

Identity in practice: Examining personal identities of engineering graduates in the transition to the workplace

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Abstract: *Despite ample research in professional identity development in engineering, there is a gap in the literature regarding how professional identities relates to the personal identities of individuals in these contexts. This paper examines literature on personal identity and uses findings from an interpretive phenomenological analysis (IPA) investigation on identity transitions of students as they enter the workplace. The findings, based on interviews with seven participants, highlight how the individuals felt an elevated sense of significance in relation to their personal identities when entering the workplace, but they also concealed moments of insecurity when performing their engineering roles. I discuss the importance of examining personal identity in engineering contexts, both in the interest of advancing psychological identity theory and in the aim of supporting outcomes related to personal identity.*

When we think of students as a human form of capital, the view potentially restricts our intellectual terrain. We run the risk of limiting ourselves to questions about what students know or how they perform prescribed tasks. We lose sight of the notion that schools allow people to forge new selves (Hanson, 2014, p. 10).

The above quote from sociologist Chad Hanson (2014) captures an important insight as to why identity research is so critical in the context of engineering education and practice. As students are gaining core engineering competencies, they are also developing in their understandings of who they are. Such a notion has received substantial treatment in engineering education research. But in this paper, I contend that much of the focus on developing an understanding of engineering identity has been undergirded by interests in the health of the profession rather than in the personal identity of individuals on their own terms.

In the sections that follow, I review how professional identity has been examined by existing research in engineering education and then survey literature from psychology that depicts personal identity as a comprehensive, holistic construct. I then present findings, original to this paper, from my previous research on the individual experience of identity in the transition from engineering education to the workplace (Huff, 2014; Huff, Smith, Jesiek, Zoltowski, & Oakes, 2018). I conclude by discussing how these findings highlight the complex lived experience of identity that occurs in the formative processes of professional development.

Professional Identity in Engineering Education Research

Prior research on professional identity in engineering education research tends to examine how institutional structures shape a collective engineering identity. Such work illustrates how identity is constructed through sociocultural structures that shape individuals in engineering domains. For example, in her ethnographic research on gendered patterns of engineering workplaces, Faulkner (2000) framed engineering identity to be marked by a clear demarcation of the technical and social, noting how the professional identity of engineers tends to privilege technical features while excluding social elements that are, in fact, deeply intertwined with engineering work (Trevelyan, 2007). Research that examines identity from a sociocultural lens often aims to elucidate systemic explanations related to how individuals are marginalized against the powerful social forces that dominate the collective identity of engineers (e.g., Secules, Gupta, Elby, & Turpen, 2018; Tonso, 2006; Walden & Foor, 2008).

Prior research in engineering education has also examined engineering identity from the perspective of the student as it relates to their motivation to pursue an engineering career. Godwin, Potvin, Hazari, & Lock (2016) found that first-year engineering students' connection to math and physics subjects, as marked by their interest and by others' recognition, predicted their choice to major in an engineering discipline. Furthermore, Matusovich, Streveler, & Miller (2010) found that engineering students were motivated to complete their degrees when they found alignment between their degrees and their identities. These investigations and others (e.g., Patrick, Borrego, & Prybutok, 2016; Pierakkos, Beam, Constantz, Johri, & Anderson, 2009) study professional identity as oriented toward understanding how students might persist in their trajectories to becoming engineers.

Generally, extant literature in engineering identity tends to be buttressed by at least one of two motivations. Research related to sociocultural perspectives of how professional identity is framed by engineering structures highlights the problematic features connected with dominant images of what it means to be an engineer. Importantly, these studies illuminate how engineering institutions, via education or the workplace, can create environments that marginalize a number of individuals who do not align with the prototypical identity of what it means to be an engineer. Alternatively, research on professional identity that is focused on individual experience tends to view the achievement of a professional identity in engineering as a positive outcome and, conversely, leaving engineering as a negative outcome. And, indeed, it is in the best interest of the engineering profession to attract effective and competent individuals to the field and for broadening participation in engineering.

