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Becoming Women Engineers: Dismantled Notions and Distorted Perspectives

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Introduction

The research project described in this article was fueled by ubiquitous pronouncements of women's underrepresentation in STEM (science, technology, engineering, and mathematics) disciplines at universities and in careers. For more than three decades, concern about this underrepresentation has been prolific in research, marketing, and calls for proposals for external funding. The resultant discursive practices enable and constrain how we speak, write, think, and measure women and their representation in STEM disciplines. Under these conditions—local, sociohistorical, and material—in 2007, we approached the question of underrepresentation with a reliable, validated instrument previously developed by colleagues (Goodman et al., 2002) and supported by funding from the National Science Foundation (NSF). Now, 10 years later, we are revisiting our initial—dormant and silenced—inquiry in light of more nuanced onto-epistemological approaches to being/understanding (Barad, 2007; Britzman, 1995; De Freitas & Sinclair, 2013; Lenz Taguchi, 2012; St. Pierre, 2011) that offer a different course of action for thinking about women in engineering. Or, as Goldberg and Somerville (2015) experienced, we are "disrupting our professional ways of thinking" (p. 6).

Background

The immutable crisis in STEM can be traced back at least to the 1957 Russian launch of Sputnik. While the founding of the crisis is steeped in the "nationalistic goals of militarism and economic security," Chesky and Wolfmeyer (2015) make clear, "Within the current context of neoliberal governmentality and multinational corporations, these commitments [to STEM] have made broader turns towards global economic and elite power" (p. 6). Since that time, education reformers in the United States have been zealously working to reinvigorate our educational system to bolster our global competitiveness (Chesky, 2013; Goldstein, Macrine, & Chesky, 2011). The crisis, of course, shifts and spreads to take on different forms and create a sense of urgency. Many such shifts include the plethora of initiatives that have been developed to ameliorate efforts to usher women and girls into STEM. Educate to Innovate (2009) and Change the Equation (2010) are two such examples. It is normative views like these that frame our world, our vision of ourselves, and our thinking. Why would we stop to reconsider our thinking about women in STEM? In our initial inquiry, we rightly, or so we thought, secured permission to use an already existing instrument (Goodman et al., 2002) that was developed and validated with NSF funds. Interview questions were dictated by this NSF protocol. Did those questions perpetuate the notion that the experience for women in engineering is different from their peers who are men? Would the participants have discussed differences between men and women if we hadn't brought it up? Recently, researchers have begun to examine STEM education policy discourses, particularly those disseminated to influence public opinion (Chesky, 2015; 2016). We are following that lead to dig a little deeper into our thinking about women in STEM. By troubling and problematizing these conceptualizations, we opened up a different way of thinking, where *being* and *becoming* are relational and entangled.

We need to make clear our conceptualization(s) of gender/sexuality. The work discussed here is particularly interested in examining the experiences of young women as they pursue a baccalaureate degree in engineering. We acknowledge the binaries of gender/sex, social construction/biology, women/female, and men/male, and the presumptive heterosexuality (Butler, 1990) that accompanies such dualisms. At the same time, we contextualize our work within a higher education setting, specifically a college of engineering. A dialectic or co-constitutive understanding makes clear, "that things, practices, and persons are constitutive of places and constituted by them" (Jones, Nast, & Roberts, 1997, p. xxvi). We suspect the dominant institutions and ideologies through which these young women maneuver daily affect their sense of being. Sensitive to the realities and multiplicities of women's lives, we are not representing autonomous female subjectivity. Hence, we are mindful of our language choices to not reinforce oppressive practices.

Initial Inquiry

Purpose

This paper stems from an investigation into US-origin (non-international) undergraduate students who are women and their experiences with their engineering major. As noted, building on prior NSF funded research, this inquiry used the Women's Experience in College Engineering (WECE) Student Questionnaire (Goodman et al., 2002) to "collect and analyze data from female engineering students in order to identify aspects of women's educational experiences that are critical to their retention and success in engineering" (p. 3). Through the use of this validated instrument, this research contributed to the knowledge base addressing student experiences with engineering. Over the past ten years, the number of engineering bachelor's degrees awarded to women has remained relatively stable at both the national level and at Tennessee Tech, the site of the research in this article (See Figure 1).

