STATE OF THE WORLD

EarthEd

Rethinking Education on a Changing Planet

THE WORLDWATCH INSTITUTE

CHAPTER 1

EarthEd: Rethinking Education on a Changing Planet

Erik Assadourian

What is education for? Education—the process of facilitating learning—has been an integral part of human societies since before we were even human. After all, humans are not the only species that transmits knowledge from one individual to another. Chimpanzees and dolphins, for example, both teach their young specialized foraging and hunting techniques that are known only to their communities and pods. Learning has been documented in numerous species, even in plants and bacteria. Because learning is a natural part of being alive—and increases the odds of staying alive—at its very root, the role of education may be to facilitate survival, both for the individual that is learning and for the social group (and species) of which it is a part.[1]

As humans evolved—going beyond day-to-day survival and developing systems of writing, arts, tools, and the like—complex cultural systems formed and helped to shape educational priorities. As anthropologists David Lancy, John Bock, and Suzanne Gaskins explain, "the end points of learning . . . are culturally defined." In other words, education prepares children for life in the cultures into which they are born, giving them the tools and knowledge that they need to survive in the physical and social realities in which they most likely will spend their entire lives.[2]

This might have been fine throughout most of human history, where cultural knowledge correlated strongly with the knowledge that was needed to survive and thrive in the immediate environment (for example, how to identify which plants and animals are dangerous and which are edible; how to make fire, tools, clothing, and shelter; and how to coexist with neighboring

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populations). But the cultures that most humans are now born into are variations of consumer cultures—cultures that, through their profligate use of resources and promotion of unsustainable levels of consumption, are rapidly undermining the Earth's systems to the point that they now threaten the very survival of countless species and human communities around the world.[3]

For humans to thrive in the future, we will need to systematically rethink education, helping students learn the knowledge that is most useful for their survival on a planet that is undergoing rapid ecological changes. We must provide them with the tools and strategies that they need to question the current sociocultural reality and to become bold leaders who will help pull us back from the brink of ecocide and usher in a sustainable future. But even that is not enough. Considering how much damage human civilization has already done to the Earth, students also must learn how to prepare for and adapt to the ecological shifts that are already locked in to their future—and ideally do this in ways that help both to restore Earth's systems and to preserve their own humanity.

State of the World 2017 explores how education—particularly formal education—will need to evolve to prepare students for life on a changing planet. Some priorities will not change much in this new "Earth Education" or "EarthEd" context: basic literacy, numeracy, multilingualism—these skills will continue to be as important in the future as they are today. But many new educational priorities must emerge: ecoliteracy, moral education, systems thinking, and critical thinking, to name a few. Without these and other key skills, today's youth will be ill-equipped for the dual challenges that they face of building a sustainable society and adapting to a changing planet.

Our Changing Planet

Over the past few hundred years, as humans have harnessed coal, oil, and natural gas to generate heat, steam power, electricity, liquid fuels, and new materials, we have unleashed the start of a climate shift that has never before been experienced in human history, with temperatures today already higher than during our last eleven thousand years of civilization. Moreover, we have enabled a massive spike in the human population, thanks to discoveries ranging from germ theory to the scientific developments behind the Green Revolution. As early innovations solidified into a complex industrial economic system based primarily on fossil fuels, humanity's impact on the planet has grown exponentially—to the point where most of the Earth's ecosystem services are now degraded or are being used unsustainably.[4]

Worse yet, we have created a series of positive feedback loops that are further accelerating the damage. This includes the $579 billion a year spent around the world to promote the ever-increasing consumption of consumer goods—from fast food, soft drinks, and coffee to cars, computers, and smartphones. Amazingly, many of these goods are no longer seen as luxuries but as necessities, even entitlements—indicators of a basic level of prosperity—despite the planetary resource constraints that make it impossible for all Indians or Chinese, let alone the entire human population, to live like Americans or even Europeans. In the process of normalizing the consumer economy—and actively spreading it to people around the world (including to 220 million Chinese over the past fifteen years)—we have locked in a frightening series of ecological changes, whose tragic impacts are only starting to manifest today.[5]

Let's look at climate change. In the past, as the Earth emerged from episodic ice ages, temperatures tended to rise 5 degrees Celsius over periods spanning some five thousand years. Now, models project that temperatures will increase 2 to 6 degrees Celsius in the next century and will continue rising beyond that. This translates to many meters of sea-level rise, rapid acidification of the world's oceans, and dramatic changes in rainfall patterns, causing, in turn, droughts, disasters, and famines—all within a very short time frame (from a human history perspective, let alone a geological perspective). In all probability, this will be catastrophic to human civilization as we know it today.[6]

