

## Exploring Professional Identity Development in Undergraduate Civil Engineering Students Who Experience Disabilities

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## Abstract

Recent calls throughout the engineering education community have focused on increasing diversity and broadening participation in STEM, particularly within the field of engineering. Many of these conversations have been dominated by research examining race and gender, with little if any work addressing disability. National agencies, such as the National Science Foundation and the American Institute for Research, have begun to implore educators and researchers to include the experiences of students with disabilities within these conversations to gain a better understanding, meet the needs, and promote the success of this marginalized population. Such work is crucial to broadening participation in engineering, as students with disabilities can experience structural and programmatic challenges not experienced by their peers without disabilities. Such challenges include the negotiation of physical, cultural, and bureaucratic structures to access necessary resources for academic and workplace success.

In this paper, we introduce a recently-initiated longitudinal, grounded theory exploration of the experiences of civil engineering students with disabilities as they move through their undergraduate careers and into the workforce. To provide context and establish the need for this type of work in engineering education, we discuss prior research that highlights the current state of disability studies, particularly within the engineering education and higher education literature. We then identify the sensitizing concepts underpinning this study and outline our research methods, including data collection and analysis plans. As this project is currently in the initial phase, we conclude with a discussion of challenges encountered, strategies for overcoming those challenges, and next steps.

## Introduction

Currently available statistics suggest that between 11 and 15% of U.S. college students identify as individuals with disabilities [1, p. 135]. At the same time, research on K-12 environments indicates that students with disabilities leave high school with lower college aspirations [1], are less likely to have access to college preparatory programs [1], and, most salient to this project, are “often discouraged from taking science and engineering courses”; when they do enroll, they are often not supported effectively [2, p. 261]. This lack of support within schools extends to a lack of attention among researchers to better understand - and ultimately address - the needs of this population. As Kimball notes in his 2016 review of the literature of students with disabilities in higher education [1], the marginalization experienced by these students within schools “holds true for the scholarship of higher education, too,” with such research found predominantly in specialized disability journals but absent in the leading higher education journals.

The same pattern holds in engineering education research. While engineering education has focused attention on broadening participation [3, 4] and increasing diversity for several decades, gender and race have dominated these efforts, with virtually no work addressing students with disabilities [2, 5]. At the same time, a number of calls, including those from national agencies such as the National Science Foundation [6] and the American Institutes for Research [3]

implore educators and researchers to broaden participation in STEM fields to those with disabilities. In particular, they identify the need to better understand and meet the needs of students with disabilities in “actionable ways” [3] as a means to foster success and better prepare students for their careers. Such work is critical because the research that does address college students with disabilities suggests that this population faces a unique set of challenges unrecognized by their peers without disabilities [7, 8]. Students with disabilities must often spend more energy than their peers to negotiate physical, cultural, and bureaucratic structures of the university to effectively access the curricular and co-curricular resources necessary to succeed.

Our work addresses this vital need by heeding the call of the Research in the Formation of Engineers (RFE) program to explore the “development of identity as an engineer and its intersection with other identities” [9] by using grounded theory to understand how students with disabilities develop (or fail to develop) professional identities. Moreover, because practices and experiences can vary widely across fields, particularly with respect to physical and cognitive expectations, we have chosen to focus on a single discipline to provide some level of continuity across participants’ experiences. To provide a meaningful point of comparison across institutions and a contextual frame for identifying and operationalizing research findings, we therefore narrow our scope to civil engineering. As the second oldest engineering discipline [10, 11], civil engineering is one of the largest engineering majors, providing a broad starting population for recruitment, and continues to play a central role in the development of national infrastructure. In particular, we draw from prior literature in identity and retention in engineering to ask two research questions:

1. How do students with cognitive, developmental, or physical disabilities form identities as civil engineers during their undergraduate programs?
2. How do students with cognitive, developmental, or physical disabilities form identities as civil engineers during their first year at work?

