

# Educating as if Survival Matters

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**O**ver the past 40 years, environmental educators throughout the world have been aiming to motivate and empower students to work toward a sustainable future, but we are far from having achieved this goal. Urgency is evident in the warning issued by more than 15,000 scientists from 184 countries: “to prevent widespread misery and catastrophic biodiversity loss, humanity must practice a more environmentally sustainable alternative to business as usual... Soon it will be too late to shift course away from our failing trajectory, and time is running out. We must recognize, in our day-to-day lives and in our governing institutions, that Earth with all its life is our only home” (Ripple et al. 2017).

In this tumultuous era of ecocatastrophes, we need every child to grow up caring deeply about how to live sustainably on our planet. We need some to become leaders and all to become environmentally minded citizens and informed voters. Going beyond buying greener products and aiming for energy efficiency, we must find ways to balance human well-being, economic prosperity, and environmental quality. These three overlapping goals form the “triple bottom line,” aiming to protect the natural environment while ensuring economic vitality and the health of human communities. This is the basis for sustainable development, defined by the United Nations as “development that meets the needs of the present without compromising the ability of future generations to meet their own needs” (WCED 1987). Strong economies of course are vital, but they cannot endure at the expense of vibrant human societies and a healthy environment.

Within the formal K–12 setting, a primary hurdle in teaching for sustainability is the need to meaningfully address environmental issues within the constraints of established courses and curricular mandates. In the United States, for example, the Next Generation Science Standards designate science learning outcomes for grades K–12 (NGSS 2013). These standards misrepresent sustainability challenges by portraying them as affecting all humans equally, overlooking the substantial environmental justice issues evident within the United States and throughout the world. Another oversight is that these standards portray environmental issues as solvable through the application of science and technology, neglecting the potential roles of other sources of knowledge (Feinstein and Kirchgasser 2015).

One might argue that K–12 students are too young to tackle looming environmental issues. However, they are proving up to the challenge, such as through project-based learning in which they explore issues and pose potential solutions. This may involve designing and conducting scientific investigations, with the possibility of participating in citizen science. Case-study research into teen involvement in community-based citizen science revealed that the participants developed various degrees of *environmental science agency*. Reaching beyond understanding of environmental science and inquiry practices, this term’s definition also includes confidence in one’s ability to take positive stewardship actions (Ballard et al. 2017). The study concluded that the development of environmental science agency depended on involving teens in projects that included these

three factors: investigating complex social–ecological systems with human dimensions, ensuring rigorous data collection, and disseminating scientific findings to authentic external audiences. Educators interested in undertaking such endeavors can make use of free resources, including an ever-growing compendium of lesson plans for use with citizen-science projects (SciStarter 2018) and a downloadable curriculum that leads students through the processes of designing and conducting their own investigations, especially those inspired by outdoor observations and participation in citizen science (Fee 2015).

We need to provide opportunities for students to investigate environmental issues, collect and analyze data, and understand the role of science in making informed decisions. But sustainability challenges will not be resolved through scientific approaches alone. Students also need opportunities to connect deeply with people from drastically different cultures and think deeply about their own lifestyles, goals, and assumptions. As faculty members of the Educator Academy in the Amazon Rainforest, we have had the privilege of accompanying groups of US teachers through 10-day expeditions in the Peruvian Amazon. Last summer, we asked Sebastián Ríos Ochoa, leader of a small indigenous group living deep in the rainforest, for his view of sustainability. Sebastián responded that he and his community are one with the forest—it is their mother, providing life and wholeness. Reflecting on the changes occurring at an accelerating rate even in remote rainforest communities, Sebastián went on to state that his greatest wish is for his descendants to forever have the opportunity to continue living

at one with their natural surroundings (Sebastián Ríos Ochoa, Maijuna Community Leader, Sucusari, Peru, personal communication, 18 July 2017). After decades of struggle during which their rainforest resources were devastated by outside loggers and hunters (Gilmore 2010), this indigenous group has regained control over their ancestral lands and the power to enact community-based conservation practices. Their efforts provide compelling examples of how people (no matter how few in number and how marginalized) can effect positive change.

In collaboration with leaders of Sebastián's remote Peruvian community and a nongovernmental organization with a long history of working in the area, US educators are creating educational resources designed to instill this same sense of responsibility in children growing up without such direct connections to nature. Rather than developing a sense of entitlement to ecologically unsustainable ways of life, we need children to build close relationships with the natural world, empathy for people with different ways of life, and a sense of responsibility to build a better tomorrow. Although the Amazon rainforest is a common topic in K–12 and undergraduate curricula, typically it is addressed through textbook readings. Instead, we are working to engage students in grappling with complex real-world issues related to resource use, human rights, and conservation needs. This is accomplished through exploration of questions such as the following: (a) How do indigenous cultures view, interact with, and perceive their role in the natural world, and what can we learn from them? (b) How do our lives influence the sustainability of the rainforest and the livelihoods of the people who live there? (c) Why is the Amazon important to us, no matter where we live? (d) How does this relate to the triple-bottom-line goal of balancing social well-being, economic prosperity, and environmental protection?

