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Using Cognitive Apprenticeship to Enculturate New Students into a Qualitative Research

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Abstract

Acquiring and mastering research skills is essential for doctoral students preparing for a future in academia or research-focused positions. However, they are among the most difficult to teach, and significant practice and enculturation is necessary to attain proficiency. The subjective nature of qualitative analysis often leads students to doubt their own abilities. This paper describes how cognitive apprenticeship was paired with Lincoln and Guba's Constant Comparative Method for Naturalistic Inquiry, using a hands-on, physical card sort approach to mentor a novice qualitative researcher. Steps followed are discussed in detail, and voices of both the mentor and mentee are shared.

Keywords

Cognitive Apprenticeship, Doctoral Preparation, Mentorship, Naturalistic Inquiry, Card Sort

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Using Cognitive Apprenticeship to Enculturate New Students into a Qualitative Research

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Acquiring and mastering research skills is essential for doctoral students preparing for a future in academia or research-focused positions. However, they are among the most difficult to teach, and significant practice and enculturation is necessary to attain proficiency. The subjective nature of qualitative analysis often leads students to doubt their own abilities. This paper describes how cognitive apprenticeship was paired with Lincoln and Guba's Constant Comparative Method for Naturalistic Inquiry, using a hands-on, physical card sort approach to mentor a novice qualitative researcher. Steps followed are discussed in detail, and voices of both the mentor and mentee are shared. Keywords: Cognitive Apprenticeship, Doctoral Preparation, Mentorship, Naturalistic Inquiry, Card Sort

Newly minted PhDs are expected to be “advanced knowledge workers” (Lee & Boud, 2008, p. 18) and need to be prepared to discover, preserve and disseminate knowledge through active participation in research. Doctoral students’ participation in research activities is at the core of doctoral programs (Austin & McDaniels, 2006). Engaging in these activities from the outset of graduate training is key to enculturating students into their roles as future academics or industry researchers, as well as to learning norms, values, ethics and methodological approaches of the discipline (Austin, 2009; Gonzalez, 2001; Kolikant, Gatchell, Hirsch, & Linsenmeier, 2006).

Faculty play a key role in students’ growth as researchers within their respective disciplines (Nettles & Millett, 2006; Wisker, 2005). Working with a faculty member on a research project provides opportunities to practice research methods and techniques. Faculty mentors can facilitate the development of research skills and subsequent academic and professional growth in the student’s field (Ghosh, 2012; Johnson, 2002; Repak, 2012). Mentoring in research methods helps students develop a deeper and more holistic understanding of research, acquire related skills and improve self-efficacy (Humble, Solomon, Allen, Blaisure, & Johnson, 2006). However, tacit knowledge, or knowledge that experts use during problem solving and decision making without being consciously aware of it, may not emerge explicitly during typical mentoring check-in meetings (Golde, 2008). Therefore, faculty may wish to employ cognitive apprenticeship to enculturate graduate students into field-specific research practices (e.g., Austin, 2009; Maher, Gilmore, Feldon, & Davis, 2013; Walker, Golde, Jones, Bueschel, & Hutschings, 2008).

Inherently constructivist in nature, cognitive apprenticeship (Collins, Brown, & Holum, 1991; Collins, Brown, & Newman, 1987) allows faculty members to share their tacit cognitive and metacognitive knowledge and skills with more novice graduate students through guided learning experiences. The experience of sharing such knowledge is student-centered, as mentees have to learn to question the methods used by the mentor and subsequently to apply now-explicit heuristics to authentic problems on their way to becoming experts themselves (Greer, Cathcart, & Neale, 2016). Collins, Brown, & Holum (1991), outlined six components to cognitive mentorship, where each step happens in a sequential order (see Figure 1).

Figure 1. Cognitive apprenticeship (Collins, Brown, & Holum, 1991; Collins, Brown, & Newman, 1987).

