

WORK IN PROGRESS: EMPOWERING STUDENTS WITH DISABILITIES THROUGH RESEARCH INVOLVEMENT

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I am a recent graduate with my Bachelor's and Master's in Biomedical Engineering from the University of Florida. During my time at UF, I focused my studies on both Biomaterials and Cellular/Regenerative medicine. I have a passion for making voices heard and getting individuals involved in research to better their community! This interest is what helped spark the inspiration for my submission to the ASEE National Conference as I worked with those around me to impact change for the involvement of students with disabilities at the University of Florida. I hope to be able to continue to influence change by advocating for diversity and inclusion as I transition into my new career in the biomedical industry!

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Introduction

It has been widely reported that the majority of engineering departments in the United States of America are predominantly comprised of high functioning, white, males [1]. Despite the recent surge in interest towards the involvement of women and racial minorities in the STEM fields, students with disabilities remain an underrepresented minority in these fields [2]–[4]. Additionally, the barriers that those students with disability face once they do enter one of these fields can hinder their success and lead to a higher than average rate of students leaving their degrees unfinished. In one such study, it was reported that while these students with disabilities are enrolling at the same rate as their non-disabled counterparts, their graduation rate is much lower – 38% compared to 52% [5]. The barriers that these students face can range from institutional misconceptions & lack of support to personal feelings of “otherness” and inadequacy [3], [5]. As a result, students with disabilities are less likely to participate in social and school activities; a necessary aspect for those wishing to succeed in college [2]. Despite recent postsecondary enrollment gains for students with disabilities, barriers to success persist, particularly for students in STEM. Astin’s seminal theory of student involvement suggests that students are more likely to persist in college if they engage in extracurricular activities [6]. However, students with invisible disabilities such as emotional and behavioral disorders as well as physical disabilities may be less likely or able to engage in campus activities or organizations.

The University of Florida (UF) is a large 4-year R1 public university with 5,197 students (9% of the student population) currently enrolled with the campus Disability Resource Center (DRC). Of those 5,197 students, 693 are enrolled in an Engineering major (7.2% of the Engineering student population). The DRC is primarily responsible for providing academic and residential support in the form of resources and accommodations. There is currently a lack of support, and therefore an opportunity, in empowering these students outside the classroom and residence.

The aims of our project include (1) conduct an analysis of research programs across the university campus and identify which programs have high or moderate alignment with disability topics, (2) create and share our analysis as a resource for disabled students, (3) understand the current landscape of disabled student participation in disability-aligned research, and (4) investigate how our empowerment initiative impacts disabled student participation in disability-themed research.

The purpose of this project is to create a resource that reduces the barrier for students with disabilities to participate in academic research by making explicit the connection between research opportunities and the student’s lived experiences. It has been reported that students with disabilities make up only 2% of doctoral students and 6% of graduate students [7] – by improving undergraduate participation in research, we hope this will lead to an increase in representation at the graduate level.

Using the University of Florida as a case study, we are establishing a comprehensive survey of which individual research programs across the campus are conducting research in topics of disabilities. Disability categories were chosen to align with the University of Florida's Disability Resource Center's accommodation survey categories. These categories are as follows: hearing, physical/mobility, mental health, ADD/ADHD, visual, medical health, learning, Autism Spectrum Disorder, and Other (Traumatic Brain Injury, Speech, etc.). This project intends to review all research programs in every college – there are currently 16 colleges at UF – however, this work-in-progress shares findings specifically from engineering and the health sciences. Although students are able to join a research program in any department or college, we find that the majority of students on UF's campus prefer to conduct research in their "home" College, so with our interest in empowering STEM students with disability, we felt that our prioritization list should begin with the Colleges containing STEM programs. Further, with engineering discipline's drive for commercialization and clinical translation ("benchtop to bedside"), starting first in engineering and the health sciences was seen as an opportunity to easily tap into empowerment and changemaking already fostered in the engineering community.

We believe that the creation of this resource will increase the knowledge and access of these research programs to encourage students to be empowered beyond their disability and increase their overall academic success. We hope to empower disabled students to scientifically contribute to a topic that greatly impacts their lives with this intentional dissemination. Long-term research opportunities from this work could include the formation of disabled research identity, persistence, and belongingness.

