THE NEEDS OF OTHERS: SOCIAL ENTREPRENEURSHIP VERSUS THE PROFIT MOTIVE

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Abstract: In our first-year living-learning community for engineering students who are interested in sustainability, we experience tensions between competing narratives about who and what education for sustainability is for. Our challenge is how to define sustainability in the environment of an engineering education that prizes industrial values like innovation, entrepreneurship, and vocational training. Our solution, so far, is to keep emphasizing the contexts of the engineering problem-solving

1 WHO AND WHAT IS COLLEGE FOR?

Ask American undergraduates—and their parents—what college is for, and the most common answer will be fiscal: our students say they want "to secure a comfortable living," "to make money," and, circularly, "to get a job to pay off student loans." Given that college costs and student indebtedness have increased sharply over the last forty years, given that a post-secondary degree seems more necessary than ever, it is not surprising that students and their families should view higher education primarily as a financial investment with an annual rate of return.[1] After all, universities clearly share this conception, boasting about their school's rankings on *Payscale* and in *US News & World Report*.

Industries need profit, of course, and even non-profits need to stay solvent, so if there is a problem with thinking of college in monetary terms, it is not that finances should be addressed at all, but that this explanation is part of a broader cultural narrative that undersells *what* college is for by mistaking *who* college is for. Each student necessarily considers how a college degree is for her own individual good: she takes her classes, earns her grades and eventually her own degree, and is graduated to her own income. As she crosses the dais to take her diploma, she is applauded from her own corner of the room. Her employer and other employers doubtless applaud, too, having just outsourced much of the cost of on-the-job training. Industries are more than happy to have universities serve as clearinghouses for hirable human capital (Roth 2012). Any individualistic narrative about what college is for, then, is ultimately reductive.

Most faculty members have a different answer about what and who college is for. While many professors also see college as instrumental to their students' future careers, few enter the teaching profession for the sake of lucre. Rather, we professors either tend to be pleased enough to focus on our areas of specialization that we do not much reflect on the purpose of education, or we tend to see education as transmission: we emit knowledge, even "truth" or wisdom; we demonstrate *techne*; we initiate apprentices

[1] And yet the tension between an instrumentalist, "administrative," or "vocational" view of education and a pragmatic, progressive, civic view goes back at least a century to debates between David Snedden and John Dewey (Larabee 2011). In a longer historical view, tensions between populist, practical, and elite ideals of the American university system go back to the start of the nineteenth-century and have thus *always* been part of how we think about higher education (Larabee 2013).

into disciplines, professionalizing them, preparing them for the workplace and perhaps even, as an afterthought or externality, for life. For us, education tends to be more about learning for learning's sake than it is about learning for profit.

Like all schooling, however, higher education serves critical cultural and social functions. The importance of these functions dwarfs the personal and financial gains of any individual student—or any university or industry—as well as the research agenda of any individual professor. The world has needs. Higher education is a complex system for turning the accumulated experience and wisdom of disciplines of knowledge to face those needs, real problems like "decaying inner cities, a deteriorating infrastructure, a weakening public school system, an irresponsible mass media, declining civic engagement, and the increasing ineffectiveness of government, to name a few" (Astin 1997; Astin 1999). Students and professors, in this broader view, are almost beside the point: we matter to this system because it is our interaction that embodies the turning-to-face. The primary question, again, is whose needs and interests this system actually serves, who college is really for. Up close, in other words, college learning is about individuals—learning styles, maturation, identity formation, finding a career, earning a living. But from a cultural perspective, what matters more is that the disciplines, methods, principles, the conceptual frameworks, histories, and toolkits, the best of human endeavor, that all of this serve the needs of the world. And so the chief problem with any cultural narrative about education that approaches learning as a capital investment is that it cannot notice how and when our best tools are being diverted from their best uses, when tools such as critical thinking, cultural literacy, numeracy and scientific acumen, broad awareness, deep humaneness, and rigor and flexibility of mind are turned toward capital gains rather than the common good.

