

Experiencing Disability: A Preliminary Analysis of Professional Identity Development in U.S. Undergraduate Civil Engineering Students

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STRUCTURED ABSTRACT

CONTEXT

Within higher education, reports show that approximately 6% of Australian college students and 13% of U.S. college students have identified as having a disability to their institution of higher education. Findings from research in K-12 education report that students with disabilities often leave secondary school with lower college aspirations and are discouraged from taking engineering-related courses. Those who do enrol are often not supported effectively and must navigate physical, cultural, and bureaucratic university systems in order to access resources necessary for success in school and work. This lack of support is problematic as cognitive, developmental, mental health, and physical disabilities can markedly shape the ways in which students perceive and experience school, form professional identities, and move into the engineering workforce. However, little work has explored professional identity development within this population, specifically within a single engineering discipline such as civil engineering.

PURPOSE

To move beyond tolerance and actively embrace students with diverse perspectives in engineering higher education, the purpose of this study is to understand the ways in which undergraduate students who experience disability form professional identities as civil engineers.

APPROACH

Drawing on the sensitizing concepts of identity saliency, intersectionality, and social identity theory, we utilize Constructivist Grounded Theory (GT) to explore the influences of and interactions among students' disability and professional identities within civil engineering. Semi-structured interviews, each lasting approximately 90 minutes, were conducted with undergraduate civil engineering students who identified as having a disability. Here, we present our findings from the initial and focused coding phases of our GT analysis.

RESULTS

Our analyses revealed two themes warranting further exploration: 1) varying levels of disability identity saliency in relation to the development of a professional identity; and 2) conflicting colloquial and individual conceptualizations of disability. Overall, it has been observed that students' experiences with and perceptions of these themes tend to vary based on characteristics of an experienced disability.

CONCLUSIONS

Students with disabilities experience college – and form professional identities – in a variety of ways. While further research is required to delineate how disability shapes college students' professional identities and vice versa, gaining an understanding of student experiences can yield insights to help us create educational spaces that better allow students with disabilities to flourish in engineering and make engineering education more inclusive.

KEYWORDS

disability, undergraduate civil engineering, professional identity formation

Introduction

Current statistics report that approximately 6% of Australian college students and 13% of U.S. college students have identified as having a disability to their institution of higher education (Kimball, 2016; Koshy & Seymour, 2015). While the number of students with disabilities matriculating into higher education is slowly increasing (Cunninghame et al., 2016; Vaccaro et al., 2015), this group still remains largely underrepresented within STEM (Chubin, May, & Babco, 2005). This lack of representation may point to deeper issues within secondary education; students with disabilities often leave secondary school with lower college aspirations (Kimball, 2016) and are often discouraged from taking engineering-related courses (Lee, 2014). Those who do enrol in engineering and other STEM majors are often not supported effectively (Lee, 2014; Cunninghame et al., 2016).

This lack of support has been traced to broad definitions of disability within government agencies (Cunninghame et al., 2016) and a lack of attention from researchers to effectively address the needs of this population (Kimball, 2016). To provide these students with the necessary resources for academic success, many institutions of higher education refer to definitions of disability established by governmental agencies (U.S. Department of Justice, 2009; Disabled World, 2015). However, researchers and equity groups criticize these broad, normative definitions as being too vague and failing to adequately describe disability, particularly when considering the range and combinations of differences, variabilities, or impairments an individual may experience (Cunninghame et al., 2016). As a result, these definitions can make it more difficult for these individuals to access necessary resources. At the same time, a paucity of research exists exploring the needs of these students (Kimball, 2016; Lee, 2014) and their experiences in higher education.

While many calls have implored educators and researchers to broaden participation in STEM fields (e.g., Jamieson & Lohmann, 2009; Engineers Australia, 2017), many of these conversations have been dominated by race and gender, with little to no work addressing disability (Svyantek, 2016; Lee, 2014). This gap is problematic, as prior research in higher education broadly suggests that disabilities can markedly impact the ways in which students perceive and experience school and develop professional identities (Kimball, 2016). At the same time, research in engineering education has found that students who do not maintain a sense of belonging to or identification with engineering are more likely to leave the profession (Lichtenstein et al., 2009; Tonso, 2014; Jones et al., 2013). Developing and maintaining this identification with engineering may be particularly difficult for students with disabilities because they face a unique set of challenges in navigating physical, social, and bureaucratic university structures typically designed for those without disabilities (Hadley, 2011). While some prior research has examined the systemic and personal barriers experienced by engineering students with disabilities (e.g., Pearson-Weatherston, Mayes, & Villanueva-Perez, 2017), little work has examined the ways in which students with disabilities experience, interpret, internalize, and engage in the field to become professional engineers.