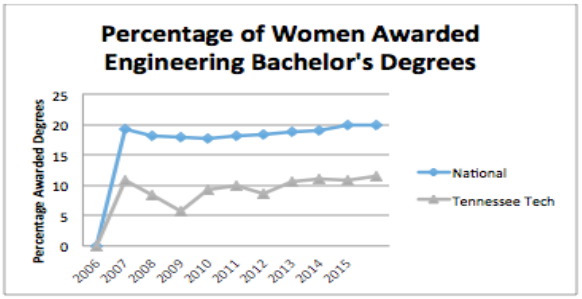

Figure 1. Percentage of Women Awarded Engineering Bachelor's Degrees. Adapted from: "Engineering by the Numbers, " by B. L. Yoder, 2014, American Society for Engineering Education, Washington, DC. Institutional Research, Degrees Conferred. Retrieved from Tennessee Technological University, Institutional Research website: https://www.tntech.edu/ir/ipedsc

The proportion at the national level is twice that at Tennessee Tech, which continues to cause us concern and justifies our interest in this research. There is, however, a good deal of research with results that provide little new information. We do not know much more today about why women remain underrepresented in engineering than we did ten years ago.

Design/Methods

In the initial design of this research project, we set out to interview women/girls in engineering majors at Tennessee Tech, which is a masters-large institution, according to Carnegie classification, that is geographically bound and rural in nature. After IRB approval was granted, one of the researchers contacted students to ask if they were interested in participating in "a research study of undergraduate female engineering students and their academic and

social experiences in their major field." The request for participants further emphasized gender, "Your input about your experiences in engineering at Tennessee Tech is vital to this research. Only through your sharing of this information can we work to understand and enhance the academic and social environment for female engineering students." Once potential participants were identified, focus groups were scheduled according to student availability. Focus group interviews were conducted with two groups of engineering students who are young women in a locale convenient to the students. Focus groups were conducted one week apart with each group including five students. Using the WECE protocol (Goodman et al., 2002), we interviewed 10 young women asking a series of questions related to their experiences as engineering majors. Questions were asked about their interactions with instructors, academic successes/struggles, and any challenges they felt they had faced as women/girls in engineering. Focus groups were digitally recorded. Interview transcripts were transcribed verbatim and inductive analysis techniques were applied; open coding was followed by grouping and categorization of codes and themes were identified (LeCompte, 2000).

Findings

Analysis resulted in four overall findings. While the findings here cannot be generalized, they do offer insight into the experiences of women engineering students. Participants overwhelmingly reported a desire for active, student-driven learning. They expressed that they thrive on the challenge from the coursework and feel they would benefit from more opportunities for co-ops and internships. Research has indicated that active learning rather than lecture-style approaches helps women to persist in STEM majors, and contributes to a desire for young women to prove they can be successful in pursuing STEM fields (Hernandez, Woodcock, Schultz, Estrada, & Chance, 2013; Litzler & Samuelson, 2013; Watkins & Mazur, 2013).

Supportive, understanding personal relationships were reported as exceedingly helpful to students. Whether it was family members, mentors, faculty members, or other role models, students explained how important these relationships were to their academic success. Interestingly, these relationships also were reported as contentious at times, burdening the students with increased stress. In order to understand gendered dynamics in engineering programs, research (Archer et al., 2013; Chinn, 1999; Goodman et al., 2002; Hobson, Jong, Dockery, Hermann, & Carter, 2013; Kahveci, Southerland, & Gilmer, 2006; Leslie, McClure, & Oaxaca, 1998; Nauta, Epperson, & Waggoner, 1999; Seymour & Hewitt, 1997; Skaggs, 2013) indicates pre-college exposure and family background play a crucial role in students who are young women choosing engineering as a major.