To address these questions, we are conducting an exploratory study in which we plan to (ideally) follow 40 students for three years. Qualitative methods are particularly appropriate for this research because of their “capacity to give voice” to individuals who have been historically stigmatized, marginalized, and discriminated against; these methods provide a vital tool to elicit and highlight the lived experiences of students with disabilities [1]. To provide a rich longitudinal data set that can achieve these aims and, given the limited information available regarding the number of students with disabilities in engineering, we are recruiting students nationally to maximize our sample population.

## **Literature Review**

Existing research on identity development in engineering students highlights strong differences associated with students’ personal identities. For example, both gender and race have been shown to impact the ways in which students experience engineering culture as well as the ways in which they experience belonging, self-efficacy, and other factors closely related to identity development [12-15]. Similarly, studies of the experiences of LGBTQ students highlight significant conflicts between students’ personal and professional identities, with participants

often describing the need to mask or conceal their sexual orientation in order to fit into the engineering culture [16, 17].

While current work in engineering education includes studies addressing the experiences of students based on gender, race, ethnicity, class, and, more recently, sexual orientation, little if any work considers the experiences of students with disabilities. In her literature review, Svyantek [5] reveals this lack of work, stating that “within engineering education, the experiences of the disabled community, of disabled students, and of disabled engineers are not yet part of our concepts of diversity and inclusion” (p. 5). Yet research in higher education broadly suggests that cognitive, developmental, and physical disabilities can markedly impact the ways in which students experience school and the ways in which they develop their professional identities [1]. In addition to managing typical college adjustments experienced by most students, those with disabilities are faced with a unique set of challenges in navigating “physical, social, and intellectual structures” [1, p. 96] of the university that are generally designed for those without disabilities [7]. These same challenges, particularly those regarding disclosure and accommodations requests, may also be transferred to the workplace as graduating students enter the job market in their respective fields [18]. At the same time, persons with disabilities often continue to experience stigmatization, prompting fears that can affect their choices about disclosure, use of services, and overall academic engagement [1].

Despite these challenges, identity research on students with disabilities is limited. Studies that do exist typically include disability as part of larger conceptions of social identities, but as Kimball et al. note, “In contrast to other more widely studied social identities, however, the impact of disability on the learning and development process of college is poorly understood, in part due to a paucity of high quality empirical research” [1, p. 101]. The gap with respect to disabilities persists in work on identity research in engineering education and intersects with a gap in considerations of disciplinary influences. Few studies consider the interaction of disciplinary and experiential factors that influence the formation of an engineering identity and often generalize the process of professional identity formation to all or multiple engineering majors [9, 13, 19-22]. While there are similarities among students’ professional identity formation across engineering disciplines with respect to factors such as the ABET Student Outcomes [23], few studies explore these common factors within the contexts of individual engineering disciplines. Yet recent research exploring teaching and learning within engineering has revealed varied cultures among the engineering sub-disciplines that may pose differential barriers to students [24, 25]. The ways in which these barriers are encountered, experienced, and overcome are influenced by disciplinary characteristics such as the inherent nature of disciplinary work and the professional societies by which the discipline is governed [24-27].

Given that neither the experiences of students with disabilities nor the discipline-specific identity formation process are well understood, we have narrowed our study to a single engineering discipline: civil engineering. We chose civil engineering for two reasons. First, while civil engineering is credited as being the second oldest engineering discipline [10, 11, 28], it continues to maintain a direct influence on the organization and operation of society, particularly regarding accessibility in built environments [29, 30]. Our second reason centers on the nature of civil engineering work. To create such infrastructure requires learning mathematically-intensive disciplinary content and often engaging in physically demanding jobs such as concrete testing or

surveying on construction sites, which can limit career opportunities for individuals with cognitive, physical, or learning disabilities. Therefore, understanding how these individuals form professional identities as civil engineers is particularly useful for exploring ways to enhance engineering education and surpass traditional expectations of civil engineering work. The perspectives of civil engineers with disabilities are also important for developing and establishing universal engineering design practices, thus embedding considerations of disability into our infrastructure and daily lives. From this perspective, civil engineering can serve as the nexus that integrates disability, engineering design, and infrastructure to advance the future of civil engineering and the engineering profession.