However, while such work on professional identity in engineering has developed important understandings related to the construct, they also contain critical gaps. First, the underlying interest of the research is conducted from the interest of advancing the profession itself—either through critiquing the dominant collective narratives of identity that define the profession or through supporting individual commitment to the profession. The body of research on identity in engineering tends to neglect the experience of personal identity on the terms of the individuals themselves. Furthermore, there is little understanding of how core forms of personal identity, beyond the scope of the profession, might interact with the individuals' professional identity in the engineering domain.

Personal Identity in Psychological Research

From a psychological perspective, the framing of identity is vast and contains a broad range of perspectives on how to understand and, accordingly, investigate the theoretical construct. Vignoles, Schwartz, & Luyckx (2012) conceptualize identity as involving “people’s explicit and implicit responses to the question: ‘Who are you?’” (p. 2). They maintain that identity researchers have been divided on if identity is understood as a personal, relational, or collective construct. In this section, I review key references related to the understanding of *personal identity*. I examine this particular framing of identity in order to highlight how the construct might be investigated within individuals in engineering contexts in ways that speak to their lived experiences of how they understand who they are.

Identity was understood as a personal phenomenon due to the contributions of Erik Erikson (1959) in his theory of psychosocial development. Specifically, he understood identity to be the central focus of an individual in the stage of adolescence, and that through this formative period, an individual would be oriented to define oneself in a consistent, unitary manner. Although other perspectives on identity later emerged to frame the construct as something that was more defined by social and contextual contexts (e.g., Holland, Lachicote, Skinner, & Cain, 2001; Tajfel & Turner, 1986), Eriksonian perspectives on identity that are oriented to the individual have persisted in psychological literature.

Building on Erikson’s work, Marcia (1966) developed the concept of identity statuses as a way of recognizing how individuals engage with their identity through both commitment and exploration. Further, Kroger, Martinussen, and Marcia (2010) named three significant

dimensions of identity in which individuals interact with through commitment and exploration: vocation, ideology, and sexuality. Arnett (2004) also has built upon Erikson's work by extending identity explorations to be the core feature of emerging adulthood, that is, the period following adolescence in which individuals are seeking to explore identities and achieve a sense of autonomy in relation to their social environment. Arnett further highlights that emerging adults are particularly attentive to exploring identity in relation to love and work. Thus, from an Eriksonian perspective, one's identity in relation to their profession is understood to be a dimension of a global, personal identity. Furthermore, an individual's goals in exploring an identity in relation to their profession are more related to understanding one's global sense of identity rather than simply developing as a proficient professional.

However, while it is well recognized in theory on personal identity that individuals do, in part, shape their understandings of themselves through contexts such as that of their workplace domains, there is little research in psychology that examines how personal identity is integrated across multiple domains. One useful construct to considering how an individual's core personal identity might interact with their professional identity is contextual identity integration, which "involves the fit of the multiple identity domains that individuals consider important to who they are, or are forced to deal with due to social-structural factors" (Syed & McLean, 2016, p. 111). Syed and McLean (2016) develop their general understanding of identity integration as a phenomenon that is connected to McAdam's (2012) framing of narrative identity. Indeed, his Eriksonian perspective of identity is quite distinct from the previously discussed work of Marcia (1966) as it defines identity to be "an internalized and evolving story of the self, providing a person's life with some semblance of unity, purpose, and meaning" (McAdams, 2012, p. 100). From such a perspective, an individual's role in multiple contexts might be cohesively tied together through the narrative that they develop in order to unify how they enact identity in contextual domains.

In summary, psychological research on personal identity is oriented to considering the individual's sense of self in a more global manner than professional identity alone. However, this does not mean that professional identity is trivial to an individual. On the contrary, this body of research also frames the formative processes of identity development in the professional domain as important to gaining insight into a broader picture of a core identity within an individual. Accordingly, the present study is anchored in the framing of identity as a personal construct, where the contexts of engineering education and the workplace inform global patterns of identity development, which in turn provide robust insight into key features of how engineers understand their role within the institutional structures of their profession. Throughout the findings, I reference *core identity* to mean features of identity that are particularly central to the individual who is experiencing their identity.