And climate change is not the only worrisome change looming. We are crossing several other planetary boundaries as well: disrupting the phosphorus and nitrogen cycles, depleting biodiversity, and spewing enormous amounts of chemicals into the air, soil, and water, to the point that we have brought about a new, human-dominated, geological epoch: the Anthropocene. Meanwhile, the human family is adding 83 million members each year. At current projections—assuming that ecological catastrophes do not slow this growth—the global population is projected to reach 9.7 billion by 2050. Of course, businesses and marketers will continue to work hard to sell this growing population ever more stuff, putting ever-greater pressure on Earth's overtaxed systems.[7]

We have hit a point where climate scientists now question whether civilization—whether their own children and grandchildren—will actually survive. "It's clear the economic system is driving us toward an unsustainable future, and people of my daughter's generation will find it increasingly hard to survive," says Will Steffen, director of the Climate Change Institute at The Australian National University. "History has shown that civilizations have risen,

stuck to their core values, and then collapsed because they didn't change. That's where we are today."[8]

The defining quest for humanity today is how we will be able to provide fulfilling lives for 8–10 billion people even as Earth's systems are declining rapidly. These cannot be consumer lives, ecologically speaking, but decent lives that offer access to vital services, such as basic health care and education, to livelihood opportunities, and to essential freedoms. Unfortunately, few people today understand the urgency or magnitude of this quest—some even deny it—and few fully grasp the changes that are necessary to succeed. Far fewer have the skills that are required to help with this transition or, at least, to survive the ecological shifts if the quest for a sustainable future fails. Education will be essential in changing this.

Educational Reform on a Planetary Scale

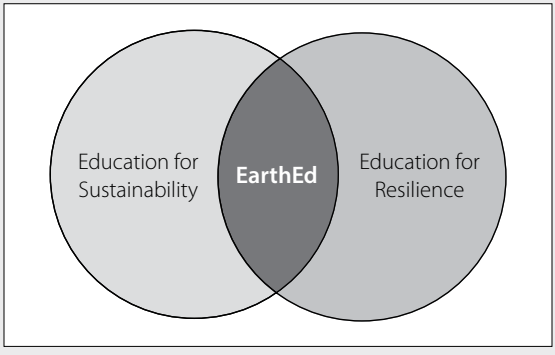
Unfortunately, schooling today tends to ignore the massive changes that are looming and offers little in the form of preparation for slowing those changes or coping with them. Worse yet, many would argue that schools are often designed to "train children to be employees and consumers," only exacerbating our current problems. This comes as little surprise, given that consumerism is the dominant cultural context in which most students now grow up. Socializing them for that reality may be the "natural" role for education, even if, in the long term, it is maladaptive.[9]

This maladapted role of education is made far worse when governments change the law to make it easier to mislead students about climate change, as lawmakers in the U.S. states of Tennessee and Louisiana have done, or when school boards allow corporations to shape the curriculum. In Chapter 13 of this book, Josh Golin and Melissa Campbell of the Campaign for a Commercial-Free Childhood discuss the expanding foothold that corporations have in schools around the world, from the oil giant Chevron sponsoring science education to fast-food purveyor McDonald's recruiting teachers to host school fundraisers in its restaurants. There are long lists of how students are indoctrinated into becoming unquestioning consumers in schools (let alone through the six or more hours on average that American youth spend watching television and interacting with computers, tablets, and smartphones each day). But even when schools guard themselves from these types of infiltrations, they are still doing very little to prepare students for the social and ecological realities that they will soon inherit.[10]

Considering the present moment in history, it is clear that most schools are forgoing their responsibility to question the status quo—whether this is the dark history of colonization and genocide on which industrial civilization is founded, or the horrific ecological and societal abuses on which the consumer economy continues to be built. The current role of schools will have to change if we are to prepare students to slow down—and survive—the ecological transition ahead.

Specifically, we will need to redesign education to teach students to become sustainability champions: those who are willing to boldly step out of current realities and commit themselves to drive social, political, economic, and cultural change so that human societies can live sustainably on the planet. Almost as importantly, education must make students more resilient to the changes that are locked in to their future—offering them a variety of life skills (particularly skills that will increase in value as the consumer era comes to an end) and coping skills, such as social and emotional learning, which will enable them to more sanely navigate the tumultuous, conflict-ridden future. Ideally, given the limited hours in the school day, curricula will need to be designed around lessons and projects that maximize both education for sustainability and education for resilience, whenever possible. (See Figure 1–1.)