The process of cognitive apprenticeship may take a significant amount of time—time that may already be allocated to a faculty member's scholarly work—especially if it happens on a regular basis across a graduate student's entire academic career (McAlpine & Amundsen, 2011). However, a project-based approach to cognitive apprenticeship allows for enculturating graduate students into such work, while potentially decreasing the amount of time needed to analyze data by allowing for immediate feedback during each step. In this paper, we discuss a case of employing cognitive apprenticeship while working on a qualitative research project.

Experiences

Setting

This case took place at a Purdue University, a large research-intensive Midwestern university in the United States. The Learning Design & Technology program requires that doctoral students take at least 12 credit hours of research methods courses. At least one course (three credits) is an introduction to research methods, which surveys both quantitative and qualitative research approaches, and at least one course addresses qualitative research. The program also includes one course on methods specific to the field, which requires the class as a whole to conduct a collaborative research project. Each student entering the program is assigned an adviser with similar research interests, but students are welcome to participate in multiple research groups with faculty inside or outside of the program.

The experiences described in this paper were documented during the process of analyzing data for a research study that we conducted and that was led by Marisa (mentor) with a small team of graduate students. At the time that Iryna (mentee), a doctoral student, entered the program, experience conducting research either individually or as part of a research team was strongly recommended, but not required. Prior to working on this study, Iryna had primarily had experience with quantitative methods. A cognitive apprenticeship model was used to introduce this doctoral student (mentee) to the Constant Comparative Method (CCM) for Naturalistic Inquiry (Lincoln & Guba, 1985) as a method of qualitative analysis in order to describe and interpret the experiences of our participants.

Where We Started

Marisa' profile (mentor)

Marisa is in her fifth year as an Assistant Professor of Learning Design and Technology at Purdue University. The majority of her research experience has been qualitative or mixed-methods.

Marisa: A member of my doctoral committee recommended that I use Lincoln and Guba's technique for my dissertation, since I was looking for an exploratory approach to uncover themes in a body of interview data. I ended up using this method in several different studies, including one in which I worked side-by-side with a peer in a very similar way to the process I go through with my students, as described in this paper. Although Lincoln and Guba break down the process into steps followed individually and steps followed as an entire team, my friend and I worked through all of the steps together. It took us forever, but it was engaging and interesting, and by the end we felt very confident about our analysis, since we had already duked out any areas of inconsistency or doubt. My husband said it was interesting to watch us "playing cards" as we moved things around from pile to pile and began to develop our own unique language of codes and themes across the duration of several weeks.

Since then, I have used NVivo software in a similar process multiple times, but never felt as connected to the data or as confident in my analysis, as when doing the physical card-sort. When collaborating with others, discussion while looking at NVivo on the screen never felt as connected. Therefore, although I usually work in NVivo now, I like to do a physical card sort every once in a while, especially when working with new students. I find it a good way to enculturate students into using a really rigorous, multi-round constant comparative method. Since our very collaborative use of this method involves making our thinking very explicit, this activity also serves as a good foundation for a cognitive apprenticeship in qualitative data analysis.

Iryna's profile (doctoral student)

Iryna, a doctoral student in Learning Design and Technology (LDT), entered the program with a Master's degree in LDT and several years of experience in quantitative research design and implementation in adult training and secondary school settings. Early in the doctoral program, Iryna took six credit hours of statistics and six credit hours of qualitative research methods along with an additional 3 credit-hour course on NVivo.

Iryna: I entered the program with experience in quantitative research and basic skills in identifying themes and quantifying open-ended survey responses. Therefore, rigor of a research process was not new to me. From the beginning of my doctoral program, I have been involved in qualitative data collection. The natural question was what we can do with it to get the meaningful answers and how to ensure that our research is rigorous and trustworthy. However, using a qualitative methodology required some changes in my overall approach to research thinking, including how to address biases in qualitative research. While the courses on qualitative research methodologies were helpful, I needed a more intensive experience to actually develop skills. Since English is not my native

language, I also felt that analysis and explanation of some of the sentiments might be skewed by my own cultural and linguistic background. All in all, I was looking forward to working with my mentor.

