

# Going Beyond Gender Balance: Understanding the Intersection of Gender and the Engineering Experiences of Alumni

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**Abstract**—This Research Full Paper investigates how students experience “gender-balanced” engineering environments and how alumni narrate the stories of their experiences in such “gender-balanced” engineering environments. Using the grounded theory approach, this study examines interviews of engineering alumni about their experiences in a “gender-balanced” educational environment. Using two emergent constructs, awareness and impact, we take a detailed look at how gender has shaped the participants’ undergraduate and post-graduate experiences. These constructs suggest that having parity in the number of men and women in an engineering institution is not sufficient for creating equitable environments for men and women to thrive.

## I. INTRODUCTION

Defining and understanding the gender-related challenges facing the field of engineering is an important step toward creating an equitable engineering environment for all. One of the most prominent discourses surrounding this topic is the lack of gender diversity, which, it has been argued, creates opportunities in STEM for all gender identities, because many who choose to enter other fields “might be [those] who could make important contributions to science or engineering if given a chance” [1].

Literature demonstrates that, at least in part, the lack of gender diversity in STEM is a result of unsuccessful recruitment and retention efforts for underrepresented gender identities in engineering education and careers [1], [2]. A common explanation for the critical need of focused efforts in these two areas is that better recruitment and retention strategies will lead to improved gender diversity, in turn resulting in a broader range of perspectives and ideas that will lead to increased workforce quality overall [3]. In addition to improved recruitment and retention efforts, proposed solutions to address this lack of gender diversity range from shifting STEM curricula toward a focus on societal applications, to normalizing women as engineers, to redefining “engineering identity” to be more inclusive of all gender identities [4]–[6].

Determining the underlying causes that contribute to the lack of gender diversity in engineering institutions has become increasingly important as the significance of gender diversity has grown to be more apparent. The “leaky pipeline” metaphor is often used to describe the attrition of underrepresented gender identities as a continual “leak” from the system throughout one’s academic and professional trajectory in STEM [1], [7],

[8]. A wide variety of reasons, as outlined by Blickenstaff, have been proposed to explain specifically the paucity of women in STEM, including differences in men’s and women’s biology, an absence of role models for women in STEM, and cultural pressures that channel women away from STEM education and careers [9].

Though these explanations aid our understanding of what is wrong, seeing gender inequity as a problem in and of itself will lead to solutions that fail to challenge the factors that drive this cultural dynamic [10], [11]. Highlighting these cultural factors, Faulkner explores the overwhelmingly masculine culture within engineering and how it presents barriers to women. She argues that the prevailing cultural viewpoint regards engineering as being a masculine endeavor and that women who identify as engineers are viewed as inauthentic, resulting in a tension between their identities as women and their identities as engineers [12]. To create meaningful diversity in engineering, the definition of engineering itself must be made more inclusive of all identities [11].

As a way of contributing to this conversation, this study seeks to understand the effect gender has on individualized student’s experiences in the creation and propagation of various gender dynamics affecting the retention of underrepresented gender identities in engineering. This paper evolved from a past grounded theory study which explored the role of the educational environment in shaping individuals’ teaching and education identities through the narratives of engineering students and alumni at a single institution [13]–[15]. Gender-related themes that emerged during that study are now investigated.

Celadon College is a small, undergraduate-only engineering college in the northeast U.S. whose mission is to educate innovative, entrepreneurial engineers through a hands-on, project-based learning curriculum. Many core engineering courses include projects either as their main focus or as a way to apply theory to practice at the end of the semester. Students are also required to complete a number of semester- and year-long team projects throughout their education at the College. Of importance for this study, Celadon is approximately gender-balanced by design: 48% of the student body is female by legal sex, while women make up approximately 40% of the faculty. Among the college’s leadership, women make up 57% of the

president’s cabinet, including several vice presidents, deans and associate deans.

