



Universal Design for Learning in Engineering: Global Faculty Development for Neuroinclusive Teaching and Assessment

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Background

Neurodiversity encompasses both neurotypical and neurodivergent individuals, recognizing natural variations in brain function and behavior. Neurodivergence includes conditions such as ADHD, autism, and dyslexia. Our research indicates that 30-45% of engineering students identify as neurodivergent [1-3].

At our institution, a survey of over 1,000 engineering students found that 18% identified as ND, 19% as possibly ND, and 62% as neurotypical (Figure 1). Notably, higher percentages of women and students identifying outside the male-female binary identified as ND. This highlights the critical need for systematic initiatives to support the retention and success of ND engineering students.

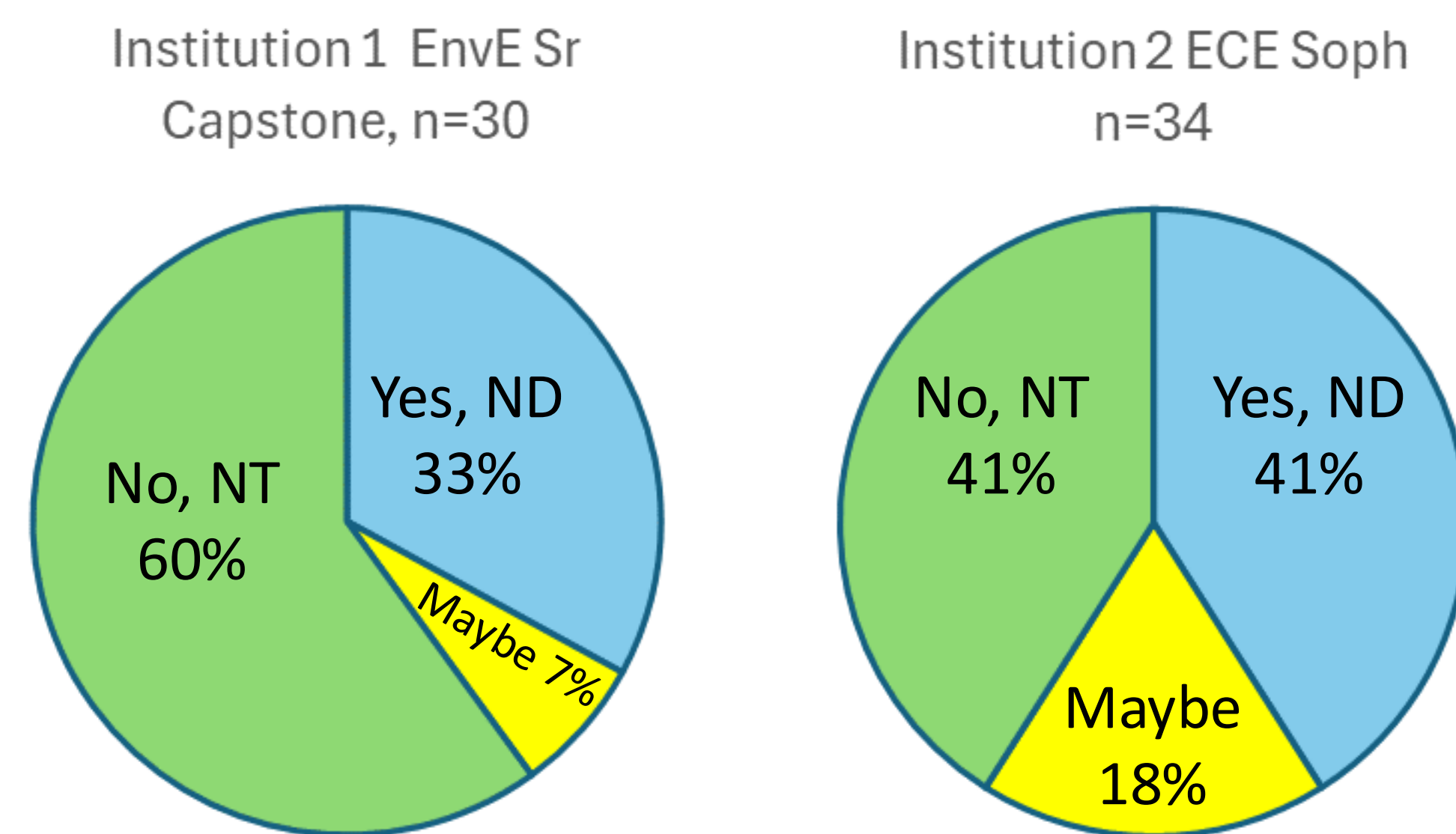


Figure 1- Prevalence of Neurodiversity across 2 institutions. Comparison: An estimated 15-20% of the world's population is ND. NT: neurotypical (Bolhari, Bielefeldt, Dyer, FIE 2024).

