Board 187: Poster: WIP: Neurodivergent Engineering Students' Sense of Belonging at the University, Major, and Course Levels: A Mixed Methods Study

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Robert is a doctoral candidate in the learning sciences program at Clemson University. His research interests lie at the intersection of structured learning environments, sense of belonging, and academic confidence in undergraduate engineering students.

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Exploring Neurodivergent Undergraduate Engineering Students' Sense of Belonging: A Proposed Mixed Methods Study

BACKGROUND

- Recent increase in enrollment of neurodivergent students enrolling in undergraduate engineering programs
- Neurodivergent students in engineering remain underrepresented
- Neurodivergent students' retention and graduation rates remain lower than neurotypical peers
- Neurodivergent students in STEM programs face barriers that shape their educational experiences and outcomes
- Lack of research centering on neurodivergent student populations
- Sense of belonging among engineering undergraduates is a critical component that impacts students' academic success and persistence

(Freeman et al., 2007; O'Hara et al., 2020; Strayhorn, 2012; Tinto, 2017; Wilson et al., 2015).

WIP: CURRENT STUDY

This work seeks to provide postsecondary engineering stakeholders (e.g., faculty and administrators) with information that can bolster their support of neurodivergent engineering students by exploring how sense of belonging influences their academic experiences and outcomes.

RQ1: Is there a difference in sense of belonging for neurodiverse students, non-neurodiverse students, and those with physical disabilities at the university, major, and course level?

RQ2: How do neurodivergent engineering students describe their sense of belonging at the university, engineering major, and course level?

RQ3: In what ways do interview data with neurodiverse students explain their reported sense of belonging at each level (university, major, course)?

PARTICIPANTS

Table 1

Participant Demographics

Demographic		Percentage (n = 795)
Race/Ethnicity	American Indian or Native American	< 1%
	Asian	3.1%
	Black or African American	3.9%
	Hispanic, Latino, or Spanish Origin	3.0%
	Middle Eastern or North African	<1%
	Native Hawaiian or Other Pacific Islander	<1%
		73%
	White	16%
	Some other race or ethnicity	
Gender	Men	63%
	Women	36%
	Gender nonconforming/gender nonbinary	1%
Academic Year	First-year	48%
	Sophomore	17%
	Junior	20%
	Senior	15%

RESULTS

Across all levels, neurodivergent students had lower levels of belonging than those students who held no disability status and those who held other disability statuses.

Table 2

Means, SDs, and One-Way Analyses of Variance in Belongingness & Neurodiversity Status

Belonging Level	Neurodivergent		Non-Neurodivergent		Other		F(2, 792)	η^2
	M	SD	M	SD	M	SD		
University	5.45	1.20	5.81	1.04	5.66	1.05	6.23**	.015
Engineering	5.24	1.26	5.74	1.01	5.74	1.04	12.4***	.030
Course	5.23	1.43	5.79	1.06	5.82	1.25	13.7***	.034

Note. N = 795. Other = participants identifying with a disability not related to neurodiversity; η^2 is a partial estimate.

*p < .05. **p < .01. ***p < .001.