As such, gender dynamics, particularly as they are enacted within the College, are often the subject of formal and informal academic discussions, curricular and pedagogical design, and engineering education research on campus. As a part of these discussions, educational (re)design, and research, much effort is focused on preventing the environment moving towards a “chilly climate” [17] and on creating a more gender-equitable environment within the school. Because of this distinctive culture and intentional work toward creating gender equality and equity in engineering, Celadon serves as a unique study site at which to understand how “gender-balanced” environment may affect students’ experiences.

## II. METHODS

The data sources for this study include interviews with thirteen survey participants from the original study [13]. The participants for this work, all alumni, were selected using maximum variation purposive sampling [18] to allow for a representative sampling among gender, major, and graduation year. Participants included eight women and five men from a range of graduation years (2006–2014), who went on to pursue diverse post-graduate experiences. A semi-structured, open-ended protocol was used to conduct 60-90-minute interviews, which were transcribed and pseudonymized prior to analysis. Interview questions primarily focused on the participants’ learning experiences and attitudes towards teaching and/or education research while at Celadon and beyond. The interview protocol also included a small section related to gender—although we expected that the gender-related narratives may emerge organically through participants’ reflections of their experiences at Celadon, we also wanted to ensure that such narratives are explicitly touched upon in all our interviews. Therefore, to maintain methodological fidelity with our original study [13], and to allow for emergence of new theories, particularly given the unique, currently under-studied, “gender-balanced” nature of Celadon College, grounded theory provides a compelling lens with which to examine the ways in which gender may have impacted individuals’ experiences [19].

Initially, *in vivo* and open coding were used to capture ideas and trends in the participants’ responses across all sections of the interviews. Subsequent processes used axial and binary coding (i.e., presence or absence) and the constant comparative method to reflect the presence or absence of codes and categories, which were then synthesized to identify emergent categories, and later, themes. The small sample size is offset by the rigor of this approach, rather than the small number of participants, was in development of a “range of relevant conceptual categories, [including the two emergent categories described below], saturating (filling, supporting, and providing repeated evidence for) these categories” [20] while also rigorously explaining the data through visual organization strategies and rigorous memo-writing practices [21], [22]. Selected codes from the codebook relevant to the study are

Table I  
SELECTED GENDER-RELATED CODES.

Code Name	Description	Example
Cultural norms	Participant describes the attributes, demographic makeup, perspectives, or norms of a community or culture.	“There were a number of women who were moving up into positions of great responsibility. It was cool to see ...how that helped shape the culture of their departments.” - Shawn
Diverse perspectives	Participant describes the effects of having multiple perspectives within a group of people.	“[Women] again tended to be more focused on sort of making sure that everybody was happy and making sure that stuff was being distributed equitably rather than just on getting things down and getting the right number of decimal places.” - Shawn
“Don’t think it affects me”	Participant does not notice a trend or irregular situation because they believe it does not affect them. Also when participants state that a situation did affect them.	“I would say for a lot of my time at Celadon ...I didn’t really think about ...gender mattering.” - Tricia
Limited opportunity	Participant describes a situation in which a personal handicap, a cultural block, etc. limits their access to opportunities.	“I think that I held back a little bit in college because of this perception that I was too stupid to be there ...” - Betty
Only woman	Participant describes a situation in which they believe they are the sole representative of a minority group, in this case “a woman,” within a team or community.	“I was always the only woman on my technical team. I’ve never been on an engineering team with another woman at my level, ever, in my entire life, outside of Celadon.” - Christine

shown in Table I. Codebook validity and intercoder reliability were established through code schema comparison between three primary coders and through regular meetings with the entire five-member research team.

## III. RESULTS AND DISCUSSION

Two emergent constructs were identified from the analyses of participants’ gender-related responses: their *awareness* of a role gender may have played in a particular experience and the *impact* that gender had on their perceptions of this experience. Our analyses further focused on the ways in which a participant discursively demonstrates either a presence (however large or small) or absence of both the *awareness* of and *impact* that the gendered experience had on them.