The amount of time students committed to their academic studies interfered with time family members and friends expected to spend with the students. Formal and informal social networks have also shown to aid retention of students who are women (Goodman et al., 2002; Kahveci, Southerland, & Gilmer, 2006; Leslie, McClure, & Oaxaca, 1998; Nauta, Epperson, & Waggoner, 1999; Poor & Brown, 2013; Riegle-Crumb & Moore, 2013; Seymour & Hewitt, 1997; Tobias, 1990; Young, Rudman, Buettner, & McLean, 2013). A discourse of choice (Beddoes & Pawley, 2013)—prioritizing between family and studies—has shown to cause a good deal of frustration for students.

Lastly, students perceived an unusually high level of academic effort in comparison to their peers outside of engineering. The

requirements and expectations for their engineering programs were reported as drastically exceeding those for other majors. For example, a student shared, "Workload for non-engineering is nothing." Another said, "Other students have more fun." Similarly, the time constraints resulting from the degree of difficulty of course work affected students' perceptions of themselves in comparison to their non-STEM peers. Programs dominated by men are typically perceived as more academically challenging (Archer et al., 2013; Smith, Lewis, Hawthorne, & Hodges, 2013).

Our conclusion is that much to our disappointment, our study had only served to confirm and reaffirm findings previously cited in the literature.

Inquiry Revisited

Purpose

How do we create a college environment that bolsters student success? We kept coming back to the idea of troubling—troubling our methodology, our thinking, our assumptions, and the discursive practices that influence these conceptualizations. We take comfort in knowing that other researchers, engineers, educationists, and theorists share the same struggle. Douglas, Koro-Ljungberg, and Borrego (2010) presented a convincing argument for epistemological diversity in engineering education. Such a move can be seen as opening space in which to ask new and different questions. Goldberg and Somerville (2015), in a guest editorial in the *Journal of Engineering Education* (*JEE*) addressed the challenges in crafting their book *A Whole New Engineer* (2014) in order to share the "deeper and unexpected lessons of writing the book" (p. 2). What they found was that their language was inadequate in describing the experiences in founding a college of engineering, a foundry, and the partnership between the two, but also the degree of emotion that went unrecognized until they were confronted with reflecting on their experiences to write the book. Pawley, Schimpf, and Nelson (2016) conducted a content analysis of gender in engineering research in the *JEE* and came to the conclusion that, "*JEE* needs a diverse gender ecosystem" (p. 522). These three papers make clear that this shift in thinking is not easy, natural, or self-occurring. It takes intentionality, reflection, and questioning the status quo. Such a shift helps us to see how discursive practices impact our thinking. The very questions we ask and the very words we use speak to the influence of the discourse surrounding STEM and women's underrepresentation. As such, we were compelled to trouble our study by calling into question the very methodology used as well as the relatively limited findings.

Design/Methods

Here we depart from conventional qualitative methodological approaches (St. Pierre & Jackson, 2014) to employ our theoretical insights and experiences as three researchers coming to a phenomenon from different places/spaces. Together we are able to make meaning that would otherwise go unrecognized. We acknowledge the value of our multi-perspectives and collective mind as we approach the data versus our individual minds. Our "interpretive group" approach has breathed new life into the transcripts. Even our "non-intellectual," sometimes emotional, responses to the data have been insightful. In reflecting on the research methods and troubling the design, the transcripts remain, but data sources open up to include previous research, theoretical perspectives, and the experiences we bring as one engineer, one math educator, one social foundationist, education and

engineering researchers, former students, and—perhaps most importantly—women.

Signs of Trouble. Our initial findings left us unsettled and discouraged. How could we "resist habitual ways of reading data" (Lather, 2013, p. 639) or "use what has already been thought as a provocation and a call to invention" (De Freitas & Sinclair, 2013, p. 468) or "make matter intelligible in new ways and to imagine other possible realities presented in the data" (Lenz Taguchi, 2012, p. 267) to plug into the assemblage (Mazzei, 2013) that is engineering students who are women? Why would we "shake up the status quo to bring about transformation" (Goldberg & Somerville, 2015, p. 6)? These findings brought us to a juncture that stalled our subsequent progress with this research for almost 10 years. From the perspective of an engineer who was new to qualitative research design and methodology, there were two choices to consider. First, perhaps we applied the methodology incorrectly. After all, our efforts did not yield any new or interesting findings (so we thought); this must be an indicator we did something wrong. Or, alternatively, we could dismiss the value of qualitative research altogether. We tried it; we learned nothing. Let's move on. Consequently, without any intention of forcing one of these choices, we simply laid the data aside, and though we thought about it often, we did nothing. We were stalled.

