"I WISH THAT I BELONGED MORE IN THIS WHOLE ENGINEERING GROUP:" ACHIEVING INDIVIDUAL DIVERSITY - TRYTTEN

One of the challenges of this research was to find ways to allow Inez's voice to be heard without identifying her as our participant. The uniqueness that made Inez worthy of a case study made it difficult to conceal her identity. Since we were interviewing at four predominantly white institutions including our own, the number of multi-minority engineering students is limited, which makes these students easy to identify. Protecting Inez's identity was particular important because some of her comments did not reflect well on the faculty at her institution, and sometimes on the institution itself. We therefore needed to protect her institution from identification too. Unfortunately, the research project had already produced a publication that identified our research sites. The best that we would be able to do was to conceal which of our research sites Inez came from. As we were performing two large ethnographic studies simultaneously, we requested and received permission from the National Science Foundation to list both studies as possible sources for this interview. This effectively doubled the number of students who could have been Inez.

Lesson Learned: *Do not identify research sites in publications. We now use pseudonyms like MU for Midwestern Institution to conceal our research sites.*

When Inez was quoted in the paper, we had to remove as much identifying information as possible while maintaining the information content of her interview. Determining which variables to expose and which to hide was difficult. We revealed her gender, and her status as a multi-minority, but concealed the specific racial and ethnic groups. We partially concealed her parent's professions. We revealed that she was an engineering major, but concealed the major. Her pseudonym in the paper was a source of protracted discussion. The decision to use a pseudonym was a good early decision. We felt that by using a pseudonym, we increased our readers ability to empathize with Inez. Which pseudonym to use was another issue. Some anthropologists use pseudonyms that are similar to the person's real name, for example a participant named "Miriam Webster" might be given a pseudonym of "Miranda". In the end, we determined that her identity was best protected by using a pseudonym that was unrelated to her name, and that might encourage incorrect guesses about either her race or ethnicity. The process of removing identifying information iterated over a period of months with more and more information being concealed as time continued. Even in the last days before the paper was submitted for review, several identifying elements were removed to protect her identity.

Lesson Learned: *Have every member of the research team repeatedly consider whether information that may identify the participant is necessary, or may be omitted without substantive loss of information content.*

The use of state generated data describing her home town was also problematic. If we cited the source of the data, we would have identified the state that she came from. Given the geographic range of our research sites this would have been a hint at her institution, which also needed to be protected. We also had to conceal specific demographic data about her community. For example, we stated that there is an achievement gap among students of different ethnic and socio-economic backgrounds. This conclusion was drawn from examining state standardized test scores posted on a state sponsored web site. We would have preferred to support this claim with a table showing the data. However, to do so would make it possible for an internet search to discover her community and move towards identifying Inez. We are grateful that the reviewers and editors of the Journal of Engineering Education were willing to allow us to use the data without specific citation, and make claims without providing the data to help protect the confidentiality of our participant.

Lesson Learned: *When determining if data would identify your participant, consider that internet search technology is still improving and may make it possible to identify research subjects from fragmented information.*

One question that we are asked about Inez is whether she graduated from college or not. The sad answer is that we do not know. She was in her final year of college, and was fully committed and determined. We hope that she was ultimately successful both in graduating, and in her new profession. Unfortunately, our informed consent forms did not ask participants for permission to contact them after the interview. The IRB determined that making this contact was beyond the scope of consent given by the student; we will never know what happened to Inez unless she chooses to contact us at a future date, which we would welcome. Our informed consent form could have asked for contact information and permission to contact students in the future. However, we never anticipated the necessity of contacting a research participant after the end of the study. As a result, we may never know Inez's fate.

Lesson Learned: *When doing qualitative research, remember that one of the advantages is unexpected findings. Try to keep your options open when writing informed consent forms.*

Since our research projects had interviews that occurred at four different institutions, we had to work with four different Institutional Review Boards. Each board has its own forms, processes, deadlines, and culture. Negotiating this maze of paperwork took months of tedious work. Even with all of this scrutiny, an inconsistency between the requirements of our IRB and one at a participant institution occurred. Both IRBs required that we keep all informed consent documents in locked filing cabinets at their institution. Therefore, the informed consent documents for this institution's students were supposed to be in locked filing cabinets in two different states. We resolved this difficulty, after much discussion and effort, by modifying the

research protocol with the IRB.

Lesson Learned: *When working with multiple IRBs, examine the details of the process carefully for inconsistencies between institutions.*

On a more personal note, I've come to recognize that few people in Computer Science, the discipline of my training, can see the unlevel playing field of engineering education, let alone appreciate cultural reproduction theories, cultural capital, and accrued disadvantage. The more research I do in this area, the more I distance myself from those in my discipline, and increase my isolation within my department. That is a costly choice for someone who is not yet a full professor. Even the students in my discipline think I can't be a real computer scientist and treat me differently.

Lesson Learned: *People who do multi-disciplinary research risk losing their identification of members of their discipline and being left in fascinating, highly fertile, productive, but sometimes lonely ground.*

Establishing and maintaining collaboration with social scientists has also been difficult at times. Social scientists are, understandably, setting their own research agendas that rarely include engineering education. Even when there are shared areas of research interest, there are a lot of cultural variables to negotiate (e.g. are calendars shared electronically or on paper, is the best form of communication phone or email, are drafts shared on paper or through email attachments, when and where should meetings be held, etc.) Our solution to these difficulties was to hire a social scientist (CEF) as the Assistant Director of the Research Institute in STEM Education, and have her learn to work within the culture of engineering (although we also learned a lot about the culture of her discipline as this paper attests). The disadvantages of this arrangement include inequities between the treatment of tenure-track positions and those that are not eligible for the tenure track (like job security and academic freedom), salary differentials, and continuously funding a critical member of the research team on soft money.

Lesson learned: *Creative solutions to finding social scientists to work in engineering education research projects must sometimes be found.*

On another level, this research has caused me to see accrued advantages of being educated, affluent, middle class, and white in many more dimensions than I used to. I see parents provide advantages for their children that people with less social, cultural, and economic capital cannot provide. I see the advantages that children accrue as a result of the provided advantages, and the inability of these children to recognize or appreciate these advantages. I now see more of the injustices of our society on a daily basis in an uncomfortably bright light. As an example, I used to look at the SAT and ACT tests as an evaluation of student ability that made it easier to fairly compare students from different high schools. I now see parents buying preparation books for their children, sending their children to expensive extracurricular preparation classes, offering them test taking strategies, having them retake tests when they are disappointed by the results and gaming the system. While I used to see this as good, involved parenting, I now see that what is happening is my friends are using their capital to give their children an advantage so large that it causes SAT and ACT scores to be nearly as unreliable as high school grades. This type of revelation is a source of continuous psychological discomfort. I'm a better person for experiencing this discomfort, but not a happier one.

Lesson Learned: *While knowledge may not make you happier, it's still better than ignorance.*

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