## **Sensitizing Frameworks**

### ***Professional Identity***

In this study, we adopt the definition of identity presented by Tonso [12] in her review of research on engineering identity, which she draws from the work of Holland, Lachicotte, Skinner, and Cain [31, p. 47]: “Identity is a concept that figuratively combines the intimate or personal world with the collective space of cultural forms and social relations.” This definition is particularly salient to the proposed study because it focuses on the ways in which individuals form identities as they interpret, are influenced by, and internalize the experiences, incidents, and relationships of the world in which they live.

More specifically, our project focuses on the development of students’ professional identities and, in particular, their professional identities as civil engineers. The term “professional identity” has been used in a variety of loosely connected ways by researchers to date. For example, in her study exploring the ways in which women adapt to a professional engineering culture, Dryburgh [13] describes a professionalization process in which individuals learn, adjust to, and internalize the values, behavioral norms, and symbols of a profession to which they wish to belong. Similarly, Loui [16] uses the process of learning the values upheld by a profession through role acquisition [32] to explore professional identity development in undergraduate electrical and computer engineering students. More recently, Pierrakos et al. [33] treat professional identity as interchangeable with engineering identity in their study exploring trends in freshman engineering students and describe this professional/engineering identity as one that students develop across their undergraduate experience.

To ground this project, we draw from the work of Dryburgh [13], Downey and Lucena [34], and Tonso [12] to define professional identity. Here, we define professional identity as an identity that is constructed as an individual learns, internalizes, and maintains the values, behaviors, symbols, and discourse of a profession as a result of social interactions with its members and disciplinary practices.

### ***Social Identity Theory***

Because we are particularly interested in the ways in which students with disabilities form professional identities within the context of undergraduate civil engineering programs and the first year of work, we frame our study using social identity theory (SIT) – an approach that is

consistent with broader studies in higher education that treat disability as a social identity [1]. In general, this theory implies that membership in a group is framed through comparisons of values and behaviors that members make between them and individuals belonging to other groups [35-37]. These comparisons allow members to partially define who they are based on the valued meanings and regulatory influences to which the group ascribes [12, 36]. SIT is further delineated into two smaller sub-theories that consider the interactions between social and individual identities: the SIT of intergroup relations and SIT of the group, also known as self-categorization theory [35, 36, 38].

**Intergroup Relations:** The SIT of intergroup relations acknowledges the comparisons, conflicts, and struggles among groups found within a larger social structure [36]. Notably, while SIT partially allows individuals to determine who they are through group interactions, SIT may also indicate to individuals who they are not [35]. For example, some civil engineering students may find themselves struggling to either perceive themselves or be perceived by others as an engineer based on perceptions of other factors that do not traditionally align with engineering (e.g., gender, sex, race, and even economic status) [13, 39, 40]. In these instances, the individual is unable to be identified with a group due to external constructions that are defined and accepted by larger social groups, not by the individual. For example, women in civil engineering may find themselves excluded from a domain stereotypically characterized by hard hats, steel beams, and concrete mixers because such symbols conflict with traditional symbols of femininity such as high heels and manicured nails. Fashion and construction sites do not mix, as the stereotypical logic goes, and therefore women do not belong in the field. This concept introduces the double-sided perspective of identity in which individuals position themselves and are positioned by others through socially-influenced and negotiated constructs [41].