This paper helps bridge this gap by exploring the experiences of students with disabilities to identify strategies for increasing inclusivity and equity in engineering. To help move beyond tolerance and actively embrace students with diverse perspectives in engineering, this study seeks to understand the ways in which undergraduate students experience disability as they form professional civil engineering identities. We focus here on an initial grounded theory examination of interviews with 11 undergraduate civil engineering students who identify as individuals with physical, learning, cognitive, and/or mental health disabilities.

Sensitizing Concepts

Three frameworks serve as sensitizing concepts for the study (Charmaz, 2014): social identity theory (Tajfel & Turner, 1979; Spears, 2011), intersectionality (Collins, 2015; Crenshaw, 1989), and identity salience (Abes, Jones, & McEwen., 2007). Social identity theory posits that individuals partially define who they are through member comparisons and self-categorization, based on the valued meanings and regulatory influences to which particular groups ascribe (Tonso, 2014; Abrams, 2015). This theory is particularly useful for this study due to its alignment with studies that situate disability as a social group (Kimball, 2016). Intersectionality, initially conceived in terms of social justice (Collins, 2015; Crenshaw, 1989), has evolved as a lens for examining the interrelations among various dimensions of a single individual's identity (Abes et al., 2007). For this study, we utilize intersectionality to acknowledge the interrelated and integrated nature of the various dimensions of identity as students navigate their undergraduate careers across contexts. Finally, identity salience and multiple dimensions of identity suggest that a core sense of self is influenced by multiple factors that become

more or less salient through various contexts and interactions as individuals interpret and make meaning of them (Abes et al., 2007). Within the context of this study, we recognize disability as a social construct or categorization (Kimball, 2016) to which individuals are socially assigned or ascribed and as a dimension of one's concept of self.

Methods

To move beyond tolerance and actively create space for students belonging to the disability community, we must gain a deeper understanding of the ways in which these students understand and experience disability as they form professional identities. Therefore, we are conducting a longitudinal grounded theory study to explore professional identity formation for this population. While grounded theory is most commonly used to make sense of a process when a theory is not available, it is also useful for adapting an existing theory to a specific sample population that possesses characteristics of interest (Charmaz, 2014; Creswell, 2013). Given prior research examining the nuanced experiences and access requirements of students with disabilities in higher education, this research approach enables us to develop a richer understanding of why and how these students form professional engineering identities as they move through their undergraduate programs and into the workforce. To bound our study, we focus on civil engineering, one of the oldest and most codified engineering professions (Groen, McNair, Paretti, Simmons, & Shew, 2018).

While participant recruitment remains open to date, semi-structured interviews, each lasting between 60 and 90 minutes, were conducted with 11 participants possessing a variety of disabilities. Due to the exploratory nature of this study and the myriad of impacts that different disabilities may have on students' identity formation, eligible student participants were those who experienced any form of cognitive, developmental, physical, or mental health disability. Participants were not required to obtain an official doctor's diagnosis nor disclose their disability to their home institution (for further discussion of the sampling criteria, see Groen et al., 2018). Interviews were conducted using intensive interviewing approaches (Charmaz, 2014) framed by constructive interviewing (Charmaz, 2014) and critical incident techniques (e.g. Sattler, Turns, & Gygi, 2009). Combining these techniques enabled us to tailor each interview to participants' unique responses and achieve an in-depth exploration of individuals' experiences related to professional identity and disability. Interviews were audio-recorded and transcribed, and field notes were recorded to preserve the context and subtle implications of topics discussed by participants. Aligning with the constant comparative approaches of grounded theory research (Charmaz, 2014), initial coding was conducted line-by-line and incident-by-incident for each interview to identify incidents related to professional identity formation and disability. Researcher insights were captured in memos. Because this study is in its initial phases, the findings represent preliminary themes identified to-date that will be used to initiate the development of a grounded theory as the study continues.

Results and Discussion

Two overarching themes have emerged that add nuance to our understanding of students' experiences with disability as they form professional identities: 1) varying levels of disability identity salience; and 2) navigating colloquial versus individual definitions of disability.

Salience of Disability Identity

Disability identity saliency captures the dynamic role of disability identity within and across participants. Aligning with identity salience (Abes et al., 2007), participants varied in the ways in which they identified with their disability based on contextual factors (e.g., setting, people, etc.) as they experienced different events throughout their lives. Some students exhibited low levels of disability identity saliency and described their disabilities as integrated dimensions of who they are. For example, David, a first-year student, was diagnosed with autism very early in life. When asked if he considered himself to be disabled, he stated, "Not really. I've always been this way." During the interview, he linked his disability identity to his professional identity by positioning his autism as advantageous for someone studying civil engineering:

I view the world and certain things somewhat differently than other people. [. . .] Especially in math. There can be certain ways of doing something, then I'm always the person that does it the third way, in a sense, because it's the way that makes the most sense to me, but maybe not other people.