Not that financial gain and the improvement of the world are necessarily mutually exclusive. As a common formulation of the "green-collar economy" has it, it is clearly possible to do well by doing good (Hawken 1993; Hawken et al. 1999; Jones 2008). Examples abound (Anderson and Leal 1997; Bornstein 2007). Yet even this popular formulation confuses the end and the means; it ought more properly to be "doing well in order to do good" (Speth 2009). Moreover, those who assume that, inherently and by definition, "traditional for-profit ventures, with nary a 'social' bent, benefit society," would have us believe that social good automatically follows profit, so making money IS solving problems (Lenox 2012). As professors, we must formulate this relationship correctly: the world's needs come first, and we fail our students when we forget who our work is for. As Alexander Astin puts it,

> there is nothing inherently wrong with higher education's attempting to produce graduates who possess more of the job skills required by modem business and industry, but it is naive to think that this will make much of a dent in our myriad social problems. Indeed, becoming more "competitive" economically may well be antithetical to any effort to deal constructively with problems such as the infrastructure, crime, and especially the environment. (1997)

2 THE FIRST-YEAR LIVING-LEARNING COMMUNITY APPROACH: THE HERE PROGRAM AT ROSE-HULMAN INSTITUTE OF TECHNOLOGY

The occasion for what must seem such sermonic comments on the purpose of higher education is our own more narrowly focused reflection on how industrial values like technophilia (Postman 1992), innovation, and entrepreneurship affect our attempts to teach first-year engineering undergraduates about sustainability, sustainable engineering, and sustainable design. More particularly, we want to reflect on why it is that our students, who have chosen to participate in a sustainability-focused living-learning community, frequently have such trouble with those aspects of education for sustainability that have little to do with career preparation and/or making money. We believe, after reflecting on what, how, where, and why we teach, that the deepest problem we face is the reductive and all-consuming narrative of college as vocational training for profit. Our hope, by contrast, is that framing sustainability as a kind of social entrepreneurship might allow us to disrupt the monopoly of the profit motive, replacing it with the needs of others. We hope that approaches to education for sustainability such as social entrepreneurship, social innovation, and bright-green environmentalism can allow our students to see their own profit motives as

enriched and aimed, rather than threatened or displaced, by turning their engineering education to face the needs of others.

Our continued fear, however, is that such approaches, which require an empathy and an ethical commitment to others that many of our students have not yet developed, dissolve all too easily into more marketable, greenwashed versions of the same old reductive belief that the purpose of college is to be hired by industries and make money—that pervasive narrative that we find most students bring with them. As we and others have argued elsewhere, the triple-bottom-line of sustainability itself often devolves, in practice, into the single-bottom-line of return on investment, with environmental and social costs and benefits translated into fiscal language that renders them second-order concerns (House et al. 2011; Norman and MacDonald 2003). Our continued challenge, then, is to help our engineering students see their work in more expansive contexts so that their desire to make money is seen more properly as one tool among many for trying to meet the world's needs, so that education is not directed toward individual profit but toward the common good.

Our program, called HERE (Home for Environmentally Responsible Engineering), is a first-year living-learning community at Rose-Hulman Institute of Technology. It was designed in 2010 to introduce students from various science and engineering disciplines to sustainability and sustainable engineering. In addition to residential and co-curricular projects, speakers, and events, the program involves designated sections of courses required of almost all students at the school. Students in our program enroll together in a writing course, a course on the global contexts of sustainability, and an introductory design course. They participate in campus and community projects such as building greenhouses, studying water quality, and conducting eco-audits. The purpose of the HERE program is, in the words of an article on "deep learning," "not simply to teach concrete facts about the environment but to create an active, transformative process of learning that allows values to be lived out and debated, and permits a unification of theory and practice" (Warburton 2003). By introducing sustainability across several classes and into students' lives, we have attempted to make designing for sustainability a ground-floor, even a second-nature part of their thinking.

