Imagining the Future of Undergraduate STEM Education - Idea Competition
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As a white, heterosexual, cisgender, male, I benefit from essentially every obvious privilege category. Additionally, as a physics professor, my path to success was helped by many other aspects of privilege. Why do I mention my privilege? It is part of my journey to understand the anti-black, institutional racism that is part of universities. ***Institutional structures that must be changed if the future of STEM education will achieve the diversity needed for STEM research to achieve its full potential and for STEM graduates to maximize their contribution to society in whatever roles they engage.***

Before going further, I do want to acknowledge all of the great research on inclusive pedagogy and anti-racist approaches to teaching. These are important, well-documented, and need to be embraced. Also, the elements I discuss here are not the only examples of institutional racism in our university system, and I certainly have more to learn in this space. Finally, these are not new suggestions for reforming university education. However, at this moment in time, naming the explicit connection between these elements and institutional racism adds a level of urgency to addressing these issues.

Three elements that have emerged for me as critical elements to interrogate are: gatekeeping elements of the curriculum, approach to academic integrity, and the role of high-stakes assessments. These can be summarized as the *university in its role as enforcer of "standards"*. The challenge with standards is that over time the proxies for standards become seen as the standards themselves, transforming into *barriers*. To be clear, I am not advocating for any lowering of standards or reduction in academic rigor. I have been involved in conversations about teaching for long enough to already know that challenging these core elements of the university system tend to generate defensive feelings and claims that changing these norms will have a negative impact on the university. These are excuses to avoid change. This is why we need to be crystal clear that these practices are currently employed as *proxies* for standards, rigor, and excellence.

Though all three are important, the gatekeeping role of the university is at the core of all of them and provides a good example of the changes we need to embrace. All too often, our curriculum, grading scheme, and entire system is justified by a sense of responsibility for ensuring that only qualified students "make it through" – that doctors, lawyers, engineers, teachers, etc. are "good at their job". Everyone phrases it differently, with this practice being described with everything from the negative connotation of "gatekeeping" to the positive connotation of "ensuring quality". A challenge of this approach is that this fundamental perspective leads to a selection mentality that is especially susceptible to implicit bias, creating imposter syndrome, and other challenges for students. It is often the justification for grading on a curve, a practice with increasing evidence of being inherently biased. If you view your role as the gatekeeper for the next stage, the unconscious (and sometimes explicit) focus is predominately on if people are qualified – which is not inherently bad *– but in education the focus should be on providing the opportunity for students to learn.* How often in the first year of a student's career do we attempt to determine if "they are already qualified to be a STEM major"? This is often justified as ensuring students "do not waste time in the wrong major". To use buzz-words, it is harder to be student focused, and can lead to a deficit focused approach. Again, not everyone wants to or should be a STEM major, but 17 and 18 year olds probably need more than one semester or even one year to make this decision!

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A more appropriate goal for a University is to provide every student the chance to be the best they can be at a discipline – whether they are then selected for a particular career or graduate program is the responsibility of the next stage. This is a radical shift in the view of our role as faculty and an institution. If your goal is to help people reach their potential, it is more natural to be strength based. This requires leveraging student's strengths, resulting in a growth mindset approach. You will create a curriculum that has multiple pathways and is student focused. It is about scaffolding the student experience to maximize success. ***You will create a curriculum that is truly capable of creating the diverse STEM workforce of the future that is essential to ongoing progress that embraces equity and inclusion.***

There are a number of challenges and barriers moving beyond a gatekeeping mentality. On the surface, the current system appears "neutral", in that faculty work to apply standards equally to all students. This creates a sense of "fairness" and any criticism of the current structures is dismissed as attempts to "make it easier for some students". This is precisely one of the problems that years of research on implicit bias has pointed to. Moving forward, the claim of "neutrality" must be understood for what it fundamentally is – an excuse that does not acknowledge years of valid research and allows us to avoid making difficult changes.

It is worth briefly closing with a specific example from physics. The main selection criteria for making it through a physics degree – the ability to do word problems that involve detail algebraic manipulations and calculations "by hand". This is justified by "this is how we all learned to be physicists". And yet, the competencies we test and grade for are probably the least used by professional physicists, and certainly the least used by physics majors that go into the wide-range of fields they populate. Imagine a STEM education future that allowed multiple pathways and alternate assessments that achieve the end goal of having the critical thinking, complex problem solving, team work, and communication skills we claim the undergraduate STEM education is intended to provide.