Because David's autism is such an integrated dimension of his personal identity that has been present throughout his entire life, he experiences very low disability identity saliency and identified it as a positive contributor to his formation as a civil engineer. However, other students experience disability identity saliency in more fluctuating ways. Madison, a senior, was diagnosed with Lyme Disease as she was entering college. She explained that symptoms of Lyme Disease manifest themselves in a variety of ways based on an individual's unique pre-disposition. In Madison's case, her symptoms include severe knee and general joint pain, which can sometimes significantly impact her mobility to, from, and across campus:

There was this semester where I drove to class every single day because it hurt too much to walk the whole way. [...] I'd leave my house like 45 minutes before my class started so I could take my time [walking] there. Then eventually I was like, "No, I'm just driving. I can't do this every day."

Unlike David, who consistently experiences autism with low disability identity saliency, Madison's Lyme Disease symptoms are intermittent, causing her disability identity saliency to fluctuate daily from high to low. For Madison, this fluctuation can also vary from one course activity to another due to cognitive side-effects that include dizziness and word confusion:

That's a very common symptom – is saying the wrong word, then not realizing you've said the wrong word, and trying to get something out, and you can't think of the right word, and stuff like that. [...] I dread having to do presentations because I'm like, "I'm going to say the wrong thing, and I'm not going to realize it, and everyone's going to be confused," and stuff like that.

Here, Madison connects her disability identity to her professional identity formation in terms of technical communication and presentations. She experiences some anxiety when giving presentations based on fear of "saying the wrong thing" and "confusing people." While Madison's comments suggest potential interactions between course activities and disability identity that influence her professional identity formation, further work is needed to better identify and articulate this relationship.

Like Madison, Darren also experiences an intermittent disability that causes fluctuations in his disability identity saliency. Darren, a second-year student, is a veteran who served in the United States Army for 10.5 years. During his last tour in Afghanistan, he was involved in an explosion and was later diagnosed with a traumatic brain injury. While Darren's symptoms include anger, frustration, memory loss, and content retention, he did not realize the full extent of his injury until he returned to college to earn a bachelor's degree in civil engineering. When asked if he considered himself to be disabled, he stated:

I didn't initially, but now that I'm in school, I know that I'm struggling with things that I never used to struggle with as far as learning issues. I guess you could call it a learning disability, basically. What it really boils down to for me is retaining any information and then being able to re-apply that information later on in an exam or something like that and having complete memory blank-outs [...] I would just go blank and couldn't remember anything, and my brain would temporarily shut down for temporary amounts of time. "Bad brain days" is what I call them.

Through this explanation, Darren indicates that he experiences higher levels of disability identity saliency during his "bad brain days" when he is attempting to learn material for his coursework. However, during his interview, Darren also indicated experiencing low levels of disability identity saliency during an internship experience. In comparing these two contexts, we hypothesize that these identity fluctuations may occur based on the skills emphasized within each context. While Darren experiences high disability identity saliency when completing tasks that highlight his traumatic brain injury (e.g., memorizing equations and studying for exams), he experiences low disability and high professional identity saliencies when completing internship tasks unrelated to his brain injury (e.g., communication and working in teams), though again, further exploration is needed.

Colloquial versus Individual Conceptualizations of Disability

The second identified theme captures the ways in which students navigate the development and enactment of their own conceptualizations of disability in relation to established colloquialisms in U.S. culture. Inspired by social identity theory (Tajfel & Turner, 1975) and the double-sided perspective of identity (Stevens, O'Connor, Garrison, Jocus, & Amos, 2008), this theme identifies the ways students may position themselves or be positioned by others as "disabled." That positionality is then accompanied by individual and social conceptualizations of what disability is and who is considered a

person with a disability – which is particularly relevant for students as they request and utilize accommodations in university settings. Johnny, a recent-graduate who was diagnosed with Attention Deficit Disorder (ADD) during primary school, speaks to this theme at great length when describing how faculty reacted to his extended testing accommodations:

...except for three professors, everyone was really rude about it. They would always ask me more questions than were necessary. [...] When I first requested it, people were really, really rude. Like, "Really? Do you really want that?" They bring up a really, I don't know, micro-aggressive tone, I would say. [...] Sometimes they'd actually send me back to the resource center to get extra verification that I wasn't trying to cheat or something. It was really weird.

Although Johnny had requested accommodations through his university's student services office, he still experienced pushback from faculty and often had to advocate for himself and repetitively explain his disability to justify using his accommodation. He experienced similar questions from his peers:

...more often than not, they are like, "Did you drop the class? Why weren't you in the exam? Why weren't you in the room taking the exam with us?" People would always question. I explained that to them, and then people wouldn't believe me in school. "I have a learning disability." "Johnny, you're right [on homework], why do you have to do that?" [...] The hard part was explaining it to my peers. A lot of my peers would never really accept that, really.

