Bringing the edges to the core

Damien Motte and Rhiannon Pugh

***Abstract*—When a course is designed, it is common to do it for a typical group of students, considered to represent "the majority", the "norm" or the "average". The concept of "edges" challenges this view: given the multiple dimensions that teaching and learning encompass, there will always be students who do not belong to a norm and will end up on an edge if they are not included in the course design. In this paper, we propose to adopt "design to the edges" as a useful teaching tool for making our teaching more inclusive, higher quality, and appropriate for more of our students. We draw on some examples from ours, and our colleagues, pedagogy, to illustrate some practical ways in which "edge" thinking can be incorporated into our teaching.**

***Index Terms*—Design to the edges, Universal Design for Learning, Inclusive Classroom, Student Diversity**

I. Introduction

THE concept of designing a course "to the edges" has been popularized by Todd Rose in his TEDx talk, *The Myth of Average* [1]. Rose explains that there are so many variations in a classroom that "the average student" should not be seen as the norm, and that it is therefore beneficial to systematically have the edges of the distribution of students in mind when designing or updating a course. In other words, if there are always "edges" in any group, then the edges should not be considered deviations from the normal population, but instead we should be aware of the interplays and overlaps between the edge and the core.

The edge concept is quite similar to what has been developed within Universal Design for Learning (UDL), which focuses on diverse students, or "those in the margins" [2, quote in original]. Design to the edges or for the edges is also found in the Universal Design (UD) literature, from which UDL stems [3], as illustrated by [4]. This literature agrees that what is good for the edges or margins is generally good for the core [2, 4]. In this sense, an "edge" is not a problem to solve; instead, it is a way of viewing student diversity in its various facets.

UDL principles can in theory be applied to every type of inclusion problem, but the narratives developed around the UDL framework, and its applications, are overwhelmingly oriented towards students with some form of physical, language-related, or psychological impairment or belonging to a minority group. What is appealing about the term "edge" is its neutrality, freedom of interpretation, and the idea that anyone can end up at the edge. "Design to the edges" can be used as an approach to include types of diversity that would not be naturally prioritized under the UDL paradigm, such as very skilled students, students from different programmes, etc.

In this paper, we will first present how the design to the edges concept can help avoid pitfalls in course design and enhance inclusivity. We will then provide some illustrations from our own and others' pedagogic practices as to how we can design our teaching for the edge, and explain why we think this might be beneficial for our students, and even for us as teachers.

Manuscript received November 9, 2023.

D. Motte is a senior lecturer at the Division of Innovation, Department of Design Sciences, Faculty of Engineering LTH, Lund University (corresponding author, e-mail: damien.motte@design.lth.se).

R. Pugh is a senior lecturer at the Division of Innovation, Department of Design Sciences, Faculty of Engineering LTH, Lund University (e-mail: rhiannon.pugh@design.lth.se).

II. Design to the edges

A. Different course design strategies and their pitfalls

Different strategies can be used to design and update courses. Some strategies ignore the edges altogether or do not consider them important. Edyburn and Edyburn [5] mention that some teachers assume that the students are similar to themselves (motivated by course subject, for example), and design the course accordingly—the trap of *ego design.* This can lead to problematic teaching if, as Goldstein and Benassi [6] explain, there is a mismatch between what the teacher and students think good teaching actually is and how to go about it.

Another trap is to *design for the average*. Rose [1, 7] strongly advises against designing for the "average", that is, the average student, or the majority of the students in a course or classroom. As soon as several dimensions or criteria are involved in the development of a course, there is no such thing as an average student anymore.

From the design typology presented by Molenbroek and de Bruin [8] (which inspired Edyburn and Edyburn [5]) other course design strategies can be identified. Teachers can be attentive to the edges, but often via *design for the small* or *design for the tall*, that is, helping only one end of the student population. This can be unintentionally the case when using UDL principles: the focus is placed on supporting students with specific disabilities, possibly neglecting the other end of the population. This is obviously not part of the UDL philosophy, but teachers can easily disregard the other types of "edges". For example, whilst university teachers are highly likely to encounter "gifted" students, very few actually have any training or preparation regarding this specific group [9].