Helping Iryna to adopt a different epistemology required a method that would allow her to explore the tacit knowledge of an experienced researcher beyond the technicalities described in research literature.

Selection of Research Approach

The research project in which the cognitive apprenticeship model was employed was part of an exploratory study in which we decided to use a naturalistic inquiry approach in order to gain insights into the experience of a self-identified group of practitioners in the field of interest (Salkind, 2010). As is appropriate for a naturalistic approach, “qualitative research designs develop over time as researchers formulate new understandings and refine their research questions” (Salkind, 2010, p. 881), making cognitive apprenticeship, in which each decision was intentionally discussed and probed, especially appropriate. It is important to note that, rather than attempting to reduce bias in order to remain objective, Lincoln and Guba (1985) stress the importance of honing the researcher as a human instrument, leveraging their own prior background and growing understanding of the data. This was supported by our own (particularly Iryna’s) experience working in the same field as the participants, and by our experience in interviewing participants, using a semi-structured interview protocol that required the researchers to probe into participants’ responses in order to gain a deeper understanding of their perceptions and experiences.

Although the process of conducting the interviews led to an increased feeling of connection to the participants and familiarity with the way participants framed their thinking, it also provoked some anxiety in Iryna. The loosely followed semi-structured protocol resulted in transcripts that did not follow a set pattern of question and answer (since interviewers would allow participants to discuss topics as they came up, even if they fell later on the protocol), and did not necessarily cover each topic at the same level of depth for each participant. This made it impossible to follow a mechanical process to identify relevant transcript segments, and, more importantly, created anxiety among new researchers on the team, especially those whose prior experience was primarily quantitative or involved structured quantification of qualitative data.

We used Lincoln and Guba’s (1985) Cognitive Comparative Method for Naturalistic Inquiry to analyze and identify themes found in 30 interviews (60-90 min each). Unlike its more well-known use in the development of Grounded Theory (Glaser and Strauss, 1967), Lincoln and Guba’s use of the CCM is for “data processing” rather than theory development, and uses a variation on the original steps proposed by Glaser and Strauss (Lincoln & Guba, 1985, p. 340), as summarized in Figure 2. Lincoln and Guba’s CCM approach breaks qualitative data into discrete units, which are compared and grouped, allowing for the emergence of categories. These categories then undergo revision through ongoing comparison of individual units and their alignment with the category description in order to further refine concepts, identify properties, explore relationships, and create a coherent model to explain phenomena (Taylor & Bogdan, 1984). As Lincoln and Guba (1985) described it, “the process of constant comparison stimulates thought that leads to both descriptive and explanatory categories” (p. 341). Unlike qualitative analysis approaches that begin with a framework based on existing literature, the CCM requires researchers to leverage themselves as a human instrument, which can be more of an art than a science.

Marisa: During my first few years as a new faculty member, I observed that students new to qualitative research tend to have a lot of difficulty in unitizing and forming meaningful categories. Those who have had some research coursework tend to be uncomfortable without an existing theoretical framework, while those with little prior experience or coursework seem overwhelmed by the data and frequently come up with categories that either literally mirror the research questions or are not relevant. They tend to give up after reviewing a small amount of data, yet seem reluctant to talk it over with me, assuming that they must be doing something “wrong.” This has led to frustration and feeling of inadequacy on the part of new students... not to mention, on my own part as a mentor!

After experiencing this several times, I recalled how fruitful it had been for me to work through this method with a friend for the first time and decided to try doing the same with one or two students at a time.