Johnny's descriptions of his interactions with faculty and peers offer insights into students' own interpretations of broader cultural definitions and expectations of disability. Despite Johnny's repeated explanations, it was difficult for his professors and peers to comprehend and, in some instances, accept that one can have a learning disability and need accommodations while performing well in school. In a culture that remains predominantly white, male, and nondisabled (Chubin et al., 2005), Johnny represents an incongruity between an inherent colloquial conceptualization of individuals with learning disabilities (e.g., as low performers in school) and his own experience (e.g., as a high performer).

In contrast, other students experienced congruencies between colloquial and individual conceptualizations of disability. Angela, a second-year student, was diagnosed with depression and anxiety during secondary school and, more recently, obsessive compulsive disorder (OCD). When asked if she considers herself to be disabled, Angela replied:

I usually don't ... I have depression, anxiety, and [obsessive compulsive disorder], which none of them are physical disabilities, and because they affect so many people, I don't normally think of them as a disability. But obviously, they do actually qualify as one and they do actually make things harder. I don't tend to think of them as a disability.

Here, Angela aligns her mental health disabilities with general colloquial conceptualizations of disability in the U.S.: disabilities are physical in nature. Despite Angela's acknowledgement that her mental health diagnoses qualify as disabilities and can significantly impact her life, she does not identify as disabled. This de-identification reflects current debates in the U.S. that typically stigmatize mental health and question its status as a disability or medical condition.

Angela's description also evokes the notion that a disability sets one apart: "because they affect so many people, I don't normally think of them as a disability." These comments are echoed in Deena's description of her disability. Deena, a second-year student, was diagnosed with ADHD in primary school. When asked if she considers herself to be disabled, Deena replied:

Not really, because I feel like a lot of people have ADHD, so it's something that I feel like a lot of people don't talk about – that they have it. [...] I don't really think of it as something that sets me apart from other people all of the time.

Like Angela, Deena aligns herself with colloquial conceptualizations that a disability cannot be something experienced by a vast number of people, highlighting the complexity of how one positions and is positioned by others as an individual with a disability. Future work will explore more fully why and how students develop their conceptualizations of disability in the context of broader cultural beliefs.

Implications and Conclusions

Bringing student voices to the forefront not only expands our understanding of their experiences with disability as engineers, but also informs strategies for making engineering education more inclusive.

By more fully understanding disability identity saliency, conceptualizations of disability, and characteristics of an experienced disability, we can begin to develop strategies for embracing students who are often neglected in the planning and development of STEM education.

First, different types of course activities can impact disability identity saliency in a variety of ways. Some students, such as Madison and Darren, experienced high disability identity salience as they navigated intermittent symptoms of their disabilities while completing course activities typically used in engineering (e.g., presentations and exams). Due to the unpredictable nature of their disabilities, these activities became more about completing a requirement for a course rather than demonstrating content knowledge (e.g., Madison's anxiety about saying an incorrect word; Darren "blinking out" on an exam). By gaining an awareness of the different disabilities students face, instructors can adopt universal design practices (Silver, Bourke, & Stehorn, 1998) to proactively address accessibility as an integral component of teaching and assessment. For example, instructors may offer students several modes of accessing course notes (e.g., including verbal and text annotations) and use multiple forms of assessment such as reflections (Eliot & Turns, 2011; Ibarra, 2004) and eportfolios (Eliot & Turns, 2011; McNair, Paretti, & Gewirtz, 2017) that allow students to learn and demonstrate content knowledge.

Second, students experience disability and form professional identities in a variety of ways that often differ from their peers and from one another (e.g., Deena and Johnny). While this finding is seemingly logical, it conflicts with general disability discourse that popularly imagines individuals with disabilities as a monolithic group with apparent physical disabilities (e.g., an individual in a wheelchair). However, as highlighted by participants in this study, disability can vary based on a variety of dimensions (e.g., apparent and non-apparent disabilities; physical, cognitive, developmental, and mental health disabilities; continuous and intermittent disabilities). While we do not analyze each of these dimensions in detail here, we encourage faculty to become aware of the vast variety of the types of disabilities that students experience, be open-minded, and work with students and student services offices to ensure that all individuals can access tools necessary for academic success.

The themes identified throughout this paper serve as initiation points for future work. Further research is required to delineate and articulate how disability shapes college students' professional identities and vice versa. However, this initial understanding has already provided new insights that can help us create educational spaces that better allow students with disabilities to flourish in engineering.

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Acknowledgements

This material is based upon work supported by the National Science Foundation under Award No. 1733636. Any opinions, findings, and conclusions or recommendations expressed in this material are those of the author(s) and do not necessarily reflect the views of the National Science Foundation.