Professional Shame as a Socio-Psychological Mechanism for Marginalization in Engineering Education

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BACKGROUND

Previous work has identified the reality of structural constraints placed on engineering students from underrepresented gender, racial, or ethnic backgrounds, a process known as minoritization. Students from minoritized and marginalized backgrounds are often expected to overcome additional obstacles in order to be successful in engineering or to claim identity as an engineer. Such a cultural backdrop contributes to the experience of *professional shame,* which has not yet been characterized in the lived experiences of engineering students who identify with minoritized backgrounds.

PURPOSE

We contend that professional shame is a major factor in both creating and perpetuating cycles of marginalization that inhibit students from forming a professional identity as an engineer or succeeding in their academic program. Anchored in theoretical foundations of psychology and sociology, we define professional shame as a painful emotional experience that occurs when individuals perceive themselves to be wholly inadequate in relation to identity-relevant standards within a professional domain. In this paper, we examine the lived experiences of professional shame in undergraduate engineering students in the United States who identify with racial, gender, or ethnic backgrounds that are minoritized within the structural constraints of their engineering programs.

METHODS

To answer our research question: How do students from minoritized gender, racial or ethnic backgrounds experience professional shame within the context of engineering education? We conducted an interpretative methodological analysis (IPA). Specifically, we conducted semi-structured interviews with junior engineering majors (*n* = 7) from two predominantly white institutions (PWIs) who self-identified as being from a minoritized gender, racial, or ethnic background. We found IPA to be especially effective in answering our research question while affirming the nuances of the diversity found in our participants' gender, racial and ethnic backgrounds. We carefully analyzed the interview transcripts, generating descriptive, linguistic, and contextual comments. These comments informed multiple emergent themes for each participant, which were subsequently integrated into robust themes that characterized the psychological experiences shared by all participants.

SUMMARY OF FINDINGS

Our findings are summarized in four robust, psychological themes. First, minoritized identities were salient in moments of professional shame. Second, in response to professional shame, students sought out confirmation of belonging within the engineering space. Third, their perception of engineering as an exceptionally difficult major that required exceptional smartness intensified the shame experience. And, finally, participants experienced a tension between wanting to adhere to engineering stereotypes and wanting to diverge from or alter engineering stereotypes.

SIGNIFICANCE AND IMPLICATIONS

Through examining participants' experiences of shame and subsequent struggle to belong and claim identity as an engineer, we seek to address efforts in bolstering diversity, equity, and inclusion that may be hindered by the permeation of professional shame in the experience of minoritized students. We see these findings as critical in giving insight on how minoritization occurs and so that equity can become a systemic objective for everyone in the engineering community rather than the burden only on the shoulders of those who are marginalized by the community.

KEYWORDS Emotion, shame, identity, marginalization, interpretative phenomenological analysis

Introduction & Background

In this paper, we are specifically examining the experience of professional shame in the context of engineering education for students who are minoritized in their departments. Based in our understandings from sociopsychological literature, we define shame as powerful emotional experience that occurs in an individual when they perceive to have failed to meet identity-relevant, socially constructed expectations in a professional setting (Gilbert, 2003; Huff et al., 2020; 2021; H. Lewis, 1971; M. Lewis, 1995; Tangney & Dearing, 2002). From previous literature about marginalization in engineering, we know that this socio-cultural phenomenon impacts the individual student in a myriad of ways that provide barriers for minoritized students (Foor et al., 2007, Faulkner, 2007; Hererra & Hurtado, 2011, Russell & Artwater, 2005). Like most experiences for students from underrepresented backgrounds, professional shame is tied to this experience as a student *minoritized* in their department, that is, or constrained as subordinated or underrepresented on the basis of gender, racial or ethnic backgrounds (Varraco & Newman 2016). Deep shame, especially exemplified in the cases of our participants who hold identities as a student who is minoritized in their department, can be found in felt failure to match the *idea* of an engineer—even when that idea is completely unrelated to competency in the engineering field. In conducting this research, we seek to understand these emotional experiences so that we may improve both individual and cultural strategies for advancing systemic equity and emotional well-being within engineering programs.

Research Question and Methods

To understand the lived experiences of shame for minoritized students within the context of engineering education, we asked the research question: How students from underrepresented racial or ethnic backgrounds experience shame?