Research Questions and Methods

Based on the gap in our understanding of the personal identities of engineering students and engineers in the contexts of their professional domains, the present study is framed by the following research questions:

- 1) How do students psychologically experience personal identity trajectories of becoming engineers?
- 2) How do these individuals relate their professional identities to their core identities?
- 3) How do these identities develop in the transition to the workplace?

I investigated these research questions using interpretative phenomenological analysis (IPA), which is a qualitative research methodology that facilitates an in-depth examination of individual lived experience in relation to a certain phenomenon (Smith, Flowers, & Larkin, 2009; Huff, Smith, Jesiek, Zoltowski, Graziano, & Oakes, 2014). Specifically, I interviewed seven participants who were set to graduate from degree programs in civil, electrical, and mechanical engineering from a large public institution in the United States. I conducted two interviews with each of these participants: once in the final month of their last academic term

before graduation and once after they had been in their workplaces for two to three months. Three of these participants identified as men (pseudonyms Haden, Parker, and Warren) and four identified as women (pseudonyms Alice, Naomi, Rachel, and Trixie). All participants identified as White, East Asian, or South Asian, ethnic and racial backgrounds that are overrepresented in engineering education within the United States. Moreover, all participants had received job offers at the time of the first interview. The study was approved by both the Institutional Review Board offices of my institution and the participants' institution.

I employed a semi-structured approach to interviewing the participants on both occasions, which is documented in my previous work (Huff, 2014; Huff et al., 2018). The goal of each interview session was to elicit how the participants understood their core identities, how they mentally modeled what it meant to be an engineer, and how they positioned their identities as engineering students or early-career engineers in relation to their core identities. Further details about the data collection procedures may be found elsewhere (Huff, 2014; Huff et al., 2018). I then analyzed the data for these interviews in line with the highest standards of IPA research, which involved making multiple analytical passes through a single case at a single time period (e.g., Parker at Time 1), annotating the descriptive content, linguistic features, conceptual insights, and finally, emergent psychological themes. I then organized all of the emergent themes into a robust set of findings for an individual at that particular point in time. Following these analytical procedures, I moved on to analyze the same individual at the second time period (e.g., Parker at Time 2) by employing the same procedures. I continued this case-based analysis for each participant before combining the individual findings into a set of collective findings. Thus, by undergoing analysis in ways that maximized the idiosyncratic voice of each participant, IPA allowed for me to provide in-depth insight in ways that were aligned with the theoretical construct of personal identity. Further detail for the analytical procedures of the present investigation are reported elsewhere (Huff et al., 2014).

Findings

In the transition from education to the workplace, the participants demonstrated two significant themes, that is, psychological patterns of how they experienced their personal identities in the context of their professional roles. First, they incorporated their engineering role with an increased salience in relation to how they understood their core identities. Second, amid this sense of elevated significance in the importance of their engineering role, they privately grappled with insecurity in how they, as holistic individuals, enacted their identities in a professional setting. In the subsections below, I narrate these two themes in ways that are grounded in the lived experience of the participants. Following this section, I discuss how examining identity through a lens that focuses on the experiences of the whole person allows us to see these two themes that are ostensibly in tension with one another.

Theme 1: Elevating the identity salience of the engineering role

As students, the participants understood their identities as engineers to be primarily related to their personal interests and their intellectual performances in their discipline-specific coursework. However, after they had entered the workplace, they came to understand their role as engineers as something that was elevated from what they had envisioned as students. As early-career engineers, they perceived their identities in the engineering domain to occupy a more grandiose significance in relation to their social environment than they had experienced as students. Furthermore, among the study participants, there was a particularly nuanced and gendered pattern that distinguished the ways in which the men and women participants experienced this change in their identities as engineers. The men participants embraced this newfound significance to understanding who they were as engineers, but the women participants had a mixed emotional response to this change in their identities. However, the women participants did connect, with a sense of sobriety, to the newfound responsibilities that accompanied their roles as engineers in the workplace. I organize the description of the present theme by presenting each gender group together.