**Self-Categorization:** Self-categorization theory (SCT), or SIT of the group [35, 36], relies on a core concept of social categorization that considers a social system as a defining framework from which an individual's place in society is determined [37]. Social categorization leads to categorizations of groups to which an individual may self-categorize [38]. Hence, this sub-theory of SIT creates and explicitly acknowledges the psychological link between the self and the group, articulating the influential relationship between individual interpretations and categorizations about a social context or environment [36]. It places primary focus on the positive values that an individual may derive as a member of a group.

As individuals interact with multiple groups and interpret social contexts in a variety of ways, they maintain positive values from some groups and distance themselves from others with whom they maintain negative values. From these experiences, individuals are able to create, or construct, an identity from chosen, positive values exhibited by particular groups. These constructions may vary depending on the individual's surroundings and contexts, presenting the concept of multiple identities [42, 43]. An individual may enact multiple identities as certain aspects of their identity become more prominent within specific situations [43].

## **Methods**

As noted above, little work exists on professional identity formation for students with disabilities; therefore, we are conducting an exploratory, longitudinal study using grounded

theory to examine how professional identities form for this population within a single engineering discipline. Grounded theory is typically used when a theory is not available to understand or explain a process; however, when potential models are available, grounded theory provides a means to further develop the theory for a particular sample population that possesses potentially valuable variables and characteristics of interest [44, 45]. Given the prior work on identity development broadly and the relative dearth of work in both civil engineering and students with disabilities, this research approach enables us to understand why and how students with disabilities form their professional engineering identities as they are exposed to perceived engineering-related activities during their undergraduate experiences.

This study seeks to follow 40 students using twice-yearly interviews to understand how they are developing their identities as civil engineers. Due to the myriad of impacts that different disabilities may have on students' identity formation, as well as the exploratory nature of this study, we chose not to limit potential study participants based on the type of disability they experience. As such, eligible student participants are those who experience any form of cognitive, developmental, or physical disability including, but not limited to:

- Visual Differences (e.g., Stargardt's Disease, glaucoma, retinitis pigmentosa, and other forms of complete or partial blindness)
- Hearing Differences (e.g., chronic buzzing or ringing in ears, deafness in one or both ears, and other forms of complete or partial hearing loss or difference)
- Learning or Developmental Differences (e.g., autism, Asperger's, obsessive compulsive disorder, dyslexia, or other forms or learning or developmental differences)
- Auto-Immune Disorders (e.g., multiple sclerosis (MS), lupus, lyme disease, amyotrophic lateral sclerosis (ALS), type I diabetes, or other autoimmune diseases)
- Limb Differences (e.g., limb amputee or born without a limb)
- Mobility Differences (e.g., needing a walker, wheelchair, cane, or crutches or experiences difficulty walking or lifting/moving objects due to paralysis, stamina limitations, cerebral palsy, or other neuromuscular or orthopedic reasons)

Notably, students are not required to obtain an official diagnosis from a doctor nor are they required to disclose their disability to their institution in order to participate in this study. These criteria, as an addition to disability type, were implemented for two reasons. First, because obtaining an official doctor's diagnosis can be a lengthy and expensive process, particularly for low income families, we wanted to allow all students experiencing disabilities to participate in the study, regardless of economic status. Second, due to the highly-personalized nature of the decision to disclose one's disability to their institution, we did not want potential participants to feel coerced into disclosing as a condition for participating in the study.

To enable us to examine both undergraduate and early work experience, we initially intended to recruit 20 students in their first year and 20 students in their junior year. From this logic, we would ideally follow freshman and junior students for three years into their third year of school and first year of employment or graduate school, respectively. However, given the literature on challenges faced by students with disabilities in higher education and their marginalized status within civil engineering and engineering broadly, we have expanded the participant pool to include undergraduates at any stage; each participant will then be followed for the full term of

the study. Conducting these interviews over time enables us to extend prior work that often explores only a single moment or relies on a retrospective view of participant experience. Equally important, the longitudinal study allows the interviewer to build a relationship with each participant that can allow for a richer and more complete picture of each person's development as it unfolds. Finally, as noted earlier, the longitudinal interviews provide an ideal tool to enable us to give voice to our participants [1] and co-construct an emerging theoretical framework in ways that are more fully rooted in their lived experiences and grounded within the data [46].