Recognizing that professional shame is both a deeply individual phenomenon while also being influenced by broader patterns within the experience of holding a minoritized identity, we used interpretive phenomenological analysis (IPA). IPA allows the study of personal experiences of phenomena in ways that maintain the nuances of individual experiences while allowing investigators to present the findings in a cohesive manner (Smith et. al 2009). Emerging literature demonstrates that underrepresentation, although being quite diverse in its manifestation for different groups, is often the mark of deeper patterns of marginalization at play. (Faulkner, 2000; Faulkner, 2007; Jorgenson, 2002). The participants of this study belonged to social categories who were minoritized in relation race or gender in engineering education. This study was approved by the institutional review boards of the investigators' universities.

Data Collection

Participants were recruited using a sampling survey sent out through the engineering departments of two predominantly white institutions which recorded responses about their racial and gender identities and surface level experiences of failure which helped the

investigators gauge their willingness to speak on the subject of the interview. Each participant was given a $35 Amazon gift card for their participation in the study. In relation to the gender, racial, and ethnic identifications of the participants, we interviewed two participants who identified as White women, three participants who identified as men from a racially minoritized background, and two participants who identified as women from a racially minoritized background. In order to ascertain the participant's experience of shame as an engineering student with an underrepresented background, we followed a non-standardized interview approach in which the participant guided the researcher through their experiences of failure within the department and then probed the emotional experience of such failure experiences. Our approach to interviewing the participants is extensively detailed elsewhere (Huff et al., 2020; 2021).

Data Analysis

Consistent with the process of IPA, we analyzed the interviews with attention the participants' experiences of shame within the specific context it took place. The transcripts were prepared for analysis by sending the interview recordings to a professional service and transcribed a second time by the investigators with special attention to nuances in the way the participant spoke. From there, the interviews were analyzed with three lenses that gave insight to how the participant understood their experience on their own terms (descriptive), the language the participant chose to use (linguistic) and connections to socio-psychological concepts (conceptual). From these comments, emerging themes, which highlighted major insights or patterns from the interviews, were developed. Each participant had their own set of emerging themes from the interview. Emerging themes from each participant were taken from the interview, with reference to the specific quotes from which they were drawn and organized into 3-5 overarching themes. Quotes related to the individual participant's overarching themes were then organized into themes regarding the patterns found in the group. It is from these themes that our findings are drawn.

Findings

In order to present the experiences of these seven participants in a way that is understandable while preserving the nuances of the individuals, we have chosen to delineate the findings from this study in four themes. First is an exploration of how salience of the participants' marginalized identities fostered a sense of unique pressure to succeed. Second, in recognition of the experiences of the first theme, we see a pattern of searching for confirmation belonging in the engineering space. Third is an exploration of how the definition of engineers as exceptional impacted our participants' ability to identify themselves as part of the engineering group. Fourth and finally is discussion of the complex relationship the participants had with the stereotypical expectations of being an engineer and their individual need for belonging.

Theme 1: Salience of Minoritized Identities

Participants experienced heightened awareness of their minoritized identities by feeling categorized by those around them. Such categorization added complex layers to how they understood themselves within engineering and, consequently, how they would experience professional shame. For example, Nicole described her identity categorization as a woman among her male peers and a resulting desire to prove her place:

> When I started in engineering, some boys did not know how to talk to me in the class. I was like, "Guys." I told them, I said, "Treat me like a boy because we cannot have a conversation." Because they would look at me, they're like, "Hey." Then they'd run away. I'm like, "Human, I'm a human. It's fine, really" … But I was like taken aback by it, like, "This is why women shouldn't do engineering." (mockingly) I was like, "Look, I have a brain. I can do whatever I choose to do" (Nicole).

In Nicole's case, the salience of her minoritized identity created a complex weight on her performance:

Honestly, I just felt more pressure on myself, like well I'm standing for all girls in engineering. Since there's only two of us, I have to do better. And I definitely did put more pressure on myself. I mean, I still do. I feel like a responsibility to represent - to try and represent women in engineering as well as I can, which is not a bad thing. I don't think- It can be, and I definitely put a lot of pressure on myself for that (Nicole).

