

Personalized Transdisciplinary Education

As the STEM workforce is required to address increasingly complex human-centered problems, members of the workforce will increasingly be required to innovate across disciplinary boundaries. Additionally, the undergraduate STEM student body will also be more diverse by 2040, so we need to develop educational approaches to suite the broad needs and interests of the student body. We need to develop paradigms that present material in a way that is applicable to the full range of students who will be in our classrooms and that allows all of them to apply the material to their own lives. Ideally, these paradigms will also leverage the diverse perspectives of the student body to enrich the experiences of all students

In order to best prepare students to join the STEM workforce of the future and to leverage the diverse strengths and interests of the students in the future, I propose that undergraduate STEM education in 2040 adopts an approach which I call “personalized transdisciplinary education.” This approach would require all students to choose 2-3 subject foci, with at least one of them falling outside of what we traditionally consider STEM disciplines, and a mandatory culminating project of their choice. By definition, this approach would require all STEM students to gain a deep understanding of at least one non-STEM subject, making training in multiple disciplines the norm rather than the exception.

The personalization of this experience would come not only from students selecting their own constellations of subject foci, but also from ongoing reflective activities, exchanges of ideas through a peer network, and individual faculty mentoring. These activities will be layered above existing coursework in the different subject areas to allow students opportunities to reflect on the relevance of their coursework in their lives and connections between the questions and ideas presented in different subjects. The ongoing reflections will allow students to spend some time doing this individually and embrace all different forms of reflection, expression, and communication (different genres of writing, visual and performance art, digital creations, mixed media, etc.). Students will also periodically meet and reflect with peers to engage in facilitated discussions where they can share their ideas with small groups of peers from the subject foci that they have selected. Since each individual student will be involved in groups for multiple subject areas, this peer network structure will facilitate further cross-pollination of ideas. For instance, a group with students who are all studying mathematics may have some of them doubling in philosophy, creative writing, and dance and thus will hear ideas that are influenced by the ideas and practices in all of these disciplines. The consistency of meeting with the same groups of peers throughout will facilitate free sharing of ideas and the development of trust so that these peer groups can help foster students’ transdisciplinary thinking throughout their undergraduate trajectories and potentially beyond.

The peer groups and individual faculty mentoring will form the support structure as students develop their ideas, reflect on their coursework and its relevance, and pursue their culminating projects. Importantly, these culminating projects should be as open-ended as possible, emphasizing process over final products. This will give students the freedom to explore an area of inquiry that feels important to them, regardless of its disciplinary implications, and to

communicate their journey of engaging in the product in whatever way feels authentic to them and their inquiry. This freedom gives students to leverage their diverse ways of learning and communicating.

This approach has the advantage that it can build on existing disciplinary curricula that already exists in undergraduate institutions. Many courses have already shifted towards highlighting open areas of investigation and connections to society, which will all be beneficial in implementing the proposed approach. The innovation comes from layering coursework in multiple subjects with an ongoing process of reflection and peer and faculty support through the process of ideating and investigating topic(s) of student interest. By having cognitive and procedural autonomy in this process, student agency is honored and students can learn from the diverse approaches of members of their cohort. Furthermore, the process facilitates students considering new connections between the areas that they choose to study, thereby promoting the type of interdisciplinary thinking required in the STEM workforce.