### ***Data Collection***

Our data collection procedures are informed by social identity theory and have been developed and tested in a prior study by Groen, together with McNair, Simmons, and Paretto [47]. The study utilizes intensive interviews [44] framed by the Critical Incident Technique [48-50]. Intensive interviewing is a gently-guided qualitative interviewing technique utilized in grounded theory research, similar to semi-structured interviews. By relying on detailed participant responses to open-ended questions, the aim of these interviews is to achieve an in-depth exploration of individuals' experiences with an emphasis on participant perspective and meaning. The sequencing and content of these interviews are flexible and highly dependent on the findings from previously-conducted interviews within the study. This allows researchers to follow-up on unanticipated hints, areas of inquiry, and implicit actions while streamlining data collection as the study progresses [44].

To further frame and tailor subsequent interviews, probe the unique experiences of each student, and refine data collection for an emerging grounded theory, participants receive online follow-up minute reflection surveys approximately two days upon completion of each interview via email. These surveys are designed such that students can complete them within five minutes and consist of four multiple choice and one short answer questions. These minute surveys offer three advantages: 1) results of the surveys are used to tailor students' subsequent interviews to further probe experience; 2) they enable students to express any concerns or topics that they may have forgotten or were too nervous to discuss during the interview; and 3) they facilitate further contact with the participants while interviews are not being conducted. These surveys will be analyzed in tandem with interview transcripts and field notes to further inform theory development.

### ***Data Analysis***

Constructivist grounded theory encourages simultaneous data collection and analysis such that researchers persistently interact and engage with the data [44]; data analysis shapes and is shaped by the data collection process. Following established procedures for grounded theory [44], our analysis includes three distinct phases: 1) coding and categorization, 2) theory building, and 3) memo writing. Table 1 summarizes this process.

Importantly, in grounded theory analysis, the emphasis lies within participants' conceptualizations of incidents, events, and happenings that are perceived as indicators of the phenomenon, rather than within raw data [51]. Therefore, we define the unit of analysis for the

proposed study as a single concept occurring within the interview, meaning that multiple units will emerge from a single interview [51].

Table 1: Data Analysis Procedures

Analysis Phase	Grounded Theory Tool	Definition/Description
Coding and Categorization	Initial Coding	The initial process of defining data that forms the connection between data collection and emergent theory [44]
	Focused Coding	The sequel to initial coding in which researchers test the most frequent and significant codes against larger batches of data to demonstrate analytical strength for category development [44]
	Axial Coding	A prescriptive type of coding that specifies the properties and dimensions of a category surrounding a core phenomenon [44, 45, 51]
	Theoretical Coding	Codes from prior theories or analytical schemes that researchers apply as a means to integrate their analytical categories [44]
	Theoretical Categories	The analytic step in which groups of codes are clustered into common concepts according to an overriding significance or common theme to bring analysis to an abstract theoretical level [44, 52]
	Theoretical Saturation	The point at which gathering more data reveals no new properties nor theoretical insights about the grounded theory [44]
Theory Building	Constant Comparison	An analysis method consisting of the continuous comparison of codes and categories from previously collected data to those of recently collected data [44, 45, 53]
	Abductive Reasoning	A distinguishing characteristic of grounded theory that allows for researchers to account for anomalies in the data by provoking the researcher to imagine all possible explanations for its occurrence [54]
Memo-Writing	Initial Memos	A type of memo in which the researcher captures initial explorations of qualitative codes and provides direction for future data collection [44]
	Advanced Memos	A type of memo in which the researcher identifies, traces, and describes the supporting assumptions, emerging changes, and practical applications of categories throughout analysis [44]
	Integrated Memos	A type of memo in which the researcher begins to integrate codes, categories, and prior memos to enhance theory development [44]

### Research Progress To-Date

As this project is in its initial phases, our work completed to-date includes multiple research activities that focus on establishing a solid foundation for high-quality recruitment and data collection. These activities are summarized in Table 2.