For Rebecca, identity salience developed an into understanding that the responsibility to positively represent one's own identity group is an opportunity. She says, "Most engineers are guys. That's like the stereotype so I like being a girl. I think I can bring an interesting perspective to engineering. So I enjoy that." Here, identity categorization lead to a sense of pride in being able to positively stand for their identity group. Mano's case provided another strong example of this thought process as she describes herself within the engineering space:

And there's not a lot of like natives in general, um, in the STEM field at all. So I think it's really cool that us natives, we can actually be a number. I mean, we can start growing our number. Um, and especially me being a native woman, I mean being a woman is already a minority and me being a native woman is already a minority within a minority. So it already kinda makes me a little exclusive. So it, and I, of course I want to, um, have other women to come into it, but I'm also open to like just everybody in general (Mano).

From this perspective, success does not only belong to the Mano herself, but to all Native women in STEM. The sense of pride demonstrated in the above quote is foundational in positioning the self in the engineering educational space. It is from this position, meeting the salience of an underrepresented identity with pressure to perform and/or pride, that our participants experience shame. In both perceived success and failures which contribute to shame, the experiences of their identity being made salient in the educational space were relevant in how participants applied the meaning of external events to their sense of self.

Theme 2: Searching for confirmation of belonging in the engineering space

For our participants, the experience of failure brought on shame characterized by a global, that is, holistic, negative self-evaluation. Consequently, they sought affirming messages regarding their overall value as an engineer through belonging within the engineering group. Leona discussed her experience of looking around to see if she was failing with others or alone:

And during that class it's like there's people who are doing the work and they're speeding through it. And then there was like me and my friends, we were just like, I don't know how to do this. And we tried to get her to help us and it didn't help at all. And I felt like I just wasn't a part the major because of that separation. The people who are doing well, they just ignored all of us. They just wouldn't want to help. And the professor tried to make groups for people to talk to each other, the people who are doing well, she would pair two of those people with people who weren't doing so great. And that made me feel even worse because those people just didn't talk to both of us (Leona).

Here, the isolating nature of failure compounds the shame experience and expands the implication upon the global self. As failure led to shame, Leona looked to see if her experience was unique and personal or perhaps part of the educational experience. Our participants also provided examples of moments where the distress of shame was relieved through messages that restored belonging. Here, Steven experienced failure but rather than hiding, sees that others had also failed:

I feel like, I don't know, if everyone else fails it, it makes it feel like it wasn't more of your fault. It maybe might have been too difficult or there's a lot of times where professors put something on a test that they never taught in a lecture. So because of that they take away so many points, and so everyone could relate to it. And so when you do talk to others and you're like, "Oh you got a 40." And I was like, "Oh, yeah, I got a 45." I was like, "Dang." This is funny. It's funny, we laugh about it, but a lot of times we understand that it's not hurtful. And then that makes it more relieving because most of the times when ... Because when you take a test or a quiz, it's literally all you. It's you, and the paper, and the material that's on the paper, and the

> *pencil of course, and calculator. But when you realize that everyone else is doing the same thing, you're thinking, okay, maybe it wasn't your fault (Steven).*

Steven saw failure with others as part of the learning experience that could be repaired. In his mind, knowing that others are struggling too removed the sole weight of failure from himself. Without the element of assigning blame for failure to the self, shame became action-focused and the path forward can become action-focused as well. Willingness to bring failure into the community space was key to repairing the direct consequences of failure – bad grades. For example, Steven, who received strong positive messages regarding of belonging place in the engineering space, emphasizes the importance of belonging in coping with shame. Distress of the shame experience was either resolved or fueled by belonging and the understanding of failure as part of the educational experience or, as a signal of their overall worthiness to be an engineer.

