'I Came in Thinking There Was One Right Practice': Exploring How to Help Graduate Students Learn to Read Academic Research

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Abstract

In the fall of 2017, an engineering educator with many years of experience offered a course to incoming doctoral students. The course was focused on helping the students explore approaches to reading published scholarship and develop their own scholarly reading practice. The course was taken by a student who documented her experiences in a reflection journal. Against this backdrop, this paper uses intertwined autobiographical perspective of the student and the educator in relation to the course to shed light broadly on learning and instructional design in the context of scholarly reading. This paper contributes to the body of knowledge on the learning trajectories associated with emerging scholars becoming capable, critical, and generous readers of published disciplinary scholarship. For example, the student is shown to have experienced a realization of accumulated knowledge and skill, confronted questions of the self, identity, and belonging, and discovered personal reading strategies as she navigated learning how to read academic research. In addition, this paper provides insight into the considerations involved in designing learning experiences that help emerging scholars become capable, critical, and generous readers of published disciplinary scholarship. Specifically, we note the potential importance of considering the synergy between individual and group contributions, the balance between seriousness and lightheartedness, and the need for both opportunities to learn and opportunities to be aware of learning.

Introduction

Reading published scholarly work is a central activity in academic life. Further, reading published scholarly work is a challenge [1], [2], [3]. Such challenges are further exacerbated in fields characterized by flux in what is acceptable methodologically, epistemologically, and discursively [4], [5]. Such flux is common in interdisciplinary contexts. While approaches such as journal clubs are one way to support students [e.g., 6], some have argued that it is important to look beyond journal clubs for more formal ways to support student development as capable, critical, and generous readers [e.g., 7]. In order to move towards such formal learning experiences, it is helpful to address the following two questions:

1. What trajectories do emerging scholars go through as they work to become capable, critical, and generous readers of published disciplinary scholarship?
2. What considerations are involved in creating formal learning experiences that help students become capable, critical, and generous readers of published disciplinary scholarship?

This paper explores these questions in reference to a course offered to doctoral students. The results leverage two approaches that have been used elsewhere in engineering education

scholarship: first-person accounts and multiple perspectives. First, we provide some background on the issue of helping emerging scholars become capable, critical, and generous readers.

Background

Questions about helping doctoral students become capable, critical and generous readers of published academic research are part of the larger conversation about helping doctoral students work with the literature in their field. As a result, such questions can be understood in reference to these larger conversations and answers to such questions can contribute back to the broader context of such conversations.

Synthesizing across the work of others, Golde notes that being able to work with the literature in a discipline entails the ability to: "absorb the content of what they read, determine what is known and what needs to be known, identify important ongoing disciplinary debates, develop the judgment to discriminate between work of high quality and mediocre efforts, extract useful information on which to build, juxtapose multiple theoretical perspectives and explanations, connect research studies to one another, synthesize and reappraise others' work, and learn the stylistic conventions of written work, such as norms of what to say and what to omit [8]." Such a list emphasizes the scope and complexity that may be entailed in learning to work with the literature in a discipline, and suggests the additional challenges that could arise for those doctoral learners in interdisciplinary contexts.

Journal clubs, list mediated examinations, and proseminars are three pedagogical approaches that have been discussed in writings on doctoral education. Golde identifies the first two of these approaches, journal clubs and readings lists, as signature pedagogies by which different disciplines address goals of helping doctoral students learn to work with the literature [8]. Journal clubs, which are common in medicine and biological sciences, are somewhat formal settings in which individuals come together to discuss pre-chosen scholarly articles. Because the process of reading a single article is repeatedly made visible in the journal club, this format has great affordances for helping people improve the ability to process such articles. In addition, the journal club has a benefit of helping its members on a practical level by helping members keep up with current published scholarship. Indeed, "reading more effectively" and "reading more" are among the types of outcomes identified as resulting from participation in a journal club.

"The list," which includes the creation of readings lists and subsequently examination of a student in relation to the material covered in lists, is a pedagogical approach the Golde identifies as associated with the humanities [8]. Golde describes how this pedagogy has evolved from a state where reading lists were given to students and were relatively static, to a current state where reading lists tend to be more specific to a student and also to be prepared in conversation with a student [8]. Golde describes the key features of this pedagogy: it emphasizes the emerging scholar's situatedness within a larger context, it is explicit preparation for subsequent dissertation work, and it helps to prepare the emerging scholar for teaching as well as research [8]. Challenges of this pedagogical approach include the solitary nature of the reading once the lists are prepared and the need to balance breadth and depth in such lists. In relation to journal clubs, it is interesting to note how the "list" approach does little to support the critical reading of individual items on the list.

As a third pedagogical perspective, Metz describes another approach--a formally structured proseminar designed to expose students to methodological traditions, epistemological debates, and ontological issues as they manifest in educational research [9]. In relation to the ideas just presented, the proseminar she describes can be seen as blending the journal club emphasis on *discussion* of specific articles with the *curation* and *broad trends* emphasis of "the list" [9]. In Metz's reflective report, which is based on three years of engagement with the design and execution of the proseminar, she draws attention to issues such as the emotional work involved in surfacing assumptions and coming to new understandings and the potentially long timescale of fully appreciating the value of such learnings [9].

Looking across these three approaches, it is possible to see the contours of a pedagogical design space delineated by issues such as what is being read, where the reading happens, and who is involved. The broad contour of possible outcomes is also apparent (e.g., being more critical as a reader, actually reading more over time). Clearly, this is a big pedagogical space and anyone designing new learning experiences in this space will benefit from guidance about what to consider. Looking further, the trajectories of learning also start to come into view--trajectories that involve not just accumulated knowledge and skill, but also emotional ups and downs, self questioning, discovery of personal strategies and strengths, and issues of belonging. Given the complexity of this teaching and learning space, there is room to follow Metz' work with additional contributions that feature specific teaching and learning experiences as well as insights gleaned from such experiences [9].

Approach

One way to understand instructional design considerations and gain insight into trajectories is to trace through a single instruction experience in a detailed way. Such detailed tracing is the basic approach in the current paper. As a result of the detailed tracing of this single instructional experience, the paper is lengthy.

The context of this work is a course offered to doctoral students. The course is situated in a department called Human Centered Design & Engineering (HCDE), and students in this department are entering an emerging interdisciplinary context at the intersection of social sciences, systems thinking, design & engineering. In the specific offering of the course being discussed, students analyzed "best papers" in terms of dimensions important for reading (e.g., citation practices, argument, use of theory, implications for practice), documented their "findings" in "handouts" to share via a "virtual notebook," and then discussed their findings with their peers in class. An overview of the course is provided in Table 1. The table shows the key components of the class: a curating papers requirement, three timed reading engagements, and seven targeted investigations (the instructions for these investigations are included in Appendix 1). In addition, students posted weekly entries to a personal journal in order to reflect on their experiences in the class and share those reflections with the educator. This specific offering of the course built on insights from four previous offerings.

This paper leverages two approaches that have been used elsewhere in engineering education scholarship: first-person accounts and multiple perspectives. For example, a paper by Welling,

Canney, and Lambrinidou [10] features the first person account of a senior undergraduate civil engineering student exploring the issue of personal-professional identity alignment. Adams et al. [11] and Thompson, Chua, and Joslyn [12] feature multiple first person accounts woven together as intertwined perspectives. In the paper by Adams and colleagues, the authors are engineering educators offering different approaches for engaging engineering students [11]. In the Thompson, Chua, and Joslyn paper, the authors explore the role of spirituality in scholarship [12]. In all of these cases, combining first person accounts and multiple perspectives creates affordances for understanding the phenomenon at the focus of the paper.

In this paper, an omniscient account of the class is intertwined with the first-person voices of the educator and one student. This intertwined approach highlights how a particular instance of a course and its features are situated historically in an educator's experiences of teaching and are engaged with by students who have their own distinctive experience.

In the results section below, we open with thoughts from the student at the beginning of the class and then focus on four class elements: the requirement for students to curate their own readings, the third targeted investigation in which the students explored implications for practice, the fifth targeted investigation in which the students focused on the issue of epistemology, and the timed reading engagement as a cross-cutting class element. Each of these class elements is presented from three perspectives: an omniscient "what happened" perspective followed by the educator's story and the student's story. These story components of the text are in first person, and are distinguished from the rest of the text by being in italics.

The text representing the educator's story was written specifically for this manuscript. The text representing the student's story is text that was originally written as reflections that were submitted during the class. These reflections have been edited only slightly (i.e, to remove identifying information, to fix grammar, or make something clearer). As a result, the reflections include both significant realizations as well as comments that some readers may feel are mundane. We believe this range of detail offers the reader a reminder of how students are more than individuals sitting in a classroom, rather they are citizens of the world – taking in their surroundings, learning beyond the classroom, and reflecting on how their learning experience connects to the details of daily life.

Table 1. Roadmap to the class and the paper. The first column contain the key elements of the class. Columns two, three, and four represent the perspectives presented in the results, and the numbers correspond to numbered results sections.

Class Element	Omniscient story	Educator's story	Student's story
Curating Papers	1	1a	1b
Timed Reading Engagement 1			
Targeted Investigation 1: Citations			
Targeted Investigation 2: Argument			
Targeted Investigation 3: Implications for	2	2a	2b

Practice			
Targeted Investigation 4: Theory			
Timed Reading Engagement 2			
Targeted Investigation 5: Knowing & Epistemology	3	3a	3b
Targeted Investigation 6: Ethics			
Targeted Investigation 7: Trustworthiness			
Timed Reading Engagement 3	4	4a	4b

Results

The student at the beginning, September 17, 2017

In the text below, I (the student) share some of the thoughts I had at the beginning of the quarter about this class. The text is from a journal entry written during the first week of the quarter. In this reflection, I focus on how important setting the scene for myself is when I read. I touch on memories I have from reading at my grandparents' house and how I separate reading for fun and reading for school. I note, "Having the opportunity to think more about reading will make me a more intentional reader in my practices, in the content I chose, in my analysis of reading whatever material I chose, and to document my process of understanding what I do now and how I will become a better reader at the end of this course and beyond."

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For my first timed blog post reflecting for our reflection journal I made sure to set the scene for myself. I have a stopwatch on my iPhone that started when I typed out my first word, I am sitting in one of the most recommended coffee shops in the city overlooking the water… and have a vanilla latte to my right.

