Rutgers, The State University of New Jersey

15:262:610:01 Design-Based Research
Fall 2016
Mondays 7:35 PM - 10:15 PM
GSE Room 211

Instructor: Clark Chinn	Email: clark.chinn@gse.rutgers.edu
Office Phone: 848-932-0824	Office Location: GSE 337
Office Hours: By arrangement	Prerequisites or other limitations: Admission in a GSE doctoral program or special permission
Mode of Instruction: ___ Lecture X Seminar ___ Hybrid ___ Online ___ Other	Permission required: __ No X Yes Directions about where to get permission numbers: Office of Academic Services, Ericka Diaz, ericka.diaz@gse.rutgers.edu

Rutgers University welcomes students with disabilities into all of the University's educational programs. In order to receive consideration for reasonable accommodations, a student with a disability must contact the appropriate disability services office at the campus where you are officially enrolled, participate in an intake interview, and provide documentations: https://ods.rutgers.edu/students/documentation-guidelines. If the documentation supports your request for reasonable accommodations, your campus's disability services office will provide you with a Letter of Accommodations. Please share this letter with your instructors and discuss the accommodations with them as early in your courses as possible. To begin this process, please complete the Registration form on the ODS web site at: https://ods.rutgers.edu/students/registration-form.

Course Description

Course Catalog Description:

Students will learn what about design-based research and how to design and conduct this kind of inquiry. Throughout the class, students will use data collected by the instructor to examine various design research principles and to consider how learning scientists approach the study of learning environments such as technology, curriculum units, and teaching strategies. We will take an action-oriented approach to the conduct of design-based research in the context of actual research projects.

Goals:

The learning goals for this class are as follows:

- Understand the nature of design-based research
- Develop skills in designing a design-based research study
- Design instruments and data collection plans for a DBR study
- Understand how video analysis can be used in DBR and develop skills in this type of analysis
- Learn how to write a research proposal using academic style appropriate for the discipline

Required Texts:

All materials will be provided as PDFs on our class Sakai website, so there are no required texts. However, the following two books are recommended. First, the following handbook is the most comprehensive source for design-based research methods, and we will read a number of chapters from this edited volume in this course:

Kelly, A. E., Lesh, R. A., & Baek, J. Y. (Eds.). (2008). *Handbook of design research methods in education: Innovations in science, technology, engineering, and mathematics learning and teaching.* New York and London: Routledge.

Another useful text to have is the American Psychological Association (APA) publication manual. Each major assignment for this course should be formatted using the formal standards articulated by APA publication manual for a manuscript:

American Psychological Association. (2010). *Publication manual of the American Psychological Association* (6th ed). Washington, DC: American Psychological Association.

An incomplete but very useful explication of many APA guidelines can be found at this Purdue University site: https://owl.english.purdue.edu/owl/resource/560/01/

Important Note

This syllabus, along with course assignments and due dates, are subject to change. Any major changes will be clearly noted in a course announcement in class and on the course website.

Grading Policy

Evaluation of Written Work:

Grading Breakdown by Course Assignment:

1.	Class Attendance and Participation	20%	Weekly
2.	Analysis of designs	5%	Due 9/26 (Wk 3)
3.	Setting Description and Design Ideas	5%	Due 10/17 (Wk 6)
4.	Annotated Bibliography	10%	Due 10/24 (Wk 7)
5.	Theoretical Framework and Embodied Conjecture	10%	Due 11/7 (Wk 9)
6.	Elaborated Project Plan and Design Prototype	10%	Due 11/21 (Wk 11)
7.	Data Collection Plan	10%	Due 12/5 (Wk 13)
8.	Research Proposal	30%	Due 12/19 (Wk 15)

Grading Scale:

- A   = 90-100
- B+ = 85-89
- B   = 80-84
- C+ = 75-79
- C   = 70-74
- F   = Below 70

Academic Integrity:

Any violation of academic honesty is a serious offense and is therefore subject to an appropriate penalty. Refer to http://academicintegrity.rutgers.edu/integrity.shtml for a full explanation of policies.

Academic integrity policy proscribes any form of cheating, including plagiarism. **Plagiarism will be addressed in accordance with the University policy.** Please keep in mind that the penalty for plagiarism can include **suspension and even permanent expulsion from the university**.

