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Promoting Awareness Of, And Sharing Good Practices On, Supporting Engineering Students With Disabilities

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SUPPORTING ENGINEERING STUDENTS WITH DISABILITIES: PROMOTING AWARENESS AND SHARING GOOD

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1 BACKGROUND

The amount of literature that focuses on diversity and inclusion within engineering education continues to grow. However, research traditionally focuses on gender, and despite the United Nations Convention for the Rights of Persons with Disabilities (CRPD) being passed in 2016, there is still a lack of work which describes the experience of students with disabilities.

This is particularly pertinent given the increasing number of engineering students with non-visible disabilities (NVDs) including ADHD, dyslexia, dyscalculia, dysgraphia, dyspraxia, autism, and mental health conditions, whose outcomes are, in part, dependent upon the reasonable adjustments they receive. These students face many barriers, for example: bias around decisions regarding accommodations (Druckman, Levy, and Sands 2021); dependence of grades on suitability of reasonable adjustments (Singer, Golan, Rabin and Kleper 2020); and stigma over disclosure of disability (Pearson Weatherton, Mayes and Villanueva-Perez 2017). Non-academic factors such as systemic and personal barriers are more likely to affect students with disabilities, this being especially true within engineering where the culture and climate limits potential for cognitive diversity to impact engineering. Whilst the number of engineering students with NVDs is increasing, the disability employment gap indicates that students face barriers to opportunities within the profession (Pearson Weatherton, Mayes and Villanueva-Perez 2017). There is also insufficient academic training and understanding of how disabilities affect learning and academic performance, and staff attitudes toward disability support have been shown to have a direct impact on academic success (Pearson Weatherton, Mayes and Villanueva-Perez 2017).

These issues are heightened by the learning experience within higher education (HE), which varies substantially from that within schools, in which learning is often

highly structured. At the same time there is shift in pedagogical approaches used within engineering education (Dusek et al. 2018) and a higher degree of unstructured time and informal instruction. In comparison, existing accommodations have been developed for traditional learning environments and it is unclear whether reasonable adjustments allow students to develop the professional skills (e.g., flexibility, executive functioning) increasingly required by engineering employers. This alongside, the non-academic factors which can affect disabled students, may result in lower levels of self-efficacy and reduced outcomes, particularly with respect to employability, this reducing the potential for the profession to benefit from their abilities which include strong divergent thinking, creativity, innovation and risk-taking (Hain et al. 2017).

Although the use of labels can help us understand ourselves and others, and often allow access to support and resources, they can also be problematic. For example, they can only tell you so much about a group rather than an individual and thus do not encourage the use of student-centred approaches.

2 MOTIVATION

The development of this workshop was a result of the relative lack of discussion about NVDs within the SEFI community, something which becomes more noticeable as the number of engineering students with NVDs increase, and as engineering pedagogies change. We also acknowledge that the way in which disability is treated is also likely to vary in different geographical locations, and there is a need for comparison and sharing good practice across European countries. Our objectives thus included: comparing the processes and practices which impact students with NVDs in different contexts; amplifying practices that foster inclusion of disabled engineering students; and creating opportunities to share insights and practice.

3 WORKSHOP

The workshop consisted of the following activities:

1.) Plenary:

- An introduction to the workshop format and facilitators and discussion of ground rules such as respect and confidentiality.
- Terms used and scope of the workshop. Our use of non-visible disability (NVD) was related to physical, mental, or neurological conditions that limit a person's movements, senses, or activities that are invisible to the onlooker. Whilst we recognised the existence of a range of NVDs, physical conditions were considered beyond the scope of this workshop which focused specifically on neurological conditions such as ADHD and ASD, as well as mental health conditions.
- An introduction to some of the issues that may be present within engineering education. For example: different way of processing which often require more time; losing sight of objectives which may mean students do not finish tasks; difficulty with time & self-management

resulting in late, unstructured ways of working and difficulty synthesizing; difficulties understanding expectations, especially when requirements are very open; difficulties in prioritizing or distinguishing between major and minor issues; misinterpreting questions/explanation or social situations; sensory overload which may involve getting emotional or withdrawing; and anxiety induced by unfamiliarity or unpredictability.