Haden, a male civil engineering graduate who went to work in a traffic engineering firm, demonstrated this acute sense of elevating his identity as an engineer in the transition to the workplace. As a student, he held a somewhat skeptical perspective about the meaning of his education, believing it to be disconnected from engineering practice as it would be realized in the workplace: “I think college is more of a test of, like, can you learn and, like, do you know how to learn, and do you have the abilities to learn? And then out in the real world, you’ll actually be learning how to do it.” In order to perform efficiently in the courses that he deemed somewhat irrelevant to engineering practice, Haden approached homework with a goal of completion at the expense of gaining conceptual understanding. He envisioned that his identity as an engineer had not yet been achieved and managed his prescribed curricular activities in ways that he could sufficiently perform as a student.

However, at the time of the second interview, Haden came to understand his role as an engineer to be significantly more aligned with his global understanding of his personal identity. While Haden did not particularly feel his identity shift in a dramatic way, in the second interview, there was a clear significance in relation to his connection to engineering that was not present in the first interview. He elaborated on this elevated sense of identity that he felt as an engineer in the workplace, stating:

I just know more now what it is to be an engineer, I guess . . . There’s just more responsibility in engineering than when you’re at school, because in school . . . if you miss a homework assignment . . . you can still get an A in the class . . . And in engineering, it’s kind of different; the problems don’t go away unless you solve them, and even if you solve them, a new one will arise.

Thus, for Haden, problems that characterized his engineering career had changed from the performative exercises that he encountered as a student to problems of greater importance.

Likewise, the other two men participants came to elevate the importance of their identities as engineers in their respective transitions to the workplace. For example, although he had once sought to distance himself from other electrical engineering students that he viewed as socially awkward, when he entered the workplace, Warren sought to be deemed “credible” by other electrical engineers. Likewise, Parker reflected on his newfound sense of autonomy in executing his everyday tasks, contrasting it to his experiences as an engineering intern. The men participants perceived that their engineering roles had afforded them a career identity with purpose—both to themselves and to others around them. And they found an increased significance in their career identities as engineers upon entering their workplaces.

The women participants also demonstrated a similar yet nuanced shift in how they came to feel deeper significance in their identities as engineers. For example, Trixie, a civil engineering graduate, connected her identity as an engineering student to her individual interests in structures and in her intellectual performances in mathematics and science. Upon entering the workplace, Trixie her identity as an engineer with elevated responsibility:

I never thought I would ever have this much responsibility. . . Just to put my name on a document and sign off on it and know that if anything does go wrong, it’s completely my responsibility because my name’s the one on the document . . . no one else but me.

While Trixie described elsewhere in the second interview how she was uncomfortable with the new level of responsibility in the workplace, she came to take ownership of this responsibility in understanding who she was in the context of her profession. Thus, Trixie’s concept of her professional identity expanded from one centered only on interests and abilities to one that included her responsibility to stakeholders of her engineering work.

Similarly, Alice, another civil engineering graduate, also exhibited a pattern of elevating the importance of her identity as an engineer. As a civil engineering student, she tied her professional identity to her childhood interests and abilities in “science..., problem-solving

and making things.” But in her transition into the workplace, she began to feel a larger sense of responsibility through being an engineer. As she stated in the second interview, “

I definitely have more responsibility in this job, and I have more long-term projects. . . As opposed to my co-op that was always little two-week projects, little tiny sections, so I wouldn’t ever really get the big picture of a project.

As Alice transitioned to the workplace, her personal identity in being an engineer became larger than her own interests and abilities in problem-solving. Enacting her role as an engineer meant that she was responsible for work that other individuals in her environment considered to be meaningful.