… I spent this summer reading "for fun" and it was beautiful. When I think about reading, setting the scene, much similar to setting the scene for this first blog post is important. My favorite place to read is in my grandparent's home in Zocoteaca, Oaxaca, Mexico. My maternal grandparents live in a rural community in Mexico… surrounded by the mountains. I am one of the oldest granddaughters and my grandma Romelia and my grandpa Panuncio love me and take care of me. This summer when my family and I arrived at my grandparents' house my grandma pulled out a bag she had been saving just for me with three beautiful, colorful hammocks. My grandpa got up and told me he would put them up for me whenever I was ready, wherever I wanted on their large patio. This brings me to reflect about the meaning of reading for me and the importance of the setting I have that is tied close to home. This summer I read: (It's interesting here for me to note that I just went back to my Amazon order account to think back to exactly what books I bought the title and the author, and which books I read to take me back [using the internet to reflect!])

- *Americanah by Adichie, Chimamanda Ngozi*
- *Between the World and Me by Coates, Ta-Nehisi*
- *Milk and Honey by Kaur, Rupi*
- *This is How You Lose Her by Díaz, Junot*
- *The Boys in the Boat: Nine Americans and Their Epic Quest for Gold at the 1936 Berlin Olympics by Brown, Daniel James*
- *Blindspot: Hidden Biases of Good People by Banaji, Mahzarin R.*

Reading these books and reflecting on what the practice of reading - I think I currently separate reading for fun and reading for school. The school setting I am in now is different than my undergraduate experience but I am looking forward to thinking about how during my phd journey I shift my mindset on what I am told to read vs. what I see as reading for pleasure versus what I read because I am encouraged to read and potentially even novels vs. research papers. How do I combine both activities and how do I translate the skills or the experience I have reading those novels for fun in my grandparent's backyard to reading the paper about engineering and mental health in our class.

I have recently been thinking about practices and personal preference in the context of what will work for me in graduate school and I have been thinking about this through an analysis of how I read. Personally, I prefer physical copies of books and papers to read. I recognize that having a kindle for when I read on the bus or when I am traveling is more space efficient (my luggage to my trip to Mexico this summer was overweight because of my heavy physical books!) but I enjoy the feeling of having a book or paper in my hands to fully engage and appreciate the reading I am doing. There are other factors like note-taking and how I look up things if I am reading on paper but I think I will figure it out as I go and try different things then iterate.

When it comes to content -- I get really excited about reading new things. I am not picky if it means reading a book that comes highly recommended by my peers or if it means reading a research paper about data science, I enjoy the act of learning something new. Someone once told me that there is no need to purchase a book everyday to read. There are so many words everywhere around you -- all the time. Whether that is the local Trader Joe's newsletter that arrived in my apartment yesterday, the department brochure we got during orientation, or the research paper published in CSCW about how individuals disclose mental health illness on social media, I have access to reading materials everywhere.

Having the opportunity to think more about reading will make me a more intentional reader in my practices, in the content I chose, in my analysis of reading whatever material I chose, and to document my process of understanding what I do now and how I will become a better reader at the end of this course and beyond. There are many things I listed during class as notes for what I would like to improve about my reading but the two I want to touch on here are: (1) reading things I don't know yet exist and (2) formulating disagreement arguments effectively.

1 - When I first read a scholarly piece that my graduate mentor Julie recommended about retention in engineering for minority students, strategies, analysis and so much research that looked into the practice of teaching engineering, I remember the first thought I shared when Julie and I discussed was "Wow there are people that write about my experience." There are scholars who dedicate their research to understanding the experiences of underrepresented

minorities and they find it worthy to document and publish. I know there are many fields of research and topics I don't even know exist yet and as I look forward to what I would like to improve about my reading is knowing how to find interesting papers about topics I don't even know the keywords for yet.

2 - Thinking introspectively I believe I am not a very argumentative person. I tend to read things and generally be excited about their content, their potential, their connection to something I already know or care about but I am looking forward to being more argumentative in an organized and logical method. Maybe I am not reading things that I completely disagree with yet. How do I find pieces that challenge me or provide a very different perspective than what I used to towards engineering education or how do I find authors with different values and ethics towards their work that can challenge me. Or maybe I am not yet thinking critically after reading a paper and questioning their research methods or their population set. Maybe I need to create a sort of rubric for myself so that after I read something I have a reminder of things to question. I know I am capable of getting an inkling when I read something that I don't completely agree with, or a study I think is not encompassing of minority perspectives but I am looking forward to making a compelling argument of why I get that inkling and being able to articulate it.

*My timer went off... I enjoyed this process of reflecting on what the word **reading** meant to me.*

1. Curating readings

The first activity of the class was the curation of papers that students would read. This activity featured students curating papers on their own by identifying five papers that received best paper awards from one of two pivotal conferences and then submitting their papers by adding them to a visual bibliography. The task of identifying papers to read was delegated to the individual students in the class. Each student chose papers upon which they practiced their reading skills. The students were told to select only recent papers (operationalized as those from the past year). In addition to the requirement to focus on the past year, students were required to focus on best papers from two highly respected conferences--the ACM sponsored CHI conference (Computer Human Interaction) and the ACM sponsored Computer Supported Cooperative Work (CSCW) conference. During the fall of 2017, students were each told to identify five papers. In subsequent assignments, students were directed to explore a specific issue in reference to one or two of these readings. For example, the students were later asked to analyze how citations had been used in a reading of their choosing and subsequently to contrast how implications for practice were handled in two of their readings. Students "submitted" their choices by adding pages to a visual bibliography (implemented as a shared google slide deck). Specifically, students create one page per reading, where each page include a screenshot of the first page of the reading, the full citation of the reading, and personal notes about why the reading was chosen.

In terms of outcomes, the 5 students in the class chose 23 separate readings (there were two duplicate choices, an observation which everyone found interesting). Students ultimately worked with about 60% of their chosen readings in their various assignments, since later assignments sometimes were easier to do with a paper that had been read previously. At the same time, one

student completed a later assignment with a reading that had not been included in the curated set since the student wanted, at that point, to go further afield.

1a. The educator's story. In this section, I (the educator) discuss my rationale for the key elements of this activity as well as provide notes on my experience of this activity during the fall of 2017 course.

Students pick their readings. Since students know what interests them, having them pick their own readings is a logical way to take into account their interests. In addition, the activity of choosing requires students to look over the collection of papers from which they get to choose--which has potential benefits in that students may have the chance to become aware of what is being published in general. I have been using this strategy of students selecting their own readings for a few years. In early years of teaching courses similar to this one, a pain point had been trying to curate a set of readings that would be broadly of interest to the students in the course. Sometimes I had done this based on my familiarity with students in the program, and other times by soliciting their interests through a survey. The level of work involved in these approaches and the unsatisfactory nature of the results had led me to seek other approaches, culminating recently with the delegation of the curation to the individual students.

Readings from the past year. We focused on the papers from the previous year so that lessons students learn about reading would be anchored in the current state of the scholarship. This anchoring in the current state of the scholarship is particularly important for students in a constantly-in-flux field such as human centered design (i.e., the topics, the approaches, the relevant theories, etc. are in constant flux). In early years of teaching courses similar to this one, a pain point was ensuring that readings represented the current trends in the field. If I were more centrally in the field, I might know what the current trends are. However, my personal research represents only a small window into the current trends, and thus a need emerged over time for a way to keep the readings current without having to know what was current. The emphasis on readings from the most recent year emerged against this backdrop.

Focusing on best papers from two conferences. Narrowing the focus to two conferences, and specifically the best papers of those conferences, can be understood as a liberating constraint that provided a way to balance the randomness created by having students choose their own readings with coherence. For example, the two conferences use very similar publication formats of around 8 pages with two column format. Further, publishing is these conferences is considered highly prestigious, so much so that papers in these conferences count as much as journal articles in hiring, tenure, and promotion decisions. Because of their significance to the field, departmental culture connects strongly to these conferences -- faculty meetings are not scheduled on the weeks of these conferences, public "peer review" sessions are scheduled on the weeks before the deadlines, and the rhythm of the department revolves in general around the deadlines to these conferences. Thus, introducing the students to these conferences through the work of the conferences makes good sense. Finally, since conferences have MANY papers and can also have papers of variable quality (no matter the prestige), the focus on best papers not only provides additional constraint but also ensures the students are working with the best ideas of their field. In early years of teaching courses similar to this one, I cast a broader net in terms of disciplinary breadth (publications from a broader array) and publication formats (conference

papers and journal papers). The decision to have students choose their own readings resulted in a need for constraints to provide coherence. The focus on CSCW and CHI best papers emerged as a way to create that coherence.

Choosing five readings. By having students curate a set of five readings at the beginning of the quarter, this created opportunities to have students to choose a reading for subsequent assignments but be confident that the act of choosing would not be burdensome from assignment to assignment. In the offering of the course that preceded the offering being described, students were invited to select one reading and to spend the term analyzing that reading. In-class activities, where students shared the results of their analyses with other students, were identified as the place that individual students would get a broader picture. While this worked reasonably well for most students, two circumstances led to having students start the term being described by curating five readings. First, several students reported getting bored over the term and wishing that they could move on to another reading. Second, one student in particular had chosen an interesting reading about a programmable fabric. While the reading was of great value to the students collectively in order to see the breadth of the scholarship, the reading was actually quite difficult to analyze using the frameworks being provided in the course. Thus, an additional goal of having students start with multiple readings was to ensure that unusual research could be included but no student would find themselves "locked in" by their original choice.

Visual bibliography. The visual bibliography served several functions over the term. As a first use, the visual bibliography was the deliverable of the curating assignment (i.e., evidence that the work had been done). Second, the visual bibliography served as an ice breaker in that students got to know each other through what they had include in the visual bibliography. Third, printing the pages of the visual bibliography resulted in "cards" that could be sorted in order to think about trends of research in the field. Finally, the visual bibliography could be referenced in future assignments. In previous terms, the curation had resulted in a standard bibliography which served the above functions, but was not as visually interesting. The visual element simply added to the above affordances.

My reactions. I enjoyed seeing what the students had chosen, and appreciated having 25 readings with which to help them explore the field. I also really enjoyed having the students curate the readings and then reading what they choose--this helped me get up to date with readings in my field and read in areas that are not my personal interest.

1b. The student's story. In this section, I (the student) share thoughts I documented about why I had chosen the papers that I chose. This reflection highlights my curation process – I mainly picked papers that piqued my interest based on the subject. I connect the title of one paper to my experiences as an undergraduate student on a senior capstone team. I connect the subject of another paper to my research interest in makerspaces and finally for my third paper I discuss how the topic is interesting but the abstract seems to vague and repetitive for my interpretation.

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[Paper 1] The title of the paper piqued my interest ... the intersection of mental health, social media, gender, and cross-cultural difference. I am interested in learning more about the

methodology and the author's analysis on the data they collected… I want to learn more about the area of expertise of each author and how they measured dimensions of depression or mental health stages through the lens of social media. The contributions in the design of gender and culturally aware mental health interventions can be used in the field of engineering and higher education.