Investigating the Amazon's impacts on global weather patterns, water cycling, carbon sequestration, and biodiversity leads students to see that the triple bottom line transcends cultures and speaks to our global need for a sustainable future for humans and the environment throughout the world. Tracing the origin of popular products such as cocoa and palm oil, they investigate ways to participate in conservation initiatives aiming for ecological sustainability both at home and in the Amazon.

Another way to address global issues is to have students calculate the ecological footprint attributable to their lifestyles, leading into consideration of humankind vastly overshooting Earth's ability to regenerate the resources and services on which our lives depend. In 2017, August 2 was determined to be the date on which humanity had overshoot Earth's regenerative capacity for the year because of unsustainable levels of fishing, deforestation, and carbon dioxide emissions (Earth Overshoot Day 2017). The fact that this occurs earlier each year is a stark reminder of our ever-diminishing ability to sustain current lifestyles. And as is continually illustrated in news of climate disasters, human societies with small ecological footprints can be tragically vulnerable to such calamities (e.g., Kristof 2018).

Engaged in such activities, students in affluent settings may end up deriving solutions that shake the very tenet of the neoliberal capitalistic societies in which they live. To what extent should students be encouraged to challenge the injustices and entitlements on which world economies currently are based, such as by seeking ways to transform the incentive structures under which business and government decisions currently are made? Should they be asked to envision ways of overturning the unsustainable ways in which modern societies deplete resources, emit carbon dioxide, and destroy the habitats needed to support diverse forms of life on Earth?

Anyone who gives serious consideration to the environmental degradation and social-injustice issues in today's world faces the risk of sinking into depression at the thought of a hopeless future. What can we possibly accomplish that will not simply be too little, too late? Reflecting on this inherent tension, Jon Foley (2016) stated, "If you're awake and alive in the twenty-first century, with even an ounce of empathy, your heart and mind are going to be torn asunder. I'm sorry about that, but it's unavoidable—unless you simply shut down and turn your back on the world. For me, the only solution is found in the space between awe and anguish, and between joy and despair. There, in the tension between two worlds, lies the place we just might find ourselves and our life's work."

Education for sustainability must build on this creative tension, capturing students' attention while inspiring them to become forces for positive change.

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### References cited

- Ballard HL, Dixon CGH, Harris EM. 2017. Youth-focused citizen science: Examining the role of environmental science learning and agency for conservation. *Biological Conservation* 208: 65–75.
- Earth Overshoot Day. 2017. Earth Overshoot Day 2017 fell on August 2. Earth Overshoot Day. (1 December 2017; [www.overshootday.org](http://www.overshootday.org))

- Fee JM. 2015. BirdSleuth: Investigating Evidence. Cornell Lab of Ornithology. (15 January 2018; <http://www.birdsleuth.org/investigation/>)
- Feinstein NW, Kirchgasler KL. 2015. Sustainability in science education? How the Next Generation Science Standards approach sustainability, and why it matters. *Science Education* 99: 121–144.
- Foley J. 2016. The space between two worlds. *Macroscope*. (28 October 2016; <https://the-macroscope.org/the-space-between-two-worlds-bc75ecc8af57>)
- Gilmore MP. 2010. The Majjuna: Past, present, and future. Pages 226–233 in Gilmore MP, Vriesendorp C, Alverson WS, del Campo Á, von May R, Wong CL, Ochoa SR, eds. *Perú: Majjuna*. The Field Museum.
- Kristof N. 2018. Swallowed by the sea. *New York Times*. (23 January 2018; [www.nytimes.com/2018/01/19/opinion/sunday/climate-change-bangladesh.html](http://www.nytimes.com/2018/01/19/opinion/sunday/climate-change-bangladesh.html))
- [NGSS] Next Generation Science Standards. 2013. Next Generation Science Standards: For States, By States. NGSS. (10 October 2017; [www.nextgenscience.org](http://www.nextgenscience.org))
- Ripple WJ, et al. 2017. World scientists' warning to humanity: A second notice. *BioScience* 67: 1026–1028.
- SciStarter. 2018. SciStarter for Educators. SciStarter. (12 February 2018; <https://scistarter.com/educators>)
- [WCED] World Commission on Environment and Development. 1987. *Our Common Future*. Oxford University Press.

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