Troubled. In Spring 2016, with renewed vigor and determination to revisit our data, we began to take a second look. In most research design, participants are separated from the instrument (De Freitas, 2016). This was the approach we used in our initial inquiry. The WECE (Goodman et al., 2002) protocol wasn't really an objective measure to begin with as it directed participants' mindsets. We maintain the findings from the project obtained via the described coding method are still insightful, but are not as rich as they could be. In further discussion and analyses of the data, we realized that we should not have been discouraged—or surprised— by our initial findings. We acknowledged that we found exactly what we had asked for. We asked the same questions that had been asked before. By asking if students had encountered any challenges as women/girls in engineering, we had already made the presumption that they had indeed. Otherwise, we would not have asked the question. We did not ask whether they had any challenges; we asked what challenges had they had. This brought us back to the idea that we had incorrectly applied analysis or had been faulty with our design. Did we simply ask the wrong questions during the interview? Careful consideration has affirmed that was not the case. Instead, we realized that we had approached the findings with limited perspectives. This time, rather than focusing on what the students said during the interviews, we looked at what they did not say. We paid attention to what they did not talk about. We disrupted the convention of privileging spoken and written language/naming/identifying to open a space where "something(s) different can be thought/done" (St. Pierre, 2011, p. 613). We noticed the things the students talked about that were not explicitly solicited by the questions asked and regarded these as important—if they felt strongly enough about the idea to share it without being prompted, perhaps it warranted further investigation and conceptualization.

Moreover, we approached inquiry— US-origin (non-international) undergraduate students who are women and their experiences with their engineering major—through notions of becoming, referring specifically to multidimensional ways of being constituted and reconstituted by

discursive practices. This new approach to our data opened up concepts and yielded findings that have traction—findings that offer a course of action—tangible and actionable findings. Our stalled approach that felt like a failure of methodology, allowed us to theorize differently and to craft additional iterations (Bridges-Rhoads, Van Cleave, & Hughes, 2016). Most notably, we found that women/girls in engineering majors are not struggling with content or the academic environment; rather, they are struggling with identity as it relates to their being engineering majors. The entanglements were more complex and nuanced than we originally thought. Gender and disciplinary divisions led to an unexpected internal collision of forces for these young women. Simply put, they do not struggle with being in engineering; they struggle with *being* in engineering.

Findings

***Being* in Engineering**. Identity formation is at its pinnacle when students enter post-secondary education (Chachra et al., 2008; Hardy et al., 2013; Kaufman, 2004; Klimstra, Schwartz, Vanhalst, Luyckx, & Duriez, 2012; Luyckx, 2010). As students struggle to find themselves and their place in the world, they must wrestle with many decisions related to how they identify themselves, and how others identify them. Our research shows that this identity struggle is perhaps complicated/compounded for students who are in majors dominated by the other gender (e.g., women in engineering; men in early childhood education).

Our participants wrestled with identity and how to negotiate their being in an engineering context that was dominated by men. It was unclear how they should identify, or present themselves as women/girls in engineering. After all, they had no model for what they could/should/might look like. Should I *be* like the men/boys—unemotional, detached, and seemingly unscathed by the demands of the major? Can I *be* a woman/girl who wears trendy clothes and cares about people? How can I be both an engineer and a woman? Do I have to separate the two identities and "wear different hats" in different contexts? One student shared,

> I've had a lot of people both in my co-op and the classroom tell me you just have to buck up and not let it get to you. And, I'm not the kind of person that's able to do that. And I don't ever want to be the person that doesn't let their feelings affect it. So that's hard to deal with–that buck up attitude–and you just don't want to. You want to let things affect you, so that's hard.