[Paper 2] Without reading the paper yet, this title reminds me of our work in reflection in engineering and trying to capture/understand the language that students have. That was exactly my reaction for some academic team projects where I knew the people I was assigned to and could identify based on past experiences that we were not the strongest combination of students. This paper is also interesting to me because the tool already exists. CATME (similarly to makerspaces) is currently being implemented in the engineering curriculum but as the abstract notes, little is known about how these tools are applied and how students and instructors perceive their use…

[Paper 3] This paper was interesting to me because of makerspaces, informal engineering activity, potential for engineering outreach activities with children, and toolkit development for makers. The authors of this paper introduce a new wearable construction kit for children…I want to learn more about how their contribution is unique to the field of makers products and what their research question means by "tangible & modular"…

[Paper 4] The authors of this paper present qualities of "effort investment" that are seen to be valuable in the mediation of close relationships. The design implications of this work are five qualities for designers to consider when developing technologies that foster meaningful communication and effort into everyday correspondence. This topic seems like a very interesting research paper and study but I think the abstract is a little too vague or repetitive… I do not get many details on who was a part of their research population, what particular communication technology or platform they mean, and the design methodology for developing these five qualities from the abstract.

2. Targeted Investigation 3: Implications for practice in the readings

The implications for practice targeted investigation was anchored with a "what do we want to know" set of questions. In this case, the questions were as follows: "What we want to know: How are implications for practice are handled in papers describing HCDE related research (What practices are associated with implications for practice)? in CHI/CSCW papers in CHI/CSCW best papers? In individual CHI/CSCW best papers?" The work of the implications for practice targeted investigation was coordinated through a virtual notebook (implemented as a google slide deck oriented in the portrait mode) [13]. All students could edit this virtual notebook, and they submitted their work as contributions to this virtual notebook. In the implications for practice targeted investigation, the virtual notebook contained some introductory material (key concepts, references to related work), the anchor questions mentioned above, the instructions for the work that students would do, their submissions, and a final collectively produced synthesis. (See Appendix 1 for the instructional materials).

In the first of two activities in the "implications for practice" targeted investigation, students were asked to identify two of the papers from their curated set, compare and contrast how these papers addressed implications for practice, and then create a one-page handout (via one page in the virtual notebook) that communicated the process and observations to the class. Students then presented and discussed their handouts during class. Students were shown one approach to coding sentences related to implications for practice and visualizations that could be made once such coding had been done, but they were not required to execute their compare and contrast activity using the coding scheme. In the second of two activities in the "implications for practice" targeted investigation, students were told to choose one paper, take on the role of a "translational consultant" and to create a printable resource (via one page in the virtual notebook) that would help a specified group of practitioners leverage study findings in their practice. The nature of this printable resource was left up to the students. Students then presented and discussed the resources they had made during class.

During the last fifteen minutes of the last class session of the "implications for practice" targeted investigation, the class created a structured abstract (background, purpose, approach, findings, conclusion) to summarize the work of the investigation. This abstract was created using a crowd-sourced, improvisational technique. The abstract was crowd-sourced in the sense that different sentences came from members of the crowd (i.e., the students in the class). The abstract was improvisational in that it was done in real time with class members taking turns offering a next sentence for the abstract. At the end, the final abstract was read back to the class.

2a. The educator's story. In this section, I (the educator) discuss my rationale for the key elements of this activity as well as provide a few notes on my experience of this activity during the fall 2017 course.

Anchoring questions. The anchoring questions frame the targeted investigation in research terms, suggesting to the students that they were setting out to discover something about the practices in their field. The core question (how are implications for practice handled...) is written in four variations in order to seed conversations about the work that would be required to go from what is learned in the specific targeted investigation (i.e., an investigation focused on CHI/CSCW best papers) and the more general question related to disciplinary research. In a previous version of the course, the questions had been written explicitly as "research questions" and the class had been framed as "research on research." This framing led a student concern that the class was doing "poor research" by focusing only on best papers. By not foregrounding the research nature of the questions explicitly, this made it possible for students themselves to discover that our work could be framed as doing research on research.

Virtual notebook. The virtual notebook (which was inspired by the Jupyter notebook work of Kluyver) was conceptualized as a way to coordinate activity during each targeted investigation and also a self-generating product that everyone could reference after the work was completed [13]. Having a virtual notebook for each targeted investigation frames the students as a community exploring a specific topic. It was imagined as something students might want to revisit after the end of the term, particularly as they move through their academic experience. While the virtual notebooks in this instance of the course foregrounded the collective work done

around a topic, the prior version of the course had foregrounded the collection of work produced by an individual student. That decision to aggregate by student rather than by topic was chosen in order to help students see their growth. Unfortunately, that decision made it difficult for students to think about the topic of an investigation, across the individual contributions.

Focusing on implications for practice. "Implications for practice" is both a provocative issue within the human centered design field and thus was a worthy topic for a targeted investigation. Some papers have very clearly defined implications for practice sections, some have clearly identifiable sentences, and other papers handle such implications with much less explicitness. Further, there is great variety in the nature, focus, number, and assertiveness of such implications, and the targeted investigation was an opportunity to draw students' attention to such issues. Further, the notion of "implications for practice" is also a more generally interesting topic as it raises questions about what it takes to summarize research and the functions of research within a larger ecology. A focus on "implications for practice" has long been a feature this and related courses. In the previous offering of the course, however, the students had been instructed to use a specific implications for practice coding scheme to analyze their papers. While that instruction proved interesting to some students, others did not resonate to the coding scheme and thus it was made optional (as one approach to carry out the compare/contrast assignment).

Inviting creativity. This activity was meant to be generative and creative. This was the first time I had asked students to do this particular activity. In the few months leading up the class, I personally had been engaged in efforts to creatively disseminate research to practitioners. During those months, my colleagues and I had explored the use of card decks (a popular approach), highly indexed websites, email dissemination, webinars, etc. I had also been exposed to conversations in which researchers had expressed frustration that such creative activities were not given more recognition in the community. Thus, my personal experiences and my exposure to these conversations created motivation to have students think about these issues.

A culminating structured abstract. The structured abstract was identified as a way to provide some closure to the targeted investigation by making the work and the findings of the investigation visible through the documentation. The abstract was done in a crowd-source, improvisational way in order to add an element of fun while also controlling the amount of time associated with the activity. The goal was not a comprehensive abstract, but a starting point, a sense of some of the things that were learned. In addition, the writing of the structured abstract provided a way to introduce the students to the structured abstract genre and illustrate its potential value. In the previous offering of the course, it was often unclear what had been learned through the targeted investigations. As a result, the notion of "doing research on research" felt incomplete, and thus there was a need for closure. There was also a need to address this closure issue without taking too much time in class and without adding burdensome work outside of class. With the closure issue in the back of my mind, I attended my fall faculty retreat, participated in some improvisational exercises, and learned some of the thinking behind have a group engage in improvisation (e.g., close listening, trust). This stream of considerations then intersected another stream of considerations. In assembling the newest version of the course and consolidated thirteen analyses into the seven targeted investigations, I had removed structured abstracts from the core flow of the class. Thus, leveraging the structured abstract

format as a way to support closure provided a way to bring structured abstracts back into the class, while creating the structured abstract improvisationally provided a way to add lightheartedness and also control time.

My reactions. I enjoyed what was produced by the students in their roles as translational consultants, and think that their creative solutions were tightly connected to the analyses that they had done prior.

2b. The student's story. In this section, I (the student) share thoughts from my journal about my experiences with the "Implications for Practice" targeted investigation. This targeted investigation was significant because I was able to translate my academic work into a form that I could share with my family back home. I explain why it was important for me to translate the academic paper into a handout that would be appealing for the public and practitioners while also translating my handouts into both english and spanish. My reflection also touches on how I've noticed that the virtual notebook affords unique, individual contributions while also creating a collaborative product. Some additional themes in my reflection are about the class pace, the need to connect theory to practice, and the utility of this activity for my academic career.

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This week I made the title of my reflection "Design IRL" because although I continue to learn about how important being a peer reviewer is, what it takes to get a publication, and aiming for rejections to get published more, this week felt more grounded about how I can translate a paper and research into "the real world." The two images in Figure 1 below are screenshots from a handout I made for class after reading one of CSCW's best papers "Okay, One More Episode": An Ethnography of Parenting in the Digital Age by Mazmanian et al. I took the class prompt in two directions when I read translating the design implications from the paper to a handout that would be appealing to practitioners and the public.
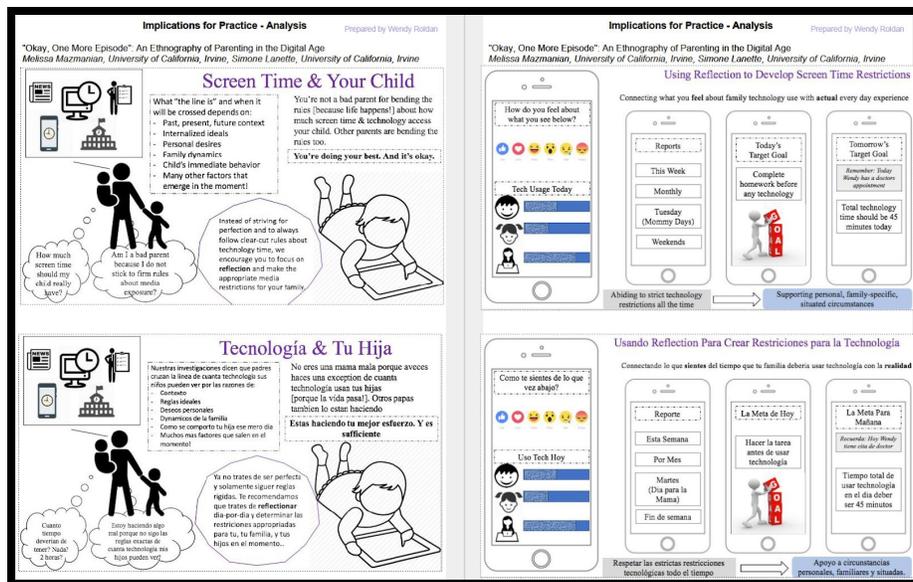

Figure 1. Examples from Handouts Brought to Class by Students

After reading the paper this past weekend, I thought about my parents and how they have to manage screen time for four girls in different ages. I decided to make my handout in both english and spanish to be able to share with my parents. The language translation also helped me think about my communication across languages and how different cultures can interpret the findings. The other direction I decided to take my handouts was that I wanted to translate this paper's important findings… but try to capture as much of it in a half-sheet as well as try to paper prototype through a wire frame the design implication the authors outlined.