Finally, Rachel and Naomi also showed similar patterns of feeling a sense of increased responsibility as they transitioned to the workplace. As mechanical engineering students, they had also connected their engineering identities to interests and abilities that they held before choosing to major in engineering. However, as they transitioned into the workplace, they came to more fully understand the responsibility of their engineering-selves, largely through a sense of ownership regarding products that they had helped to design. As concisely put by Naomi, “I’m not just making [an appliance], I’m making something that’s going to be an integral part of somebody’s house and home.”

The findings among the participants highlight a similar shift in the internal experience of identity for all participants. As they transitioned from educational programs to workplaces, the participants came to associate their identities as engineers with the image of bearing responsibility for those in their social environment, including among users of their work outputs and among their co-workers. For the men participants, the newfound sense of significance to their identities was accompanied by a shift in how central their engineering identities were to their core identities. And while the women participants recognized this newfound sense of responsibility in their engineering roles, they approached this expanded view of engineering with a sense of sobriety. Rather than focusing on their own personal sense of enhanced credibility, their identity descriptions focused on the critical influence their role would have on others around them.

Theme 2: Hiding insecurities while performing the professional identity

In spite of the participants’ more pronounced identities as engineers, all men participants and three of the four women participants also came to contend with insecurity about how they performed these identities in their workplaces. They sought to conceal these moments of insecurity from their co-workers and, thus, distance their personal sense of identity from their roles in workplaces as engineers. I begin exploring this pattern with the case of Naomi. At the time of her first interview, Naomi did not identify as a high-performing student but as one who had overcome adversity in obtaining her mechanical engineering degree. As she stated:

I did really bad on my first semester, and then up until last semester, I flipped it around . . . I feel that I found that . . . I feel . . . like I’ve gotten everything that I came to [the university] to get—like, as long as they give me my diploma (laugh)

As a student on the threshold of her graduation from a mechanical engineering program, Naomi envisioned herself as one who had accomplished a series of incremental steps toward her degree. As a student, the diploma signified to Naomi the conclusion of a journey that she had, with some difficulty, completed. Upon entering the workplace, however, Naomi began a new journey. And, in her second interview, she also related how she did not yet feel that she had the competence to offer her company:

I’m still at the point where I feel like I don’t have a whole lot to offer in terms of the workplace because I’m still learning everything and I am so new. So it’s uncomfortable for me to just know that I’m just walking up to someone who has no idea who I am, and just, like, [I feel like I’m saying], “I want this, but I have nothing to give you back” kind of thing. So, it’s just uncomfortable.

She further unpacked how this insecurity in her abilities as a new employee had affected her desire to meet with an individual in upper-level management when she sought to take on an international rotation in her next work assignment, noting how in this interaction she “just kind of [felt] like a nobody.” From these excerpts, Naomi felt like she did not have “a whole lot to offer in terms of the workplace” and extended this understanding of herself to cast her as a relative “nobody.” Even in the excerpts in which she voiced her insecurities, she used the second-person voice, possibly a mechanism to distance herself from the discomfort that she described. But her insecurity was a recognition that, in her engineering role, she would have expectations of competence to perform in the workplace. Accordingly, she sought to conceal situations where any appearance of incompetence could be seen by others. As she stated, “I think it’s still like you come in and you feel like you have something to prove, and you don’t want people to think that you don’t know what you’re doing or you don’t have this skill set.” Naomi’s case highlights the pervasive discomfort that early-career engineers may feel upon their initial entry into their workplaces. While it would be reasonable to expect new employees such as Naomi to be in a safe time of learning in the early stages of a career, it is during this time that one might feel heightened social pressure to perform a prototypical engineering identity and, thus, avoid healthy behaviors that could improve their workplace competence, such as voicing moments of uncertainty known to experienced co-workers.