Here's a thinking tool to help you decide whether you have committed plagiarism, even if it was unintentional. Imagine that Google had every word ever written on its servers (all published and unpublished writing, including all students' writing from all courses at the GSE and other universities, from all of history through this moment). Would a Google search on <u>any</u> extended phrase or clause in your document yield a hit on <u>even one</u> of these documents recorded through history? (Remember: this includes your own past papers, classmates' papers, text on any website, and all published papers and books in all of history.) If the answer is yes, and you have not cited that document and quoted the overlapping text, you have committed plagiarism, and the penalty will likely be heavy.

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<u>**Course Requirements**</u>

Website:

http://sakai.rutgers.edu

Attendance Policy:

Because this is a small seminar it is critical for your own learning and the learning of your peers that you attend all classes, arrive on time, and stay engaged throughout the class time. If you have to miss a class or be late for any reason, please contact me ahead of time.

<u>**Evaluation**</u>

1. Class Attendance and Participation (20%)

All class members are expected to attend on time and actively participate in the discussions each week. Some weeks this may involve online discussions. I also expect that your discussions will show that you have read all required assignments and that you are actively trying to connect them to your own project and to the project's of your classmates. Many class discussions will involve hearing about, reading about, and discussing components of each other's projects, and so it also essential that you provide critical but supportive feedback to your classmates to help them move their projects forward.

In addition, each class member is to post on the Sakai discussion forum a reaction to the week's readings for the group to consider in class. These reactions should be about 2-3 paragraphs in length, and they should include reference to specific ideas from the readings. You don't have to react to every reading. Rather, focus on ideas that were intriguing, useful, puzzling, etc. to you. You may also raise questions, but when you do so, still connect to specifics from the reading that prompted your question (and that may a part of an answer to your questions). Making connections across readings within the week and in past weeks is also encouraged. The reactions are due by 10 PM on Sunday before class.

In Week 2, I have been asked to be the GSE's representative at an AERA meeting for administrative leaders, so we will combine some additional reading with online discussions during this week. If I am similarly called away in any future week, we will hold discussions on Sakai that week in lieu of a class meeting. In these weeks, participation will be based on contributions to online Sakai discussion threads.

2. Analysis of Designs. (5%) The main focus of this class is design-based research (DBR) methodologies. But it is also useful to compare and contrast DBR with other approaches to research. Thus, in Week 2 each of you will examine studies embodying two different research methodologies (predominantly quantitative) so as to compare them with DBR. In this assignment, you will write an analysis for each of the two methods; you will discuss the

strengths and weaknesses of the method, particularly in terms of its capacity to show the designer how to improve their designs.

3. Setting Description and Design Ideas (3-5 pages, APA) DUE: Week 6 (5%)

Write a brief summary or interpretation of your practice/research setting and outline the implications for design (2-3 pages). Ideally, your description would be grounded in actual observations of the setting or other data that has been collected about that setting. Then, briefly outline at least three alternative approaches that you could take with a designed intervention in that setting (1-2 pages). This part of the assignment should be an act of idea generation where you push on the framing of your potential problem/research focus, learning objectives, and design approach. It is worth thinking broadly before the design gets fixed. This may be based on work you have done in other classes.

4. Annotated Bibliography (6 pages, APA) DUE: Week 7 (10%)

Create and share an annotated bibliography associated with your project. Identify and briefly describe 6 published, peer-reviewed research papers, and how each relates to your project. You should include about one page per paper, with the full APA formatted citation at the top of the page. You can choose any papers that are from high-quality journals or edited volumes. Papers can include (1) reports of DBR studies in your field, (2) reports of experimental or observational research in your field that highlights some key idea for your project, or (3) examples of intervention designs, research designs, measurement instruments, or data analyses in or out of your field that you are considering for your project. We will share the bibliographies during class, so be prepared to describe each paper in brief and what your learned from the paper that relates to your project.

5. Theoretical Framework and Embodied Conjecture (2-3 pages, APA) DUE: Week 9 (10%)

Describe the theoretical framework that you will use for your project and why that is an appropriate framework for the research questions that you are posing. An additional page should include a figure with your embodied conjecture.