This past month in a new city I have been homesick and have struggled with sharing back home what I am doing, what keeps me so busy, and what is the meaning of it all. This class assignment allowed me to bridge my two worlds of graduate school and family.

Thinking back to the ways we've been working makes me think practically. I am thinking about the methods section of my past week and how I've approached the research done in class. In one aspect, I find the research and work we have done sometimes as very introspective and individual and then on the other hand, sometimes very much as a collaborative collection of knowledge.

For example, we create the handouts individually but because of the virtual notebook we are able to see the work of others along the way making our work collaborative in a sense. When we code each citation for the purpose it served in the paper, for the first pass we each coded using our own interpretation and clusters and analysis but after our class discussion for the second pass each of us coded on a more cohesive level.

Our ways of working can also be seen in terms of a time scale. From one side, the pace of the work we have been doing can be seen as very slow because of the line by line analysis and because of the way we read 1/2 papers per week. On the other hand, the time scale of our ways of working can move very fast. It is now the end of week 4 and we have curated a set of papers that is interesting to us from CHI/CSCW, gotten a better understanding of the HCI field, analyzed citations, argument, and implications for practice from each of these best papers. Reflecting on how much we have accomplished in such a short time frame is astonishing but also thinking about how each of these weekly investigations build on each other is very interesting to think about.

My biggest takeaway… the need to connect theory to practice. One of the readings we had or maybe a class discussion noted well who's job is it if not ours? Moving forward I plan to connect my thoughts to the practice of research by thinking about how I can change my mind when I conduct and write about research. Who will be reading my work? How can I make my work more accessible to individuals who will be mass manufacturing a product I make or maybe individuals like my parents who are just trying to look out for what is best for their children. Something I want to do the next time I read is to try to continue making these half sheet handouts for really interesting papers I read for my research and for my parents. This time around I took my time reading through the screentime paper, looking up terms or methods I thought were intriguing and that I could learn more from, and highlighting areas where I would need to go back and read twice to understand better. The next time I read I will also keep in mind how each of the targeted investigations come together in my analysis of a paper. Understanding quicker

what each sentence is trying to argue for will help me build a stronger analysis of the paper and ultimately develop a stronger handout to convey the implications for practice.

3. Targeted Investigation 5: Knowledge & epistemology in the readings

The fifth targeted investigation focused on knowing and epistemology, specifically helping students appreciate the concept of epistemology and the named epistemologies underlying work and publications in HCDE. To open the conversation about epistemology, we engaged in an "epistemology mad lib" activity. Specifically, students were invited to find ways to complete one or more of the phrases __ epistemology, epistemological __ and epistemologically __. To illustrate, consider the following examples: commercial epistemology, teenager epistemology, scientific epistemology, epistemological curiosity, epistemological discomfort, epistemologically brave, and epistemologically confused. After the brainstorming, the group went on to discuss what such phrases could mean if the epistemology is understood most fundamentally as "knowing." This targeted investigation was anchored by a reading by Orlikowski and Baroudi [14] in which the authors used content analysis to explore the role of three epistemologies --positivism, interpretivism and critical perspectives--in the research of their field. The authors are from the field of management science, and the research was conducted approximately 20 years ago.

Along with their first encounter with the Orlikowski and Baroudi reading, students were asked to think about the epistemology underlying one of their own curated readings and "code" this in a specific way [14]. The students were given a template in which the three epistemologies introduced by Orlikowski and Baroudi were on the three points of an equilateral triangle [14]. The students were told to position their paper in the triangle based on their understanding of the underlying epistemology of the work, and provide a few notes of explanation (Figure 2). The template had space for this activity to be done three times, but the students were to only fill out the first instance. During class, students folded their page to cover their own answer while keeping the other spots on the template open, and then passed the template and a copy of their paper to another student who then took around 10 minutes to purposefully scan the paper, make an assessment of the underlying epistemology, position the paper on the triangle based on the epistemological assessment. The sheet was folded so that the answers of the second student were hidden and then the sheet and the paper were passed to a third student, who did the same thing. After this round, all worksheets were passed back to their owners and everyone got to reveal the three characterizations of the paper in order to see the amount of agreement or disagreement. We then discussed the pattern of results for each reading. The activity featuring multiple codings of individual papers was followed, in a subsequent class session, by an activity in which each student placed multiple of their curated readings on a collective epistemological space (i.e., in this case, on a triangle).

One example of the first activity (i.e., the multiple coders activity) is shown in the left of Figure 2, while the final collectively constructed epistemological space is shown in the right of Figure 2. The two activities generated a great deal of conversation. In the first activity, instances of relative agreement reassured the students that they had a reasonable understanding of the epistemologies, while instances of disagreement provoked deeper conversation about the nature of the epistemologies and/or the published work being characterized. For the second activity,

students were very interested in being able to see the epistemological space of the scholarship. An interesting aspect of the conversation was a discussion of the underlying triangle representation itself. One student made a very reasoned argument about the triangle representation as problematic. Rather than undermining the activity, though, her argument led to more discussion within the group about how to associate underlying epistemologies with published scholarship.
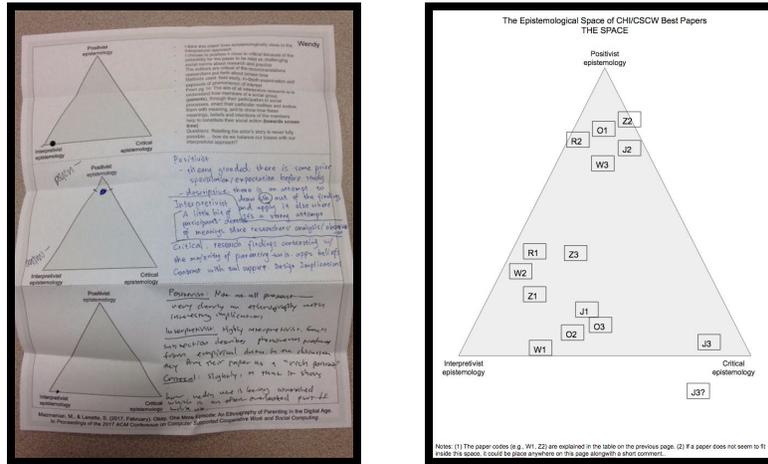

Figure 2. Examples of the work done during the knowing & epistemology targeted investigation. An example of multi-student coding a single paper is shown on the left, while the collectively constructed epistemological space is shown on the right.

3a. The educator's story. In this section, I (the educator) discuss my rationale for the key elements of this activity as well as provide a few notes on my experience of this activity during the fall 2017 course.

The focus on epistemology. Broadly put, epistemology has to do with knowing, and knowing is key to scholarship. Thus, having students know something about different ways of knowing can help not only with reading papers but also with making sense of important debates in their field. In addition to being a useful term for scholars in order to have a deeper understanding of their fields, I have noticed over the years that the term "epistemology" can be divisive when it is used in a conversation where some understand it and others do not. Thus, a goal is to help students get fluent with the concept, in order to enable future learning [15].

The mad lib. The epistemology mad lib is a quick way to get a conversation started. It is also a fun way to create names for lived experiences in the world. I have been using this activity for over ten years. I've used it in large group conversations as well as smaller conversations. It helps people get over the discomfort of the term (where my experience is that the term generates discomfort).

The conceptual reading. The Orlikowski and Baroudi [14] reading is useful because it offers explanations of three disciplinarily-relevant epistemologies (i.e., positivism, interpretivism, and critical) and it induces curiosity. Since the paper describes the prevalence of the three epistemologies in Organization Science publications at one point in time, it is easy to be curious

about the role of the three epistemologies in Human Centered Design publications at the present time. I have used other readings in the past to create conversation about epistemology. One challenge has been that the readings sometimes go into too much depth, in that they overwhelm the issue making it hard for students to get ot the point of working with concepts/seeing them in action. Another challenge has been that the readings do not invite curiosity.

The individual coding activity. The coding activity was intended to concretize the notion of identifying an underlying epistemology while permitting this identification to maintain ambiguity (hence the coding by placing the paper on a triangle). The coding activity also leveraged the generative conversation that is created by seeing agreement and disagreement among multiple raters. In a previous iteration of a similar rating exercise, I had asked students to assign percentages to each epistemology (e.g., a paper could be characterized as 100% positivism; as 33% positivism, 33% interpretivism, and 33% critical; or any other combination). While the percentage approach did generate conversation, the use of a visual (the triangle) was introduced in order to generate more conversation.

The collective coding activity. The collective placement activity was intended to help the class see larger trends in the use of the different epistemologies in the current scholarship in their field. The final collectively constructed triangle represented something I have sought to help student create but has often been elusive- a way to see the space of the current scholarship.

My reactions. I enjoyed the epistemological mad lib activity, as I have done each time I have used it. It is rewarding seeing how easily a group can have a conversation with epistemology at the center when engaged in the mad lib activity. In contrast to the many times I have used the epistemology mad lib, this was the first time I had had students code the epistemological commitments of a published research article via the epistemological triangle described above. While I was somewhat surprised by the debate around the appropriateness of the triangle representation, the debate contributed rather than detracted from the underlying goal of getting students to connect different epistemological traditions to the work that they were reading and their discussions with each other. Overall, the triangle coding activities made it possible for students to engage with, debate, see other perspectives, and thus become more comfortable with the general issue of epistemology.

3b. The student's story. In this section, I (the student) share thoughts about my experience of the targeted investigation focused on knowing and epistemology. My reflection starts with a self evaluation on how I feel about using the word epistemology, what questions I have around epistemology, and thinking about what epistemological space I exist in. I touch on how I can use the lessons learned this week to think about myself as a scholar. I use parallel structure to identify challenges while also identifying the corresponding successes in understanding epistemology. I wrap up my reflection with listening and identifying more questions that have emerged for me as a result of this targeted investigation into epistemology.

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This week in class we focused on epistemology. Before this week, I do not think I encountered that word. Or maybe if I did, I did not understand what it meant. I still do not feel confident in my understanding of the word but I can have a conversation about ways of knowing and I have

begun to challenge my own understanding of what my ways of knowing are. The questions I am thinking about now around epistemology are more personal. What epistemological commitments influence my work? What epistemological space do I exist in and what are the implications of these influences on my research? Also, I now have begun to understand positivist, interpretivist, and critical epistemology but there are others I have not yet explored like feminist epistemology or sociocultural epistemology.

I learned how to read a paper and make a judgement of the epistemological space it comes from. I learned how to be a critical of the epistemological space an author comes from and how the research is presented in a paper. If a paper is heavy on quantitative data and results but the authors claim that they developed a framework to define a new phenomena they identified I can analyze what type of claim they are making and if their methods align with their conclusion.