Theme 3: Exceptionality shapes identification as part of the group

The participant's perception of how they related to standards within the major was heavily influenced by engineering stereotypes- characterized by the perception of difficulty and need to be exceptional to succeed held by both those going through the major and those observing from the outside. Jack describes his perception of engineering:

> *I think that engineering students have a pretty difficult coursework and course load, more than some other majors. And I think that sets us apart, kind of, in a way when people hear my "Oh yeah, I'm an electrical engineer. Oh yeah, I'm a mechanical engineer," they're like, "Oh, that's difficult. Good luck to you." Things like that. It's just a different staple or stigma around it (Jack).*

Like Jack, many participants discussed how engineering is "set apart" from other disciplines by those within and outside of the major. The perception of a high standard for success produces an idea of exceptionality in order to reach it. For our participants, the high standard interacted with their minoritized backgrounds as lack of previous experiences or connections within the field seemed enlarge the gap between themselves and being an engineer. Leona discussed how her background created a separation within her peer group:

> *But I feel like students who don't realize what they have, a lot of students that I've spoken to have parents that are engineers and I'm just like, this is crazy. Three out of five people I talk to have family members who are engineers and they are allowed to talk to those family members about different things or they grew up hearing terms and things about engineering of that nature. And they don't really realize that other people don't know much about that. So I feel like those types of students set the expectation that other students should already know what they know and faculty members it's the same thing, they hold that above student's heads (Leona).*

Leona felt that the knowledge and experiences that other students had gained was "[held] above student's heads". Mano tied an experience of lacking experience similar to Leona's to belonging when she said "I just felt, as I said, it felt like I just didn't belong cause if it was already this one person and then how many other people have already had experience"? Leona and Mano demonstrated how the interaction of the standard of exceptionality and feeling behind white male peers damaged two critical elements of commitment to the major- feeling as though they could succeed and feeling that they belonged in the space. Difference in initial knowledge and experience created a divide in the engineering education space. However, that divide is maintained by the lofty idea of engineers as having some intangible "it" factor coupled with the lack of experiences that level the amount of resources available to minoritized students. For our participants, the difficulty of engineering, both in concept and reality, shaped the dynamic of the engineering group and their ability to feel they belonged.

Theme 4: Tension between wanting to be seen as part of the engineering group while also separating the self from the stereotype

The participants' need to find belonging within the intricate concept of engineering identity presented in an interesting and seemingly contradictory desire to both be seen as part of the engineering group engineer and distance themselves from it. Jack discussed his relationship to the stereotypical engineer when he said

> *Okay. So I would say that there are good aspects of the stereotype, and there are also just in my opinion negative aspects. I would say that the stereotype of being smart and studious, and staying rigorous with my classwork that's something I would want to lure to because I think that's a good thing. And I think that's something that can help me. But the stereotype of not being extroverted, or being shy that's what I'd want to stay away from (Jack).*

Jack simultaneously wanted to be some parts of the engineering stereotype like being smart and studious while differentiating himself from the idea of engineers as introverted. He elaborates on his relationship with adherence to the stereotype when he says "I would say because it's been ingrained in me, I want to live up to it. I do think that there are aspects of it that could change" (Jack). Here, regardless of a desire to change the stereotype, there is still an overarching need to adhere what is expected of an engineer. The wording "live up to" is indicative of the felt pressure of meeting expectations even in recognition of a flawed standard. Jack' desire to live up to the standard despite its flaws is indicative of a larger desire to be what is expected in order to belong in the engineering space.

Nicole also takes pride in differentiating herself as she relayed an interaction with a peer who said "'When I think of an engineer, I think of an introvert who has no life and um is quiet and nerdy and only does math all day' They were like, 'That's not you at all.' I was like, "No, I like to have friends and I like to do other things besides math'". In fact, many of our participants mentioned extracurricular activities in the interview with specific mention to how that participation separates them from the stereotype of an engineer and some members of their peer group. Despite a desire to belong in the group, our participants sought to distinguish themselves in some aspects from the group to avoid becoming a caricatured representation of an engineer.

Discussion

Following an understanding of the findings within this study, we now present connections between the lived experience of the participants and theoretical frameworks. This discussion will be organized around two major points. First, we explore the impact of connections, made by the student or the surrounding culture, between the participant's minoritized identity and their experience of shame. Second, we argue that the stereotype of what an engineer looks like, which is centered largely around the White male experience, is specifically salient in the shame experience of minoritized students.