Our program was built in order to meet aims specified by the United Nations Decade of Education for Sustainable Development, namely, that education for sustainability ought to

- Be interdisciplinary and holistic;
- Be values driven (be explicit so that values and norms can be examined, debated, tested and applied);
- Promote critical thinking and problem solving;
- Facilitate co-learning, co-meaning-making;
- Incorporate participatory decision making; and
- Be locally relevant (i.e., globally minded but locally focused and applied). (United Nations Education 2004)

During the first three years of the HERE program (2011-14), however, what we found was that students felt our efforts had not gone far enough, with Introduction to Design not coming until the spring quarter, and course content too compartmentalized. Our students expressed frustration at a perceived discrepancy between their professional goals—defined by technical specialization and the rewards of their eventual profession—and our curriculum, in which the goals and traditions of the liberal arts, interrogating and contextualizing arguments and values, preceded the practice and processes of engineering design. Many have reported that when we define sustainability, the cultural contexts and conceptual frames we discuss seem unnecessary for their future professions. Some students have seen challenges to their beliefs as threatening, and have even said that as student engineers, they should not be asked to approach engineering problems from historical, philosophical, and rhetorical perspectives, let alone to allow such problems to "constrain" design. Such difficulties have prompted us to rethink the program's goals of achieving meaningful education in sustainability at the freshman level, especially because students who see engineering education and sustainability foremost as on-the-job matters miss

out on the attitudinal, behavioral, and civic dimensions of sustainability that are so integral to the transformation that both higher education and sustainability demand (Ashford 2004; Arbuthnott 2009).

To address these problems, this year (2014-15) we merged Introduction to Design and the freshman writing class into a single course, a two-quarter-long, interdisciplinary, team-taught sequence. Our third course on the global contexts of sustainability was moved ahead to the spring quarter, so that students could immerse themselves in designing immediately. Our new design sequence took place during the fall and winter quarters, at the very beginning of the program. As in so much of the "greening of the campus" movement, students now explore design solutions to problems that affect the campus: heating and cooling inefficiencies and other expenses associated with fossil fuel consumption; food and paper waste; runoff, transportation, and more. Folding the requirements of a writing course into the process of design has allowed for more reflection as well as for even more complete contextualization of the problems to be solved. In response to students' concerns, in other words, rather than decontextualizing engineering problem-solving as some of them had hoped, we have doubled-down on showing how "problem-setting," in the words of Donald Schön, is integral to the processes of engineering design, of writing, and of education for sustainability: "In real-world practice, problems do not present themselves to the practitioner as givens. They must be constructed from the materials of problematic situations which are puzzling, troubling, and uncertain" (Schön 1983).

Establishing the natural, technological, and cultural contexts of problem-solving is not just at the heart of remembering who education is for, but at the heart of engineering for sustainability, and indeed, at the heart of engineering itself. "Engineers will need considerably more awareness of the nature of politics, social processes, and the influence of institutions on sustainability choices; the much larger community of non-engineers needs a stronger understanding of the impact of engineering decisions on societal structures," a report called *Benchmarking Sustainability Engineering* Education concludes ((Allen, et al. 2009). Seven of the Sandestin Declaration's "9 Principles of Green Engineering" require deep contextual awareness (bolded in Table 1).

Table 1: Sandestin Declaration: 9 Principles of Green Engineering (Abraham and Nguyen 2004)

1.	**Engineer processes and products holistically, use systems analysis, and integrate environmental impact assessment tools.**
2.	**Conserve and improve natural ecosystems while protecting human health and well-being.**
3.	**Use life-cycle thinking** in all engineering activities.
4.	**Ensure that all material and energy inputs and outputs are as inherently safe and benign as possible.**
5.	**Minimize depletion of natural resources**.
6.	Strive to prevent waste.
7.	**Develop and apply engineering solutions while being cognizant of local geography, aspirations, and cultures.**
8.	Create engineering solutions beyond current or dominant technologies; improve, innovate, and invent (technologies) to achieve sustainability.
9.	**Actively engage communities and stakeholders** in the development of engineering solutions.