Table 2: Research Activities for Fall 2017 and Spring 2018

Activity	Purpose	Status
Develop recruitment survey	To allow students to provide general demographic and detailed disability information; this information is used to provide the researcher with participant background and bolster conversation during the interview.	Complete
Expand recruitment criteria	To allow any student, regardless of disability or academic level, to participate in the study with an overarching goal of increasing recruitment.	Complete
Identify recruitment sources/contacts	To promote access to students and broadly advertise the study across multiple organizations and universities.	On-going
Develop recruitment website	To promote student access and interaction with study information and procedures at their leisure with an overarching goal of increasing recruitment.	Complete
Conduct student pilot interview	To pilot interview protocol and identify areas for improvement based on students' experienced disabilities; this information will be used in alternative data collection development.	Complete

To date, a total of 28 students have completed the recruitment survey, 16 students have volunteered to participate in an interview, and 10 students have completed an interview. Initial analyses have revealed two themes to be further explored: 1) implications of identifying, requesting, and utilizing institutional accommodations; and 2) varying levels of disability identity saliency in relation to the development of a professional identity. Overall, it has been observed that students' experiences with and perceptions of these themes tend to vary based on the transience of one's disability.

### **Methodological Challenges and Strategies for Continued Progress**

Since launching this project in September 2017, the research team has experienced multiple challenges related to overall data collection including recruitment, approaches/procedures, and ensuring the protection of human subjects. The following sections describe each challenge and the strategies employed to mitigate their impacts on research progress. We offer these descriptions so that other researchers can use this information to manage similar challenges experienced in their own projects as research on students with disabilities in engineering grows.

#### ***Recruitment***

**Challenge:** Our first and most significant challenge is recruitment. We are experiencing difficulty finding, accessing, and reaching out to these students. This challenge is exacerbated by further scoping participant selection to include only individuals enrolled in civil engineering programs. Hence, this challenge has prompted us to continue to reach out to a wide range of organizations and individuals, develop and implement additional recruitment tools, and expand interview selection criteria.

**Strategy 1 – continue to identify and contact recruitment sources:** To increase our access to potential study participants that meet our selection criteria for the study, we have continued to

reach out to various organizations within engineering education (i.e., divisions of the American Society for Engineering Education (ASEE)), civil engineering (i.e., national industry chapters of the American Society of Civil Engineers (ASCE)), disability support organizations (e.g., the Association on Higher Education and Disability (AHEAD) and the National Center for College Students with Disabilities (NCCSD)), social media (i.e., Facebook and Twitter) and personal contacts. Future recruitment will continue these efforts but also utilize other avenues, including university disability support offices (if able), student chapters of ASCE, and college deans.

**Strategy 2 – implementing additional recruitment tools:** In addition to continuing recruitment efforts via interpersonal contact, we have also developed supplementary tools to further promote recruitment efforts. A project website (<https://blogs.lt.vt.edu/exploringidentity/>) was developed and launched through the host university to allow students to learn more about the project and research team at their leisure. Using an alternative recruitment platform – other than email recruitment – also enables students to remain anonymous as they explore and learn about the project, if they so wish. However, the primary goal of the project website is to provide a space for the research team to build rapport with potential participants in two ways. First, short biographical sketches, personal motivations for conducting this work, and a personal photo are provided for each member of the research team. Second, the website homepage contains a recruitment video in which the primary interviewer, Groen, describes the project and study procedures to students and invites them to participate in an interview. It is hoped that providing additional information to students will reduce potential anxieties that they may face when deciding to participate in this type of research. To ensure that the project website is accessible to any individual regardless of disability, the research team is collaborating with an on-campus organization to ensure necessary accessibility features are continuously integrated into the site.