Figure 2. Summary of the Constant Comparative Method for Naturalistic Inquiry (Lincoln & Guba, 1985)

Adapting the Qualitative Method for Use in a Cognitive Apprenticeship

The Constant Comparative Method for Naturalistic Inquiry (Lincoln & Guba, 1985) includes the following steps: (1) unitizing; (2) individual categorizing; and (3) team categorizing (See Figure 2). Each of these steps include a number of specific sub-steps, providing a high level of detail about how and even where the sub-steps should occur. Within this model, significant time is devoted to individual work sorting through data and developing rules and categories. At the end of the individual process, or at “convenient intermediate points,” researchers will “relate [their] work to other members of the inquiry team” (p. 350). Lincoln and Guba provided a very specific set of instructions on how to approach this step as well. The team is to meet in a room in which each member can sit behind a large table and lay out their own set of cards, containing data they have individually collected and analyzed. One member of the team serves as a leader and begins with his or her own categories, reading the title and defining the rules of each in turn. Other team members with similarly titled categories read off their related category title and rules, and the group discusses which can be combined and what the revised title and rules should be. Cards in the new category are once again

reviewed for fit. Once all of the leaders' categories have been reviewed, other members assume the leader role for their remaining categories. Finally, the miscellaneous piles are reviewed one more time.

This method has the benefit of allowing all team members the opportunity to think through the categorization individually, before examining and negotiating categories as a group. However, each team member would have to be sufficiently confident in their own abilities to unitize and categorize the data individually. As we discussed above, our experience is that new doctoral students may not have this confidence level and may struggle to even begin the process on their own.

Our team modified the first two steps (unitizing and categorizing) to be a collaborative process that would allow for employing cognitive apprenticeship, as summarized below. Because of the collaborative approach, we excluded the third step (relating work to other members of the inquiry team). To ensure that we were "steeped" in the process, we both re-read and then discussed the chapter on the data analysis process (Lincoln & Guba, 1985, Chapter 12) just prior to beginning the data analysis. This was helpful for both of us: for Iryna to be inducted into the process, and for Marisa to further reflect on the steps and their purpose.

<i>CCM for Naturalistic Inquiry</i>	<i>Our collaborative process (using cognitive apprenticeship)</i>
Unitizing	Prior to this process, Marisa reviewed the interview transcripts and selected several that seemed to be relatively straightforward in order to initiate the process.
Break data into units of information that are each "heuristic" as well as being the smallest piece of information that can stand on its own.	During the first meeting, she walked the student through her thinking process as she identified the "smallest meaningful unit" of analysis. She would read a section of the text, which might vary from a sentence to a paragraph, depending on length and complexity. First, we discussed whether one or more units of meaning were included in the segment. Then, we discussed what this meant within <i>this</i> set of data. As we went through an entire transcript together in this way, we also discussed how to deal with overlaps in codes (for instance, while giving an example of <i>evaluation</i> , a participant may also discuss the use of <i>specific models</i> or <i>technology</i> , or <i>challenges in explaining the process to their superiors</i>). Then each of us reviewed half of the transcripts on paper and highlighted the segments we would use for the study. We swapped transcripts to cut out sections and pasted them on cards, thinking through potential initial categories, thereby ensuring that each person had gone through each transcript. When uncertain, we discussed whether we saw one or more ideas in a given section of text. Even after this process, we ended up breaking up text segments throughout the process as we better understood our codes and the data. On each card, we recorded the participant ID code and a brief summary of the card that could be used to facilitate initial categorization. In the beginning of the process, significant modeling and coaching were required, particularly for more complex and rich segments of data. However, discussions and question asking by both Marisa and Iryna provided clarification and allowed us to reach consensus about how to unitize the interview data. This allowed Marisa to authentically bring her tacit knowledge to the surface as we progressed through the data analysis.

**CCM for
Naturalistic Inquiry**

Our collaborative process (using cognitive apprenticeship)

Categorizing

1. Select first card and begin yet-to-be-named category.
2. Select second card and determine whether it is a “feel-alike” with the first card.
3. Continue with successive cards. If a “feel-alike”, add to an existing provisional category; otherwise, start a new one.
4. If some cards are potentially irrelevant, put them into a miscellaneous pile.

We initiated the Categorizing step after we unitized approximately half of the interviews. This was done for two reasons: 1) the data set was quite large, and Marisa felt that we would each benefit from beginning the coding process, since we had already spent multiple meetings silently highlighting, cutting, and pasting transcript segments. She feared that this process may end up overwhelming and discouraging Iryna before she could see the full picture of the process. 2) Beginning the categorization process would help both of us get a better handle on the data and data segments we were looking for, thereby aiding in the unitizing process going forward.