Both ABET and the National Academy of Engineering see the contexts of engineering solutions as crucial. ABET's definition of engineering design begins with the brief phrase "the process of devising a system, component, or process *to meet desired needs*" (ABET). The oxymoronic adjective "desired" notwithstanding, the purpose of design is to meet needs, needs that must be articulated and re-articulated. The National Academy of Engineering's 2004 report on *The Engineer of 2020* is even clearer and more insistent, with lengthy chapters on "technological contexts" (including threatened natural resources and water supply, among others) and on "social, global, and professional contexts" (including population increase and complexity, among others). Two of their claims stand out.

> Engineers must know how and when to incorporate social elements into a comprehensive systems analysis of their work. This changing landscape for engineering can be illustrated in a complexity model developed by the committee that indicates that it is not just the nature of a narrow technical challenge but the legal, market, political, etc., landscape and constraints that will characterize the way the challenge is addressed.
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> It is difficult to know how the flow of resources will vary over the next several decades, but it is certain that, along with conservation, technological innovation must be part of the solution to circumvent, or at least mitigate, these crises. Engineering practices must incorporate attention to sustainable technology, and engineers need to be educated to consider issues of sustainability in all aspects of design and manufacturing. (NAE 2004)

This, at any rate, is the ideal, an ideal founded in the "aspiration" of the NAE's Engineer of 2020 report that "engineers will continue to be leaders in the movement toward use of wise, informed, and economical sustainable development. This should begin in our educational institutions and be founded in the basic tenets of the engineering profession and its actions."

3 FRUSTRATIONS WITH COMPETING NARRATIVES AND HOW WE HANDLE THEM

And yet, our students continue to express frustrations with what we're doing in the HERE program—they want to be doing more *doing*, they still say, and they want more marketable skills. Some of their frustration is endemic to engineering design, as Barry Hyman describes in his popular textbook *Fundamentals of Engineering Design*. Freshmen in engineering programs have excelled at high-school math and science, solving "well-posed" problems that have "a unique solution," "readily identifiable closure," and "application of specialized knowledge." And yet "most real-world engineering design problems do not share these characteristics. In particular, many real engineering design problems are poorly posed, do not have a unique solution or a readily identifiable closure, and almost always require integration of knowledge from several subject areas" (Hyman 2003). Our students are often excited about installing solar panels all over campus, for instance, but their interest falters when they run up against logistical and organizational constraints.

Similarly, some frustration is endemic to writing in college, where students are challenged to think more analytically about their writing and thinking than ever before (Smith 1988; Rosenwasser and Stephen 2014). Being forced to interrogate and then defend or let go of beliefs that have never even been identified can be threatening. Being challenged to move up the Perry scheme from black-and-white thinking to more nuanced, "committed relativism" can make students defensive, especially when those students fear that they are not good at writing or at this kind of thinking. All engineering students—indeed, all students in college—in other words, tend to experience the kind of frustration that is an important part of growth.

Some of our students' frustration, moreover, is endemic to learning about sustainability, a notoriously open-ended domain (Kagawa 2007) (Emanuel and Adams 2011). Students who are passionate about local foods or ceramic coffee mugs, for example, can lose heart when we urge them to nuance their all-or-nothing support of one-size-fits-all solutions. It can be daunting even to approximate the embedded energy of everyday objects, let alone to conduct rough life-cycle analyses or perform true-cost accounting. Frankly, it can be daunting even as a consumer whose awareness is increasing: buy the fair-trade coffee? the single-origin? the organic? or the shade-grown? As with education for sustainability, there are inherent challenges to interdisciplinary education, too (Richter and Paretti 2009), and no doubt some of our students must be frustrated by our own inability to master these challenges as well, of course: trying to plan together, grade together, coordinate schedules, all in addition to our usual teaching responsibilities.

Because all of these frustrations are typical, we are generally able to anticipate and plan for them. We can clarify our expectations, encourage persistence, reassure students, show them lighting, heating, and

bioswale design projects that have already been successfully implemented on campus. Yet some of our students' frustrations have to do primarily with the narratives we addressed at the beginning: many have come to school to make money in a career that guarantees them work. Our school in particular has told them to expect this, advertising our high program rankings, our very high job placement rate and our high starting salaries for graduates. We ourselves have told students who apply to the HERE Program that our living-learning community will help them with skills and traits that employers want. Having been assured of this fact by a number of regional companies who routinely hire our graduates, we tell our students that the job market values engineers who can incorporate sustainability in their thinking. We express this in terms of value-added. And yet, students have expressed disappointment with the parts of our program that seem irrelevant to them, especially those parts in which we explore the social and environmental scope and impact of the problems their engineering work hopes to solve.

