part of a complex puzzle. The findings from in-depth interviews conducted by student-as-researcher teams are discussed with much detail in Lee (2012) as well as Lee and Lee (2013).

As the researcher was the instructor and the designer of course interventions, data collection during the phase 3 precluded the researcher-led interviews. Instead,

the cohort of students who completed basic training as research assistant conducted in-person and focus group interviews with their peers to obtain unbiased, honest feedback as part of evaluating local impact of course interventions implemented during the previous phase.

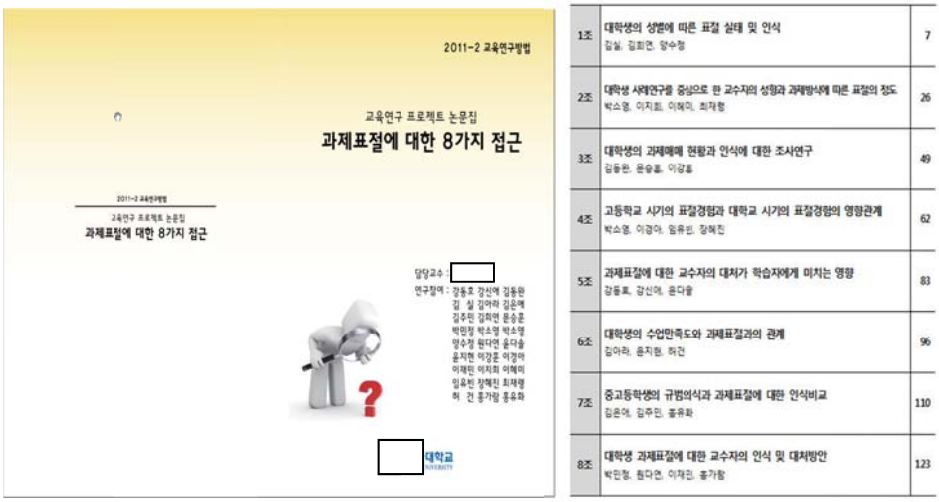

Figure 5. Documents Presenting the Work of Student-as-Researcher Teams

Phase 4: Evaluation of Broader Impact

Evolved from Year 1 to Year 5, the DBR project is still in progress and reaching for the next phase. According to the ILD framework originally explained by Bannan-Ritland (2003), the goal is to evaluate the broader impact of intervention, expanding the methodology to address any practical problems found in the design and implementation of interventions prior to scaling them up.

Challenges of DBR and Lessons Learned

According to Anderson and Shattuck (2012), DBR blends empirical educational

research with the theory-driven design of learning environments. More specifically, DBR addresses theoretical questions about the nature of learning in context, going beyond narrow measures of learning. By doing so, it provides a powerful methodology for understanding how, when, and why educational innovations work in practice. Yet, working in constantly changing real-world environments that are complex and messy presents serious challenges for the researchers conducting DBR.

Getting Started: From Practical Problems to Humble Theories

To put it bluntly, the traditional or "quantitative" research paradigm urges the researcher to generate research hypotheses based on grand theories. Then, he or she needs to carefully design an experiment and test the hypotheses in controlled environments. On the other hand, DBR offers a very different view on where and how we get started with a research project. One of the many differences between the two approaches, and the most "inviting" aspect of DBR to the researcher in this study personally, is that DBR encourages researchers to start from humble theories. The longitudinal, iterative design-and-redesign cycles may not be laid upon a perfect solid ground of proven theories and fool-proof experimental design from the beginning. Otherwise, DBR could not be a viable option for most researchers if they are not equipped with stable funding and strong research teams.