### A. Emergent Construct One: Awareness

A coding of an interviewee’s responses as ‘awareness’ means that the participant actively identifies gender and gendered patterns—both through explicit prompts and unprompted—as present in their description of an experience.

Awareness is when such language as “divisions,” “stereotypes,” and “differences” is used in descriptions of specific experiences or observations. For example, Alexander, a mechanical engineering alumnus who is now working for a sustainability company, describes a situation in which a coworker was hampered by her identity as a woman and the ensuing gendered patterns of interaction he observed:

I had an associate working on the project who was [a woman]... A lot of [clients] wouldn't even return her calls, or talk to her, or give her the information that we really needed... From that perspective, I'm sad that [gender discrimination happens] in, at least the workplace, that I've experienced, but, I mean, I'm fortunate that I'm on this side of the coin [a man] rather than the other.

- Alexander

Alexander's comment demonstrates active engagement with ideas about gender and gendered interactions both upon reflection with his interviewer and while present in the situation. In other responses, when explicitly facing questions related to gender or gendered patterns of interaction, participants exhibit an uncertainty about or a lack of awareness of such patterns, a linguistic turn often marked by such language as “I don't know...” or “I didn't notice.” Karen, a systems engineer who at the time of the interview worked as a middle-school math and science teacher, displays this uncertainty in her description of her relationship with a male adviser.

I don't know if that's anything to do with gender at all, but that was an experience that I had, and I don't know if that would have been different if I had had a female adviser who I could have felt closer with.

- Karen

This response is coded as an absence of awareness because of Karen's uncertainty regarding the role that gender may or may not have played in this relationship. Participants who discursively present absence of awareness may still discuss gender dynamics, though they remain unsure about the contextual significance that these dynamics may have had. Another participant, Nate, an engineering with computing concentration graduate who was pursuing further education in a non-STEM field at the time of the interview, describes how he didn't think about gender during his time at Celadon:

I never really thought about [gender] just because the way that I use gender is that if we do it right, if we have proper gender relations, ideally you won't notice them... it's just something that is a normal part of the world.

- Nate

In the quote above, Nate attributes his lack of gender awareness to gender being “done right” at Celadon. Several participants also realize during the interview itself that gender may have played a role in how they experienced their environment while at Celadon. For example, Fred, a systems engineering graduate working as a high school educator at the time of the interview, shares an example of this realization

when he describes how gender shaped his experiences beyond Celadon:

[A]lthough I haven't really [thought] about it until right now, it's probably real important to have female professors who are strongly voiced, outspoken, intelligent educators and researchers because [it] shows you should respect women in technology too.

- Fred

Fred explicitly states that he was not aware of the importance of having access to successful female faculty during his time at Celadon. Although he notes one of the ways in which diversity of gender identities among his instructors may be valuable, he does so retroactively, i.e., Fred's quote above implies absence of awareness at the time of the actual experience, which is different from participants who describe awareness during the time of their experience. Karen's, Nate's, and Fred's quotes are all coded as ‘absence of awareness;’ however, their responses do display slightly different facets in which this construct may be operationalized.

### *B. Emergent Construct Two: Impact*

‘Impact,’ the second emergent construct in this study, is defined as a participant's perception that their gender identity or the gender identity of others influenced the dynamics or outcome of a given experience. This effect can manifest itself in the dynamics within and between student teams, students' interactions with faculty, and attitudes toward gender stemming from cultural and systemic practices, biases, or stereotypes. Participants describe ‘impact’ within a single experience or as a part of a series of experiences that form a pattern. Of note is that this construct has emerged in the participants' descriptions of the impact of gender on themselves, on others, or on a group of people.