6. Elaborated Project Plan and Design Prototype (3-5 pages, APA) DUE: Week 11 (10%)

Describe the educational focus associated with your project, the package of "objects" to be designed, and what you know about the research setting that is relevant to your project. Describe at least three specific contextualized uses or sample cases of your design. These scenarios should be used to flesh out, test, and refine your design work. There will be a public design review so you can present your design work and receive feedback from the group.

7. Data Collection Plan (3-5 pages, APA) DUE: Week 13 (10%)

Describe in detail the kinds of data you plan to collect. Make sure that you connect to the data you collect to your embodied conjecture. Wherever possible, you should prepare or include draft

versions of written instruments that you are planning to use. At a minimum, these must address targeted learning outcomes. You may do this through a written measure, performance assessment, or structured interview. Be clear about how each instrument will address your research question and how you will handle the data (e.g., will it require additional coding, will surveys need to be scaled in some way, etc.). The data collection plan should also include a detailed spreadsheet or table in your document. During your data collection phase, you can use the spreadsheet to keep track of your activities in the field. During the data analysis phase, you can update the spreadsheet in order to track progress in your analysis. It can be a working document for your actual study.

8. Research Proposal (10-15 pages, APA) DUE: Week 15 (30%)

Your research proposal should build upon and integrate all previous assignments. The research questions, argument, design, and methods associated with your research project should be detailed, and your project's relevance to the literature should be examined. This should incorporate feedback from the earlier assignment.

<u>**Submitting Assignments**</u>

All work should be submitted through the class Sakai assignments tool.

In addition to the content/substance of your writing, each major assignment will be evaluated based on a writing rubric that assesses the following:

1. *Organization* - The writing is clear and focused. The organization is obvious throughout, and the reader is skillfully guided through the document (i.e. using appropriate headings, thesis statements, and transitions).

2. *Argumentation and Analysis* - All sentences and paragraphs are fully developed and coherently connected. The writer makes clear, strong, and logical points supported with rich and relevant details from the data or related research literature (i.e., course readings).

3. *Technical Correctness* - There are almost no major or minor technical writing errors with regard to APA conventions, sentence structure, spelling or punctuation.

4. *Appropriate Design Principles* - The assignment skillfully implements design principles appropriate to the assignment.

Each major assignment should be formatted using the formal standards articulated by APA publication manual for a manuscript. Those standards include, but are not limited to:

- Times New Roman, 12 point font
- One inch margins on all sides
- Page numbers
- Cover page that includes title, course, student, professor, date
- Left alignment with default spacing between words and letters

- Double spaced lines with only one hard return between indented paragraphs
- Proper in-text citations and a separate bibliography or reference section

Refer to the APA publication manual, the Purdue website mentioned earlier (https://owl.english.purdue.edu/owl/resource/560/01/), and to a document I provide to you for further details.

Course Schedule by Week

Week	Topic	Readings	Assignments
1: 9/12	General Intro	No readings	
2: 9/19	**NO CLASS:** *All class participation will be via Sakai this week.* Foundations	(Bell, 2004) (Brown, 1992) (Collins, Joseph, & Bielaczyc, 2004) (Schworm & Renkl, 2007) (Miller & Connolly, 2013) (Andreassen & Bråten, 2011)	*See Activities for Weeks 2 and 3*
3: 9/26	Issues and Prospects	(Bereiter, 2014) (Cobb, Confrey, diSessa, Lehrer, & Schauble, 2003) (Design-Based Research Collective, 2003) (Shavelson, Phillips, Towne, & Feuer, 2003) (Cartwright 2007) (Cartwright, 2010)	*See Activities for Weeks 2 and 3*
4: 10/3	Theory in DBR	(Sandoval, 2004) (Sandoval, 2014) (diSessa & Cobb, 2004)	
5: 10/10	Conducting DBR	(Cobb & Gravemeijer, 2008) (Middleton, Gorard, Taylor, & Bannan-Ritland, 2008)	
6: 10/17	Project-Level Examples	(Bannan-Ritland & Baek, 2008) (Barab, Baek, Schatz, Scheckler, & Moore, 2008)	*Setting Description and Design Ideas*
7: 10/24	Math Examples	(Kapur & Bielaczyc, 2012) (Roll, Aleven, McLaren, & Koedinger, 2007)	*Annotated Bibliography*
8: 10/31	Case Study Examples	(Enyedy, 2003) (Lee, 2001)	