Haden and Parker likewise expressed their desires to avoid the appearance of incompetence in the workplace. As engineering students, at the time of their first interviews, they varied in how secure they felt in relation to their professional identities. However, each of them noticeably shifted toward a more insecure posture toward their professional identities. Parker described how asking questions about employer’s work processes made him feel like a burden to his co-worker: “You just feel like you’re pulling those around you down because they have to take time out of their day to help you understand something that they seem to think is so trivial.” Likewise, Haden discussed the phenomenon of “hating to ask about the next task.” He juxtaposed his internal perception with the explicitly welcoming social cues of his workplace, stating, “So they’ve been very open to [him asking questions], but it still kind of just looms in the back of your head.” In both Parker and Haden’s cases, they would eventually overcome their fears about asking questions in order to gain necessary knowledge for accomplishing tasks. But seeking input from co-workers was preceded with a ruminative internal dialogue where they weighed the benefits of gaining necessary knowledge against the costs of feeling judged by their colleagues.

At the time of her second interview, Rachel gave voice to this tenuous moment that preceded the times that she might express her judgment in a professional setting:

I constantly push myself at work, to, you know, speak up, voice my opinion, because I don’t think I’m competent enough yet to say, “Okay, this is how I feel.” . . . I know no one’s is going to laugh at what I say, because that’s just not who they are, but I think in the back of my mind . . . that’s the worst scenario.

Rachel’s statement aligns with the sentiments of the other participants. Her description suggests a split sense of her global self, in which she is both “pushing” and being pushed. In the moments where she could be seen as incompetent in performing her identity, she became highly attentive to her internal state and to how she was being seen by others. Rachel’s experience illuminates the fraught nature of developing identity in the workplace. In order to be understood as an engineer, the participants needed to practice expressing their professional voice—through seeking specific input from others or through stating their judgment. However, it was also in these moments that they felt a salient threat to their identities as engineers. By verbally expressing themselves, they became highly self-conscious of how they could be deemed as incompetent by their colleagues. And indeed, this judgement incompetence was a question that they were engaging in asking of themselves. As put by Trixie, who reflected on the new phenomenon of signing documents as an early-career structural engineer: “I know it’s definitely flattering to know that they think we’re that

competent, but sometimes I'm just like, 'Are we competent enough (laugh) to put our names on these documents (laugh)?!'"

Discussion

The findings of the present investigation highlight the complexity of identity development in the transition from engineering degree programs to workplaces. The first theme, which describes how participants elevated the internal significance of their professional identity upon entry into the workplace, superficially seems in line with previous studies in engineering education on identity. As reviewed earlier, such research portrays the professional identity development of engineers as a positive outcome. And, indeed, the participants did shift in the understanding of the significance of who they were as engineers. While as students, they perceived their connection to engineering to be a feature of their interests and recognized abilities (Godwin et al., 2016; Matusovich et al., 2010), their entries into workplaces afforded them the opportunity to recognize their role to their social environment as something that was more significant than individual expressions of their interests.

For the men participants, the elevated salience of their professional identities (Theme 1) was welcomed as something that was positive for their perception of their core, personal identities. While the women participants did not approach this shift in identity with a negative valence, they did regard their newfound sense of significance with more sobriety than the men participants. This is also in line with literature that critiques the dominant masculine images of engineering in workplaces (Acker, 1990; Faulkner, 2000). It is possible that the men participants were able to access a form of privilege in being ascribed an elevated status through their entries into the workplace.

However, the pattern described by the first theme cannot be understood in isolation from the second theme, which depicts the hidden forms of insecurity that the participants felt in enacting their identities as engineers. On the surface, it might appear that these two themes stand in a strange juxtaposition to one another. The first theme suggests that becoming early-career engineers in the workplace afforded a newfound sense of importance to the participants in relation to their personal identities. But the second theme indicates that these same professional identities were regarded, through the emotional experiences of insecurity, as distant from the core identities of the participants. Although these patterns stand in tension with each other, I contend that the participants felt both an increased sense of significance in their personal identities through their engineering role *and* a profound sense of personal distance from this same professional role when they were expected to perform what was required of an engineer.