Methods

The first step in this work began with establishing a direct connection between the researchers and the Disability Resource Center (DRC). It is critical for this work to be reviewed and critiqued by the community and advocates of the community. The researchers of this project discussed with the DRC representative, community members, and ambassadors the motivation behind this Work-in-Progress as well as the potential project aims. These conversations supported that there indeed existed an interest and need in the type of resource proposed and that this type of research is not currently being conducted in the setting.

The University of Florida is a comprehensive campus; consisting of arts and sciences degrees awarded at undergraduate and graduate levels, and schools of medicine, veterinary medicine, pharmacy, physical therapy, dentistry, and law. The Colleges that have been analyzed to present include; College of Liberal Arts & Sciences (CLAS), College of Agricultural & Life Sciences (CALS), College of Engineering (HWCOE), College of Education (COE), College of Public Health & Health Professions (PHHP), and the College of Human Health & Performance (HHP).

To address Aim 1 (*perform an initial assessment of the disability relevance for each research program at the University of Florida*), an online search of each department's primary faculty was conducted. Each principal investigator's name, department, and primary governing college was recorded in an excel sheet for use in tracking and the final resource production. From this faculty directory, each research biography and laboratory website was analyzed to determine if their research program addressed any topics of disability. In instances where a research biography, or

website, was not available, a further publication search was performed to assess the potential for disability relevance.

Based on these searches, research programs were given a relevance score of either “No”, “M”, or “H” for each of the 9 disability categories. Those that had no perceived relevance were scored as “No” for all categories. Similarly, those that had a moderate level of relevance to any one of the disability categories were recorded as “M” in the specific columns of relevance and as “No” in all remaining category columns. The same method was used for recording research programs with high disability relevance where “H” was used to denote these categories.

The determination of whether a research program had moderate or high relevance was based on qualitative means. As an example, a faculty’s research biography that mentions a general topic like “mechanisms of muscle contraction and movement” would receive a moderate relevance score. In contrast, one that describes the research interests as focusing on “ Clinical Biomechanics: ACL injury, Traumatic Brain Injury” would receive a high relevance score for the Physical/Mobility and Other categories. To reduce scorer to scorer variation, the same individual examined all research programs to ensure the same scoring standards were used across all research programs.

After determining the relevance of each program, the number of moderate and the number of high relevance categories were recorded. Any research program that had zero “M” rated relevance scores and zero “H” rated relevance scores, received an Overall Relevance score of “No Relevance”. In contrast, any program that had either one or more “M” level disability categories but no “H” level categories received an Overall Relevance score of “Moderate Relevance”. Similarly, those research programs which had one or more “H” level categories but no “M” level categories received a score of “High Relevance”. In cases where there was a combination of both “M” and “H” level relevance categories, the Overall Relevance was recorded as “Combined Relevance”.

Results

To date, 1836 research programs have been examined across six different colleges within the University of Florida. The total results for all research programs examined in these programs can be seen in Table 1. Disability-related research, whether moderate, high, or combined relevance is represented in 7.2% of total research programs reviewed (Table 1).

TABLE 1: OVERALL RELEVANCE SCORE BREAKDOWN OF ALL RESEARCH PROGRAMS EXAMINED

Overall Relevance Score	Number of Research Programs	Percentage of Total Research Programs Reviewed
No Relevance	1702	92.7 %
Moderate Relevance	100	5.4 %
High Relevance	26	1.4 %
Combined Relevance	8	0.4 %

From this broad view provided in Table 1, we then disaggregated research program survey data in order to more closely examine by College within each Overall Relevance Score type (Figure 1). From this figure, it can be seen that there is wide variety of representation in disability-related research across the 6 colleges, and that every college had at least one research program conducting disability-relevant research.

