Author's Commentary: The Higher Education Problem

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The 2021 ICM Higher Education Problem

The 2021 ICM® Policy Problem asked students to look at different systems of higher education around the world and find a way to measure the health of the ecosystems. This problem was conceived at a time when many U.S. institutions, already struggling to balance their books, were faced with lost revenue as students moved off campus and were no longer paying room, board, or activity fees. For decades, many U.S. institutions of higher education have entered a race that has less to do with the quality of the education itself and more to do with the amenities: the swanky coffee shops in the library, the climbing walls and indoor tennis courts, and the wide array of dining options. All of these amenities cost money, and yet state and federal funding has gone down. This has led some institutions to increase their level of privatization or their dependence on alumni donor support.

During the covid pandemic, many of these outside sources of funding also started drying up. The cracks in the financial schemes in higher education grew wider in the spring of 2020, as schools were just beginning to wrestle with the reality of the pandemic and as high school seniors were finalizing their decisions for the fall, some universities began jockeying for student matriculation dollars by offering highly optimistic promises of a fully in-person college experience in Fall 2020. Some students were left with bills from private dorms and apartments even though the universities were closed. Other students were told to show up in the fall, only to be told 10 days later that everyone had to go home. Students and faculty scrambled to acquire the necessary hardware and learn the requisite software to continue classes online; and disparity in the availability of laptops, high-speed internet, and even quiet spaces to learn raised very real concerns

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about equity and access in online learning. As sports seasons were canceled, many student athletes became concerned about the uncertainty of ability to stay in school as they awaited announcements about the continuation of their scholarships. Every week throughout the summer and fall of 2020, it seemed as if every major media outlet had a new story chronicling the unexpected impacts of the covid pandemic on higher education.

This set of events exposed some very real and concerning cracks in the U.S. system of higher education, and it caused me to wonder:

- What really is the point of higher education?
- In what proportion is the purpose of higher education to provide a liberal education to a large swath of the population, to expand the middle class by training students for careers, to produce cutting-edge research?
- In what proportion should we value: the dorm experience, the quality of education for undergraduates, the quality of graduate programs, the quality of research, the athletics programs, the exposure to diversity of thought (which relates to issues of access and international draw), and/or other aspects of higher education?
- If we consider some ideal proportion for valuing various goals of education, is the current funding structure—who pays and how much is allocated to each area—aligned with that ideal?
- Even if things are aligned, how can we measure the health of the system today and the level at which that health can be sustained over time?

The answers to these questions will vary based on who is asked: a college junior on a full scholarship at a private school, an administrator at large public university, a parent of a high school student in the throes of college applications. The answers also vary from country to country, since there are different approaches to funding, to the experience, and to access. For example, some nations have public universities that are completely tuition-free, some offer only the educational aspect of the experience with most students living at home or finding their own off-campus housing, and some limit access to their universities by identifying university-bound students through early testing and educational tracking. I have had many conversations with colleagues from around the globe; and while each system of higher education has been hit differently by the pandemic, nearly all have had cracks exposed—systemic issues that were always there, now visibly stressing the system.

Having had conversations with university faculty and administrators, I wondered what students thought about this issue—and the 2021 ICM Higher Education Problem was born! In early drafts, the problem focused on the challenges in the U.S. and focused on the pandemic. However, given the international level of participation in the contest, and given that far too many students could have fresh emotional wounds from the losses

due to the pandemic, the problem was re-framed to be more general, allowing students to explore any nation's system of higher education and really pushing them towards a measurement system that allowed nation-to-nation comparisons.

As I read stack after stack of ICM team entries, I realized that the problem statement that we had provided led many teams to revert to ranking systems with very traditional measures of "academic goodness," such as number of top-ranked universities and number of Nobel laureates. Ironically, based on these metrics, the U.S. system that I saw in distress and on life-support from the U.S. Congress often emerged as one of the best in the world.

It is important to note that this article is not a criticism of student work. In fact, these sorts of situations are excellent reminders to myself and to all those who engage students in modeling: We are ceding control so that our students can take ownership, restate the problem from their own perspective, and bring their own ideas into it. The teams who participated in this year's contest did exactly that—and the work that they did, on the problem as they interpreted it, was commendable!

Given that students answered a very different question, this leaves us with an opportunity—an unanswered question! Therefore, this article is intended to offer students a chance to explore something more in line with the originally intended problem. The problem posed here could be used in a course that teaches modeling, or it could be used as a practice problem for teams training for the ICM. I offer wording for an alternative problem as well as ideas to tailor the problem and coach students through it.