Table 3

Pairwise Comparisons with Tukey's HSD Adjustment

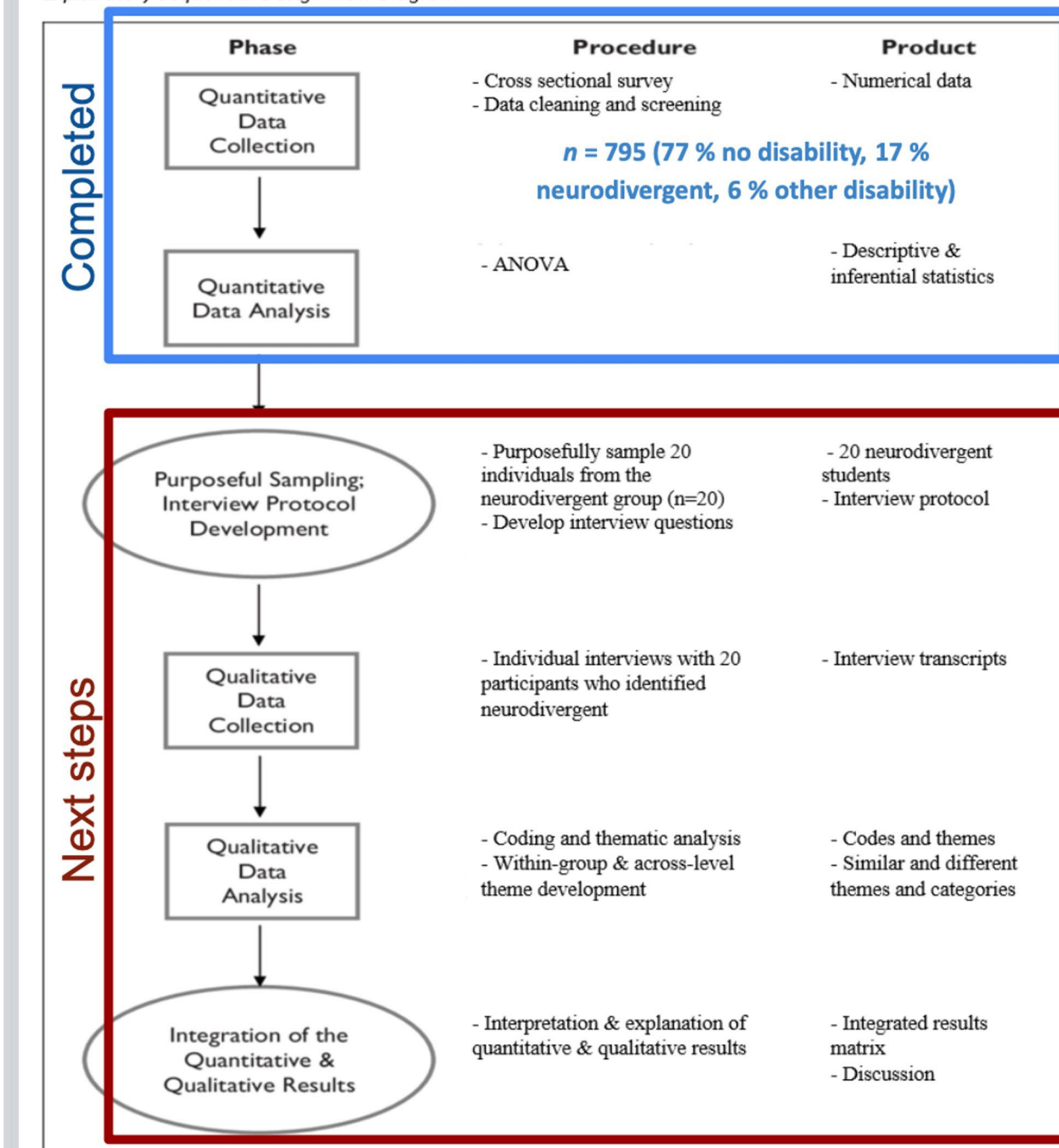| Pairwise Comparison	MΔ	SE	p	95% CI
University Belongingness				
Neurodivergent & No Disability	-0.36	.102	.002	[-0.596, -0.116]
No Disability & Other	0.155	.162	.607	[-0.226, 0.536]
Engineering Belongingness				
Neurodivergent & No Disability	-0.50	.101	<.001	[-0.735, -0.262]
No Disability & Other	.005	.160	.999	[-0.370, 0.380]
Course Belongingness				
Neurodivergent & No Disability	-0.57	.109	<.001	[-0.818, -0.308]
No Disability & Other	-0.03	.172	.983	[-0.440, 0.375]

Note. N = 795. CI = confidence interval.

STUDY TIMELINE

Figure 1

Explanatory Sequential Design Flow Diagram

Completed

Phase	Procedure	Product
Quantitative Data Collection	- Cross sectional survey - Data cleaning and screening	- Numerical data
	n = 795 (77 % no disability, 17 % neurodivergent, 6 % other disability)	
Quantitative Data Analysis	- ANOVA	- Descriptive & inferential statistics

Next steps

Phase	Procedure	Product
Purposeful Sampling; Interview Protocol Development	- Purposefully sample 20 individuals from the neurodivergent group (n=20) - Develop interview questions	- 20 neurodivergent students - Interview protocol
Qualitative Data Collection	- Individual interviews with 20 participants who identified neurodivergent	- Interview transcripts
Qualitative Data Analysis	- Coding and thematic analysis - Within-group & across-level theme development	- Codes and themes - Similar and different themes and categories
Integration of the Quantitative & Qualitative Results	- Interpretation & explanation of quantitative & qualitative results	- Integrated results matrix - Discussion

DISCUSSION & NEXT STEPS

- Findings suggest there are factors contributing to a lower sense of belonging for neurodivergent engineering students
- Quantitative results told the "what" but did not provide much insight on the "why"
- Phase II of the study will include participant interviews interviews and thematic analysis
- Sequential integration will be used to connect the qualitative data findings to explain quantitative results (Creswell & Plano Clark, 2018)

Scan QR Code for References

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