Stanford eCorner

Don’t Stop at STEM

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Olin College President Richard Miller, a prominent voice in the movement to reform engineering curriculum, explains how higher education can create more innovators by better integrating studies that have traditionally segregated students, in order to show them that the potential for large-scale impact is at the intersection of feasibility, viability and desirability.

Transcript

- What exactly is innovation? Now there are lots of definitions of this. The one I want to talk about is the kind of innovation that changes the planet. This is not just the kind of innovation that develops a new product or a new industry, but it changes the way people live on a very large scale. If you have a very profound innovation, it changes the way people live so profoundly that people can't remember the way life was before it happened. My kids, for example, can't imagine how the caveman lived before the cellphone. I mean they've sort of always been here. How could you possibly make that work? The point of this is that you have to implement ideas or you don't change the way people live. Without implementation, it's just an idea. Ideas are cool, but innovation requires adoption of the ideas, it requires people on a large scale to choose it. Now, if you think about this, I think our traditional model for education may actually be preventing us from producing innovators.

Let me explain why. If you graduate from high school, and you go on to college, you need to choose a major. This might be a map of a large state university campus. Maybe the dimension of the whole page is a couple of miles in each dimension. Then, once you go to, say the engineering school, you're going to spend four years in that little region of that map, which is called the engineering quad. That's where people learn engineering. By the way, for accreditation, you're going to spend 75% of your time taking courses from people with PhDs in science, math, and engineering. If you look at the kinds of questions that they examine in all of those courses in science, math, and engineering, they're about the feasibility of ideas. What we really study is, is it feasible to do this based on what we know about the natural law? Almost exclusively. On the other hand, if you went to the business school on the other side of campus in the green circle, they have to spend half of their time according to the accreditation standards, studying things like management, marketing, organization, accounting, and that's all about viability.

What does this do to producing dollars? Okay? Do you have enough capital? Is it legal to do this? How can you sustain it over time? It's a very important set of questions. They don't spend much time over in the blue circle learning about science. What about the people in the middle? In the red circle. I know about this because I have a couple daughters that did this, okay? In the red circle, this is where everything else in the university sits, the main campus library. People were majoring in psychology, in arts, or humanities, so they have a different kind of question. Questions like, what is the meaning of love? What is the meaning of truth? What is the meaning of beauty? These by the way, integrating by parts doesn't help you in this set of questions. Neither does having a spreadsheet. Are these important questions? Decent questions, answers to those questions determine motivation at the deepest level for all of humans. If people don't choose to do things, nothing happens on a large scale, so this is actually about what people desire. What drives people from the center? The observation is, you have people that we separate that just look at feasibility.

Other experts that we separate that just look at viability, and then we have the people who just think about what's desirable. The problem with that is very obvious, and that is, based on work that was actually done at Stanford, all innovations, the kind of

innovations that change the way people in a large scale, only happen at the intersection of all three. I'll bet you can't think of a single innovation that isn't simultaneously feasible, and viable, and desirable. If you're going to be an innovator on a large scale, you have to be able to see all of the pieces of the jigsaw to put them together, and if we only study one kind of piece of the puzzle, it's going to be a rare person who understands how they all fit. If we're going to create innovators, we need to do a better job of integrating these in the same head, so that one person can see the whole picture. Big message for engineering schools. No amount of doubling down on math and science courses is going to improve the output of innovators. We're just going to produce experts in science and math. Those are cool, we need them, they're not innovators.