Although we had noted a potential category based on the research question on each card during the initial steps, we reviewed each card one by one using the process recommended by Lincoln and Guba (1985). Each card was put down and “feel-alike” cards were added to piles. As we began reviewing cards together and discussing each of them, we realized that some cards contained concepts that did not match our intended unit of analysis. In such cases, we would cut up the quotes and create new cards as necessary. Cards that could not yet to be categorized were placed into a *miscellaneous* pile for further review. Initially, this pile was fairly large (see Figure 3).

Figure 3. Initial categorization of cards

**CCM for
Naturalistic Inquiry**

Our collaborative process (using cognitive apprenticeship)

5. Once there are piles that have reached a critical size (6-8 cards), create a list of category properties for each pile. Write a descriptive title and provisional rules for each category.
6. Continue using the inclusion rules until all cards have been reviewed. As the process continues, address anomalies and conflicts in the rules.
7. When the entire pile of cards has been exhausted, review the entire category set. Review the miscellaneous pile for inclusion in existing categories. Break up cards with dual meanings. Review categories for overlap and ensure there are no ambiguities about how a card might be categorized. Make categories internally homogenous. Identify cards that were inappropriately placed and move them. Review categories for relationships between them.

As recognizable piles began to emerge, we created sticky-notes with initial category names. We added tentative properties as bullet points on these notes. We soon began organizing them into larger themes, creating a hierarchy of themes, sub-themes, and categories. As we continued creating piles, we began to understand them better. This triggered us to review all card sets multiple times throughout the process. We continued to merge or break up piles at each round, refining the list of properties for each theme and category as we returned to it.

As we went, we refined our own process and developed a common language that helped us to more quickly discuss and come to consensus about where individual cards would fall or when categories should be adjusted or moved to another theme (see Figure 4).

While initially Marisa lead the process, we soon transitioned to Iryna reading each card and initializing the review by making a suggestion on how to categorize each card and explaining her rationale. Since Iryna read the content of each card aloud, Marisa could actively think along and spur further discussion on potential alternative interpretations and categorization. This allowed us to purposely share and examine our thought processes and better understand our rationale behind each decision which then informed themes, and subthemes.

Once all cards had been designated to an initial pile, we continued the iterative process of reviewing and adjusting categories as well as the organization of themes and sub-themes, as described above.

Figure 4 Creation of themes and sub-themes

On Iryna's suggestion, we added color codes to each card to indicate type of participant across contexts worked in (K-12, higher education, corporate) and positions (e.g., instructional designer vs. educational technologist). This would allow us to quickly summarize prevalence of codes across each different group or combination of groups, as we continued to play with the data. Iryna also began keeping track of the category hierarchy and traits of each code on a mind map, updating as cards were added or rearranged and we gained a more solid conception of inclusion criteria for each.

We also began entering the themes, sub-themes, categories, and descriptions/properties into mind-map software, which allowed us to visualize the information in different ways. This also served as a digital repository which allowed us to review the data during the writing process when we did not have all of the cards laid out in front of us (Figure 5).

**CCM for
Naturalistic Inquiry**

Our collaborative process (using cognitive apprenticeship)

Figure 5. Review of one major theme and creation of the MindMap

8. Look for categories that may be missing and plan for subsequent data collection efforts.

In this particular case, we decided to halt data collection once we had interviewed 30 participants across three demographic groups. We reached saturation across major themes, although we had tantalizing hints of additional potential themes, which we will may continue to pursue in future studies.

9. Determine a “stop collecting and processing” point.

10. Review the entire category set once again to ensure nothing has been overlooked.

As suggested by Salkind (2010), in a naturalistic study, “the process is circular but ends when the researcher has created an account that seems to capture and make sense of all the data at hand” (p. 881). We recognized that we needed to determine an end-point for our review. While we felt that a clear picture had formed and we had reviewed all categories multiple times after they had taken shape, it was still difficult to declare the analysis complete. Lincoln and Guba (1985) warn that “...the category set that emerges cannot be described as *the* set; all that can reasonably be required is that he or she produce *a* set that provides a ‘reasonable’ construction of the data” (p. 347). Therefore, we contented ourselves with the understanding we had gained from the card sort.