**Strategy 3 – broadening participant selection criteria:** In our initial project proposal, we anticipated interviewing two cohorts of study participants twice per year for three years. As noted earlier, Cohort 1 was to consist of 20 first-year students while Cohort 2 was to consist of 20 juniors. However, due to the challenges experienced while recruiting, we have broadened our selection criteria to include civil engineering students with a disability at any undergraduate level. As such, our selection of interview participants will include not only first year students and juniors, but also sophomores and seniors who will be followed for the remaining duration of the project.

### *Approaches to Data Collection*

**Challenge:** Our second challenge occurred during initial recruitment. Recruitment survey responses highlighted the complex relationship between data collection approaches and the disabilities experienced by potential participants. In particular, some students may be uncomfortable or experience difficulty when speaking with an interviewer either in-person or virtually. This realization has prompted the research team to analyze modes of data collection and develop potential alternatives that would be most comfortable for student participation.

**Strategy – develop alternative modes of data collection:** For students who experience disabilities that may impact interactions with an interviewer, other modes of qualitative data

collection are in development. These alternative modes include open-ended question prompts and visual aids that can be used to supplement existing interview protocols.

**Challenge:** Our third challenge, relating to approaches to data collection, is the inherent nature of the longitudinal, intensive interviews that accompany this grounded theory study. While these types of interviews allow for researchers to build rapport with study participants, these relationships may also influence a student's decision to remain in the field of civil engineering. As such, students may choose to stay in their major not because they genuinely want to remain in civil engineering, but because they want to meet assumed expectations of the researcher.

**Strategy - bracketing and promoting student voices, regardless of disciplinary retention:** To mitigate this potential effect, the research team employed bracketing, a reflexive tool in grounded theory research by which the researcher discloses preconceived notions about the context, participants, and role within the research study [44]. Using bracketing memos, the interviewer was able to outline biases and remain objective regarding students' academic and career decisions during interviews, and rather, focused interview questions on why and how students are making these decisions than on the decision, itself. Within the field of engineering education, we seldom hear from students who are thinking about or choose to leave the field, thus making this perspective highly valuable, particularly with regard to research in professional identity formation.

### *Ensuring Protection of Human Subjects*

**Challenge:** The last challenge we experienced during the initial study phases was the prolonged time required for approval of amendments and other IRB-project management activities. Working with the IRB is a necessary and vital step in conducting research with human subjects. Because we have chosen to include students with cognitive disabilities, some of whom may be classified as belonging to a vulnerable population per university IRB definitions, all IRB submissions and amendments must undergo full-board review, which occurs once per month at the host university - a sharp contrast to many educational research studies that are considered expedited by the host university and are thus reviewed on a rolling basis by the IRB..

**Strategy – plan ahead and make amendments count:** To mitigate the impacts of the monthly full-board meetings, the research team has begun to plan ahead and intentionally submit amendments that will achieve maximum research progress at any given time. Additional strategies include knowing the monthly IRB full-board meeting schedule, noting submission deadlines for meeting agendas, and developing a working relationship via frequent contacts with individuals in the IRB office. These working relationships have been particularly useful, as these individuals provide meaningful guidance and suggestions on our proposed plans to ensure adequate protection of all participants. While these are good practices for any researcher on any project, the research team has found that making these small adjustments in protocol and personnel amendments more streamlined and minimized waiting time between amendment submission and approval.

## Next Steps

As noted above, this project is in its initial phases, with a focus on recruitment and initial data collection. Constant comparative analysis of collected interview data is on-going and will continue as more interviews are conducted. Next steps for this research include further implementation of the strategies discussed in the prior section, which include continued recruitment from identified sources, development of data collection materials (e.g. questionnaires and supplemental visual aids), as well as scheduling interviews with more students.

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