An Alternative Problem Statement

The existing model for higher education in the U.S. has serious flaws, including ever-rising tuition costs, overwhelming student debt, decreasing government funding, diminishing marketability of an undergraduate degree, and matters of equity and access. However, a system of higher education is an important element in the nation's education and its innovation ecosystem, and therefore has value—both within the U.S. and abroad, since the U.S. hosts many international students. So something needs to change—but what is it? And what, really, is the point of higher education? Is it about job training, advanced research, opportunities to explore with curiosity, creating an educated public, a lived experience of young adulthood, athletics, Greek life, or something else? For every student, it is probably some combination of these things, but what is the right balance on a national scale? And does the current amount of investment towards each of these goals of higher education align with that balance?

As an ideal end state, what would a healthy and sustainable system of higher education look like in the U.S.? And what policies should be im-

plemented to migrate from the current state of the system to the proposed healthy, sustainable state?

Develop a model or suite of models that allow you to assess the health of a nation's system of higher education, and apply this model to both the current U.S. system and to the proposed improved system. Propose targeted policies and an implementation timeline that will support the migration from the current state to the proposed state, and be sure to use your models to shape and/or assess the effectiveness of your policies. Recognizing that change is hard, identify groups who will be impacted by your policies, and discuss these impacts of implementing your plan both during the transition and in the end state.

Ideas for Tailoring the Problem

While this alternative problem statement is about the general state of the U.S. higher education system, there are several ways to modify it to address things of concern to you and to your students. You might want your students to focus on financial issues of access and equity. Maybe you want to have them dig into the tension between high-quality research and high-quality teaching (not that these cannot coexist, but this is a tension to be explored). Or perhaps you want your students to think about the resources dedicated to the educational aspect of higher education relative to resources allocated to the other aspects of the U.S. college experience (sports, dorms, dining, etc.). The problem above is yours to modify as you see fit to get students to engage with the issues that best align with your learning objectives. And, of course, since this problem was written about the U.S., if you want your students to focus specifically on a different country, you can reword the question to address the salient issues of higher education in the setting of your choice.

Coaching Students Through the Problem

The primary objectives of this problem are to have students examine and assess a particular nation's system of education, use modeling to identify weaknesses in the system. These could be weaknesses that are immediate, weaknesses that impact the sustainability of the system, and/or weaknesses that would only reveal themselves in the presence of a shock such as what we saw with covid. Students could also use their models to make recommendations for improvement for a healthy, sustainable, and sturdy national system of higher education.

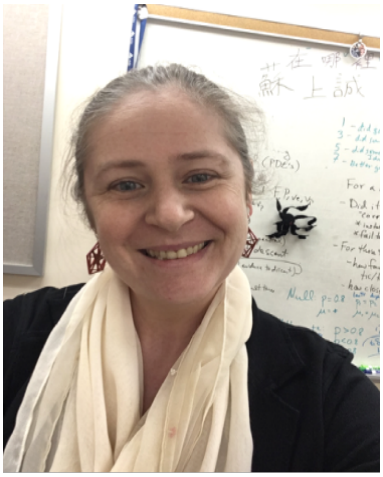
While the focus is on a single nation, it would be helpful for students to do some exploratory research on multiple systems, so that their solution can draw on a broader base of knowledge. Depending on your stu-

dents and their expertise, you might launch the assignment with a short research phase. Depending on the amount of time that you want to dedicate, you could take an open-ended approach in which students must create the landscape of systems of higher education on their own, you could assign to each of several groups a country and ask the groups to prepare briefings to their classmates, or you could simply provide short readings about three or four countries that provide a broad set of perspectives.

Additionally, it might be beneficial for students to think about inputs vs. outputs. It was surprising to see how many otherwise-excellent ICM solutions to the Higher Education Problem took both inputs to and outputs from the educational system and rolled them up together into a single measure, instead of exploring the relationships among them.

Lastly, we note that this problem rests on a very subjective and messy foundational question: What is the point of higher education? Our individual answers to this question are inextricably linked to our identities—and for many students, college is a time of questioning and redefining their own identities. As instructors or coaches, we should be prepared to listen to our students offer a window into who they are through their answers to this question. We should also be prepared for potential disagreements. For some, being in college is very personal, whether they are the first in their family to go to college, they are a fifth-generation legacy student, they are able to afford to be there only because of an athletic scholarship, etc. We should be mindful of our own biases as we enter this conversation; and while we may responsible for helping expand students' perspectives, this work needs to be done in a way that doesn't risk erasing the lived experience of our own students. Therefore, we should create a space where students feel safe not only sharing their perspectives with us and with one another, but also listening to perspectives that may challenge their own.

About the Author



Jessica M. Libertini holds advanced degrees in both engineering and applied mathematics. She has served as Senior Engineer at General Dynamics, National Research Council Fellow at the US Military Academy, and Science & Technology Policy Fellow in the Office of the Secretary of Defense. She currently resides in Geneva, Switzerland, where she applies mathematical modeling to global issues that span security, diplomacy, and humanitarian domains. She first became involved with the MCM®/ICM in 2008, for which she has been a head final judge.