Figure 1–1. Optimizing Education for the Challenges Ahead



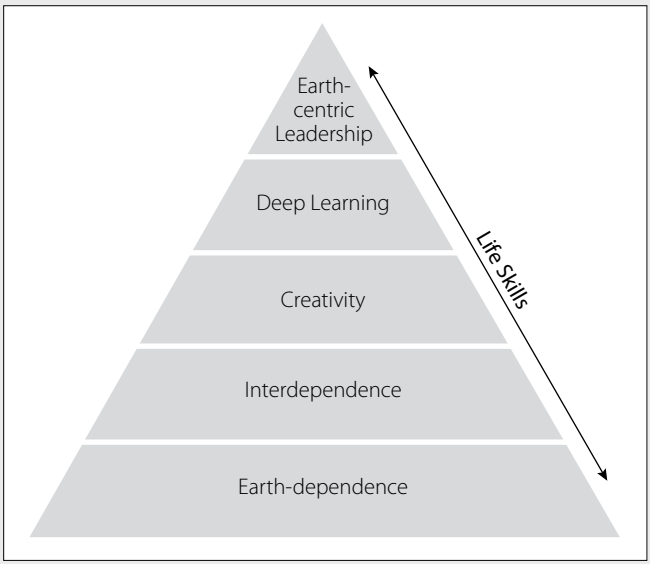
This is the necessary path forward, given that the precise future that the next generations will inherit remains uncertain. Will governments, corporations, and civil society find the will to significantly scale back economic and population growth, consumption, and the use of fossil fuels in order to stabilize the climate? Will agreements be "too little, too late" to stop climate change, but at least keep the transition to a hot state manageable (whatever that means)? Or will negotiations break down entirely, with business-as-usual and climate denial driving us to a rapid and out-of-control shift to a 4 degree or even 6 degree Celsius apocalyptic future, marked by devastating famines, inundated

cities, mass migrations, and climate wars? Even in the best scenario of intentional economic degrowth, the skills and knowledge that students will need will be very different than what they are being taught today.[11]

Principles of Earth Education

For humanity to get through the coming century, our schools must emphasize a new set of proficiencies—a Common Core-equivalent that will enable us to survive life on a changing planet. These Earth Education Core Principles, or EarthCore, include six broad tenets, each building on the former (although with considerable interlocking, as all sturdy construction has). (See Figure 1–2.) Redesigning education so that these principles are present in essentially every aspect of the school experience—from class lessons and field trips to lunch menus and school infrastructure—can ensure that students are better prepared both to become leaders in the sustainability transition and to navigate the disrupted future ahead. Many of these EarthCore principles are being taught already to some degree or another, but rarely to the extent needed, nor typically in combination with one another. The challenge will be finding ways to integrate these principles in education as quickly, and to as great an extent, as possible.

Figure 1–2. Earth Education Core Principles (EarthCore)



Principle 1: Earth-dependence

At the base of the EarthCore pyramid is a deep understanding that humanity, as a species and as a civilization (in all of its cultural variations), is completely

and utterly dependent on the Earth, a lesson that most people seem to have forgotten in the modern era. This understanding—and the corresponding humility and awe (in both the joyous and fearful sense of the word)—is essential, for without this foundation, the pyramid, and the institution of education and human civilization, will collapse.

But how does one teach "Earth-dependence"? Ecoliteracy is a key piece of the puzzle. Without a strong understanding of both the environmental sciences (which includes the underlying basic sciences such as biology, ecology, chemistry, and physics) and the limits to growth, children will grow up with unrealistic expectations for what life in our closed planetary system can provide. The good news, as Michael K. Stone describes in Chapter 3, is that ecoliteracy can manifest in all aspects of education—even the school cafeteria, which Luis González Reyes explores in more depth in Chapter 6.[12]

Ecoliteracy is not just a curricular add-on. It can, and must, be taught in in-depth ways and be embedded fully in the core curriculum. At the School for Examining Essential Questions of Sustainability (SEEQS), a middle school in Honolulu, Hawai'i, students devote two hours a day, four days a week, to exploring an "Essential Question of Sustainability," and they focus a full semester on a topic such as, "What are ways to restore and preserve native habitats in Hawai'i?" Rather than passively exploring this question by memorizing facts and figures, students learn this material actively, working on collaborative projects, receiving mentoring from local experts, and presenting their findings to the larger community. Through this, students not only learn about, but deeply internalize, the challenges—and solutions—to the sustainability crisis they face.[13]

But learning about our dependence on the Earth academically is not enough. As David Sobel discusses in Chapter 2, before we can get children inspired to "save the rainforests," we need to nurture their own relationships with local forests, streams, and meadows. Nature-based and place-based learning opportunities—such as the forest schools now present in many countries around the world—are leading the way in creating educational experiences that cultivate deeper relationships with the broader ecological community. At the Wald Kindergarten (Forest Kindergarten) in Langnau am Albis, Switzerland, a score of four- to seven-year-olds spends all day in the woods—rain, shine, or snow—playing, learning, and connecting directly with the local ecosystem. This extended time in nature deeply affects children's development, from reducing attention-deficit disorders to improving confidence, cognitive functioning, and self-control. Most importantly, it helps reveal nature's role as

