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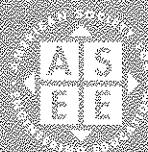
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UNSTABLE EQUILIBRIUM BY MEL CHUA

Culture Clash

To encourage self-starters, begin with the curriculum.

One thing that differentiates engineers from scientists is our approach to problems. We "shape the future" by applying design principles, and testing and improving prototypes until a solution emerges. But there is another, equally essential habit of mind that engineering undergraduates must develop: self-directedness. Engineers don't wait for orders to go out and change the world.

Shaping the future is a difficult mindset to master for some students, and it's easy to grow frustrated with these seemingly passive learners. "They need their hands held," we complain. "Why don't they take the initiative?"

Like all skills, self-directedness is honed through deliberate practice. And, like much that correlates with privilege in America, those skill-building opportunities are unequally distributed. Look at our honors classes, start-up incubators, and the makeup of students who compete in car, robotics, or other contests. Who walked in embracing the "learn through failure" mantra? How did they learn to become self-starters?

Some of us grew up in cultures or social classes that emphasized obedience in ways that limited our opportunities to practice improvising within complex contexts (aka "mastery"). Others of us grew up insufficiently masculine, unable to pass as white and able-bodied, or under pressure to keep parts of ourselves hidden. We learned to interject our soft-spoken words into technical conversations, sport T-shirts with trendy software logos, and never talk about our partners. We bought our own machining gloves because the shop's pairs were too big, hid our accents, and anglicized our names.

When you're used to changing yourself to fit the world, the notion of stepping up and shaping the world to your needs is a huge paradigm shift. There's an incentive

to reject risk: Bulletproof vests may make running harder, but they protect from incoming fire. For many students, becoming self-directed often means stripping off the social armor.

Students also arrive with different comfort levels and abilities in physics, technical writing, and machining. Because graduates must know these fundamentals, we design experiences to meet students where they are. If the ability to shape the future is as important as calculus, shouldn't engi-

blundering around costs productivity and can cause tremendous upheaval for individuals and society. That's the whole point. Teachers are the midwives of makers and doers. By letting students scope their projects, write their own rubrics, decide which topics to cover in class, and launch into the unknown with shaking hands, engineering educators transmit a culture of self-directedness – not with rhetoric, but with action. Each moment is an opportunity to redesign our world instead of simply reproducing it.

FIG. 1: MY FIRST YEAR IN ENGINEERING COLLEGE



neering programs also create experiences that foster self-directedness and are accessible to those who won't participate unless prompted?

This doesn't necessarily mean adding classes or assignments. Engineering educators can look afresh at their routines. When students read a syllabus at the start of term, they're staring at their future – so perhaps they could practice shaping that.

All sorts of efficiency metrics show that having students co-design their learning experiences is a terrible idea. Novices don't know what they need to learn. Moreover,

If students get in the habit of shaping their own futures while in school, they'll continue the practice out in the wider world, in companies and schools, governments and nonprofits, and, yes, also on Frisbee teams and around the family dinner table. When self-directedness seeps into all aspects of our lives, everyone around us gets exposed to a "do something" attitude. Perhaps they'll acquire an itch to shape the future. If so, we'll have expanded ours.

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Illustration by Mallory L. Chua