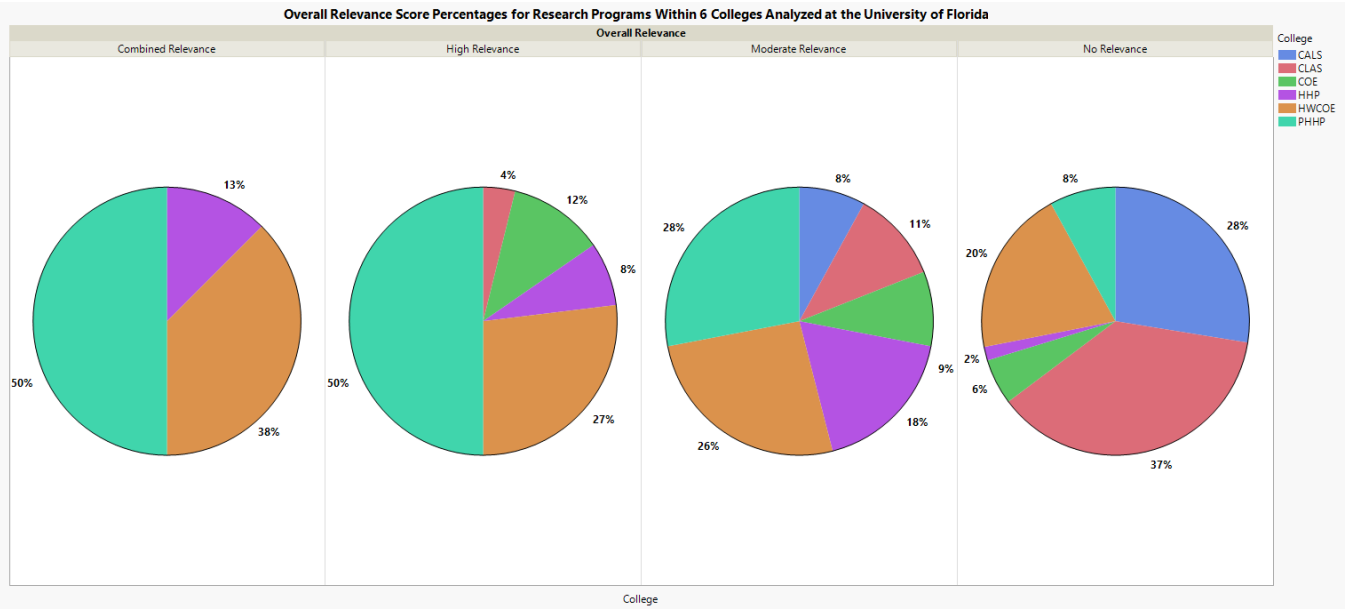


FIGURE 1: THERE EXISTS A WIDE VARIETY OF DISABILITY-RELATED RESEARCH BETWEEN THE 6 COLLEGES EXAMINED. ANALYSIS INCLUDES COLLEGE OF LIBERAL ARTS & SCIENCES (CLAS), COLLEGE OF AGRICULTURAL & LIFE SCIENCES (CALS), HERBERT WERTHEIM COLLEGE OF ENGINEERING (HWCOE), COLLEGE OF EDUCATION (COE), COLLEGE OF PUBLIC HEALTH & HEALTH PROFESSIONS (PHHP), AND THE COLLEGE OF HUMAN HEALTH & PERFORMANCE (HHP).

At the University of Florida there are 10 departments within the College of Engineering accounting for a total of 378 research programs. As seen in Figure 2, the percentage of programs exhibiting a moderate disability relevance level was 6.9 % within the College of Engineering. Additionally, the total percentage of programs supporting disability research (high, medium, and combined categories) was 9.6 %. When reviewing the pool of 378 College of Engineering research programs and their alignment with disability topics, we found this representation to be higher than the general pool of 1836 research programs reviewed across 6 Colleges in which only 7.2% supported disability research.