- Definition of reasonable adjustments or accommodations: “making changes to tasks, environment, or the way things are done to provide equal access to education without changing the fundamental learning objective of a course” and discussion of the process that occurred before adjustments could be made (Figure 1).

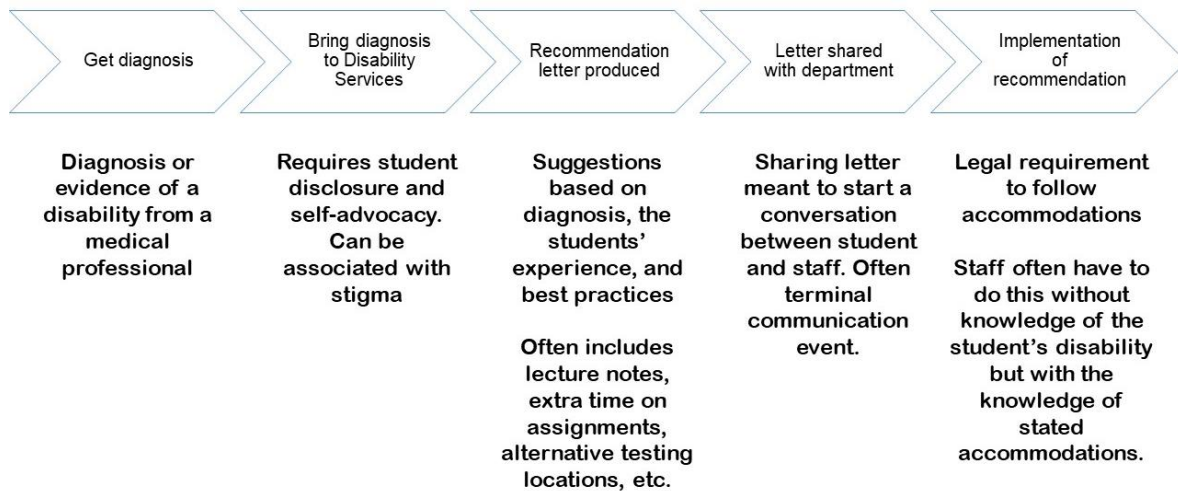


Figure 1: Stages of the processes which is typically followed in order for a student with NVDs to receive reasonable adjustments or accommodations.

- 2.) Activity: Participants discussed variations in the definitions of disability and institutional policy with respect to requirements for support and reasonable adjustments within different contexts.
- 3.) Plenary: Discussion of UDL and UDL pyramid (AHEAD). It was recognized that a continuum of support is required for inclusion. Participants were introduced to The Inclusive Education Pyramid (AHEAD) which encourages us to aim to move supports as low down the pyramid as possible to ‘Universal Design for the majority of students’ whereby UDL principles are incorporated into the mainstream teaching, learning and assessment practices of an institution and thus the majority of students can have a successful learning experience without additional support being necessary. The UDL Guidelines (UDL 2018) were suggested as a tool for the implementation of Universal Design for Learning. The framework offers a set of concrete suggestions that can be applied to any discipline (including engineering) to ensure all learners can access and participate in meaningful learning opportunities.
- 4.) Group activity: Participants provided examples of learning and teaching activities in which they needed to support a student with a NVD. They were invited to share concerns and experiences, as well as ideas for classroom

policies and practice including: support for transition to university; examples of practices and teaching interventions that support students with NVDs.

5.) Plenary: The workshop finished with recommendations and next steps. We suggested:

- asking students with NVDs what they need;
- ensuring multiple ways in which to access course material and feedback e.g., lectures and (old) videos;
- providing detailed answers to coursework;
- providing written and verbal feedback;
- using clear, specific instructions;
- addressing unacceptable behaviour regarding disabilities by others;
- creating alternative spaces.