I have also learned a new way (maybe?) to think about myself. I know this is just the beginning as I think about the ways of knowing that I believe in and that influence my research, my research practices, and my research papers. I am excited as I will continue to learn more epistemologies and gather different ones that best align with who I am become as a scholar.

I also learned that maybe not every graduate student is exploring the epistemological space they exist in because of the many factors that come into play in this process. My department is so broad and open to epistemologies that in class when we attempted to map the best CHI/CSCW papers on a critical, interpretivist, and positivist angle our papers spanned the poles. This can be both exciting and also nerve-racking to an extent. In class, we started to talk about the freedom our field affords of being able to present a paper that has both positivist and interpretivist epistemologies. We also discussed the challenge of writing a paper that has all three of those epistemologies and how this can be confusing to readers and reviewers as they figure out how to critique your work.

The challenge is still wrapping my head around the word epistemology. The success is feeling comfortable writing it so many times in this reflection even though I am just beginning to understand.

The challenge is understanding the many types of epistemologies that exist in my research journey and identifying which ones I like and investigating why I like them. The success is having another tool in my kit to have conversations with professors in the learning sciences, in engineering education, in technology design, and in communications.

Moving forward, I am thinking intentionally about what my ways of knowing are. Exploring dual-language proficiency as a way of knowing is intriguing. Learning about ways of knowing for immigrant students. Thinking about my own ways of knowing as an undergraduate to my new ways of knowing that I am developing as a graduate student feels very relevant to my life right now. The surprise in all of this are the many questions that have emerged for me. What is my department's epistemology? What epistemological influences underlie research in HCI? At my undergraduate institution? In Engineering Education? In my Era?

4. Timed Encounters with Readings

The class featured three instances of an activity called a "timed encounter with readings." The first instance occurred on the first day of class, the second instance occurred at the midpoint of the term (week 6 of 11), and the final instance occurred on the penultimate class session (in week 11 of 11).

The structure of a timed encounter is well illustrated by the first event. During that class session, everyone in the class (i.e., all five students and the instructor) engaged with a paper they had not yet read. Students had been told (by email) to bring one of their curated readings to class, specifically a paper they had not yet read. After some introductory remarks on the purpose of the activity and the intended process, a timer was set for 20 minutes, and each participant read silently using whatever personal strategy they wanted.

The timed reading period was followed by a pairwise conversationally-conducted debriefing. Once the 20 minute period had ended, everyone in the class paired up (including the instructor since there were an odd number of students in the class). Each participant received a debriefing worksheet containing questions to ask and a place to jot notes about the other person's answers. The questions focused on what had been understood from the reading, the reactions to the reading, and the experience of reading. Each student had about 10 minutes to debrief their partner and record notes. At the end of the activity, students received the worksheet with notes about their own answers, and they were required to type up and submit these notes through the course management system.

The second and third timed encounters varied slightly from the first. For the second timed encounter, students were invited to bring a paper that they *had* read. During class, students exchanged papers, and then students debriefed the person who had read the paper they had brought. This structure created the conditions for additional interest during the debriefing. During the third timed encounter, students asked if they could open up the timed encounter to journal papers, and two of five students brought journal papers. Because these papers were longer than the conference papers we had been reading, there was a joint decision to lengthen the timed encounter to 30 minutes.

4a. The educator's story. In this section, I (the educator) discuss my rationale for the key elements of this activity as well as provide a few notes on my experience of this activity during the fall 2017 course.

The first timed encounter. This first instance of the timed encounter was intended to function as a conversation starter, so that we could have class discussions about different strategies for reading as well as class discussions about the overall experience of reading. This first instance of the timed encounter was also framed as a benchmark, so students could compare later experiences with timed reading to this initial experience. When I first conceived of the timed encounter activity as a way to help students see their learning, I was told that this would likely be stressful for students but also told that it might be fun. Thus, during the planning of the

activity, I focused specifically on how to reduce stress. Part of this was to reduce power distance between me and students by choosing to engage in the activity myself.

Making learning visible. In earlier versions of the course, I had been uncertain about the extent to which the students could see growth in their own reading competence. Since the ability to see growth is critical, I was interested in trying to find a mechanism to make growth visible. While a possibility could have been to have students read something new outside of class, this could easily turn into an activity that took a long time, and have students feeling that "they would have done better if they had just spent longer." The timed reading was conceived as a way to manage these issues. Further, the timed reading encounter leverages the productive anxiety associated with more formal test taking.

The time of the timed encounter. In order to have the activity function as a "test" it needed to have a bit of stress. The 20-minute benchmark was set as a time in which the research articles the students were reading could be understood at a reasonable level, but not completely or critically understood. The 20 minute benchmark was set as a balance of inducing a need to strategize while making it possible to read a reasonable amount of the paper. Further, the 20 minute benchmark meant that there would still be plenty of time during the class session for other activities even beyond the debriefing. In my experience, students spend wildly different amounts of time on reading. As a result, constraining the reading time was an opportunity to demonstrate that the students could possibly choose how long to read rather than feeling like the readings were controlling them. Also in my experience, students rarely calibrate themselves about how much they can accomplish when reading in a timed manner and rarely explore different reading strategies. By constraining the time to a point that would induce choice, students could start to calibrate and think more critically about their choices.

Choosing the readings. By having the students choose the readings that would be involved in the timed encounter, they had a certain amount of autonomy. In the first instance of the timed encounter, the instruction was to bring a paper that had not been read.

Conversational debriefings. Since a key goal of the timed engagement was to draw attention to issues such as what can be done in a short period of time, what conditions are associated with what reading strategies, and (later), how one's reading ability is changing to reflect what is being learned, it was critical that conversation about such issues be part of the overall exercise. Because I anticipated that students would be interested in each others' answers, I decided to have this information be part of a social activity--i.e., a conversation. Because I wanted the information to be recorded for later reference, I had the students type up and submit the notes of their debriefing.

My reaction. In terms of outcomes, despite having thought through the activity quite a bit in advance, I was still nervous during the first timed encounter. My nervousness receded within a few minutes of introducing the activity--the students were excited by it and embraced it fully. Overall, I was very satisfied by this component of the class.

4b. The student's story. In this section, I (the student) bring forward thoughts from my debriefings during the third timed reading encounter. The debriefings from the first and second timed encounters are included in Appendix 2. In this reflection I bring in connections from my

first and second timed encounters. I touch on how I approached reading this paper systematically, how I was able to pick up new material and critique the work, and how I brought in lessons I learned from this class to tackle this reading. In my synthesized reflection, I reflect on the role confidence plays in my approach to reading and how an intentional focus on each targeted investigation has led to an understanding towards reading approaches so that reading can come naturally when I read papers on my own. Using the targeted investigations as a framework for reading, when I pick up a paper that I have never seen before I think about the citations used, the arguments the paper is making, the epistemological framework presented and the other targeted investigations naturally as I attempt to make sense of it.

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Timed Encounter 3 (12/13/17)

Approach: I approached reading ... by reading the abstract first. I attempted to understand Figure 1 on page 1 at first glance but recognized that I lacked the content knowledge to understand the concepts on flexible diffusers and what computationally generated reflectors meant. Prior to this class I am not sure I would have been able to recognize so quickly what I don't know and look for the section in the paper that would answer my questions. Once I read the introduction, I understood the focus of the paper… but I also learned they conducted a user study. I then jumped to the users and evaluation section even though it wasn't the primary focus of the paper because that is what I felt comfortable with. I used the pictures and figures to help me wrap my mind around what informed the development of the tool and was able to have a conversation with the class about what questions I had after the reading.

Appraisal: I think something that went really well this time around was my ability to read and understand a paper that was based on CHI knowledge and explorative engineering. If I had more time next time I would try to understand the tool building process better and the tool components. On a positive note, I had constructive questions … which means I was able to understand enough to inform my questions.

Comparison & Influence from Targeted Investigations: I was able to quickly skim the entire paper this time around and consciously make an informed decision about the best way to read this paper. As [another student] said in class, I could take cues from the authors when they used a certain language to refer to the tool deployment versus when they discussed prior related work. This timed reading engagement was significantly influenced by all of our targeted investigations but I thought a lot about trustworthiness when reading this paper. Do I trust the work enough to then trust the conclusions the authors make? Do I trust the tool development to understand the workshop implications for novices? I asked trustworthiness questions as I read and relayed my questions to the group.

My approach to this timed reading engagement was different than my previous two reading engagements because I did not feel anxious going into class and reading a paper I had never seen before for 30 mins. For my first timed reading engagement, I did not know what I was going into and when presented with the task of reading on the spot I got nervous. The origins for these nerves were feeling like I lacked formal training on reading research papers. I also lacked the confidence to feel capable of reading research and having conversations with others right after I

read it given my limited experience. At the time of the second timed reading engagement, my approach going into the class was to skim over the virtual notebooks for the targeted investigations we had done. I was nervous for the second timed reading engagement because I imagined an expectation of connecting the targeted investigations to specific instances of the paper. Instead, during the second timed reading investigation, the targeted investigation concepts were a toolkit I could turn to support my reading of the paper handed to me. Going into my third timed reading engagement, I felt confident picking up a paper about concepts I was unfamiliar with given that I had spent the past 10 weeks reading and gaining knowledge about how to read well. The practice and targeted investigations structure helped make reading research a muscle memory task flow for me that I am looking forward to continuing exercising and improving on.

Synthesis: As a wrap up reflection – I will connect my experience with my third timed reading engagement in class with my recent experiences doing two separate literature searches on equity in engineering and familism as a concept in education and Latino families. Going into my first quarter of graduate school and specifically this class, I knew that I was going to take a course where I would learn how to read. 543 has not only given me a framework (UBASE) to think about when I read papers but has also given me confidence. I am able to read research, read research quickly and capably, and engage in a conversation about my reading understanding with others. During the third timed reading engagement in class I thought it was a good thing that we could not decide how to exchange papers to read. I was drawn to the paper that one of my classmates brought to class on explorative engineering because of the content but I was also drawn to another paper because of the challenge I anticipated it would present. At the beginning of the quarter I am not sure if I would take up the challenge of reading a paper out of my content area that I had never seen before from a journal I was just getting acclimated with so quickly. This third timed reading engagement connects directly with my recent independent dives into literature searches and reading papers to understand. Deciding what to read or curating papers is the first strategy that this class taught me. I am a much better skimmer and I can identify the papers that I want to read in depth. Once I select the papers that interest me the most I am able to read them in depth rather quickly at first glance and engage in conversation with others about the papers. The CHI paper on the Labella design I read on my 30 min bus ride home one day and I read it capably even in that setting. I got excited about it and engaged in a conversation with my classmate about it the next day. I read a paper in a higher education journal about parents and their role in their child's education through the lens of familism as a core value quickly and capably the other day and was able to entice my professor, my mom, and a colleague to consider reading it. On a weekly basis, I've intentionally focused on targeted investigations related to reading and understanding so that it can come naturally when I read papers on my own. Using the targeted investigations as a framework for reading, when I pick up a paper that I have never seen before I think about the citations used, the arguments the paper is making, the epistemological framework presented and the other targeted investigations naturally as I attempt to make sense of it.