Another relayed,

> This might be kind of petty, but you can't be trendy in engineering. I wore heels one day and if you make noise when you walk down the hallway, people are like, "What are you dressed up for?" If it's anything other than jeans and a sweatshirt, they're like, "Got an interview tonight?" It can't just be, oh, I'm having lunch with a girlfriend. It's not expected for us to be fashionable.

In contrast to their peers in other majors, women/girls in engineering noted that they worked harder academically, spent less time in fun/"frivolous" activities, and did not have the luxury of being lost in the crowd, or going unnoticed in the classroom. They cited instances where they chose schoolwork over socializing, "Sometimes the guys–you can only take so much of their comments. Sometimes I want to go out with my friends and I can't because I have to study so much more." Or, they shared examples of how

they differed from their counterparts in other majors,

> I like to think I'm a really practical person and that's probably why I like engineering and focus on what I think is important. And other girls are more in to frivolous things, I guess. I think that's the difference between us and other girls.

And, they expressed concern over standing out in class,

> It is kind of intimidating to be one of maybe three girls in a class. Part is my personality, but I don't like talking in class. I don't answer questions, but I don't ask questions. I think [about] being the only girl and [about] not looking like the stupid girl that shouldn't be there.

These data substantiate the notion that being in engineering is quite challenging. These students did not struggle academically; they did not share instances where they felt discriminated against or disadvantaged. Instead, the challenges they pointed to were centered about this notion of identity and what it means to *be* an engineer—more specifically, to be a woman/girl in engineering.

***Becoming* in Engineering**. We couldn't agree more that, "The interaction of gender with the development of an engineering identity is complex and multilayered" (Chachra et al., 2008). We want to take this line of thinking a bit further and suggest identity development is always in process of becoming and this becoming is always partial and contingent. Rather than trying to "solve a problem" like women's underrepresentation in STEM, we need to engage in practices that "work through problems" and think more about becoming (Mazzei, 2016). Is achieving an engineering identity ever complete? At what point is it possible to claim completeness? The "tension of identity" (Chachra et al., 2008), "the emotional floor of the enterprise" (Goldberg & Somerville, 2015, p. 5), "in/visibility paradox" (Faulkner, 2009, p. 172), "extensive identity work" and "identity negotiation tactics" (Hatmaker, 2013, p. 394) all speak to a process of identity in a perpetual state of becoming. Our research shows that this sense of becoming weighs heavily in the minds of these young women. They repeatedly cite instances of sticking with it: "I'm going to finish it;" "I'm not going to give up;" "It'll be worth it in the end;" "I've gotten this far and it hasn't been too terrible;" "Sometimes I wish I were on the other side." These data suggest an engineering identity for these young women is indeed in a state of becoming rather than achieved. As they work to prove themselves worthy of *being* in an engineering program, the degree of *becoming* remains partial and contingent.

Conceptualizing our Findings

Three major themes informed the women's/girls' perceptions of self as it related to their identities in engineering. One we have dubbed "womaness" for lack of a better descriptor and it included references to their experiences in which "being a girl" conflicted or troubled their notions of what it means (or they thought it meant) to be an engineer. For example,

> I get tired of guys looking at me expecting me to have the answer. I'm just as smart as you. I don't have any advantage over you. They expect you to be smarter or something. Since you're the female you should have an advantage or know it better.

Or, another student shared,

> I've cried numerous times on the way out the door just from… I don't attribute it to me being a woman. I possibly handle it differently than a

male student. I don't think any guys in class would cry.

A second contributing theme was "proof of self." This identifier was applied to data in which the participants described the dedication and disciplined approaches they used to prove that they could be successful in engineering, as both a major and as a career/profession. One student shared concern over,

> There still is that general attitude that women can't do engineering and it is frustrating. I think in a way it makes you stronger. It makes you feel like you've got more of a reason to do well, so I almost appreciate it sometimes as a chance to push myself harder.