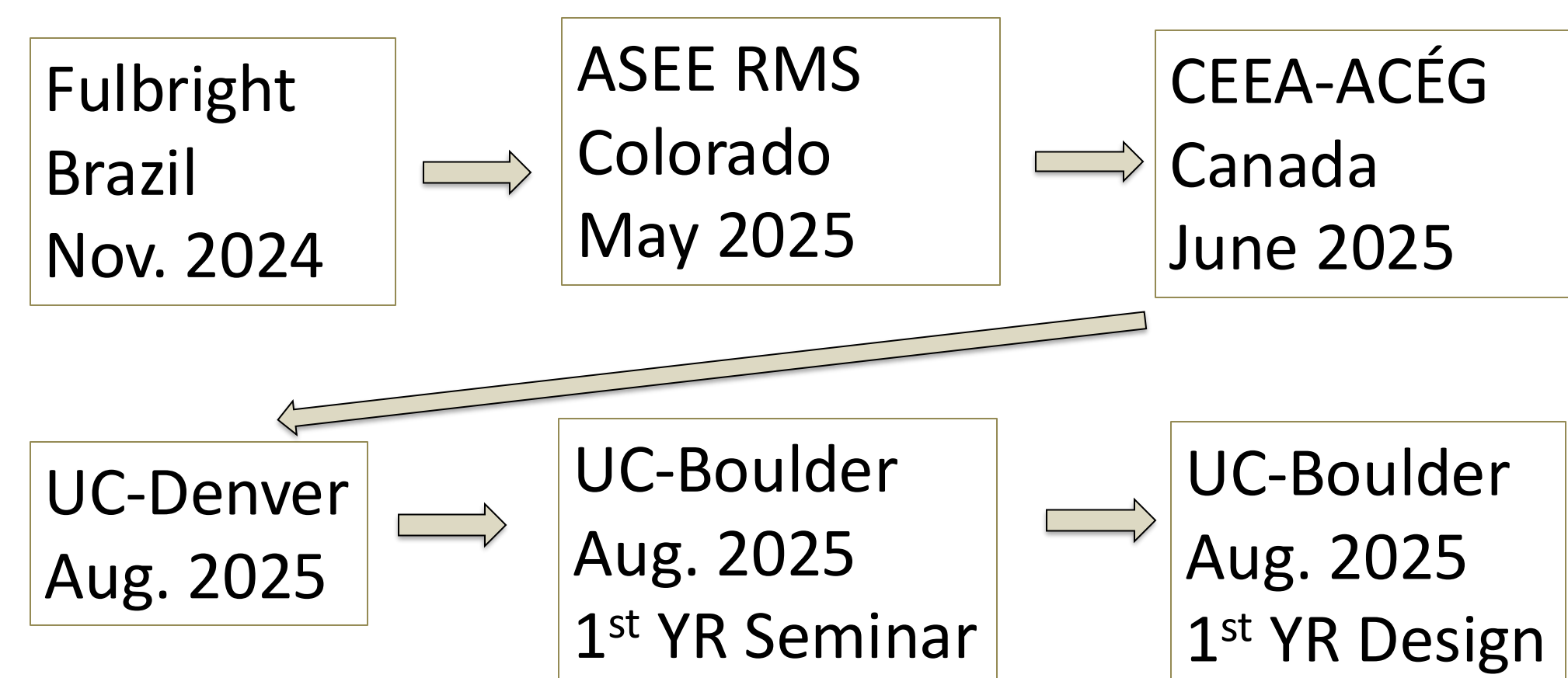


Figure 2- Flow Diagram of our ND training workshop expansion from Fulbright Brazil, to American Society of Engineering Education Rocky Mountain Section, The Canadian Engineering Education Association's (CEEA-ACÉG), and later at CU-Denver and Boulder.

Methods

Our journey in advancing our neurodiversity training workshop for STEM faculty is depicted in Figure 2. In 2024, we facilitated a well-received workshop at Fulbright Brazil's Modernization of Undergraduate Education (PMG) to train 50 engineering faculty from 8 universities on Personalized Learning Systems for Neurodivergent Undergraduate Engineering Students (Figure 3).



Figure 3- The ND training workshop conducted for Fulbright Brazil, November 2024.

The success of this model encouraged us to expand its reach. We offered the workshop at the Canadian Engineering Education Association (CEEA-ACÉG) annual conference in June 2025 and later at the University of Colorado's three campuses, training ~160 engineering faculty and their course assistants over the 2025-2026 academic year.

The workshop introduces participants to neurotypes and the strengths/challenges experienced by ND students. Through engaging discussions, case studies, and hands-on activities, participants learn to apply Universal Design for Learning (UDL) strategies and adapt instructional materials to enhance teaching effectiveness and student engagement (Figure 4). Effectiveness is being assessed via pre- and post-workshop surveys and follow-up interviews.

Results

This ongoing initiative has reached more than 100 STEM faculty so far and aims to reach over 200 engineering faculty and their course assistants within the next year. Data from the pre- and post-workshop surveys and interviews will be analyzed to evaluate the training's impact and inform future improvements.