More specifically, the construct of impact often emerges in situations where an individual experiences differential treatment due to their (perceived by others) gender identity, or the perceived gender identity of others. For example, Christine, a 2007 alumna who was completing a PhD in engineering education at the time of her interview, describes her experience during a class project related to gender, for which she presented as a man while attending an on-campus event:

And the experience I had at that hack-a-thon sort of blew open for me the, “Oh, gender makes a difference. Oh, my gosh.” [In] that I wasn't being interrupted, that I was being given different tasks to do... just the entire experience was different...

- Christine

This event allows Christine to understand—in an embodied way—the impact that gender (her own, perceived or otherwise) has on her overall educational experience. As another example, Karen, the same woman who is unsure about whether gender played a role in her relationship with her advisor, describes her realization that women in her class were not being allowed to do the “neat work” of design and engineering in team projects. In the following quote, Karen describes a group of women in a class:

And we kind of all had these shared experiences of not doing the neat work of the project, and we're like, "Oh, that's kind of weird"...that's when I started realizing that this is something that had affected more than I'd realized.

- Karen

Karen acknowledges that there may be a larger cumulative effect of rarely having the opportunity to work on substantial elements of her team projects, something that she is still attempting to make sense of during the interview.

Participants also describe experiences that lack any perceived impact of gender. For instance, Michelle, an engineering major with concentration in materials science working as a manager for engineering consultancy projects at the time of the interview, recalls how gender had no impact in her decision to talk to professors about needing help:

And I didn't really care about the gender of the [professors] I was talking to. I don't remember that having an impact on me...on my decision to talk to them or not talk to them.

- Michelle

When speaking on the topic of Celadon's gender environment, Michelle mentions that she was able to enjoy and thrive in the maths and sciences in a manner that "females" at other schools might not have:

So, I didn't really have the...you know, I didn't have kind of [the] stereotypical female engineering problems...

- Michelle

In these and several other instances, Michelle discursively places gender and gendered interactions as insignificant in her educational experiences, whether they are one-on-one interactions with other students and faculty or generalized observations of experiences of others. Despite the uncertainty in the assessment of whether her own gender or that of others had an impact on her learning ("So, I didn't *really* have...problems"—our emphasis), these examples are emblematic of her blindness—willful or unintentional—of the gender impact.

### C. Emergent Theoretical Framework

Figure 1 represents a preliminary emergent theoretical framework that describes the ways in which the constructs of presence/absence of the awareness or impact constructs are discursively engaged in the participants' talk. Each cell in this 2x2 matrix represents "interactions" of these two constructs with rows denoting the presence and absence of awareness and columns characterizing the presence or absence of impact.

Using this 2x2 matrix allows for identification of patterns in participants' individual responses as well as individual participants' overall narratives and positioning with respect to the constructs. In what follows we analyze participants' responses within each matrix cell.

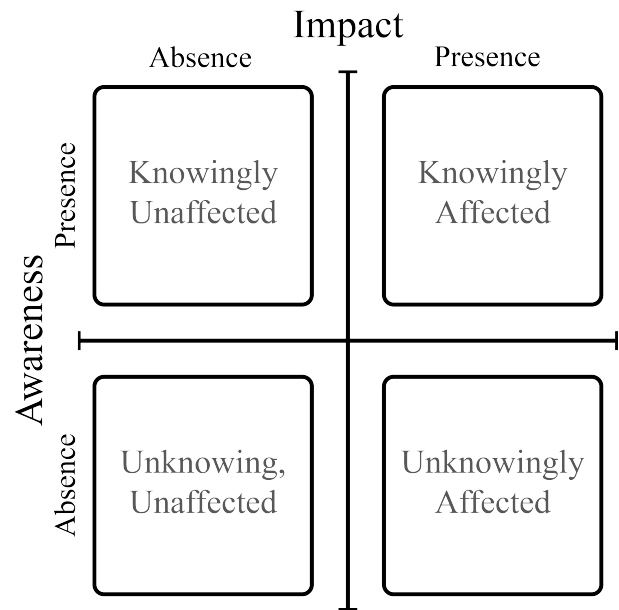


Figure 1. This 2x2 matrix represents "interactions" of these two constructs with rows denoting the presence and absence of awareness and columns characterizing the presence or absence of impact.