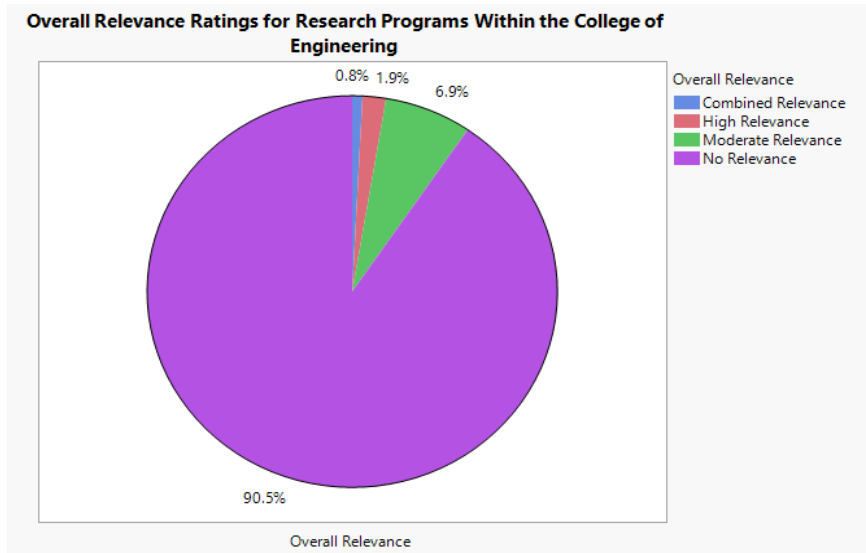


FIGURE 2: THE PERCENTAGE OF RESEARCH PROGRAMS THAT WERE DETERMINED TO HAVE RELEVANCE TO DISABILITIES WHEN ONLY CONSIDERING THE COLLEGE OF ENGINEERING.

Upon further examination of only the College of Engineering, it was determined that the largest represented category in research programs (had the greatest number of high, medium, or combined) was the “Medical Health” Category with “Other” following closely behind. As shown in Figure 3, 4 out of the 9 disability categories are currently being represented in the engineering research landscape at UF. These 4 categories can be seen on the graph as Physical/Mobility, Mental Health, Medical Health, and Other. The breakdown of the relevance scores (either “H”, “M”, or “No”) can also be seen for each of these 4 categories. However, when broadening the scope to include all programs, in all colleges reviewed, we see that all but 1 disability category has at least 1 program performing research in that area. The exception to this is the “Visual” category which none of the 1836 research programs reviewed scored either moderate or high for relevance.

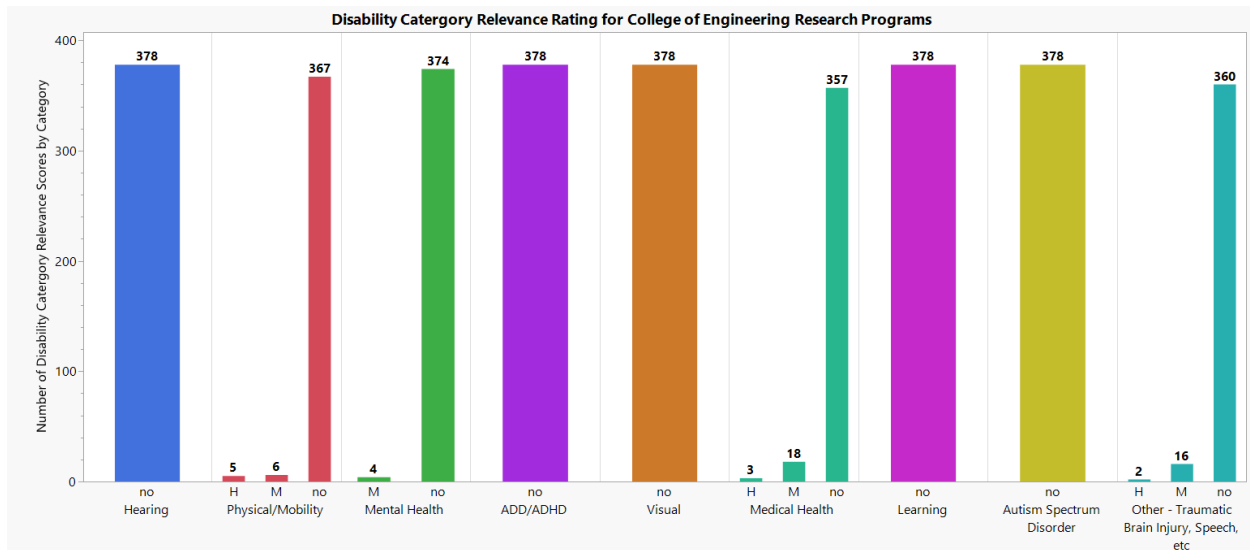


FIGURE 3: WITHIN THE COLLEGE OF ENGINEERING, THERE IS A HIGH LEVEL OF VARIABILITY FOR THE RESEARCH BEING CONDUCTED ACROSS ALL DISABILITY CATEGORIES. THE CATEGORIES OF HEARING, ADD/ADHD, VISUAL, LEARNING, AND AUTISM SPECTRUM DISORDER ALL HAD 0 RESEARCH PROGRAMS PERFORMING RESEARCH ON THEM WITHIN THE COLLEGE OF ENGINEERING.