4 WORKSHOP RESULTS

The terms used varied significantly between contexts, with those similar to 'non visible' including 'non apparent'. Although use of the term neurodivergent was common, deficit terms such as "handicapped" and "slow" also featured. 'SEND' or 'special educational needs and disabilities' was used by one participant. Multiple participants said that terms were not discussed or disclosed and that the focus was on the accommodations. One participant said that students were referred to as 'extra time students' by both staff and peers.

Accommodations included extra time and rest breaks; flexibility of deadlines; provision of quiet, sensory, or resource rooms; eating in class; one to one tutoring; and online provision. One participant noted that reasonable accommodations were referred to as 'excuses' in their context.

Discussion of support within learning and teaching primarily focused on group work, presentations, and project-based learning. We discussed: the creation of plans for missed sessions; requests for private feedback; low stakes opportunities to present; transparent course structures; use of flexible deadline and grading policies; capturing spontaneous feedback electronically; use of alternative workspaces; scaffolding team agreements; and self-advocacy within groups.

It is clear that the terms and practices used within different contexts varies considerably and that deficit approaches are still common. It is therefore likely that the community would benefit from sharing practice.

5 SIGNIFICANCE AND CONCLUSION

Participants benefited from an increased awareness of the different contextual uses of the term NVD, as well as ideas about how to enhance the experience of students with NVDs in their own institutions. The workshop also contributed to the development of a safe space in which to discuss issues which had received relatively little prior attention within the SEFI community. It demonstrated enthusiasm for such work and has helped foster relationships between interested parties. This session

therefore formed a basis for the formation of community of engineering educators interested in supporting the education of students with disabilities.

As facilitators of the workshop, we have two key reflections:

1. A large number of participants disclosed and shared their own personal circumstances with us, something which may be expected of a self-selecting audience. However, the openness to share may be an initial indication of the development of bottom-up movement towards challenging some of the embedded misconceptions and the status -quo.
2. A critical aspect going forward may be shortage of data and establishing ways of collecting it.

6 REFERENCES

- Druckman, J. N., J. Levy, and N. Sands. 2021. "Bias in education disability accommodations". *Economics of Education Review* 85,102176. <https://doi.org/10.1016/j.econedurev.2021.102176>.
- Dusek, J., D. Faas, E. Ferrier, R. Goodner, A. L. Sarang-Sieminski, A. Waranyuwat, and A. Wood. 2018, June. "*Proactive Inclusion of Neurodiverse Learning Styles in Project-based Learning: A Call for Action*". Paper presented at *2018 ASEE Annual Conference & Exposition, Salt Lake City, Utah*. <https://doi.org/10.18260/1-2--30891>.
- Hain, C. C., W. C. Turek, A. Esmaili Zaghi, and A. Hain. 2017. "*Experiences of Pre-College Teachers Working with Undergraduate Engineering Students with ADHD in Research Laboratories*." Paper presented at *2017 ASEE Annual Conference & Exposition, Columbus, Ohio*. <https://doi.org/10.18260/1-2--27786>.
- Pearson Weatheron, Y., R. D. Mayes, and C. Villanueva-Perez. 2017. "Barriers to Persistence for Engineering Students with Disabilities." Paper presented at *2017 ASEE Annual Conference & Exposition, Columbus, Ohio*. <https://doi.org/10.18260/1-2--27650>.
- Singer, G., M. Golan, N. Rabin, and D. Kleper. 2020. "Evaluation of the effect of learning disabilities and accommodations on the prediction of the stability of academic behaviour of undergraduate engineering students using decision trees". *European Journal of Engineering Education*, 45, no. 4: 614-630. <https://doi.org/10.1080/03043797.2019.1677560>.
- UDL: CAST. 2018. Universal Design for Learning Guidelines version 2.2. [Online] Available: <http://udlguidelines.cast.org>.
- UDL & the Continuum of Supports. AHEAD. [Online]. Available: www.ahead.ie/udl-pyramid.

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