### D. Knowingly Unaffected

Our examination of all participant responses placed a total of 14 quotes—from five women and three men—in the upper left matrix cell, which represents presence of awareness while at the same time absence of perceived impact of gender on interviewee's learning environments. At their core, quotes in this matrix cell describe experiences where participants are aware of gender or gender dynamics, but do not personally feel their effect, perceiving themselves as passive observers of gendered dynamics. For example, in response to a question regarding how gender has shaped her educational path, Michelle describes:

I would say that I am likely an anomaly, because I am not, as a girl, as a woman, even in growing up, I was never really afraid to voice my opinion or to state whatever it was I was thinking, or to raise my hand to answer the question, or whatever. So I never really had the timidity of, you know, "Oh, I'm smarter than you" or "not as smart as you." I just never cared.

- Michelle

Michelle articulates that gender may affect other people who identify as women; they may be hesitant to share their thoughts or may compare themselves and their intelligence to others. Yet the ways in which gender may impact other women's experiences do not seem to impact Michelle.

Christine, in response to the same question, describes her views about the Society of Women Engineers, an organization whose mission it is "to stimulate women to achieve full potential in careers as engineers and leaders" and to provide

extra support to women in an otherwise masculine field of engineering, in the following way:

I was one of the students that stayed super far away from stuff like SWE, the Society for Women Engineers... I was, like, "I want nothing to do with that. That's way too radical in terms of feminism. Um, I think things are okay. We can just work hard and, and, and it's not really a big deal. Like, I, I don't think it affects me at all. At all."

- Christine

Although aware that gender likely may or even does affect other women negatively, Christine posits that she is in some sense immune to these negative effects, the pill that boosts her immunity being "work[ing] hard."

Participants who are knowingly unaffected by gender often observe or participate in experiences where they either intentionally or unintentionally separate themselves from the group of people who are affected by their (perceived) gender identity. Michelle distances herself from a typical woman in an engineering field, explicitly identifying herself as an "anomaly" among female engineering students because of the ways in which she is comfortable sharing her opinion. In other words, Michelle is both defining what she believes to be expected behavior of women in engineering and separating herself from that expected behavior. Similarly, Christine's repetition of "at all" when offering a statement that gender does not affect her reveals an intentional emphasis on or a hope that gender lacks any impact on her learning opportunities.

The Knowingly Unaffected quotes reflect this positioning of an individual who is aware of effect of gender on others yet is not taking action towards helping others who are affected by their perceived gender (often negatively).

#### *E. Knowingly Affected*

Our examination of all participant responses placed a total of 4 quotes in the "Knowingly Affected" matrix cell, which represents the co-occurrence of both presence of awareness and presence of impact. Of all thirteen participants, three women described Knowingly Affected type of experiences. At their core, quotes in this matrix cell codify experiences where participants explicitly recognized at the time of the event that they were affected by gender or observed others being affected by gendered patterns, or where they attributed events—observed or experienced—to gender in some way.

For example, Tricia, a 2013 graduate finishing a Master's program for high-school physics teaching at the time of the interview, describes an episode in which both an awareness and impact presence categories co-occur, i.e., Tricia observes a gendered interaction and notes the impact that it has on her educational experiences. Specifically, this alumna describes an interaction with her physics professor during which she asked him if she should declare a physics concentration. The instructor told her she should not pursue physics; yet, after the first test, he declared that she "really [has] a gift for it" and could now pursue physics as her concentration. Tricia further recounts:

It was clear to me...he had thought I wasn't good at physics. [He] thought I was dumb...I'd ask questions that tried to...dig a little deeper than what he was telling us, and he would never answer them...he would repeat whatever he had said immediately before I asked the question with a tone that I interpreted as "I already told you this. Why don't you get it?" When in reality what he was saying was not an answer to the question I had asked.