Connection of Shame to Identity as a Minoritized Student

Shame is characterized by a negative emotion tied to the global self rather than the action that caused the failure. For our participants who hold minoritized identities, that connection to the self specifically connected shame and their inclusion in the department. Thus, within these student's experiences, shame transformed an experience of not meeting educational standards to a questioning if they, or minoritized students overall, can be engineers. This process delineates a phenomenon seen in existing literature where students who are minoritized in their departments show lower measures of self-efficacy, identity commitment and other measures of success (Wu et al., 2020). Our findings shed light on what numbers show- students are who are minoritized in their departments aren't just simply more effected by academic failure, the shame experience plays a key role in making failure a distinct experience from that of white male peers.

Our participants described this distinctiveness on their own terms while describing their internal reactions to moments of shame. Holding a minoritized identity brought feelings of being marked as different and, with it, a feeling of being watched by others who were wishing to. Like Nicole, many participants felt a responsibility to represent their entire group well which, when met with failure, translates to a fear that personal failure has a larger impact outside of the self. Desiring acceptance within engineering education for themselves and others like them often took the form of advocacy, which in some instances lent itself to strong resilience in grit within their studies. However, that same noble notion also quickly turned into a mechanism for amplifying shame.

Fighting to Assert Belonging in Engineering

Knowing how shame manifests for students with minoritized identities, we can understand how belonging plays a critical role in coping with shame for our participants. The ties between shame and minoritized identity means that failure accents messages that seem to invalidate belonging. Assertions of privilege highlighted the sense of "otherness" felt through the salience of minoritized identity and reinforced the shameful notion that failure to do or be what is expected is indicative of overall worthiness to be an engineer.

Our participants presented many accounts of receiving the message that their backgrounds and experiences were different from and perhaps inadequate in comparison to the expectation. These messages contributed to the feeling of not feeling like they belong within engineering education. When examining measures of belonging for minoritized students in engineering education, literature strongly reinforces the idea of previous background experience and familial capital being instrumental to engineering success (Barber, 2015; Cheryan et al., 2013; Eliot & Turns, 2011; Johnson, 2012; Malone, & Barabino, 2009; McGee, & Martin, 2011; McGee, 2016). Background and prior experiences were frequently noted as a mechanism for identity related shame in our participants.

If internal and external messaging communicates the message that grades not only determine personal standing as an engineer but the standing of an entire group of people, failure is much heavier. Across participants, various definitions of the self as a "people-pleaser", someone who cares for others or some other definition of the self in terms of other's approval were consistent. In fact, the felt requirement for minoritized students to achieve the in the eyes of peers in order to prove that they have the right to claim belonging within STEM spaces is emerging through diverse methodologies as a sort of "prove them wrong" syndrome (Eglash et al., 2013; McGee & Martin, 2011; Moore et al., 2003). This claim gives insight to the ways that our participants reacted to the experience of not belonging in engineering culture in seemingly contradictory ways, even in the same participants.

Implications and Future Work

From understanding phenomenological experiences of shame that contribute to the larger patterns seen within engineering education, we can draw some conclusions about what coping with shame looks like on both an individual and community level. Fundamentally, our participants have demonstrated that pressure to perform increases salience of minoritized identity and, much like literature describing identity threats, these pressures produce negative consequences for both academic performance and identity formation. For example, Nicole was constantly aware that her performance was meaningful to other women students and, when she failed, that meaning was a mechanism for withdrawal, low motivation and lack of identity commitment.

Since professional shame is so heavily connected to minoritized identity for these students, cultural change is required for healthy coping to be accessible. The harms of self-focused shame can be mitigated by reframing failure as action-focused. When failure is about the action and not the self, guilt leads to repair and persistence. Minoritized students have

neither the responsibility nor the ability to counteract identity-related shame messages on their own. The notion that a student, just by being who they are, without any actions, does not belong and is not capable of being an engineer is a major barrier to persistence for minoritized students. Repair must come from messages that oppose identity-related shame directly. Although it may be tempting to examine cases like Mano's and her desire to be an advocate and positive representation for other minoritized students as the heroes in the story of progress, the depth of our findings show exactly why minoritized students should not and cannot shoulder that burden. Rather than celebrating the student who persevere through a marginalizing system, the system itself must be made equitable.

Since cultures of well-being must be nurtured to create engineering education as a space of equity and inclusion, our future work is oriented to address moments of professional shame that are both experienced and propagated by engineering faculty.

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