"ultimate teacher," an insight that Indigenous education encapsulates and continues to provide today, as Melissa K. Nelson discusses in Chapter 4.[14]

Finally, it is one thing to be ecologically literate and bonded to the Earth or a local environment, but another to remain dutiful in sustaining it—even in the face of social and cultural pressures to do the opposite. Cultivating stewardship, as Jacob Rodenburg and Nicole Bell discuss in Chapter 5, is essential. This cultivation occurs in many ways, from teaching young children to know their animal and plant neighbors in their "neighborwood," to getting teens to reach out to local conservation groups and volunteer with them.[15]

Principle 2: Interdependence

Given that many of the challenges of the future will center on the equitable distribution of increasingly constrained resources and ecosystem services, education must cultivate a deeper understanding of our interdependence with our fellow humans, irrespective of differences in culture, creed, color, gender, or sexual orientation. Interdependence can be taught in myriad ways, but three elements are fundamental.

First, moral or "character" education must be front and center. There is a real value in actively teaching children to be good people: humble, helpful, kind, just, and, above all, aware that they have moral obligations to others, including future generations, other species, and the Earth itself. In Chapter 7, Marvin W. Berkowitz describes how, in places around the world where character education has been integrated into schools—from the United States to Singapore—it can have tremendous impact, improving student and teacher behavior, student satisfaction, and academic results.[16]

Second, schools need to teach social and emotional learning skills, helping students develop empathy; mindfulness; the ability to recognize, understand, and deal constructively with others' emotions; and resilience when confronted with difficult obstacles. In Chapter 8, Pamela Barker and Amy McConnell Franklin discuss how more schools are integrating training in social and emotional learning—both directly into curricula, such as through mandatory empathy training in Danish schools, and through innovative approaches such as replacing detention with meditation, as has occurred at the Robert W. Coleman Elementary School in Baltimore, Maryland.[17]

Finally, an important part of interdependence is being able to live together peacefully and respectfully—what educators of the Escuela Nueva movement, a program founded in Colombia in the 1970s and now serving 5 million children in nineteen countries, call *convivencia*, or the "art of living together." In

the Escuela Nueva program, children typically work in small groups (with the teacher playing a background role as facilitator rather than instructor) and learn to cooperate and to negotiate differences. This is reinforced with an intentional "emphasis on the formation of democratic and participatory values," such as through sharing responsibilities for maintaining and managing the school, and through electing each student to a committee. Training children in the art of living together, including democratic decision making and how to gain consensus, will prove a very valuable skill. With strong cultivation of character education, social and emotional learning, and *convivencia*, students should be far better prepared for the increased conflict and difficult ethical choices that will be part of their future.[18]

Principle 3: Creativity

Because the challenges ahead are going to be complex and will require fresh ideas on how to solve them, education also should prioritize creativity. Play is a key element in developing this creativity—one that, unfortunately, has increasingly been excised from education, whether through reduced recess time or through the heightened focus of early education on academics. Play expert David Whitebread warns that, "We put our children's future at risk, and their ability to deal with the many difficulties that the human species will confront through the twenty-first century and beyond, if we do not recognize the importance of play and begin to develop policies, both in relation to our domestic arrangements and our schooling systems, that support and nurture their natural and adaptive playfulness."[19]

Mads Bødker

A "junk playground" in Berlin, Germany.

In Chapter 9 of this book, Whitebread explores the health and social benefits of play and points to ways both within and outside schools to allow for greater time and opportunity to play, from city streets that provide safe and traffic-free environments to playgrounds full of "junk" that stimulate creativity and independence. While play is disappearing in many countries,

including the United States and the United Kingdom, in others it is well protected. In Finland, a country often touted for its high educational attainment, "playful learning" is so important that formal schooling does not start until the age of seven, and elementary schools provide an average of seventy-five minutes of recess each day, three times that of U.S. schools.[20]

As children get older and opportunities for free play inevitably shrink, play in the form of the arts, scientific experimentation, and project design (such as presentations, stories, and films) offers new opportunities to be creative. In Chapter 10, Marilyn Mehlmann and her colleagues describe how comic art is a particularly adept way to provide an opportunity to play, through a medium that encourages drawing, storytelling, writing, and group collaboration and that can be readily focused on themes of sustainability and social change. In countries from Belarus to India, sustainability-focused comics programs have helped students playfully explore ways to get to a more livable future.[21]