-Tricia

When asked whether Tricia had evidence that may have led her to believe that such an interaction was based on gender, she responds:

I don't have proof that it was about gender but...I got the impression that it was and...looking at the...ways he interacted with other students in the class and...he was generally clear about who he thought was intelligent and who he thought wasn't...he did think I was smart after that first test...So, it wasn't, like, he never thought a girl was smart, but it did seem [that] it was easier to be smart if you were a guy.

- Tricia

Tricia describes an experience that she feels is gendered. In recognizing this pattern, Tricia forms a belief that an authority figure equated male gender with intellectual ability. She posits that her gender expression as a woman may be related to her being treated differently, and having an overall learning experience that was impacted by both her gender and her professor's assumptions about women in physics. Unlike her male peers, Tricia had an additional challenge to overcome before selecting her major and concentration, that of figuring out whether she was intelligent enough to make it in physics.

Another response corresponding to the Knowingly Affected cell may also describe how an event or experience had an impact (or at least had a potential of an impact) on some students or student groups, but not on all students in their community. For example, Ellie, a Celadon alumna who graduated in 2007 with a degree in systems engineering and working as a project manager at the time of the interview, describes an experience in which a professor allowed male, but not female, students improve their test scores by discussing the test problems with him,:

...[A] poll of the entire class revealed that this was what was happening, and we all were just kind of dumbfounded. And the male students didn't really care, because it didn't affect them. And the female students were, like, well, what do we do?

- Ellie

Not only does Ellie note the indifference of her male peers; she also describes the bewilderment and possibly even helplessness felt by her female classmates as result of this experience. This incident highlights one of the problems that can occur in a "gender-balanced" engineering environment in which people who do not feel directly impacted by gender

are not compelled to address microaggressions, inequities, unfair or explicitly discriminating gender practices in their environments. In displaying both awareness of and impact by this explicitly gendered situation, Ellie becomes isolated from the parts of her community that do not share in the same Knowingly Affected beliefs/values/experiences, while at the same time bringing her closer to the peers whose resonant experiences.

When Karen describes the effect that gender had on her education path, she recalls a general environment she experienced as a member of various team projects. For example, she states:

I didn't feel I had the opportunity to fill some of [the technical] roles, because I hadn't had prior experience in some of those things. So, I don't know if that's specifically because of gender, but I think it sort of lent itself to that.

- Karen

Karen identifies that she may not have had access to some of the same learning opportunities that her male counterparts may have been privy to. Later in the interview, she further articulates that, in the project-based setting, efficiency is often held as the primary goal, creating an environment in which gender equity and equal learning opportunities are subservient to the completion of project tasks and deliverables. Although she acknowledges that the tasks she undertook in her teams may have been due to the lack of prior experiences, Karen is also aware of the effect that gender has had on the situation. This dynamic leads to further role differentiation, a self-reinforcing cycle in which those who lack early learning opportunities are set further behind by a tendency for the most experienced individuals to do the technical work [23].

It is of note that only women participants describe Knowingly Affected experiences. In the experiences that they share, their gender identity has a negative effect on their learning and access to learning opportunities. Narratives such as Tricia's interaction with her male professor and Ellie's experience with male classmates involve instances of this, where women participants interact with male faculty or students who appear to be unaware of the role that gender plays in creating and sustaining equitable learning environments. The continuing reoccurrence of such narratives in the "gender-balanced" environment of Celadon College again raises the question of whether increased gender diversity, even if it is presented as an increase in proportion of women students, results in gender equity or if a concurrent shift in attitudes and behaviors, as well as systemic shifts in culture and surrounding discourses related to gender in engineering education environments is necessary.