Yet another worried,

> Giving up would mean admitting defeat. You gotta stand up for the cause. I think we're all more determined than some of the guys who just because their dad was an engineer so that's what they're going to do and they really hadn't considered the challenge it would be.

Intersecting the previous two themes was the recurrent notion of the prestige of engineering—the power associated with fulfillment of that degree, even when that was no longer a career/profession they wanted to pursue. They valued the degree as prestigious, perhaps even more so for a woman. After all, many men graduate in engineering; women are among the few, therefore enhancing the prestige of the accomplishment. The intersections of these "themes" are nuanced and subtle, yet all play an important role for women/girls who are conquering/struggling with becoming in engineering. Figure 2 offers a graphic depiction of the interplay between these themes. Boxes were used to capture the concept spoken of by the women/girls as being "put in a box."

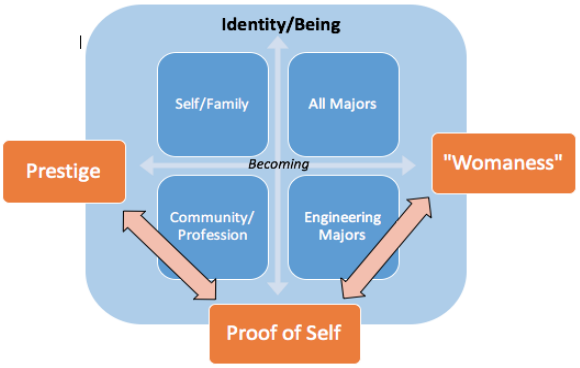

Figure 2. Identity/Being.

While the graphic in Figure 2 simplifies the relationships between these entities, it is quite complex. Identity/Being is contingent and relational. These students identified themselves in relation to their families and other engineering majors. They also identified themselves in contrast to other majors, and within communities and the engineering profession. These identities are contingent in that Identity and Becoming for our participants were framed in reference to different entities and were intermingled with prestige, proof of self, and womaness. Despite overlap and intersections among these concepts, there are questions that remain unanswered. What happens at the intersection of "womaness" and "proof of self?" What about the intersection of "prestige" and "proof of self?" Is it troubling that "prestige" and "womaness" do not intersect?

Implications

These findings bring us to new ways of thinking about supporting women/girls in engineering majors. While previous research has highlighted the value of various interventions intended to improve the recruitment and retention of women/girls in engineering, our research points us in a different direction. While STEM/engineering programs in middle/high school may pique girls' interest (Chachra et

al., 2008; Hernandez et al., 2013; Riegle-Crumb & Moore, 2013), and while mentoring/tutoring programs designed to ensure their success in college courses (Poor & Brown, 2013; Seymour & Hewitt, 1997; Young et al., 2013) are merited and offer practical strategies for us to embrace, we posit that these are insufficient—as evidenced in data nationally and abroad, but also evidenced in our own observations in our programs. Our study leads us to consider programs focused on mentoring and supporting students in their formative process of identity development. This shifts the focus of most mentoring programs away from academic support and getting girls involved towards a focus on identity formation and navigation in a male-centric environment—a novel idea. Helping women/girls reconcile their being in engineering and their being outside engineering is crucial for their success. Where in their four years of undergraduate studies do we help students—engineering majors or otherwise—self-reflect on their lives, studies, growth both academically and socially, and their new/developing ways of identifying themselves in relation to their peers (and families)? Being in the minority group (women in engineering) creates more need to adapt and create an identity with others to "fit." Where are their supports? Does the lack of support compound the stress already being encountered (by academics, time management, independence, and finances) and result in a change of major? Our study invites us all—engineering educators, advisors, instructors, researchers, and professionals—to look for solutions to our recruitment/retention problems in creative ways that we have not previously considered. The supports these women/girls need are not met by more camps or having more role models or more extracurricular involvement; while these can be valuable aids in our efforts, they are insufficient.