Discussion

This paper was motivated by two questions: (1) What trajectories do emerging scholars go through as they work to become capable, critical, and generous readers of published disciplinary scholarship? (2) What considerations are involved in creating a learning experiences that help students become capable, critical, and generous readers of published disciplinary scholarship? In this section, we look across the sections entitled "student's story" to offer some comments on the trajectories of learning associated with becoming a capable, critical and generous reader of empirical research. Similarly, we look across the information embedded in the sections entitled "educator's story" to draw out some general considerations. In addition, we provide some thoughts about the transferability of the activities described in the paper for readers interested in leveraging one or more of the activities.

Trajectories of learning

The "student's story" contributions provide a single, provocative case of a student advancing her abilities as a capable, critical, and generous reader of published academic research. The contributions make it possible to identify varied dimensions in a trajectory of learning.

- In the incoming reflection, a variety of issues are put on the table including reading as a situated practice occurring in different contexts (personal and professional), the possibility of personal reading practices and being self-aware of such practices, reading as learning, reading as everywhere, setting personal goals for reading such as engaging in disagreements and finding/reading things one does not yet know exist, and identity-related issues such as self perceptions of being or not being an argumentative person and how that connects to engagements with reading.
- In the reflection on the curating activity, we hear about the broad collection of interests that informed the curation process: topics that resonate because of personal experience, topics that resonate with prior training (in this case, training as an engineer), and topics that resonate because of the way they bring varied issues together.
- From the reflection on investigation 3 (the targeted investigation focused on implications for practice), we hear how an assignment to connect research to practice became a chance to address socio-emotional issues associated with being a doctoral student (i.e., feelings of isolation, connecting to personal communities) as well as an opportunity to think about different aspects of being a scholar (i.e., not just getting published but connecting to practice).
- From the reflection on investigation 5 (the targeted investigation focused on knowing and epistemology), we hear what it is like to learn a concept (i.e., epistemology) that opens up a broad space of questions and awarenesses.
- From the reflection after the third timed encounter, we hear explicit references to growth in reading abilities--growth not just in the ability to read quickly, but also to read with confidence and without anxiety, growth in the ability to read with specific questions in mind (such as questions about trustworthiness), and growth in willingness to read new papers quickly.

Looking across these accounts, it is possible to see multiple interrelated dimensions of learning present in this trajectory. For example, there is evidence of accountable disciplinary knowledge (i.e., knowledge that counts) in terms of concepts (i.e., epistemology) and skills (i.e., reading for a purpose) [16]. There is evidence of identity work throughout--from the beginning references to a self image of not being good at argumentation to the sense of confidence in being able to read. There is also evidence of the learning experience functioning as a preparedness-for-future-learning experience [15]. This is evidenced in the behavior of electing to read something new because it could be done quickly and in reading in order to have conversations with others. These notions of accountable disciplinary knowledge, identity, and preparedness may be promising dimensions for describing the trajectory shared here and thus for exploring the trajectories of learning of others.

Considerations in the design of learning experiences

The educator and student accounts presented in the results section suggest considerations that may be useful to explore when designing learning experiences in this space.

Consider the synergy between individual and group contributions. The learning experience presented in this paper featured individual contributions that created the possibility for students to bring their authentic self to the conversation. The learning experience also featured group efforts that built on the individual contributions. Constraints were used in many cases to support movement between the individual and group contributions. For example, in the curation of readings, students had the opportunity to address their own interests and bring those to class. At the same time, the curation constraint to choose five readings from the past year and from specific conferences created an opportunity for group cohesion through conversations about the choices. In the targeted investigations, students were given freedom over what they put on their virtual notebook contribution for each targeted investigation. At the same time, the one page handout constraint and the expectation that the page be useful for creating discussion made it possible for the individual activity to flow fluidly into the group activity.

Consider the balance between seriousness and lightheartedness. In the learning experience presented in this paper, there is an undercurrent that can be described as balancing seriousness with lightheartedness. This was present in the handouts in the virtual notebooks, the improvisationally created structured abstracts, the epistemology madlib, and the epistemological space activities. These efforts to add lightheartedness to otherwise serious topics were put in place to create a welcoming learning environment in which students could feel comfortable with the prior knowledge they brought to the course. In addition, these lighthearted activities helped the group be generative and discover the seriousness for themselves.

Consider providing opportunities to learn *and* opportunities to be aware of learning. In the learning experience presented in this paper, there were not only opportunities to learn but also opportunities to be aware of one's learning. The balancing of individual and group contributions, and the balancing of seriousness and lightheartedness, created a wide range of learning opportunities. This creation of learning opportunities was itself balanced with opportunities for students to be aware of one's learning, such as through the improvisationally created structured

abstracts, the timed encounters with readings, and the journaling requirement (which gave rise to the student accounts included in this paper). The consideration of helping students be aware of their learning is complicated by an issue of time scale since some of what is being learned will be realized over time (as students move into other aspects of academic life where they benefit from the insights made possible by reading from different dimensions). More analysis of trajectories of learning in this space may make it possible to better support student awareness of their learning.

Transferability of the specific activities described

For those readers interested in instantiating similar activities, we offer thoughts about the transferability of the activities. Considering curating and transferability, with more students, it might be better to have individual students curate fewer readings (e.g., three or four) in order to keep the process tractable. In transferring these ideas to other disciplines, a logical starting point would be in identifying the small number of venues that could serve as the liberating constraint when students are asked to curate their own readings. It is possible that journals would be a more logical choice than conferences for other disciplines. If so, it might not be necessary to focus on best papers (if the total number of papers published in a single year is modest).

Considering the implications for practice investigation and transferability, with more students, there would be more compare/contrast analyses and more translational resources produced. As such, it would likely become important to have students share their work in small groups during class, and this would necessitate thinking through how to conduct a report out (something that was not needed in the offering being described because of the small number of students in the class). It is possible that with more students there could be opportunities to group the translational resources by format, and create some additional insight through the grouping. In addition, it could be that the improvisational structured abstracts are created by small groups. The focus on implications for practice seems particularly relevant for fields in which the research has an applied orientation (i.e., it is meant, at least in some way, to inform practice). It is possible that such a topic could be leveraged even in other fields in order to surface questions.

Considering the knowing and epistemology investigation and transferability, while these activities would likely scale far beyond the five students who were in the class, if there were significantly more students it might become necessary to put them into working groups of five to ten students. The three epistemologies that formed the core of these activities, i.e., positivism, interpretivism, and critical perspectives, are important for fields involving the study of people and an orientation toward change. It is possible that the relevance of these epistemologies might vary for other disciplines.

Finally, considering the timed encounters and transferability, because the activity is decentralized, it could easily be scaled. Whether the activity were done with 4 students or 40 students, the elements of the timed period for reading, the pairwise debriefing, and the personal accountability for submitting the debriefings notes would still make sense. It is possible that students in a larger group might feel less accountable (since the students in my class were sitting only a few feet from me during the activity). If this activity were transferred to other disciplines, this might affect the types of papers brought into the timed encounter period. As was mentioned

above, this could be addressed by actively choosing the duration of the timed encounter to balance the need to induce urgency but still provide dignity (by having people be able to read enough to have pride).

Conclusion

The purpose of this paper was to contribute to the body of scholarship on graduate education by adding to what is known about helping graduate students learn to read academic research. The combination of an omniscient voice, a student voice, and an instructor voice in this account of a specific learning context provide multiple opportunities for readers to learn from. The results of this work suggest the complexity of helping graduate students learn to read published academic work, and also a chance for all who work with graduate students to be reminded of that experience (and potentially counter an expert blind spot). The trajectories of learning seen here involve accumulated knowledge and skill, with questions of identity, emotional ups and downs, self questioning, discovery of personal strategies and strengths, and issues of belonging. The results of this work provide insight into the considerations involved in designing learning experiences that help emerging scholars become capable, critical, and generous readers of published disciplinary scholarship. The results of this study should be helpful to those in the community entrusted with helping graduate student gain this critical skill. This paper suggests future research concerning a novel set of instructional activities, designed to support learning to read academic work, reveals about trajectories of learning when learning to read published academic research and the conditions that support the development of effective reading practices.

Coda

As a final note, we quote the student and one of her parting thoughts about the lessons she gained from the experience. *As I reflect on why reading research papers is becoming more natural to me, I think about the metaphor of running. I started running in college because I wanted to stay active and I was searching for a way to get out of my own thoughts for a bit. When I started running it was very mechanical. I knew I had to focus intentionally on my breathing, on the way my legs pushed me forward, on the sound of my feet hitting the pavement. Now when I run it is a flow, where all those micro-focuses come together into the act of running. This class has prepared me in a similar way to get into a natural flow of reading thanks to the intentional focus on the components of reading through our targeted investigations, virtual notebook contributions, and journal reflections.*

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Appendix 1. The complete collection of assignments from the course

This appendix contains the instructions associated with each of the targeted investigations used in the course described in this paper. The assignments are exactly as they appeared to the students. The dates have been left in the assignments to that the overall pace of the course can be understood.

Targeted investigation 1: Citations

Motivating questions

- What we want to know: How are bibliography items leveraged in papers describing HCDE related research? in CHI/CSCW papers? in CHI/CSCW best papers? In individual CHI/CSCW best papers? How many sentences contain citations? What varied functions do bibliography items play when cited in papers? What specifically is cited for different functions?

Part 1, First pass (Due Monday, 10/2)

- Do this. Choose a paper for analysis. Prepare a means for coding your paper on a sentence by sentence level (for example, scrape all of the sentences and create a spreadsheet, I provided a sample here and another example here (from the instructor's reading on 9/27). Read your paper paying particular attention to how items from the bibliography are used in the paper. For example, what function do different bibliographic items serve? Do you notice any trends in how bibliographic items are used?
- Prepare this. Prepare a single-sided or double-sided "handout" in this virtual notebook that addresses the following questions: How did you go about exploring the way bibliographic items are cited in your focus paper? What initial observations do you have about how citations are used in your paper? What might be worth discussing in the broader group? What ideas do you have for a more detailed analysis? Consider including a visualization…
- Submit this. Submit your "handout" by adding it to (this) Virtual Notebook.