#### *F. Unknowingly Affected*

Some participants also describe experiences and situations in which they were impacted by gender, but were not aware of that impact at the time. There are a total of eight quotes identified in this matrix cell, from four women and two men. Most relevant quotes explicitly mention the gender expression of others as being noteworthy, yet lack awareness of any

gender impact on the participant themselves. Karen describes how gender could have been a factor in the interactions that she had with a male adviser when she approached him to talk about her future academic plans:

He was my adviser, and was like, "Okay, that's fine. That's good, sounds good. You've thought about it. Go ahead..." I feel like I would have really loved more questions about, "Well, did you think about this?"...or "What's your goal?" I don't know if that's anything to do with gender at all, but that was an experience that I had, and I don't know if that would have been different if I had had a female adviser who I could have felt closer with...

- Karen

While Karen does suggest that gender may have affected this interaction, she remains unsure about its specific impact. It is this ambiguity and a sense of curiosity that places some of the participants' narratives into the Unknowingly Affected matrix cell. Of importance is that while most Unknowingly Affected participants wonder about the impact of gender in their undergraduate engineering experiences, they also share hesitation and a sense of uncertainty about the ways in which the local and more systemic changes to the gendered ways of interacting may be affected.

On the other hand, Nate, notes the overarching positive implications of his experiences with gendered interactions when he describes how his interactions with another student during an admissions event affected his thinking about Celadon:

...[A]nother thing is just the formative role that Celeste McIver [another student] played in my thinking about [Celadon]. Because when she hunted me down [during an admission event and brought me to]...that whole group [of women]...I didn't think anything of it at the time, but I'm sure I probably enjoyed the conversation more just because she was female, and I've always gotten along better with women...just the fact that she was there with a group, had that conversation, I'm sure played some subconscious role [in my thinking about Celadon], but I couldn't put my finger on it.

- Nate

Nate's narrative describes that his conversation with a female peer helped him to make a choice to attend Celadon-which, at the time, he only attributed to this conversation and not to the potential role of interacting with a specific set of students. However, in reflecting on the experience, he becomes aware that gender was likely a factor in how much he appreciated the experience and how much he valued Celadon. The admissions event, and specifically his interactions with women students during this event at Celadon clearly made an impact on Nate, but he does not recognize this until long after the event.

Participants who are Unknowingly Affected by gender have experiences in which they note a change in their life or an effect on their experience due to gender or gender dynamics,

but also share that they are unsure if that change was in fact due to gender or, as Nate states, “played some subconscious role.” Often participants whose quotes are categorized into this matrix cell become aware of the potential impact of gender or gendered interactions retrospectively, through a reflective process involved in the interview process, stating that, at the time, they were unaware that gender had an effect on them, but that they now believe it could have played a role. This explicitly stated lack of recognition at the time of the experience classifies it as an absence of awareness. A hesitance in attributing experiences to gender indicates that the culture of Celadon fails to create an environment in which all students actively consider the role of gender in their experiences; this may be due to a lack of emphasis on reflection or a culture that actively deemphasizes the effects of gender because gender may be already “done right” due to “gender-balanced” nature of the student and faculty populations.

#### *G. Unknowing and Unaffected*

The language used by participants whose quotes are categorized as Unknowing and Unaffected suggests that they did not feel they were affected or impacted by gender and they were unaware of it at the time of the actual experience. We found that four women and four men use this language with a total of eighteen quotes. When asked about how Celadon’s gender balance may have impacted his educational experiences, Shawn, a mechanical engineering alumnus working as a sustainability consultant at the time of the interview, describes:

I don’t think I noticed [the gender balance] while at [Celadon] or at other schools...it wasn’t something that I thought about in making the decision [to attend]...  
- Shawn

For Shawn the “gender-balanced” nature of Celadon had no role in his decision to commit to Celadon, nor did he actually notice its presence. Thus Shawn is both unaware of gender or gender role in his experiences and makes a conscious decision that gender has no impact in his learning environments and on his own learning. When asked the same question, Michelle also describes a general lack of concern in regards to gender balance, stating:

To be honest with you, I mean, I don’t know if I’ve ever actually thought about faculty male-female ratios, like balance...I guess I’d say that I don’t know if I’ve ever necessarily cared what the faculty male-female ratio was.  
And then at [Celadon]...I think [gender balance] operated the way I expected it to operate, which was, some people were good at some things, some people were good at other things, and your gender doesn’t really have anything to do with it, you know.  
- Michelle

It seems that Michelle has neither given much thought toward the issues pertaining to gender in her learning environments, nor considered the role of Celadon’s “gender-balanced”

environment in her learning opportunities and learning overall. In effect, Michelle ignores gender issues in her learning environments thereby allowing to maintain status quo in her discursive practices and normalizing all of the learners’ experiences by stating that “your gender doesn’t really have anything to do with it.” Interestingly, this is a shift from how she spoke about gender earlier in the interview when she shared that she was not affected by “stereotypical female engineering problems.” Rather than positioning herself separately from a group that is impacted by gender, she posits that gender was not a factor for anyone in general, thereby suppressing and normalizing her own and other women students’ experiences.

Similar views of gender, those of gender unawareness and possibly suppression, are also reflected in Nate’s attitude that “if we do it right, if we have proper gender relations, ideally you won’t notice them,” maintains, if not magnifies, the status quo. When individuals assume that their lack of concern toward gender reflects the view of everyone, they disregard the very real impacts of gender identified by other students at Celadon (e.g., Ellie’s account of her professor allowing only the male students to correct their tests). Creating a gender-equitable environment requires an awareness of gender and acknowledgement of its impact on and by all groups, not only those directly affected by gendered practices. Without such acknowledgement, our learning environments continue to ignore the results of gendered practices (e.g., differences in pre-college learning opportunities between different genders), which can place underrepresented genders at a disadvantage in group learning experiences, as discussed in the Knowingly Affected section.

#### IV. CONCLUSION

In this study, we identify two emergent constructs relevant to the participants’ engineering education experiences in a “gender-balanced” environment: the awareness of gender and gender’s impact. Examining how individuals across our sample bring up these constructs and how these constructs co-occur creates a picture of dynamics that exist within the engineering culture of Celadon College, despite its “gender-balanced” environment. The gender ratio and small sample size of this study create potentially unique results; next steps may include replicating this study using a larger sample of alumni or current students to review the efficacy of the constructs and resulting emergent theoretical framework and to expand our data sources to additional literature (e.g. [24]–[26]) to allow for further development of our emergent theoretical framework.

When engineers work and learn within a “gender-balanced” institution such as Celadon, they may believe that the gender-related problems that exist in engineering as a whole are no longer issues within their institutional culture. This, in turn, may further contribute to attitudes that uphold and maintain the existing gender dynamics and promote a narrowly-defined view of engineering identity, isolating those who are aware of and impacted by gender. Our conclusions are best summarized

by Christine's description of finding a minority identity at Celadon:

What does an integrated sense of identity mean when you are in a minority demographic [at Celadon] and you become an engineer from within that instead of shovelling yourself into a middle-class, white, able-bodied, straight-sexed man box?

- Christine

When achieving equality in numbers is the end goal for diversity in engineering education, this hegemonic definition of identity in engineering is perpetuated. By choosing to analyze the awareness and impact of gender on individuals in an engineering environment, instead of looking solely at the number of women and underrepresented minorities, we can support the development of engineers who have an integrated sense of identity rather than engineers who propagate the traditional engineering identity of a "middle-class, white, able-bodied, straight-sexed man." When engineers are able to approach their work with a truly integrated identity, they effectively broaden the scope of what an "engineer" can be.

#### V. ACKNOWLEDGEMENTS

We would like to thank the National Science Foundation for its support of the REU/RET site at Olin College of Engineering (NSF #1156832). All opinions expressed are those of the authors and not necessarily those of the NSF. We are grateful for the contributions of Dr. Rebecca Christianson to our data collection and initial analysis, and the work of Anne LoVerso in the early phases of analysis. We would also like to thank the current and past members of the larger research group.

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