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Week	Topic	Readings	Assignments
9: 11/7	Technological Tools Examples	(Swan, Matthews, Bogle, Boles, & Day, 2012) (Zhang, Scardamalia, Reeve, & Messina, 2009)	*Theoretical Framework and Embodied Conjecture*
10: 11/14	Museum Examples	(Louw, Ansari, Bartley, & Sanford, 2013) (Yoon, Elinich, Wang, Van Schooneveld, & Anderson, 2013) (Yoon & Wang, 2014)	
11: 11/21	Science Examples	(Rosebery, Ogonowski, DiSchino, & Warren, 2010) (Rosenberg, Hammer, & Phelan, 2006)	*Elaborated Project Plan and Design Prototype*
12: 11/28	Ethnography Examples	(Bricker & Bell, 2012) (Gutierrez & Vossoughi, 2010)	
13: 12/5	Scalability and Sustainability	(Fishman, Marx, Blumenfeld, Krajcik, & Soloway, 2004) (Penuel, Fishman, Haugan Cheng, & Sabelli, 2011) (Roschelle, Tatar, & Kaput, 2008)	*Data Collection Plan*
14: 12/12	Assessing Where We Are	(Anderson & Shattuck, 2012) (McKenney & Reeves, 2013) (O'Neill, 2012) (Ormel, Pareja Roblin, McKenney, Voogt, & Pieters, 2012)	
15: 12/19	Summations and Project Presentations	No readings	*Research Proposal*

Reading List

Four important notes:

1. Substitutions may be made for readings on this list. If substitutions are made, they will be announced before that week's readings begin. On the day when readings for a week begin, please double check course announcements to be sure that there have been no substitutions. Please check with me if you decide to read substantially ahead.

2. Shorter readings may be added to some weeks to address issues that arise in our discussions.

3. TBA (to be announced) denotes that a reading will be added to the list.

4. In some weeks, there are additional online sources posted on the class website. Each week, be sure to check what is listed under the main activities for that week.

Week 1. General Intro

There are no readings for this first week. We will spend the first class on introductory activities.

Week 2. Foundations

Bell, P. (2004). On the theoretical breadth of design-based research in education. *Educational Psychologist*, *39*(4), 243–253. http://doi.org/10.1207/s15326985ep3904_6

Brown, A. L. (1992). Design experiments: Theoretical and methodological challenges in creating complex interventions in classroom settings. *Journal of the Learning Sciences*, *2*(2), 141–178. http://doi.org/10.1207/s15327809jls0202_2

Collins, A., Joseph, D., & Bielaczyc, K. (2004). Design research: Theoretical and methodological issues. *Journal of the Learning Sciences*, *13*(1), 15–42. http://doi.org/10.1207/s15327809jls1301_2

Schworm, S., & Renkl, A. (2007). Learning argumentation skills through the use of prompts for self-explaining examples. *Journal of Educational Psychology, 99*, 285-296.

Miller, S., & Connolly, P. (2012). A randomized controlled trial evaluation of *Time to Read*, a volunteer tutoring program for 8- to 9-year-olds. *Educational Evaluation and Policy Analysis, 35*, 23-37.

Andreassen, R., & Bråten, I. (2011). Implementation and effects of explicit reading comprehension instruction in fifth-grade classrooms. *Learning and Instruction, 21*, 520-537.

Week 3. Issues and Prospects

Bereiter, C. (2014). Principled practical knowledge: Not a bridge but a ladder. *Journal of the Learning Sciences*, *23*(1), 4–17. http://doi.org/10.1080/10508406.2013.812533

Cobb, P., Confrey, J., diSessa, A., Lehrer, R., & Schauble, L. (2003). Design experiments in educational research. *Educational Researcher*, *32*(1), 9–13. http://doi.org/10.3102/0013189X032001009

Design-Based Research Collective. (2003). Design-based research: An emerging paradigm for educational inquiry. *Educational Researcher*, *32*(1), 5–8. http://doi.org/10.3102/0013189X032001005

Shavelson, R. J., Phillips, D. C., Towne, L., & Feuer, M. J. (2003). On the science of education design studies. *Educational Researcher*, *32*(1), 25–28. http://doi.org/10.3102/0013189X032001025

Cartwright, N. (2007). Are RCTs the gold standard? *BioSocieties, 2*, 11-20.