Our pre-survey data from a small CU-Boulder cohort (Figure 5) shows:

Faculty Experience with ND/MND:

- Half of the faculty (7 out of 14) reported having experience with ND/MND.
- 92% (13 out of 14 faculty) indicated they have either:
 - Encountered challenges related to ND during class lectures, office hours, assignments, labs, or presentations, or
 - Were not aware of any ND students in their class.

Familiarity with UDL:

Almost half of the faculty identified **time constraints** and a **lack of knowledge about adaptations** as the main challenges when trying to adjust student support to enhance inclusivity.

From conducting these workshops, we have learned that:

- The STEM faculty has a diverse background regarding knowledge of ND, which can limit their progress in the workshop.
- The content covered is too extensive for a 90-minute session.
- We may want to tailor the workshop for more specialized audiences, such as faculty who teach project-based courses versus those who teach large lecture-based classes.
- Consider breaking the workshop into two sessions:
 - Session 1: ND strengths, challenges, and UDL
 - Session 2: Application of UDL for effective teaching and assessment practices
- The workshop could benefit from program, department, or college support to achieve high-impact results at the campus level (e.g., applying UDL to college-wide design expo events).

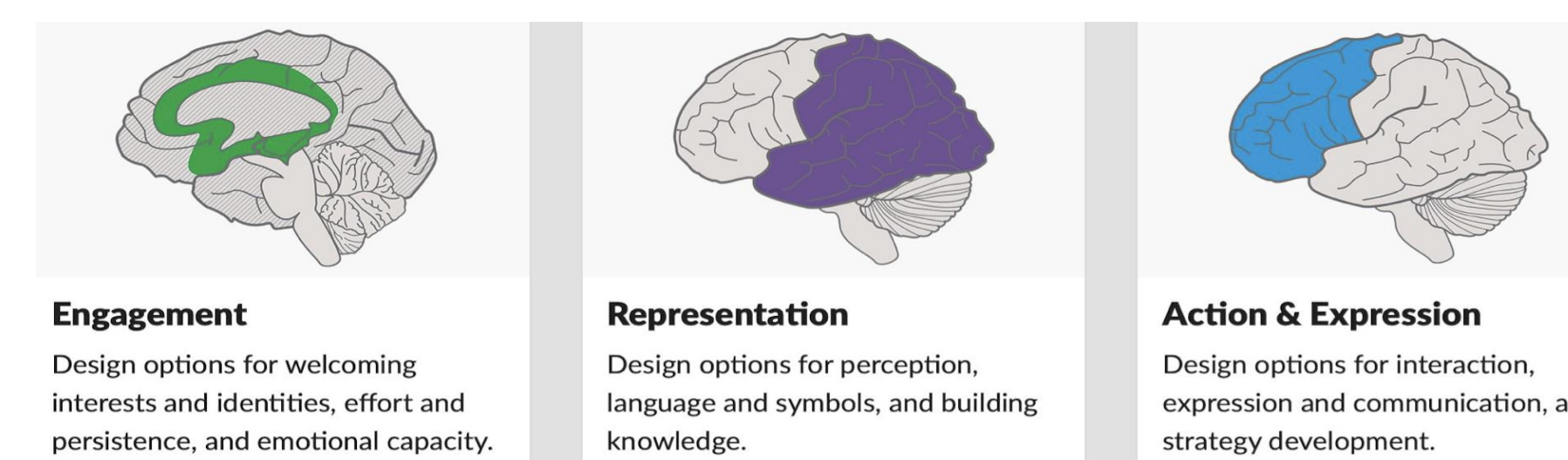


Figure 4- Our workshop is mapped to the Universal Design for Learning (UDL) principles in the area of teaching and learning assessment (cast.org).

Discussion and Conclusion

The need to support neurodivergent students in engineering education is significant and urgent. Our ND workshop model provides faculty with evidence-based strategies and practical tools to create more inclusive learning environments.

Early feedback highlights increased awareness, improved confidence in applying UDL principles, and a greater commitment to fostering belonging. Insights gained through ongoing evaluation will guide future iterations and contribute to a broader cultural shift toward inclusivity. Ultimately, by equipping instructional teams to better support mixed-neurotype classrooms, we aim to enhance student success, innovation, and equity across the field.

Acknowledgement

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References:

- [1] Bolhari, A., Bielefeldt, A., Dyer, S. (2024). IEEE FIE Conference, Washington, D.C.
- [2] Bolhari, A., Bielefeldt, A. R. (2023). ASEE Annual Conference, Baltimore, MD. <https://peer.asee.org/42464>
- [3] Bielefeldt, A., Bolhari, A. (2024). ASEE Rocky Mountain Section Conference, Boulder, CO.



Figure 5- ND workshop held at UC-Boulder for First Year Engineering Seminar Instructor, August 2025.