Last but not least, teachers can go away from student-centred learning back to the "teaching paradigm" [10], that is, on purpose, leaving the responsibility of finding learning strategies entirely to the students at the edges.

B. Design to the edges mindset and approach

As mentioned in the introduction, we think that the term

"edge" is well suited to help switching from the design strategies above to more inclusive and appropriate ones. "Design to the edges" is not as value laden as is UDL and opens for more "edges" to be included in a course design.

Our own reflections about designing to the edges in teaching are that we increase empathy as teachers towards students with different needs, experiences, and competences, and not limit ourselves to specific groups of excluded students. Above all, designing to the edges is a mindset: being aware that there can indeed be many edges and designing the course to try to bring them to the core.

Design to the edges can be applied in different ways. Rose [1, 7] strongly advocates against the idea of average and for embracing variation. In practice, inclusion is often a problem of including a minority in a larger group. In this case, one approach is to use the concept of the *academic diversity blueprint* developed by Edyburn and Edyburn [5, 11]. It consists, for each proposed pedagogical solution, of systematically controlling that it is beneficial to both the group to include and the larger group. Such a pedagogical solution has more value if all benefit from it instead of only the target group, and it is less costly because it can be applied to both groups (i.e., the development of dedicated solutions is avoided). This approach can easily be extended to several groups, and functions as a win-win.

Designing to the edges can require some initial mind training. A point of departure can be to focus on the edges or margins highlighted in the UDL literature [2], as illustrated below.

III. Illustrations

With these illustrations, we want to demonstrate how the design to the edges mindset can be used. The first section presents actions that are simple to implement. The following illustrations aim to show the range of issues that design to the edges can address. We also report, in terms of costs, by how much the adopted solutions augmented the teaching load, such as an increase in teaching time or hiring new guest lecturers or experts.

A. *Designing to the edges – first steps*

We, of course, want to include students who have possible hinderances to their studies, and help them to achieve the best possible results and to be able to access and enjoy their education of equal terms. Much of the focus on UDL is about such cases of either visible or invisible disabilities, and this is a fundamental part of designing to the edges. An easy place to start, we found, was with our own teaching materials, avoiding red-green colour schemes, adding alt text to our pictures, and switching on the caption function both when we present in real time on PowerPoint and captioning our videos. These small steps can make a big difference to disabled students. Likewise, "taking control of the room" by rearranging furniture to improve access, sorting out the lighting, using the available microphone so it links into the classroom's hearing loop (a sound system for people with hearing aids), and generally making the space as welcoming and comfortable as possible will benefit all students. When we get into the habit of doing these things, they no longer become extra work but simply part of the preparations we do—this is changing mindset to bring the edges to the core.

B. *Designing for very skilled students*

In some courses, especially first-year courses, students present a large variety of skill or knowledge levels. The strategy adopted is often to ensure that all students reach the intended learning outcomes, meaning in practice that extra effort is usually targeted towards groups of students in need of support. What is often overlooked is the other edge: very skilled students.

The course Manual and Computer Aided Drafting (MMKA25), part of the programme of Mechanical Engineering (M/MD), contains a module aimed at teaching basic computer-aided design (CAD) skills. Students coming from technical high schools already have two–three years of experience with CAD, some even with the same CAD software used in the course. These students are at the edges of the M/MD student groups in this module. When the module was reorganized, the first beneficiaries in mind were the majority of students, but the changes integrated the skilled students in a relevant and engaging way. First, the lectures are recorded, and students are able to study them at their own pace. Second, the examination is a project where the students model a product of their choice. 40% of the evaluation mark is devoted to the level of "stretch" in the project. The more they work on the project, the higher the stretch, and the higher the grade. Experienced students can then further improve their skills, without this being detrimental to novice students. Fig. 1 shows that both novice and advanced students can go very far in the project.