Principle 4: Deep Learning

As important as creativity is cultivating the ability to "learn how to learn"—what is known in the field of artificial intelligence as deep learning. Just as computers of the future should be able to apply one set of knowledge to another realm, so too should we as people. This makes us more flexible, more adaptable, and thus better able to manage the surprises that the future throws at us.[22]

One of the foundations of deep learning is systems thinking. Understanding that the world is made up of interconnected, nested systems, many of which follow similar rules, is key to fully grasping the challenges ahead. In Chapter 12, Linda Booth Sweeney discusses how teachers in a variety of disciplines are adding systems thinking to their lessons and how national governments are starting to integrate systems thinking into broader learning goals.[23]

In Chapter 11, Dennis McGrath and Monica M. Martinez explore how deep learning can be made even "deeper" by prioritizing certain competencies, such as critical thinking, working collaboratively, and having students direct their own learning and apply it across disciplines and to the real world. From middle schoolers in Maine studying invasive species and presenting solutions to the local city council, to high school students in Philadelphia learning about law and history through the design of their own citizen lobbying project, deeper learning can play an important role in preparing students for civic life and leadership.[24]

As biologist Edward O. Wilson has observed, today "we are drowning in information, while starving for wisdom. The world henceforth will be run

by synthesizers, people able to put together the right information at the right time, think critically about it, and make important choices wisely." Synthesizers are those who can take learning from one realm and apply it to another. Better integrating systems thinking, critical thinking, and deeper learning into school curricula will help develop a new generation of synthesizers who are better able to understand the Gordian sustainability knots that they are inheriting and to discover novel ways of untying them.[25]

Principle 5: Life Skills

Perhaps one of the most important elements of the EarthCore principles is the learning of life skills—so integral that, in the diagram, it interweaves through all other aspects, like rebar does in concrete. Many basic life skills are acquired in nature. Life skills require a mix of critical thinking, social and emotional intelligence, and creativity. But unlike the other categories, life skills arguably can be seen as both ends as well as means. Without providing life skills, education is failing to prepare children for life, especially on a planet in such a rapid state of change. Life skills include a wide variety of proficiencies, including basic survival skills, such as cooking and gardening; language learning; comprehensive sexuality education; and vocational training.

In Chapter 14, Helen Maguire and Amanda McCloat demonstrate how home economics plays an important role in teaching students essential skills, such as nutrition, cooking, sewing, and balancing a household budget—all of which have benefits for both sustainability and resilience. For example, choosing healthier, less-processed foods requires cooking skills, which fewer people now possess. Gaining this knowledge will help address the obesity epidemic today as well as prepare students for a future where processed foods may be harder to procure.[26]

Multilingualism is also a key life skill that research reveals offers cognitive, health, social, and economic benefits. It even "rewires" the brain, with studies of bilingual individuals demonstrating improved multitasking ability, cognitive flexibility, and resistance to dementia. With population movements all but guaranteed to accelerate in the future—as droughts, floods, disasters, and conflicts increase—knowing multiple languages will boost both employability and adaptability.[27]

Comprehensive sexuality education, which Mona Kaidbey and Robert Engelman discuss in Chapter 15, is also an essential life skill with which to graduate. This is not just for the obvious reason of preventing unwanted pregnancies and thus reducing population growth, but also to improve gender

relations, prevent unwanted sexual attention, and make life more enjoyable. "Sexuality is a dimension of who we are as human beings," Kaidbey and Engelman explain, and not being aware of or comfortable with one's own sexuality can greatly reduce one's well-being.[28]

Finally, vocational training—gaining skills that can lead to a future livelihood—is an essential element that education cannot afford to overlook. In Chapter 18, Nancy Lee Wood discusses how vocational training can provide affordable learning opportunities that both lead to employment and help in our transition to a more sustainable society—whether through direct training in renewable energy engineering, building repair and retrofitting, and regenerative agriculture, or through fields such as peace and conflict management, which will help in navigating the turbulent times ahead. The Mechai Pattana School in Thailand may offer the best example of a school integrating life skills into its core curriculum: at this high school, students are trained in social entrepreneurship, community forestry, and gardening and manage a variety of school businesses, from selling eggs and off-season limes to assembling small solar panel kits to market to Thai villagers.[29]

Kei Franklin

A student at the Mechai Pattana School in Thailand assembles portable solar panels to sell to surrounding communities.

Principle 6: Earth-centric Leadership

At the pinnacle of the EarthCore pyramid is Earth-centric leadership. Earth-centric leadership is the full actualization of education, of empowering and emboldening students to be reverent Earth citizens who work energetically to build a sustainable future and to help their fellow beings survive the coming changes. How does one teach Earth-centric leadership? To some extent, it will stem organically from teaching the other EarthCore principles—but it is too important to not teach actively.