We conducted our final review as we began preparing to write. This helped us frame how we thought about the data and align language used across categories and category descriptors.

Team categorizing

Come together as a team to negotiate and merge categories.

Lincoln and Guba (1985) describe a very specific process for negotiating coding among team members, who will have gone through steps 1-2 individually with their own sets of cards. Because our categorization method (Step 2) was entirely collaborative and resulted in a single set of sorted cards, the team categorizing step as described by Lincoln and Guba would not be applicable.

Reflecting on the Process: Benefits and Challenges

Since we discussed each decision we made and then carried it out physically, each “move” in the process was made explicit. This was by no means a one-directional teaching opportunity; we constructed meaning together at each phase. The discussion allowed for immediate feedback—not only on the coding itself, but on the thought processes behind it. This process helped both mentor and mentee deeply engage with the multiple rounds of comparison necessary for a solid qualitative analysis and helped illustrate why multiple rounds of comparison are necessary.

Iryna: The process was initially overwhelming and exhausting—much bigger than any qualitative project I have ever done for any class. It has taken us several months to go through over 700 pages of interviews. The number of cards, themes and the information packed in each sentence were daunting. Had I done it on my own and then pretty much redo it as part of the team discussion (as would have occurred in the third step suggested by Lincoln and Guba [1985]), while still not fully comprehending the process both on the granular and more overarching level, this may have deterred me from doing qualitative research in the future. However, the use of cognitive apprenticeship allowed me to build the self-efficacy along with knowledge and skills needed to appreciate the very detailed process and rigor of qualitative methodology while engaging in educational research. What I have learned from start to finish cannot be even compared with any class or working on just a piece of a larger research project.

Marisa: By the end of the process, we felt very secure in our findings. Since we are working through it together, there are no shortcuts—either for the students or for myself. We must discuss each card and each pile, multiple times. We write memos and definitions together, and reexamine them when trying to make decisions. Not only is everyone on the same page about codes—by its nature, this process ensures that we are all on the same page about the process. When we decide together we have to go through every pile one more time, we all know why and when we end up combining or breaking up piles or moving cards around, again, we all know why we did it and can see how this fits in to the larger process.

The process helped both of us contemplate and learn more about the research process itself.

Marisa: As a secondary effect, it helps us think about the larger research process and methods as well—how do we better understand our research questions, or how might we refine them based on the data as it is being shaped now? How could we have better elicited the response we were looking for in the interview protocol, or where did some of us ask follow-up questions in ways that elicited the most interesting reflections by participants? What new research questions do we have that could be addressed by this data, or by a follow-up study? How might what we learned impact how we formulate research studies in the future?

Iryna: Working on the set together also allowed us to align the understanding of the text that could have been otherwise impacted by my own cultural and linguistic background. We often found ourselves discussing potential meanings

of the words and phrases, which was also interesting since some of our participants were not native English speakers themselves. Additionally, I felt that having an opportunity to reflect on the processes or doing similar to thinking out loud allowed me to gain the confidence that I am staying on track with my research work.

Yet, our discussions were not limited to the current project. We often found ourselves talking about the field in general and the interdisciplinarity of our field, research norms and ethics, and challenges often encountered in educational research among others. The unexpected outcome for me was the socialization into the field—finding common interests, planning potential research projects, and just learning from experience of the mentor beyond the scope of the research project.

Naturally, the time it required for in-person meetings was significant. However, considering the volume of qualitative data and the rigor involved, we seemed to be on par with other researchers working on similar projects. Initially we met once or twice a week for 3-4 hours. Once we had synced up on the unit of analysis, we would do the initial review and unitizing independently. We then met for 3-4-hour sessions for team discussion and categorization of cards. Even during busier times, we made an effort to meet regularly to ensure that progress was made and also to reduce the time needed to get back “into the groove.” This process continued for 4-5 months.