The reorganization of the course has been costly in terms of time. However, there was no extra cost for including the more and less skilled (or having prior knowledge) students.

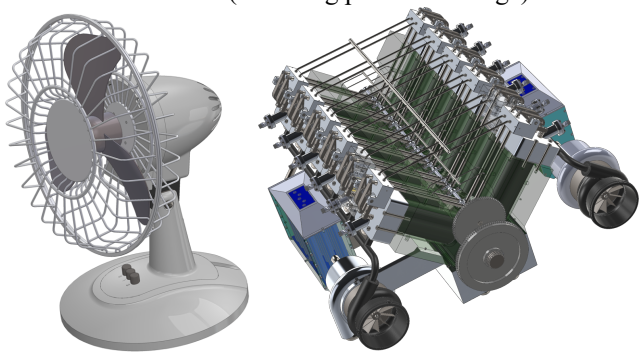

Fig. 1 Examples of project outcomes with high stretch. Left: table fan modelled by a novice student; right: engine modelled by student with prior knowledge in CAD (courtesy of the students).

C. *Designing for heterogenous groups of students*

Sometimes, existing courses can be asked to include more programmes than was intended when the course was designed. These students have different knowledge and skills and land *de facto* into the edges.

In the course Product Innovation (MMKN35), an advanced course targeting mainly M/MD students, two new programmes were recently included, Biomedical Engineering (BME) and Engineering Nanoscience (N). For the BME group, one solution for putting the group more in the centre was to search for industrial projects for which their specific skills could be employed on par with those from M/MD. For the N students, a solution was to incorporate them into groups with other programmes and

give the possibility to contribute more to some parts of the project than others, while still being able to fulfil the learning goals (retrospectively, N students contribute equally to most parts of the project). For BME and N students, an additional lecture was included to give them the same background as M/MD students. The only extra cost is this additional lecture.

D. Designing for inclusive group work

Group work is an activity where there is truly no average person; every individual presents variations in terms of personality types, preferences and life experiences, and acts differently according to those. This greatly affects group dynamics and can lead, in some cases, to misunderstandings, conflicts, and exclusion. In a design for the average perspective, some general rules of conduct can be proposed to alleviate several clashes and disagreements. In a design to the edges perspective, students can be made aware of individual variations and how to recognize them, how they govern group dynamics, and how to use them for the benefit of the group.

In the course Product Innovation (MMKN35), the students become acquainted with the Myers-Briggs Type Indicator (MBTI) [12] and work on cases illustrating how these variations can be used in product development.

The extra cost in this case was high (external lecturers, a supplementary four-hour seminar, and a follow-up session). However, the decision to include this aspect to such an extent was made based on the relevance of those skills for the students' future professional lives, not just for the course.

E. Examination for the edges

Sometimes, it is relevant for a course to have a specific form of examination. However, this penalizes students, which for external reasons (parenting, work, etc.) cannot easily adapt to this.

The examination of the technical drawing module of the course Manual and Computer Aided Drafting (MMKA25) is in the form of four weekly quizzes, which can be problematic for some. The teacher, however, provides the possibility of taking an exam at the end of the study period. This solution fits students who could not attend all quiz sessions, those who did not pass the quiz sessions, and those who would prefer exams to quizzes. For the teacher, there is no cost at all, as this replaces the course re-take.

Another example is the examination of the course Inspiring Introduction to Industrial Design, Part 2 of 2 (IDEB01). The course is part of the Industrial Design programme, an artistic education programme in which students present a large variation in terms of personal and educational backgrounds. The examination was based on a written assignment, a format that several students found limiting and gave mixed results. The teacher realized that, for this course, giving freedom in terms of format would allow the student to best express their results without consequences for the intended learning outcomes, and allowed almost any form of presentation: comic book, poem, podcast, movie, play, mind map, interview, etc. Bringing this diversity to the core increased the quality and satisfaction of the students. The original extra cost was high in terms of feedback because of the diversity of the formats, but the teacher is now using an on-demand form of feedback that suits students and is much less time-consuming.