Teaching Earth-centric leadership first requires schools to teach students what educational thinker Paulo Freire calls "critical consciousness." This will

enable students to perceive the hypocrisies embedded in the social, political, economic, and cultural systems of which they are a part and that will need to be corrected if they are to help create a just and sustainable society. These corrections will not necessarily be easy to make, but being critically conscious of the need for them will be an essential prerequisite of Earth-centric leaders.[30]

Second, schools will need to teach and mobilize students to take an active role as advocates, organizers, social entrepreneurs, and leaders of all types. Students will need to assess the need for change and then take action bravely and strategically, embracing their role as change agents, even in the face of significant resistance. Although this type of engagement is rare in schools today, some institutions are leading the way. In Toronto, Canada, the Grove Community School has framed its elementary education around community activism, social justice, and sustainability education. Embedding these values directly in the school's curriculum, the teachers are empowering their students to be activists by discussing current events in class, writing letters to government officials, and even joining local environmental protests.[31]

In Bali, Indonesia, the sustainability-oriented Green School also is taking an active role in encouraging students to solve real-world problems. This has led to real-world results: in 2013, sisters Melati and Isabel Wijsen organized a plastic-bag-ban campaign in the province as a school project. Two years later, after a petition that included thousands of signatures and a brief hunger strike, they and their fellow students got a commitment from the governor of Bali to ban the bags province-wide by 2018. Their efforts have since gone global, and their organization, Bye Bye Plastic Bags, now has chapters in nine countries around the world.[32]

While few schools have integrated activism and Earth-centric leadership training into their teaching practices, many individual educators have done so, working within their school systems to confront injustices in their local communities. Rebecca Jim, a guidance counselor at an Oklahoma high school near Tar Creek, one of the worst hazardous waste sites in the United States, worked with teachers to integrate study of Tar Creek into ten classrooms across a variety of subject areas. Through this, students not only learned about the Superfund site near them, but played an active role in advocating for its cleanup. Jim—who supported students' efforts to analyze the health and environmental impacts of the site, present findings to the community and the media, and even publish two volumes of poetry and essays on Tar Creek—was central in both mobilizing her students to become sustainability-minded civic leaders

and getting the U.S. Environmental Protection Agency to better address the site's toxic legacy.[33]

Fortunately, not all students will have an environmental disaster near them to serve as a focal point for their leadership training, but projects abound everywhere. Whether the conservation of a local stream or wetland, the creation of a new park, lobbying the local government to support sustainable living, or the establishment of a sustainable community social enterprise, there is infinite opportunity for teachers and students to develop projects that cultivate Earth-centric leadership.

Earth Education will prove essential in adequately preparing students for the challenges ahead. Ideally, EarthEd and the EarthCore principles will be advanced by school systems at an administrative level. But the teacher can, and does, play an essential role in bringing EarthCore to the fore. For example, a teacher in Vermont, inspired by a documentary on forest schools, can set up "Forest Fridays," bringing her students out into the woods one day each week. An art teacher can have her students design comics for sustainability, and a history teacher can add systems thinking to his lesson to better explain the dynamic interactions underlying historic events. A home economics teacher can teach sustainable gardening, cooking, and nutrition classes, and on and on. As the world faces an accelerating rate of change, providing students with these EarthEd fundamentals will be critical in building the more sustainable and resilient future they deserve.[34]

Higher Education Reimagined

To this point, the discussion of Earth Education has focused mainly on primary and secondary schooling. But education is a lifelong endeavor, and the focus must extend throughout all stages of learning. Moreover, if students attain an Earth-centric education when they are young, only to "graduate" to a neoliberal economics program or a traditional business school where they learn that maximization of profit is the primary fiduciary responsibility of a business leader, then the effort to rethink education for life on a changing planet will have failed. Hence, the second part of *State of the World 2017* explores how higher education also must be centered on EarthEd.

Here, higher education should be understood in its broadest context. University is just one path, even if the currently preferred one. Vocational training, apprenticeships, folk high schools, and shorter, more-targeted trainings play an important role in higher education—especially in a future where resource constraints may limit access to cost-intensive university education.

Higher educational opportunities also should be available to underserved populations, from rural villages to prison inmates. Barefoot College, for example, provides schooling and nondegree vocational training to thousands of Indian villagers each year and is also training female village elders to be solar engineers, which has helped provide both employment and development opportunities in more than sixteen hundred villages worldwide. (See Chapter 18.) And, as Joslyn Rose Trivett and her colleagues discuss in Chapter 19, providing science and sustainability education in prisons can play an important role in empowering inmates, improving their psychological well-being and offering livelihood opportunities post-release.[35]