Part 1, First Pass discussion

- What papers did we choose (populate, in real time, the "what we analyzed" table)
- Sharing our first pass - How did we approach it, what did we learn?
- Brainstorming second pass - What would we like to know more about? What could we do next / what will we each (or collectively) do next
- Second pass planning - Time to decide on a second pass approach (collective or individual)?

Part 2, Second pass (Due Wednesday, 10/4)

- Do this. Read the paper on throwaway citations and think about how the ideas from that paper connect to the paper you are analyzing. Also, identify 2-4 sentences from your

target paper that would be interesting for a discussion of how do we decide when a citation has been done well.
- Prepare this. Prepare a single-sided "handout" in our Targeted Investigation 1 Virtual Notebook that contains (a) your thoughts on how the "throwaway citations" paper's points connects to the paper you are analyzing, and (b) your sentences for our discussion.
- Submit this. Submit your "handout" by adding it to (this) Virtual Notebook.

Part 2, Second Pass discussion

- Sharing/discussion of two contributions from the class
- Pairs discuss/document one or more takeaways using the tables in the synthesis section of this notebook
- Sharing/discussion of remaining contributions from the class
- Pairs discuss/document one or more takeaways using the tables in the synthesis section of this notebook

Final summary

- The group works together to prepare a structured abstract capturing the essence of the work on the targeted investigation.

Targeted investigation 2: Argument

Motivating Questions

- What we want to know: How are arguments made in papers describing HCDE related research? in CHI/CSCW papers in CHI/CSCW best papers? In individual CHI/CSCW best papers?

Part 1, First pass (Due Monday, 10/9)

- Do this. Complete the following tasks: Choose a paper to analyze for this investigation. Read the first chapter of Shon's book in which he describes a scheme for coding sentences in journal articles (the first chapter can be found in the folder with this notebook, that chapter and other chapters can be found on canvas). Prepare a means for coding your paper on a sentence by sentence level; Conduct an initial pass of coding the sentences using the coding scheme by Shon (described in chapter 1, also included on the next page), paying particular attention to sentences that do not seem to be code-able using Shon's scheme.
- Prepare this. Prepare a single or double sided handout that addresses the following questions: (a) What initial observations are possible given your first pass of coding? (b) What questions were raised by the first pass of coding your focus paper using Shon's codes? (c) Are there any additional codes you believe we might need to add to the coding scheme in order to more completely code our papers?
- Submit this. Submit your "handout" by adding it to (this) Virtual Notebook.

Part 1, First Pass discussion

- What papers did we choose (populate, in real time, the "what we analyzed" table)
- Sharing our first pass - How did we approach it, what did we learn?
- Review second pass plan…

Part 2, Second pass (Due Wednesday, 10/11)

- Do this. Complete the following tasks: Code/recode the sentences of your focus paper based on the conversation from the previous class session; Prepare one or more visualizations to communicate your coding (such as a timeline).
- Prepare this. Prepare a single or double sided handout that contains (a) your visualizations, (b) your observations about what the coding suggests about how argumentation was done in your paper, and (c) your thoughts on what might be useful to discuss in the larger group--for example, what surprises might be worth unpacking; what implications for practice (reading, writing, and/or researching), research, or design; etc .
- Submit this. Submit your "handout" by adding it to (this) Virtual Notebook.

Part 2, Second Pass discussion

- Sharing our second pass - How did we approach it, what did we learn?
- Discussion of the questions we have for others…

Final synthesis

- Bubbling out - what are 3-7 key insights from our activity, and more specifically, how does our work shed light on issues of understandability, believability, significance, and ethics wrt reading academic research?

Targeted investigation 3: Implications for practice

Motivating questions

- What we want to know: How are implications for practice are handled in papers describing HCDE related research (What practices are associated with implications for practice)? in CHI/CSCW papers in CHI/CSCW best papers? In individual CHI/CSCW best papers?

Part 1, First pass (Due Monday, 10/16)

- Do this. Review your best papers to identify two that handle "implications for practice" in contrasting (or at least somewhat different) ways. Update the "what we analyzed" page with information on your two papers. Next do a close read of each of the two papers to see how implications for practice are handled in the papers. Consider paying attention to issues such as how explicitly implications are addressed (is there a heading? Is there a transition sentence that signals to the reader), where they are addressed (distributed or in a single section or…), what types of suggestions are offered (suggestions for what or how to design, suggestions for policy…), and how the suggestions are connected to the findings that presumably warrant them.

- Prepare this. Prepare a written response that addresses the following questions: How did you go about exploring the way implications for practice are addressed in your papers? What did you find out? What might be worth discussing in the broader group?
- Submit this. Submit your "handout" by adding it to (this) Virtual Notebook.

Part 1, First Pass discussion

- What papers did we choose
- Sharing our first pass - How did we approach it, what did we learn?
- Review second pass plan…

Part 2, Second pass (Due Wednesday, 10/18)

- Do this. Complete the following tasks: Imagine yourself hired as a "translation specialist." Your job is to create a printable resource that helps practitioners appreciate the implications for practice associated with one of the papers you analyzed in part 1. In creating this resource, you can stay close to the implications for practice articulated in the paper or supplement with additional implications that you believe also stem from the findings of the paper. Can you create a resource that would okay if used alone, but might also entice the practitioner to read the original paper?
- Prepare this. Prepare your printable resource. For example, your resource might be a handout or a set of "cards" (like the IDEO design cards). If you do imagine a set of cards, you need only mock up the number of cards that would fit on a single 8.5x11 sheet of paper.
- Submit this. Submit your work by adding it to (this) Virtual Notebook. We will discuss design process in class.

Part 2, Second Pass discussion

- Sharing the printable resources (and the design thinking/level of difficulty associated with their creation)
- Visit by xxx, a PhD student who has been exploring the issue of translation.

Final synthesis

Targeted investigation 4: Theory

Motivating Questions

- What we want to know: How is theory (or theory-related "things") handled in papers describing HCDE related research? in CHI/CSCW papers in CHI/CSCW best papers? In individual CHI/CSCW best papers?

Part 1, First pass (Due Monday, 10/23)

- Do this. Review your best papers to identify two that handle "theory" in contrasting (or at least somewhat different) ways. Update the "what we analyzed" page with the citations of your two papers. // Next do a close read of the two papers to see how theory is handled in

each. Pay attention to terms that signal the use of theory including not only (1) the obvious term theory but also (2) the terms framework, conceptualization, model, notion, paradigm, perspective, and define (and variations thereof). To do an even closer read, pay attention to (3) the use of the word as since it can be used to signal when a phenomenon is being seen in a particular way (you can ignore as well as, such as, and as used to mean "when"). // What do you find? If you see many instances of these terms, what do you make of it? If you see few instance of these terms, what do you make of that? What role do the sentences using such terms play in the paper?

- Prepare this. Prepare a written response that addresses the following questions: How did you go about exploring the way theory-ish ideas are addressed in your papers? How do the two papers compare? What might be worth discussing in the broader group? What is happening to your understanding of theory?
- Submit this. Submit your "handout" by adding it to (this) Virtual Notebook.

Part 1, First Pass discussion

- What papers did we choose
- Sharing our first pass - How did we approach it, what did we learn?
- Review second pass plan…

Part 2, Second pass (Due Wednesday, 10/25)

- Do this. Revisit both papers in light of the conversation on Monday. .
- Prepare this. Prepare a pair of double sided "cards" using the single page template provided. On the first side or each card, include a citation to the paper and some pointers the ways theory is used in the paper. On the back of each card, include a sample of the "theory" citations that are referenced in the paper.
- Submit this. Submit your work by adding it to (this) Virtual Notebook. We will discuss your designs in class, as well as how this exercise will connect to the 542: Theory course in the winter 2017 term.

Part 2, Second Pass discussion

- Sharing the printable resources (and the design thinking/level of difficulty associated with their creation)
- Thinking ahead to your expectations of HCDE 542 - "Theoretical foundations."
- Final synthesis
- Structured abstract summarizing our work.

Targeted investigation 5: Knowing and Epistemology

Part 1, First pass (Due Monday, 11/6)

- Do this. Read the paper by Orlikowski and Baroudi (1991, Studying information technology in organizations: Research approaches and assumptions. Information systems research, 2(1), 1-28; Available in the files section of Canvas), paying attention to the three epistemological positions described in the paper. Now, choose one of your best

papers to analyze. Think about how you would align the work of the paper with the three epistemologies named in the Orlikowski reading. Specifically, if you were asked to place your paper on a triangle reputation with one corner representing 100% positive, a second corner representing 100% interpretivism, and the third corner representing 100% critical, and positions within the triangle representing partial combinations, where you place your paper. Why? And, critically, how much work did YOU as a reader have to do in order to make this judgment (i.e., how explicit was the paper vs. how much was your inference).

- Prepare this. Claim one of the templates below in the "first pass" section and fill it out. You will be positioning your paper in the triangle visualization and preparing some explanation. Do you not do anything to the lower ⅔ of the page -- we will us that in class.
- Submit this. Your filled out template in this virtual workbook will be your submission.

Part 1, First Pass discussion

- How do the papers compare in terms of their alignment with the named epistemologies?
- What types of work did you have to do in order to offer this judgment?

Part 2, Second pass (Due Wednesday, 11/8)

- Do this. Identify three papers to position in our collective epistemological space. Think about how you will position these papers in the three dimensional epistemological space
- Prepare this. Record the papers in the table located on the page labeled "key." Position the papers in the collective space on the page labeled "the space" and add notes to the "key" table to explain your placement. Finally, identify something for us to discuss (question, observation, concern, muddy point) and add your suggested discussion item to the page preconfigured for the discussion.
- Submit this. Your filled out template in this virtual workbook will be your submission.

Part 2, Second Pass discussion

- Review the collective epistemological space.
- Discuss discussion points offered by each person.

Summary

- The group works together to prepare a structured abstract capturing the essence of the work on the targeted investigation.

Targeted investigation 6: Ethics

Part 1, First pass (Due Monday, 11/13)

- Do this. Think about your collection of papers in terms of (a) how ethics are addressed explicitly, where, and how as well as (b) the extent to which you feel ethics issues are latent in the work. For background on ethics that might be relevant to the analysis, consider reading Breuch et al. (2002) on ethical issues, the foundational historical text on ethics and human subjects, the Belmont Report, or the recent paper entitled "Turkopticon:

interrupting worker invisibility in amazon mechanical turk." Feel free to bring into your analysis your own perspectives on ethics. Finally, choose two papers to profile in your contribution to the class.