Another concern is the work of the discursive practices in engineering programs and fields. The STEM crisis sets the context for discursive practices ushering in a sense of urgency and anxiety that serves to bolster a channeling of funds, initiatives, and energies towards addressing the crisis. Then, women's underrepresentation in STEM disciplines shifts discursive practices to an issue of diversity where the end goal of proportionality will not ameliorate gender inequity. Gender as one identity marker in a sea of diversity can never be complete. Pawley, Schimpf, and Nelson (2016) make clear,

> Researchers [need] to move beyond justifying studying gender inequity due to the fact of women's underrepresentation, because this rationale suggests the gender inequity will disappear when the numbers of men and women in engineering in the United States are more proportional to the general population . . . proportionality does not destroy patriarchy. (p. 522)

The very language we use speaks to the discursive practices shaping our thinking; where "the word itself constitutes both a set of discourses and a set of practices" (Britzman, 1995, p. 235). Women engineers, for example, uses a qualifier that signals a profession dominated by men, "The use of such labels . . . serves to reinforce the belief that women take on a different meaning from men in the same profession" (Hatmaker, 2013, p. 383). Or, consider the very common question that frequently headlines news stories and research reports, "Why do so many women leave engineering?" How aware are we of this

language use/choice? How do these discursive practices inhibit us from thinking anew? If we are unaware of or choose to not consider these impactful practices, how do we open up new space to ask different questions? Instead of striving for proportionality with the idea that this will eliminate patriarchy, perhaps we should shift the conversation to address the dynamic, multidimensional ways of being constituted and reconstituted by discursive practices that are always already generating gendered positionings. Let's equip our students and colleagues with ways of recognizing and questioning these entanglements, not in order to solve a problem, but rather to work through a problem and think more about the processes of being and becoming.

Conclusion

An equitable academic environment is arguably the overall goal of research on women in engineering and STEM. Very few studies suggest that simply increasing the numbers of students who are women will result in greater parity. Rather, most research suggests that structural and cultural change is necessary, yet too slow for the national demand for quality engineers. The last two findings from the initial inquiry cause us the greatest concern. Pitting students' academic time commitments against family and friends forces students to choose. Beddoes and Pawley (2013) are careful to point out that the discourse of choice may obscure the unequal realities for men and women. Men do not have to choose—with acknowledged exception—as do many women, hence forcing women to adapt to an unbalanced gender workplace. Similarly, negative academic experiences such as the perception that they are working much harder than their peers, can result in the derogation of one's own gender and peers with different majors. Or, as a participant shared, "We're not finger painting" and "Other girls are into more frivolous things." Some coping mechanisms employed to assert a sense of belonging for women tend to reinforce solely masculinist constructions of identity (Hatmaker, 2013). It is important to note that men too may be negatively affected by such experiences (Settles, Cortina, Buchanan, & Miner, 2013). The lasting effects, however, will only perpetuate inequity. Gender inequity is much more pervasive economically, socially, culturally, and politically than a particular major in college, so students and faculty (both men and women) should be equipped to recognize and challenge it.

It is clear that the material forces of campus—its buildings, classrooms, students, families, faculty, disciplines of study, and even clothing—comprise flows of simultaneity that produce an entanglement that "continues to become as it joins other enactments, other assemblages" (Mazzei, 2013, p. 737). Engineering education is indeed dynamic and complex. Through our example, we show how we need to reframe the study of engineering education to address the ways the material engages with and impinges on the fluctuating identities of students to produce subjectivities that are not temporally, spatially, or socially fixed. The processes of being and becoming in these encounters inspire further problematizing of foundations of inquiry including qualitative inquiry. How should these processes of becoming be analytically conceived and captured? To what extent and in what ways are these processes and their analyses immersed in stable/rigid forms of cultural/social/academic knowledge and communication? What kinds of possibilities for questioning the crisis of women in STEM lie in tuning into the processes of becoming, particularly within research that delves into troubling stable/rigid senses of personhood that disavow processes of

becoming? To come back to Goldberg and Somerville (2015), we share their push to "change the conversation about engineering education practice" and "stimulate useful reflection" and "increase conversation" (p. 6).

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