For those who do attend university, the role of the institution, writ broadly, must be to help usher in a sustainable future. All disciplines will need to account for the ecological realities in which they, and human societies, are embedded. Some colleges, like College of the Atlantic (COA) in Bar Harbor, Maine, have done this to their very core. Regardless of what students choose to study, COA offers only one major: human ecology, or "the exploration of relationships between humans and their natural, cultural, and built environments." Within that context, students take an active role in designing their own course of study, whether choosing to study the arts, environmental sciences, sustainable business, languages, or many other concentrations.[36]

Although few schools have gone as far as COA, many are taking great strides in integrating sustainability more directly into their operations, infrastructure, research, and curricula. Although much of the emphasis today is on eco-efficiency, renewable energy, and building standards, more universities are starting to focus their attention on greening their curricula. In the Association for the Advancement of Sustainability in Higher Education's (AASHE) Sustainable Campus Index, for example, Appalachian State University received a top score of 96 percent for its curriculum, forty points higher than the U.S. average. The university not only offers undergraduate and graduate programs on sustainability, but all of its academic departments offer at least one course that includes exploration of sustainability, and all students graduate from programs that have adopted at least one of the university's three sustainability learning goals.[37]

Unfortunately, just as primary and secondary education has been captured to some degree by corporate interests in the United States, so too has higher education—from research funding to campus life. This limits the degree to which universities are free to reinvent themselves in the ways that our changing planet requires. In Chapter 16, Michael Maniates describes how universities

have grown up in an era of economic growth and play an integral role in its promotion. Moving forward, higher education will need to prioritize redirecting the university away from this role and toward preparing human society for a post-growth future.[38]

In Chapter 17, Jonathan Dawson and Hugo Oliveira discuss redesigning the classroom, where instruction today focuses overwhelmingly on delivering an unquestioned set of information. To improve education, schools and universities need to better ground education in community, in dynamic knowledge, in students' experiences, and even in their bodies, by making the intellectual tangible—whether by going on nature walks, acting in classroom plays, or doing local service education projects.[39]

Another challenge is to infuse specific disciplines that are critical for developing a sustainable future with an EarthEd orientation. Whether in agriculture, economics, or engineering, there is no shortage of work ahead. In Chapter 22, Daniel Hoornweg, Nadine Ibrahim, and Chibulu Luo describe how, with the world's economies, populations, and cities on a trajectory to grow well into the future, more engineers will be needed. However, our future engineers will need to have a better grasp on sustainability if they hope to provide the required infrastructure in ways that do not accelerate climate change and ecological decline.[40]

In Chapter 21, Laura Lengnick explores how future farmers will need to have a strong grasp of sustainable, restorative, and resilient agricultural practices to feed the 9.7 billion people projected to be on the planet by 2050, all while climate change reduces yields and as the spread of consumerism expands the demand for more ecologically taxing meats and processed foods.[41]

Joshua Farley makes the point in Chapter 20 that until economics is grounded in the real world, our myopic view of economic activity will continue to taint effective economic planning and policy making. Fortunately, there is an upswelling of effort by students and professors of economics to integrate the real world into their discipline.[42]

Finally, professional schools will need to upgrade to be Earth-centric as well. As Andrew J. Hoffman describes in Chapter 23, the business school curriculum has to evolve from being focused just on reducing *un*sustainability in business operations to reexamining the role of business in society in order to create greater sustainability. In Chapter 24, Jessica Pierce describes how medical schools, too, must adapt to the times as pollution and environmental disruptions lead to more diseases, and as our current medical system invests disproportionate time and energy in treating symptoms rather than

preventing illness. Although few medical schools have even broached these challenges, it is essential that they do.[43]

Samuel Mann

Students pursuing a masters degree in Sustainable Media Technology at the Royal Institute of Technology in Stockholm, Sweden, play a sustainability board game, GaSuCo.

Moving Forward

The gap between Earth Education and where schools are today is about as wide as the gap between human civilization's current climate policies and what science requires of us to get to a sustainable future. In societies where sustainability is typically an afterthought at best, is there any chance that we can get to a truly Earth-centric education system?

The models certainly exist: the Mechai Pattana School, Barefoot College, SEEQS, College of the Atlantic, and forest schools all point the way. More pioneers are needed to take these experiments even further. And more reformers are needed to bring good ideas into existing institutions of learning. Of course, both pioneers and reformers will need support. Global programs such as Eco-Schools—which now boasts more than forty-nine thousand registered schools (see Chapter 3)—and AASHE's Sustainable Campus Index can help provide incentives, support, and a clear path to ratchet up efforts.[44]

Philanthropy also can play a role in nudging schools toward an EarthEd model, although today foundations appear to be focusing more on short-term educational reforms that improve conventional academic performance. Even if their efforts succeed, however, without embedding these reforms in an Earth-centric "theory of change," students will remain underprepared for the challenging times ahead.[45]