Any research program that scored some level of relevance in multiple disability categories was determined to have “cross-category relevance”. Interestingly, many of the research programs examined were determined to have moderate level cross-category relevance. As seen in Figure 4, of all research programs to receive an “M”, 37.9 % received this score across multiple categories. However, those research programs that received an “H “ score did so in only one category – there was no high-level cross-category relevance.

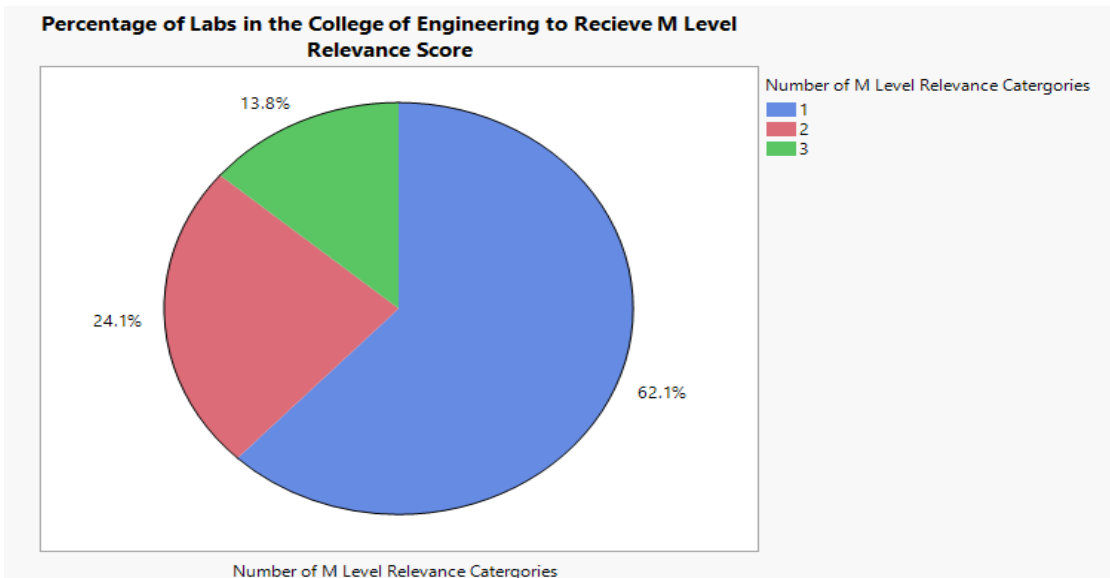


FIGURE 4: OVER ONE-THIRD OF RESEARCH PROGRAMS THAT RECEIVED AN "M" LEVEL RELEVANCE SCORE EXHIBITED SOME DEGREE OF CROSS-CATEGORY RELEVANCE.

Finally, we wanted to explore which departments within the College of Engineering are most represented in conducting disability-related research as defined by the DRC disability categories. The top 3 departments within the college of engineering for disability research, number of disability-related research programs out of total research programs in the department, were; Biomedical Engineering (19 out of 25, or 76 % relevancy), Mechanical and Aerospace Engineering (7 out of 49, or 14.28 % relevancy), and Chemical Engineering (3 out of 24, or 12.50 % relevancy).

Additionally, when listing all reviewed departments by percentage of disability-relevant programs within the department, two engineering departments ranked in the overall top 10 for the percentage of disability-related research programs; Biomedical Engineering & Mechanical and Aerospace Engineering (Table 2).

TABLE 2: TOP 10 DEPARTMENTS FOR DISABILITY-RELEVANT RESEARCH AT THE UNIVERSITY OF FLORIDA.