Cartwright, N., & Munro, E. (2010). The limitations of randomized controlled trials in predicting effectiveness. *Journal of Evaluation in Clinical Practice, 16*, 260-266.

Week 4. Theory in DBR

Sandoval, W. A. (2004). Developing learning theory by refining conjectures embodied in educational designs. *Educational Psychologist*, *39*(4), 213–223. http://doi.org/10.1207/s15326985ep3904_3

Sandoval, W. A. (2014). Conjecture mapping: An approach to systematic educational design research. *Journal of the Learning Sciences*, *23*(1), 18–36. http://doi.org/10.1080/10508406.2013.778204

diSessa, A. A., & Cobb, P. (2004). Ontological innovation and the role of theory in design experiments. *Journal of the Learning Sciences*, *13*(1), 77–103. http://doi.org/10.1207/s15327809jls1301_4

Week 5. Conducting DBR

Cobb, P., & Gravemeijer, K. (2008). Experimenting to support and understand learning processes. In A. E. Kelly, R. A. Lesh, & J. Y. Baek (Eds.), *Handbook of design research methods in education: Innovations in science, technology, engineering, and mathematics learning and teaching* (pp. 68–95). New York and London: Routledge.

Middleton, J., Gorard, S., Taylor, C., & Bannan-Ritland, B. (2008). The "compleat" design experiment. In A. E. Kelly, R. A. Lesh, & J. Y. Baek (Eds.), *Handbook of design*

research methods in education: Innovations in science, technology, engineering, and mathematics learning and teaching (pp. 21–46). New York and London: Routledge.

Week 6. Project-Level Examples

Bannan-Ritland, B., & Baek, J. Y. (2008). Investigating the act of design in design research: The road taken. In A. E. Kelly, R. A. Lesh, & J. Y. Baek (Eds.), *Handbook of design research methods in education: Innovations in science, technology, engineering, and mathematics learning and teaching* (pp. 299–319). New York and London: Routledge.

Barab, S. A., Baek, E.-O., Schatz, S., Scheckler, R., & Moore, J. (2008). Illuminating the braids of change in a web-supported community: A design experiment by another name. In A. E. Kelly, R. A. Lesh, & J. Y. Baek (Eds.), *Handbook of design research methods in education: Innovations in science, technology, engineering, and mathematics learning and teaching* (pp. 320–352). New York and London: Routledge.

Week 7. Math Examples

Kapur, M., & Bielaczyc, K. (2012). Designing for productive failure. *Journal of the Learning Sciences*, *21*(1), 45–83. http://doi.org/10.1080/10508406.2011.591717

Roll, I., Aleven, V., McLaren, B. M., & Koedinger, K. R. (2007). Designing for metacognition— applying cognitive tutor principles to the tutoring of help seeking. *Metacognition and Learning*, *2*(2-3), 125–140. http://doi.org/10.1007/s11409-007-9010-0

Week 8. Case Study Examples

Enyedy, N. (2003). Knowledge construction and collective practice: At the intersection of learning, talk, and social configurations in a computer-mediated mathematics classroom. *Journal of the Learning Sciences*, *12*(3), 361–407. http://doi.org/10.1207/S15327809JLS1203_2

Lee, C. D. (2001). Is October Brown Chinese? A cultural modeling activity system for underachieving students. *American Educational Research Journal*, *38*(1), 97–141. http://doi.org/10.3102/00028312038001097

Week 9. Technological Tools Examples

Swan, K., Matthews, D., Bogle, L., Boles, E., & Day, S. (2012). Linking online course design and implementation to learning outcomes: A design experiment. *The Internet and Higher Education*, *15*(2), 81–88. http://doi.org/10.1016/j.iheduc.2011.07.002

Zhang, J., Scardamalia, M., Reeve, R., & Messina, R. (2009). Designs for collective cognitive responsibility in knowledge-building communities. *Journal of the Learning Sciences*, *18*(1), 7–44. http://doi.org/10.1080/10508400802581676

Week 10. Museum Examples

Louw, M., Ansari, A., Bartley, C., & Sanford, C. (2013). Stories in the rock: A design case of an explorable image viewer in a natural history museum. *International Journal of Designs for Learning*, *4*(2), 56–71.