In *Ecological Literacy*, David Orr framed the difference between what he calls "technological sustainability" and "ecological sustainability" (Orr, 1992). Technological sustainability turns to technology and "market solutions," whereas ecological sustainability is a more fundamental attempt to rethink values and cultural practices. While technological sustainability sees economic growth and economic self-interest as essential for sustainable development, ecological sustainability means admitting that there are natural limits to human economy and to the scale of communities and cultures. The relevance of this difference is clear to us from our students' frustrations. They are almost all excited by technological solutions that might make the world less unsustainable: photovoltaics, light-emitting diodes, microturbines, and water filters. And yet they are almost all disinterested in the kind of cultural contextualization that ecological sustainability requires.

In the more immediate context of an engineering school that has begun more and more emphatically to insist upon industrial values like innovation and entrepreneurship, then, our challenge is to help students see the need for ecological sustainability while not getting lost in an educational environment that encourages them to think in terms of technological sustainability when they think of sustainability at all. In 2008 we began attempting to introduce sustainability across the curriculum at our school, after the model that has been used across the country and around the globe. While our grants went unfunded, entrepreneurship across the curriculum is now encouraged following the same model. We have argued for years that our school should hire a Director of Sustainability. Instead, we have a Dean of Innovation and Engagement and are in the process of hiring an externally funded Professor of Entrepreneurship. As do many engineering schools, our school values innovation and entrepreneurship, not necessarily to the exclusion of sustainability, but sometimes it seems that way (Higgitt 2006).

Our desire, however, is not to be combative or exclusionary. Sustainability is open-ended, and we have seen that for a number of our students, it is technological sustainability or nothing. So we have tried to accommodate our school's ethos, its emphasis on innovation and entrepreneurship, even as we have urged our students to see sustainability as a way of thinking more systematically about the world's needs.

As they develop their campus sustainability projects, for example, we teach the freshmen in our living-learning community about engineering economics, and ask them how they might scale up their solutions for regional and international markets. We refer them to the work of Alex Steffens and Worldchanging and other "bright-green" environmentalists who work in the field of social entrepreneurship (Steffen 2011). One student team who are building a bicycle-powered generator has written reflectively not just about how their materials selection would differ if they were to distribute their product in the developing world, but also about the kind of information they would display as cyclists generated power. Another team struggles with converting our campus cafeteria to trayless dining, and we put them in touch with communications and marketing professionals who can help them frame their design as a solution rather than as the elimination of a freedom. Yet another team struggles to prove that their vertical garden is a good way to improve indoor air quality, and stumbles across a way to use sensitive lichens to monitor air quality even as they improve it. In these and other examples, we frame our students' pursuit of sustainable solutions as innovative and entrepreneurial, highlighting the economic and vocational value of their learning. We have our students read essays like "Why Sustainability Is Now the Key Driver of Innovation" and chapters from Paul Hawken's *Ecology of Commerce*. The vocabulary of innovation and

entrepreneurship are susceptible to re- and mis-interpretation, so we sometimes consider our adoption of industrial language to be a survival skill, and sometimes consider it quietly subversive.

The challenge, however, we believe, is that the discourse of sustainability is particularly vulnerable to being appropriated, distorted and watered down (Dobers and Springett 2010). Emphasizing that an entrepreneurial mindset *can* help an engineer bring his learning to bear on the world's problems does not guarantee that this mindset *will* help. In a climate in which higher education itself has become more and more influenced by industrial and financial values, technological conceptions of sustainability seem not so much to encourage or allow ecological conceptions, but to supplant them. Only by doubling-down on the contexts of our work, on whose problems need to be solved, on who education is for, can we encourage students to see their problem-solving as sustainable in the best senses of the word.

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