To make sense of these two patterns' co-existence, I turn to literature on shame, that is, a profoundly painful emotion that occurs when an individual fails to meet real or perceived sociocultural expectations (Brown, 2006; Huff et al., 2019; Scheff, 2003; Tangney & Dearing, 2002). Shame is an emotion that occurs in a self-conscious state, where an individual is heightened in relation to how they are being observed by others, which is consistent with the accounts of the participants in their descriptions of feeling insecure in enacting their professional roles. They had established an internal and elevated sense of significance to their identities in the context of their roles as engineers. Yet, while elevated significance in personal identity might have brought some internal satisfaction to them, this increased importance also came with a cost. Performing the role of an engineer also became more important, and the possibility that they might fail to meet the felt expectations of others in their professional domain motivated the participants to conceal the normal questions that might be expected of early-career engineers. The behavioral response of hiding in response to shame is well-documented in previous literature (Tangney & Dearing, 2002; Scheff, 2006) and provides insight as to why the participants sought to conceal their insecurities in the workplace. As the significance of their identities increased through their roles as engineers, so also did the likelihood that these same identities would be threatened through any failed

performances of maintaining such an identity. Unfortunately, by concealing their uncertainty, they limited their moments where they could gain insight into their new roles as engineers.

Implications and Future Work

I note that the findings in the present study are most relevant to the particular context of individuals from overrepresented ethnic and racial backgrounds that come from large, public universities. Yet the findings bear transferrable implications for those in engineering education and workplaces. First, engineering educators can improve the transition to the workplace by providing authentic accounts of how learning is expected to continue once after one becomes an engineer. If the participants had been previously socialized to encounter moments of uncertainty in their career roles, they might have gained satisfaction from their elevated sense of identity while mitigating the threat that accompanied the expectations of their roles. Second, the present investigation opens up a considerable opportunity to further develop a shared understanding of the personal identity of engineering students and practicing engineers. In particular, while existing research in professional identity orients stakeholders to improve the health of the engineering profession, examining personal identity in education and workplace settings can orient stakeholders to cultivate outcomes that support individuals within engineering. For example, such investigations might examine the well-being of engineering students and practicing engineers in relation to their identities (Waterman, 2008) with implications that would support the overall psychological health of these individuals. We in engineering education research, who are positioned to understand the important link between professional contexts and domains of identity that are more central to individuals, have the opportunity to advance identity theory while also supporting the individual needs of our students.

References

- Acker, J. (1990). Hierarchies, jobs, bodies: A theory of gendered organizations. *Gender & Society*, 4(2), 139-158.
- Arnett, J. J. (2004). *Emerging adulthood: The winding road from the late teens through the early twenties*. New York: Oxford University Press.
- Brown, B. (2006). Shame resilience theory: A grounded theory study on women and shame. *Families in Society: The Journal of Contemporary Social Services*, 87(1), 43-52.
- Erikson, E. H. (1959). *Identity and the life cycle. Psychological Issues 1*. New York: International Universities Press.
- Faulkner, W. (2000). Dualisms, hierarchies, and gender in engineering. *Social Studies of Science*, 30(5), 759-792.
- Godwin, A., Potvin, G., Hazari, Z., & Lock, R. (2016). Identity, critical agency, and engineering: An affective model for predicting engineering as a career choice. *Journal of Engineering Education*, 105(2), 312-340.
- Hanson, C. (2014). Changing how we think about the goals of higher education. In C. Hanson (Ed.), *In search of self: Exploring student identity development* (pp. 7-14). San Francisco: Jossey-Bass.
- Holland, D., Lachicote, W., Skinner, D., & Cain, C. (2001). *Identity and agency in cultural worlds*. Cambridge: Harvard University Press.
- Huff, J. L. (2014). *Psychological journeys of engineering identity from school to the workplace: How students become engineers among other forms of self* (Doctoral dissertation). Retrieved from ProQuest (3669254).
- Huff, J. L., Okai, B., Shanachilubwa, K., Sochacka, N. W., Walther, J., Secules, S., . . . Miller, S. E. (2019). Board 67: Shame in engineering: Unpacking the expectations that students co-construct and live within. *Proceedings of the 2019 ASEE Annual Conference & Exposition*, Tampa, June 16-19, 2019.
- Huff, J. L., Smith, J. A., Jesiek, B. K., Zoltowski, C. B., Graziano, W. B., & Oakes, W. C. (2014). From methods to methodology: Reflection on keeping the philosophical commitments of interpretative phenomenological analysis. *Proceedings of the ASEE/IEEE Frontiers in Education Conference*, Madrid, October 22-25, 2014.
- Huff, J. L., Smith, J. A., Jesiek, B. K., Zoltowski, C. B., & Oakes, W. C. (2018). Identity in engineering adulthood: An interpretative phenomenological analysis of early-career engineers as they