The longitudinal DBR project reported in this paper was triggered by a local instance of student plagiarism in which a student managed to steal hundreds of reports from the university's online learning management system over the years and sold them to a popular report selling site. Alarmed by this experience, the researcher decided to investigate how and why college students commit plagiarism while completing their assignments and collected survey and interview data. While analyzing student data, a number of "humble theories" were generated and they informed the researcher to continue and refine further inquiries to explore the

complex phenomenon of student plagiarism. It was not until the end of Enactment phase where the researcher adopted several course interventions based on 435 surveys and 12 interviews that she finally recognized the resemblances of her humble class projects to DBR. This certainly is not the only or perfect way to get started with DBR studies but the researcher believes that more researchers need to develop their own "humble theories" about DBR methodology to fill the gap between the ideology and reality of conducting DBR.

The Identity of Researcher in DBR: Balancing Multiple Acts

Barab and Squire (2004) raised an interesting question to DBR researchers as following: "If a researcher is intimately involved in the conceptualization, design, development, implementation, and researching of a pedagogical approach, how do we ensure that they can make credible and trustworthy assertions? (p.10)" This puzzling problem of researcher identity, indeed, presented the biggest challenge for the researcher in this study. To make the matter worse, the 'instructor hat' was added to the researcher.

According to Cobb, Confrey, diSessa, Lehrer, and Schauble (2003), one way to ensure objectivity and increase credibility, is to stick to core theoretical issues and intervene where possible, using interventions as opportunities to examine humble theories and explore learning. From a slightly different angle, considering the sensitive and intrusive nature of inquiries on course-related plagiarism, this study adopted a rather unconventional strategy to work closely with a cohort of student-as- researcher teams. To create open, unthreatening environments where students can share honest opinions and experiences related to plagiarism, every interview with students was conducted by student-as-researcher teams. Prior to the interview data collection, student-as-researcher team members were given basic training as research assistant for 8 weeks (3 hours a week).

Compare to the alternative method where the researcher conducts student

interviews by herself, the collaborative or "mediated" data collection method could be risky and time-consuming. Still, it allows the DBR project to stick to the guiding principle that good DBR should maintain close interactions among practitioners, designers, and researchers. On retrospective, working with student-as-researcher teams was the most unique and important aspect of this DBR project, and involving students in each phase has brought many fresh insights from student perspectives.

The Problem of Replicability and Getting the Work Published

Collins, Joseph, and Bielaczyc (2004) pointed out earlier that, although DBR has gained much publicity in learning science community in recent years, the broader research community still finds it difficult to accept DBR as a serious scholarly endeavor and researchers engaged in DBR struggle to make publication and tenure. Some of the problems arise simply from introducing a new methodological approach to the research community, but the real challenge is to deal with the issue of replicability. In the existing scientific research paradigm, it is crucial to produce research findings that other researchers can replicate in contexts other than the researcher's own. Yet, DBR emphasizes to conduct research in authentic contexts, and thus DBR studies cannot (and may not want to) manipulate contextual variables.

To respond to this challenge, Barab and Squire (2004) argues that the goal of DBR is to lay open and problematize the design of intervention as well as the underlying theories in a way that provides insights into unique local dynamics. In this DBR project, the way it progressed from its conception to current shape, as well as the two course interventions to prevent course-related plagiarism, is an outcome of unique interplay of context-specific conditions and participants under study. Therefore, strategies for getting DBR studies published should not focus too much on sharing interventions as outcomes of design, not on presenting the

findings as proofs of research. Instead, one way for DBR researchers to contribute to research community and get their work published is to adopt a story-telling or "narrative" approach, make sense of DBR and attempts to provide rich descriptions of context, guiding principles and emerging theories, and design features of the intervention.

Final Remarks

The scope of DBR project reported in this study is by no means comprehensive, but rather intended to examine some of the pragmatics of intertwining research, design, and pedagogical practice in a typical 4-year university setting in Korea. Like many previous DBR studies whose practical relevance was limited to local contexts, the findings from this study may not be easily generalized for other contexts. Still, the researcher believes that the findings of this study can provide insight for design research community by illuminating the experience of researcher and encourage interested readers to engage in DBR to bring innovative reforms to schools and workplaces.

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