IV. Conclusion

In this paper, we have tried to bring design to the edges into our discussion of course design, explaining how we can use this approach to help us design learning environments that benefit the majority of our students.

What we suggest is a mindset change, where we try to think about the wide diversity of our students and move away from designing our teaching for a norm that might not exist, or only in a handful of cases. The suggestions and illustrations we have made in this paper show that this approach can be beneficial for all student groups, whether on the edge or not, often at a low cost for the teacher. Edges can come in different shapes and sizes to extend the spatial metaphor, and once we start thinking inclusively and exhaustively about edges, we realise that most of us are, indeed, on the edge in one way or another!

Acknowledgment

The authors thank Per-Erik Andersson, Despina Christoforidou and Katarina Elner-Haglund for sharing their experiences and ideas in designing to the edges.

References

[1] TEDx Talks, Santa Rosa, CA. *The Myth of Average: Todd Rose at TEDxSonomaCounty*. (June 19, 2013). Accessed: 29 October 2023. [Online video]. Available: https://www.youtube.com/watch?v=4eBmyttcfU4.

[2] A. Meyer, D. H. Rose, and D. T. Gordon, *Universal Design for Learning: Theory and Practice*. Wakefield, MA: CAST Professional Publishing, 2014.

[3] M. King-Sears, "Universal Design for Learning: Technology and pedagogy," *Learn. Disabil. Q.,* vol. 32, no. 4, pp. 199-201, 2009, doi: 10.2307/27740372

[4] D. Valgeirsdottir, "Promoting an inclusive mind-set through method support: Universal Design Playbook," in *Proceedings of the XXXII ISPIM Innovation Conference: Innovating our Common Future*, I. Bitran *et al.*, Eds., Lappeenranta, Finland: LUT Scientific and Expertise Publications, 2021.

[5] D. L. Edyburn and K. D. Edyburn, "Design for more types: Designing text to support the access, engagement, and success of diverse learners," in *Accessible Instructional Design*, D. L. Edyburn, Ed., Emerald, 2015, pp. 121-159. doi: 10.1108/S2056-769320150000002006.

[6] G. S. Goldstein and V. A. Benassi, "Students' and instructors' beliefs about excellent lecturers and discussion leaders," *Res. High. Educ.,* vol. 47, no. 6, pp. 685-707, 2006, doi: 10.1007/s11162-006-9011-x

[7] T. Rose, *The End of Average : How we Succeed in a World that Values Sameness*. New York, NY: HarperOne, 2015.

[8] J. F. M. Molenbroek and R. de Bruin, "Anthropometry of a friendly rest room," *Assist. Technol.,* vol. 18, no. 2, pp. 196-204, 2006, doi: 10.1080/10400435.2006.10131918

[9] M. Plunkett and L. Kronborg, "Learning to be a teacher of the gifted: The importance of examining opinions and challenging misconceptions," *Gift. Talent. Int.,* vol. 26, no. 1-2, pp. 31-46, 2011, doi: 10.1080/15332276.2011.11673587

[10] R. B. Barr and J. Tagg, "From teaching to learning — A new paradigm For undergraduate education," *Change,* vol. 27, no. 6, pp. 12-26, 1995, doi: 10.1080/00091383.1995.10544672

[11] K. D. Edyburn and D. L. Edyburn, "Universal design engineering," in *Transforming our World Through Design, Diversity and Education. Proceedings of Universal Design and Higher Education in Transformation Congress 2018*, G. Craddock, C. Doran, L. McNutt, and D. Rice, Eds., IOS Press, 2018, pp. 553-560. doi: 10.3233/978-1-61499-923-2-553.

[12] I. Briggs Myers, M. H. McCaulley, N. L. Quenk, and A. L. Hammer, *MBTI Manual : a Guide to the Development and use of the Myers-Briggs Type Indicator*, 3rd ed. Palo Alto, CA: Consulting Psychologists Press, 1998.