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Imagining the Future of Undergraduate STEM Education - Idea Competition

Title
Civic Education is the Civic Technology We Need Most

Statement
Civic technology is an amplifier. It amplifies democracy by applying technology.

$$Democracy \times Technology_{Civic}$$

The technology part of this equation has been doing pretty well. Technology keeps advancing, making certain things easier and more efficient. There are also exciting movements in technology meant to instill public purpose among technologists. Code for America followed by the United States Digital Service and 18F have provided an outlet for technologists eager to build technology that allows governments to be more effective and accountable to citizens. Public Interest Technology, advanced by several prominent foundations, offers a framework for encouraging STEM professionals to engage in politics and policy and more broadly find their bearings by serving the public interest. The National Academy of Engineering's Grand Challenges Scholars Program seeks to enlarge the definition of the competencies STEM graduates need in order to tackle the world's most difficult challenges. I celebrate these movements and participate in them.

The democracy part of the equation has been struggling. There is low trust in democratic institutions around the world. Surveys show declines in young people believing that living in a democracy is essential.[1] There are also long standing crises in civic engagement at all levels of collective governance. Scholars and journalists have given various reasons for civic engagement's decline: dwindling enrollments in informal organizations like bowling leagues, the rise of cable television and the internet, newfound awareness of corrupt and racist politicians and policies, and hyperpartisan

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[1] Foa, Roberto Stefan, and Yascha Mounk. 2017. "The Signs of Deconsolidation." *Journal of Democracy* 28 (1): 5–16.

politics touching every issue and locality. As threats to democracy mount, civic education as a component of primary, secondary, and higher education has gone missing in many schools or, where it still exists, represents antiquated notions of democracy and America.

We are failing to appreciate that civic education is our most important civic technology. While technologists working on civic projects often mean well and make helpful contributions, we will never recover our democracy or realize the true potential of civic technology if we don't revitalize civic education.

A 2014 study of engineering students by sociologist Erin Cech finds evidence that the culture of engineering seems to weaken students' beliefs in their professional responsibility to "public welfare" during undergraduate years.[2] In 2020, a cascade of headlines points to ways digital technologies are threatening justice, privacy, and democracy, and the political battles over COVID-19 have exposed deep mistrust of experts in science and medicine. Between now and 2040, our need for civic-minded STEM graduates will only grow.

We need a civic professionalism movement anchored in transformative civic education curricula built inseparably into every undergraduate STEM program.

A revitalized civic education acknowledges fundamental shifts in society and democratic practice and expands its definition of where democracy starts—not with voting but with citizen cooperation. Civic education begins in childhood, but STEM professionals also need educational experiences that help them recognize their profound roles and responsibilities as citizens. We need to entwine technical literacy and civic literacy. We need civic professionals in STEM, who think first as citizens, practice their profession in deeply democratic ways, and build civic technology as expressions of the identities they have developed through years of civic education.

Democratic educator Harry Boyte has written and advocated for constructing professional identities like the "citizen engineer," an engineer who acknowledges the public dimensions of their work, not separating their citizen identity from their engineer identity.[3] Democratic theorist Albert Dzur gives us the idea of "democratic

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[2] Cech, Erin A. 2014. "Culture of Disengagement in Engineering Education?" *Science, Technology, & Human Values* 39 (1): 42–72.

[3] Boyte, Harry. 2008. *The Citizen Solution: How You Can Make A Difference*. Saint Paul: Minnesota Historical Society Press.

professionalism" as power sharing.[4] Civic professionals embrace multiple forms of expertise, complementing their specialized skills with the unique experiences of fellow citizens to solve difficult problems. These open and accountable collaborations build public trust in professionals through mutual respect and shared struggle.

Civic professionals must also learn to embrace the political dimensions of their work, acknowledging the ways that technical work is always situated in particular contexts and depends on certain structures and policies that serve some ideas, people, and outcomes well and others poorly. Cech's research with higher education professional Heidi Sherick has found depoliticization of work to be one of the problematic pillars of engineering culture.[5] Science and engineering are not cleanly separable from the rest of society. That mindset robs our democracy of STEM's public purpose and accountability. Instead, civic professionals should aspire toward what Boyte calls "public work," committing to models of co-creation, joint problem solving, and shared ownership.[6] Public work binds us together in our shared citizenship and represents the foundational elements of democracy as a project of collective governance.

Education scholar Carolin Kreber envisions forging civic professional identities through transformative experiences in undergraduate education.[7] A transformative STEM civic education is action-oriented and community-engaged, forcing us to challenge and revise our assumptions, values, and identities. It asks students to practice their profession in partnership with the public at the beginning of their training. Working with citizens outside of the classroom helps cultivate civic-mindedness. A civic professional's new competencies include being able to frame a complex problem in partnership with community members who may not possess technical knowledge but whose lived experiences lead to the right questions and priorities necessary to setting a research and design agenda.

This is the future of STEM education our world needs most, reclaiming the public purpose of higher education and rebuilding trust in professions. During the next 20

[4] Dzur, Albert W. 2010. *Democratic Professionalism: Citizen Participation and the Reconstruction of Professional Ethics, Identity, and Practice*. University Park, PA: Penn State University Press. Dzur, Albert. 2018. *Democracy Inside: Participatory Innovation in Unlikely Places*. New York: Oxford University Press.
[5] Cech, Erin A., and Heidi M. Sherick. 2015. "Depoliticization and the Structure of Engineering Education." In *International Perspectives on Engineering Education: Engineering Education and Practice in Context, Volume 1*, edited by Steen Hyldgaard Christensen, Christelle Didier, Andrew Jamison, Martin Meganck, Carl Mitcham, and Byron Newberry, 203–16. Philosophy of Engineering and Technology. Cham: Springer International Publishing.
[6] Boyte, Harry. 2004. *Everyday Politics: Reconnecting Citizens and Public Life*. Philadelphia: University of Pennsylvania Press.
[7] Kreber, Carolin. 2016. *Educating for Civic-Mindedness*. New York: Routledge.

years, society will continue to ask STEM graduates and the technology they create to solve its thorniest challenges. We need civic professionals in STEM who understand and identify with a much deeper sense of their public purpose, who are prepared to amplify our collective effort as citizens.