transition to the workplace. *Emerging Adulthood*. Advance online publication.

<https://doi.org/10.1177/2167696818780444>

- Kroger, J., Martinussen, M., & Marcia, J. E. (2010). Identity status change during adolescence and young adulthood: A meta-analysis. *Journal of Adolescence*, 33(5), 683-698.
- McAdams, D. P. (2012). Narrative identity. In S. J. Schwartz, K. Luyckx, & V. Vignoles (Eds.), *Handbook of identity theory and research (Volume 1: Structures and processes)* (pp. 99-116).
- Marcia, J. E. (1966). Development and validation of ego identity status. *Journal of Personality and Social Psychology*, 3(5), 551-558.
- Matusovich, H. M., Streveler, R. A., & Miller, R. L. (2010). Why Do Students Choose Engineering? A Qualitative, Longitudinal Investigation of Students' Motivational Values. *Journal of Engineering Education*, 99(4), 289-303.
- Patrick, A. D., Borrego, M., & Prybutok, A. N. (2018). Predicting persistence in engineering through an engineering identity scale. *International Journal of Engineering Education*, 34 (2-A), 351-363.
- Pierakkos, O., Beam, T. K., Constantz, J., Johri, A., & Anderson, R. (2009). On the development of a professional identity: Engineering persists vs engineering switchers. *Proceedings of the 2009 IEEE/ASEE FIE Conference*, San Antonio, October 18-21, 2009.
- Scheff, T. J. (2003). Shame in self and society. *Symbolic Interaction*, 26(2), 239-262.
- Secules, S., Gupta, A., Elby, A., & Turpen, C. (2018). Zooming out from the struggling individual student: An account of the cultural construction of engineering ability in an undergraduate programming class. *Journal of Engineering Education*, 107(1), 56-86.
- Smith, J. A., Flowers, P., & Larkin, M. (2009). *Interpretative phenomenological analysis: Theory, method, and research*. London: Sage Publications, Ltd.
- Syed, M., & McLean, K. C. (2016). Understanding identity integration: Theoretical, methodological, and applied issues. *Journal of Adolescence*, 47, 109-118.
- Tangney, J. P., & Dearing, R. L. (2002). *Shame and guilt*. New York: Guilford Press.
- Tajfel, H., & Turner, J. C. (1986). The social identity theory of intergroup behaviour. In S. Worchel & W. G. Austin (Eds.), *The psychology of intergroup behaviour* (pp. 7-24). Chicago: Nelson Hall.
- Tonso, K. L. (2006). Student engineers and engineer identity: Campus engineer identities as figured world. *Cultural Studies in Science Education*, 1(2), 273-307.
- Trevelyan, J. (2007). Technical coordination in engineering practice. *Journal of Engineering Education*, 96(3), 191-205.
- Vignoles, V., Schwartz, S. J., & Luyckx, K. (2012). Introduction: Toward an integrative view of identity. In S. J. Schwartz, K. Luyckx, & V. Vignoles (Eds.), *Handbook of identity theory and research (Volume 1: Structures and processes)* (pp. 1-27). New York: Springer.
- Walden, S. E., & Foor, C. (2008). "What's to keep you from dropping out?" Student Immigration into and within Engineering. *Journal of Engineering Education*, 97(2), 191-205.
- Waterman, A. S. (2007). Doing well: The relationship of identity status to three conceptions of well-being. *Identity: An International Journal of Theory and Research*, 7(4), 289-307.

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