Department	College	Percentage of Disability Relevant Programs within Department
Applied Physiology and Kinesiology	Human Health and Performance	100%
Biomedical Engineering	College of Engineering	76.00%
Speech, Language, and Hearing Sciences	Public Health and Health Professions	52.94%
Clinical & Health Psychology	Public Health and Health Professions	43.90%
Physical Therapy	Public Health and Health Professions	38.89%
Health Education and Behavior	Human Health and Performance	25.00%
Epidemiology	Public Health and Health Professions	19.23%
Special Education, School Psychology, & Early Childhood Studies	College of Education	18.75%
Mechanical and Aerospace Engineering	College of Engineering	14.28%
Human Development and Organizational Studies	College of Education	12.90%

Conclusions

We have identified the need and opportunity on the University of Florida campus, and nationwide in higher education, to engage students with disabilities in opportunities on-campus, specifically supporting their involvement in disability-related research – as a mechanism to empower and retain these students to degree completion. This work-in-progress shares our current findings for Aim 1, in which we are surveying research programs across the university campus and identifying which programs have high or moderate alignment with disability topics. We developed a scoring methodology that aligns with the disability categorization used by the university's Disability Resource Center. To date, we have surveyed 1836 research programs across 6 colleges, with 10 colleges remaining for further analysis. Our current analysis includes research programs in the Colleges of Engineering, Public Health and Health Professions, Agriculture and Life Sciences, Human Health and Performance, Liberal Arts and Sciences, and Education.

Disability-related research, whether moderate, high, or combined relevance is represented in 7.2% of the total research programs we surveyed. We are unable to compare this value to other universities, as this information does not exist in literature. However, this information is still helpful in establishing an understanding of the disability-research landscape on UF's campus.

When looking at the 9 disability categories, we found that Medical Health was most supported in the 1836 research programs analyzed, with it being represented in 66 distinct research programs.

When ranking the 62 departments based on participation in disability research, we found that Human Health and Performance, Engineering, and Public Health and Health Professions, and Education Colleges performed strongest compared to the other Colleges. As we finish Aim 1 and move into our identified Aims 2-4, it is anticipated that establishing relationships with research programs from these 4 Colleges will be critical in providing support for our initiative.

Finally, the current results show that engineering, health sciences, and the social sciences are conducting the majority of the disability-relevant research at UF. Twenty-percent of all engineering programs surveyed fell within the 84th percentile for disability relevance. With the engineering discipline's drive for commercialization and clinical translation ("benchtop to bedside"), and with our preliminary disability-representation data, we confirm that continuing our project goals in engineering and the health sciences can align with empowerment and changemaking already fostered in the engineering community.

Future Directions

This work-in-progress will continue with our research program survey expanding to capture the remaining colleges at the University of Florida for research programs with potential disability relevance. Once all departments have been thoroughly examined, other research facilities and academic units at the University of Florida will be investigated for projects that may not have been listed under a department. To address researcher scorer biases in assigning category alignment for each research program, we will also create a survey where each principal investigator will self-identify their perceived level of disability relevance; with this information, we can compare PI categorization to our research team's perceived relevance categorization.

Potential differences between researcher perceived relevance and PI perceived relevance will be used to ensure that students are given the most accurate information about each research program.

Once a comprehensive survey of all research programs has been collected, we will address Aim 2 (creating an inclusive guidebook that contains a complete of disability-relevant research programs). This guidebook will then be disseminated by the DRC through our partnership.

The partnership with the DRC will also be crucial as we move towards completing Aims 3 and 4, in which we expect to understand current student participation in disability-related research and later understand the impact of our resource on this participation. Along with addressing the Aims laid out in this paper, the ultimate goal is for this initiative to be fully integrated into the DRC community; where community members feel empowered to not only participate in disability-related research but also contribute to the development and maintenance of this resource so it best serves their fellow community members. To accomplish this goal, we anticipate that there will need to be some sort of continued self-identification performed by the PIs to ensure that all incoming faculty have the potential to be included in the latest version of the resource. We hope that highlighting the gaps in the number of disability-related research program, and the participation of students with disabilities, will inspire principal investigators at the University of Florida to investigate how their research interests can be aligned with disability-related categories to better serve the underserved disability community.

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