- Prepare this. Prepare a single or double sided handout that addresses the following questions: How did you go about exploring the way ethics was addressed in the selected papers? How was ethics addressed? What might be worth discussing in the broader group? Consider adding a visual showing a two dimensional space (x axis = explicitness with which ethics is addressed, y axis = salience of ethics in the work being described) and plotting your papers in this two dimensional space.
- Submit this. Submit your "handout" by adding it to (this) Virtual Notebook.

Part 1, First Pass discussion

- Across CHI/CSCW papers, how do the papers distribute in terms of how explicitly ethics is addressed?
- Across CHI/CSCW papers, what types of ethics issue are latent in the work?

Part 2, Second pass (Due Wednesday, 11/15)

- Imagine yourself hired as a CHI/CSCW ethics advisor. Your job is to create a printable resource that helps practitioners appreciate think about the ethical issues associated with the types of research being done in HCDE-ish domains. Challenge: Can you create a resource that would okay if used alone, but might also entice the practitioner to read the original paper?
- Prepare this. Prepare your printable resource. For example, your resource might be a handout or a set of "cards" (like the IDEO design cards). If you do imagine a set of cards, you need only mock up the number of cards that would fit on a single 8.5x11 sheet of paper.
- Submit this. Submit your work by adding it to (this) Virtual Notebook. We will discuss design process in class.

Part 2, Second Pass discussion

- Review the ethics resources created by the class.

Summary

- The group works together to prepare a structured abstract capturing the essence of the work on the targeted investigation.

Targeted investigation 7: Trustworthiness

Introductory note: Now that we have had conversations about the understandability, significance, and ethics in the context of our papers (i.e.., the U, S, and E of UBaSE), it's time to turn our attention to the trustworthiness of the paper (i.e., this is represented as "B" for believability in UBASE). In this unit, we will leverage three readings from canvas: Jaeger and Bond (1996), Shenton (2004), or Walther, Sochacka, and Kellam (2013). In order to ensure the work meets the

needs of everyone in the class, we are going to start with a general focus on trustworthiness, and figure out where to go based on our initial conversation.

Part 1, First pass - (Due Monday, 11/20)

- Do this. Think about your collection of papers in terms of the "knowledge" that is offered by the paper and your sense of what is contributing to the trustworthiness of the knowledge and what might have increased the trustworthiness even further. Choose two papers to flush out a bit more.
- Prepare this. Copy the template slide available in the "first pass" part of this workbook, and fill out the template for your chosen papers. Don't worry about by trying to be comprehensive. Rather, try to contribute issues that will help us have a good conversation. Of particular note, please feel free to contribute ideas that are currently hard for you to explain - this will help us see what type of concepts/vocabulary we need in order to do this "critiquing" activity with a more professional voice.
- Submit this. Your completed worksheet will be your submission.

Discussion

- Across CHI/CSCW papers/HCDE-ish papers, what types of trustworthiness issues are important for judging the believability of the knowledge contributions?
- What do we need to know more about in order to evaluate trustworthiness more formally?

Part 2: Beginning a glossary

- In our conversation last Monday, we oriented our Targeted Investigation 7 work toward generating a glossary of trustworthiness concepts with examples stemming from our CHI/CSCW best papers. On Tuesday, [student] (thank you!) and I mocked up a spreadsheet for aggregating our glossary with HCDE-exemplars. This glossary draws from the four readings introduced last week: Jaeger and Bond (on quant), Shenton (on qual), Walther et al (on qual), and Teddlie and Tashakkori (on quat, qual, and mixed).
- In the meantime, a classmate has offered some thoughts on the "flash organizations" paper in terms of trustworthiness (in the targeted investigation notebook) and I have offered a few glossary examples based on one of the CSCW papers I've been reading (in the notebook and also in a spreadsheet containing the growing glossary). Another classmate has also (in his reflection) pointed out some of the challenges of grappling with trustworthiness issues in the context of artificially short papers…
- So, for tomorrow – let's keep the conversation moving forward. For those other than student (thank you!), please add a page to the targeted investigation document resembling either student's or mine… We will pick up the conversation in Monday's class.

Part 3: A final personal step.

- Do this. Think about our conversation from pass 2, including what you personally identified as questions that were raised. Think about what additional step you could take

that would increase your own knowledge of the issue of trustworthiness. Think also about how you might contribute to the class' understanding.

- Prepare this. Take a final personal step. This could, for example, take the form of 2-3 paragraphs reviewing a paper in terms of trustworthiness, create a checklist for thinking through a paper's trustworthiness, reading one of the trustworthiness papers in greater depth and writing a summary for others, or annotating the PDF of one of your curated readings showing how different validity concepts connect to specific issues mentioned in the methods section (or elsewhere).
- Submit this. Append your work to this virtual note in the "pass 3" section.

Discussion

- We will hear from each student.

Summary

- The group works together to prepare a structured abstract capturing the essence of the work on the targeted investigation.

Appendix 2. Reflections on Timed Encounters 1 and 2

Timed Encounter 1 (9/27/17)

Approach: First I read the abstract, then read the design implication sections, then the ethics section, then the conclusion. I approached reading this task as if I need to get the "bare-bones" understanding of the research question, the design implications from the results, and based on the title I wanted to read the author's writing on the ethical component of conducting a research study on mental health through the lens of social media. I wish I had known what the paper was really about before I read the conclusion and design implications. Or maybe I wish I had known much more about the data before reading the conclusion. My initial impression of the paper from reading the title, the abstract, the design implications and results was that the bulk of the research was to understand the role gender and cross-cultural differences play in social media disclosures of mental illnesses. What really surprised me was that the authors built an entire system where they 1) inferred the gender from the data 2) inferred the country name and 3) cleaned up the data. This, in my opinion was understated in the abstract and conclusion and I wish I had known this before I read the conclusion. I learned there is value in reading the paper in order to get the full story and understanding of what happened and what it means since I seemed to have gotten somewhat of a wrong initial impression of what happened during the study. If I had more time I would read the paper from start to finish taking detailed note of the methods section, the participant section, the inference methods, and the development of the system…

Appraisal: I got through a lot of the paper content which positively surprised me but I did not get to the discussion section. After a quick read I knew the "what" and the "key" contribution of the paper, how many tweets had been collected, the who of the four populations analyzed, and the method of aggregation. If I had more time I would have finished the paper and answered some of my questions I currently have about what happened, how the authors... what the limitations to this system are…

Personal Preference: This activity was similar to how I usually read papers under a time constraint where I start with the abstract then move on to the design implications to get an understanding of what the conclusions mean for the field and then go back to read the paper sections in order. This activity was different than how I prefer to read because I would like more time to pace myself and repeat sentences when I need to understand them better. I also like to address questions as I am going if maybe there is a certain word/phrase I do not understand right away I like to be able to look it up and then continue reading.

Reaction to being timed: I think I was relatively calm during this "timed encounter" because I understood the stakes were not as high as a multiple choice examination per se where it would be beneficially to answer or at least guess all the way to the end. I wanted to learn something from the paper over the course of those 20 mins that I could share with someone. I felt more pressure at the beginning to try to plan how to use my 20 mins most efficiently and then towards the end I slowed down to try to digest all the new data section that really intrigued me.

Timed Encounter 2 (10/30/17)

Approach:I approached this reading task by first reading the abstract and noting the two theories the authors were building off of… Then I was able to identify the argument the authors were making about… Then I read the introduction paragraph and better understood the gap in coding data methods that exists. Next, I read the last paragraph of the paper and found that the section titled final conclusions was more about design implications and future work suggestion than conclusions from the data. After I noticed this, I went to the paragraph before final conclusions and read the discussion section to better understand what the results and conclusions of the paper actually were. Finally, I read the paper in order after the introduction highlighting whenever I saw argument sentences I could have a discussion about, key points I wanted to remember or go back to, and places where I found design implications for practice.

Appraisal: After reading the abstract and realizing this was a theoretically heavy paper with theories I did not know very well I got a little nervous, wondering if I would be able to get through it. My next thought though, was that I had a framework to understand and read the paper in an organized manner. I felt a sense of preparedness knowing we had spent the last month thinking about theory, argument, design implications, and citations and if anything, I could focus on finding sentences related to those four characteristics and understand something. If I had more time, I would allocate more effort towards analyzing the methodology that led to the very interesting conclusions. Specifically, I want to spend more time understanding the p values that the authors arrive at and the significance of the statistical analysis…

Comparison: Compared to my first time doing a timed reading a month ago, this time I got through the whole paper and felt confident having a discussion with my partner about the content. The first time I did the timed reading engagement I felt more scattered when going about the paper and was overwhelmed about making sure I read everything and understood it. This time around I could identify where in the paper the authors discussed the theory they were building on and recognize their theoretical contributions. Looking forward, I now feel confident having a discussion about the key points of the paper but in the future I want to work towards being able to disagree with the arguments of the paper or question sections of the paper such as the methodology or citations.

Influence from Targeted Investigations: I think this experience was heavily influenced by our targeted investigations into citation, argument, theory, and design implications because I felt like I had a structure to follow my analysis that I could always turn to if I felt lost or confused. Whenever I came upon citations, I looked back to the bibliography to try to see if I recognize who they cited and I noted which citations were properly explained in the text and which were just there in the text. When we did the argument investigation in class, I felt that I did not grasp that lesson as much because we were using Shon's coding scheme but in reality when I was reading this paper I felt very good about highlighting sentences where I recognized the authors were making an argument. These sentences were prompted by words such as "seems," "the data suggests," and "it is clear that…"

Synthesis: Wrapping up my reflection, I see a significant improvement in my reading abilities after our discussions and handouts developed around the four targeted investigations. The first

improvement I see is in my confidence level. I felt much more capable when I am given a paper that I have never read before and are expected to debrief about the key points in 20mins. I had a very fruitful discussion with my partner after reading the paper about the design implications of this new epistemic network of scientific reasoning method that the authors present in the paper. I felt equipped to take on this challenge of reading under time pressure in the moment because I knew if anything I could identify sentences in the paper that related to theory, citations, design implications, and argument to help my mind analyze all the new material I was reading regarding coding in ENA. The second improvement I note is my ability to understand very challenging material in 20 minutes using the skills I have developed so far in class. When handed the paper I read the title and skimmed the whole paper to try to recognize keywords that I knew maybe about engineering education or ethnography or reflection. I did not recognize very many words I felt comfortable with. Even though I could not even recognize what the words stringed together in the title meant at first glance, after my timed reading engagement, I understood ENA as a methodological framework for scientific reasoning in dyads and individuals and could have a discussion about its benefits. My ability to stay with the trouble in the case of not knowing what the paper was going to be about at first glance was supported by my knowledge of what an analysis of citations, theory, argument, and implications sections look like and my ability to connect all of them together to ground my understanding of the paper.