Marisa: There were real trade-offs to dedicating this amount of time to data analysis. I am tenure track and nearing my penultimate year. I have a lot of pressure to complete manuscripts and other activities that are directly “count” towards tenure. I know other faculty use a more structured approach in which students work independently with check-in points and more formalized processes for determining inter-rater reliability. However, I did not feel that that approach would do justice to this data set and the exploratory nature of the study.

More importantly, mentoring students is my passion. In my first couple of years here I was frustrated that after many meetings with students to talk about what they were doing I still didn’t feel they would “get it.” Utilizing principles of cognitive apprenticeship, I feel much more secure that I have provided sufficient scaffolding and that Iryna is now ready and confident to take on a complex research project on her own and provide leadership to our next group of mentees. I can only hope that my tenure committee agrees with me that mentoring students is time well spent!

In addition to the time it took to complete the work, there were some physical challenges to the technique. Each time we met, we needed to have access to a large table for many consecutive hours, which sometimes presented a problem due to the limited number of meeting rooms available in our building. The fact that the data analysis resided in the physical card sort had its own unique constraints. Along with hundreds of index cards, we had to carry a kit of paperclips, elastic bands, sticky-notes, markers, scissors and glue-sticks—and more importantly, had to ensure that we carefully glued, stacked, clipped, and labeled all of the piles at the end of every session. If the piles were not carefully maintained, the entire analysis would be lost. Happily, this worked well, and we were so intimately familiar with the piles that we could quickly recognize them. The larger drawback to this system came when it was time to write up our findings. Whereas a software-based solution would allow us to quickly retrieve,

skim and select from relevant quotes, we needed to have the physical box of cards available to constantly reference during the writing process.

As the 2018-2019 academic year began, we launched new research projects as well as gaining a new doctoral student in our research team. As we prepared to welcome our new team member, we discussed our respective roles as faculty- and peer-mentor in introducing junior team members to the research processes in general, and qualitative research in particular. We reflected on what went well in our own mentorship relationship, and where more support could have been given to Iryna, as well as other students that Marisa mentored in her early years as Assistant Professor. Guided by the principles of cognitive apprenticeship, more cognitive and metacognitive supports have been introduced into our regular research team meetings, including bi-weekly critique of methods readings and scholarly articles recommended by each team member in turn, discussion of our individual learning goals, and appropriately scoped and scaffolded individual research responsibilities. Once we get to the data analysis phase for our next qualitative study, we plan to use the naturalistic inquiry model described in this paper with both Marisa and Iryna serving as mentors within the cognitive apprenticeship model.

Recommendations and Conclusion

Sharing tacit knowledge about research processes with graduate students is key to their preparation for a career that involves dedication to research. However, such sharing should go beyond what is often offered during mentoring meetings and should include projects that students can do alongside faculty, allowing faculty to share their tacit knowledge and to provide scaffolding for the students' development of related skills. Once the student gets more comfortable, such scaffolding may be faded away and students can take a leadership role. For these purposes, faculty may employ cognitive apprenticeship as a signature pedagogy in preparing their graduate students through a deliberate process of engaging in research activities (Golde, 2008; Maher, Gilmore, Feldon, & Davis, 2013). Its use was certainly satisfactory in our case. Based on our experience, we recommend the following considerations:

- Students with limited or no experience with research may need additional scaffolding through extra readings, discussions and walk-throughs of the process by a mentor.
- It may be beneficial for new students to start with a smaller data set to ensure that they do not become overwhelmed and can walk through the whole process in a timely manner.
- For the process to be effective, faculty need to carve out a sufficient amount of time to have regular interactions with their mentees.
- Faculty must be aware of and purposeful in sharing their thought processes.
- Time should be built in for students to reflect on their experiences and the research processes within their fields to ensure the transfer of practices beyond a single project.
- Faculty should consider engaging mentees as co-mentors for future students, to help them continue to develop their research skills while sharing their own tacit knowledge base.

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