Yoon, S. A., Elinich, K., Wang, J., Van Schooneveld, J. B., & Anderson, E. (2013). Scaffolding informal learning in science museums: How much is too much? *Science Education*, *97*(6), 848–877. http://doi.org/10.1002/sce.21079

Yoon, S. A., & Wang, J. (2014). Making the invisible visible in science museums through augmented reality devices. *TechTrends*, *58*(1), 49–55. http://doi.org/10.1007/s11528-013-0720-7

Week 11. Science Examples

Rosebery, A. S., Ogonowski, M., DiSchino, M., & Warren, B. (2010). "The coat traps all your body heat": Heterogeneity as fundamental to learning. *Journal of the Learning Sciences*, *19*(3), 322–357. http://doi.org/10.1080/10508406.2010.491752

Rosenberg, S., Hammer, D., & Phelan, J. (2006). Multiple epistemological coherences in an eighth-grade discussion of the rock cycle. *Journal of the Learning Sciences*, *15*(2), 261–292. http://doi.org/10.1207/s15327809jls1502_4

Week 12. Ethnography Examples

Bricker, L. A., & Bell, P. (2012). "GodMode is his video game name": Situating learning and identity in structures of social practice. *Cultural Studies of Science Education*, *7*(4), 883–902. http://doi.org/10.1007/s11422-012-9410-6

Gutierrez, K. D., & Vossoughi, S. (2010). Lifting off the ground to return anew: Mediated praxis, transformative learning, and social design experiments. *Journal of Teacher Education*, *61*(1-2), 100–117. http://doi.org/10.1177/0022487109347877

Week 13. Scalability and Sustainability

Fishman, B., Marx, R. W., Blumenfeld, P., Krajcik, J., & Soloway, E. (2004). Creating a framework for research on systemic technology innovations. *Journal of the Learning Sciences*, *13*(1), 43–76. http://doi.org/10.1207/s15327809jls1301_3

Penuel, W. R., Fishman, B. J., Haugan Cheng, B., & Sabelli, N. (2011). Organizing research and development at the intersection of learning, implementation, and design. *Educational Researcher*, *40*(7), 331–337. http://doi.org/10.3102/0013189X11421826

Roschelle, J., Tatar, D., & Kaput, C. (2008). Getting to scale with innovations that deeply restructure how students come to know mathematics. In A. E. Kelly, R. A. Lesh, & J. Y. Baek (Eds.), *Handbook of design research methods in education: Innovations in science,*

technology, engineering, and mathematics learning and teaching (pp. 369–395). New York and London: Routledge.

Week 14. Assessing Where We Are

Anderson, T., & Shattuck, J. (2012). Design-based research: A decade of progress in education research? *Educational Researcher*, *41*(1), 16–25. http://doi.org/10.3102/0013189X11428813

McKenney, S., & Reeves, T. C. (2013). Systematic review of design-based research progress: Is a little knowledge a dangerous thing? *Educational Researcher*, *42*(2), 97–100. http://doi.org/10.3102/0013189X12463781

O'Neill, D. K. (2012). Designs that fly: What the history of aeronautics tells us about the future of design-based research in education. *International Journal of Research & Method in Education*, *35*(2), 119–140. http://doi.org/10.1080/1743727X.2012.683573

Ormel, B. J. B., Pareja Roblin, N. N., McKenney, S. E., Voogt, J. M., & Pieters, J. M. (2012). Research–practice interactions as reported in recent design studies: Still promising, still hazy. *Educational Technology Research and Development*, *60*(6), 967–986. http://doi.org/10.1007/s11423-012-9261-6

Week 15. Summations and Project Presentations

There are no readings in Week 15 to give you time to reflect on the course and to complete your Final Paper.