Most important is shifting government policy to better orient schools on sustainability, as this is where the bulk of funding and education policy direction comes from. Although many governments have made some effort to integrate education for sustainable development (ESD) into their national curricula, few have deeply integrated sustainability to the extent needed to tackle the challenges ahead. Sweden, for example, requires every level of education to promote sustainable development, and, since the mid-1990s, the country's

National Agency for Education has been integrating ESD into the curriculum, supporting this with teacher training, sharing of best practices, and regular assessments of ESD implementation. Yet while leading the way, even Sweden's efforts are far from comprehensive: for example, no assessment of ESD learning is included in Swedish national testing, signaling ESD's secondary role in national learning objectives.[46]

Perhaps with implementation of the new United Nations Sustainable Development Goals—Goal 4 of which aims to "ensure inclusive and quality education for all and promote lifelong learning"—governments will increase their attention to sustainability and resilience education. After all, if education does not teach about sustainability or how to live on a changing planet, it is hard to argue that it is quality education that promotes lifelong learning. Perhaps reassuringly, a more-specific target of Goal 4 is: "By 2030, ensure that all learners acquire the knowledge and skills needed to promote sustainable development, including, among others, through education for sustainable development and sustainable lifestyles, human rights, gender equality, promotion of a culture of peace and non-violence, global citizenship, and appreciation of cultural diversity and of culture's contribution to sustainable development."[47]

If governments strive to achieve this goal, education could look quite different in the future. Chapter 25 of this book envisions what education could look like in 2030 if educators, administrators, and others both comprehend *and act on* this need for a fundamental shift in educational priorities—focusing on Earth Education and establishing new types of schools that specialize in teaching local ecological knowledge, activism, and Earth-centric leadership. On a changing planet, it will be essential for education to evolve, not simply to expand to reach more people.[48]

Education alone will not save humanity, but it may play an essential role in enabling people to get through the turbulent times ahead with their humanity intact. It also may help train a new generation of leaders who can slow the ecological crisis to a speed to which humanity may be able to adapt. For education to play this role, however, it will take bold leadership on the part of educators and the administrators and policy makers that support them. If they can summon up this leadership, then perhaps tomorrow's students will be not only better equipped for surviving the challenges ahead, but also well on the way to building a sustainable future.

Notes

Foreword

1. Donella Meadows, *Thinking in Systems* (White River Junction, VT: Chelsea Green, 2008).

2. Edward O. Wilson, *Half-Earth: Our Planet's Fight for Life* (New York: W. W. Norton & Company, 2016).

3. William Ophuls, *Ecology and the Politics of Scarcity Revisited* (New York: W. H. Freeman, 1977/1992).

4. Joachim Radkau, *The Age of Ecology* (Malden, MA: Polity Press, 2011).

Chapter 1. EarthEd: Rethinking Education on a Changing Planet

1. Bijal Trivedi, "Chimps Shown Using Not Just a Tool but a 'Tool Kit,'" *National Geographic News*, October 6, 2004; John Downer Productions Ltd., "Dolphins: Spy in the Pod," Episode 1, 2014; Charles I. Abramson and Ana M. Chicas-Mosier, "Learning in Plants: Lessons from *Mimosa pudica*," *Frontiers in Psychology*, March 31, 2016; "Mimosa Plants Have Long Term Memory, Can Learn, Biologists Say," Sci-News.com, January 16, 2014; Michael Hopkin, "Bacteria 'Can Learn,'" *Nature*, May 8, 2008.

2. David F. Lancy, John Bock, and Suzanne Gaskins, "Putting Learning in Context," in David F. Lancy, John Bock, and Suzanne Gaskins, eds., *The Anthropology of Learning in Childhood* (Plymouth, U.K.: AltaMira Press, 2012), 5.

3. Erik Assadourian, "The Rise and Fall of Consumer Cultures," in Worldwatch Institute, *State of the World 2010: Transforming Cultures* (New York: W. W. Norton & Company, 2010), 3–20.

4. Michon Scott, "What's the Hottest Earth Has Been 'Lately'?" Climate.gov, September 17, 2014; Millennium Ecosystem Assessment, *Ecosystems and Human Well-being: Synthesis* (Washington, DC: Island Press, 2005); John S. Watson, "Why I Think Oil and Natural Gas Are Indispensable for the Foreseeable Future," LinkedIn, August 30, 2016.

5. Leo Barraclough, "Global Advertising Spend to Rise 4.6% to $579 Billion in 2016," *Variety*, March 21, 2016; Assadourian, "The Rise and Fall of Consumer Cultures"; "The New Class War," *The Economist*, July 9, 2016.

6. Holli Riebeek, "Global Warming," Earth Observatory, June 3, 2010; Brady Dennis and Chris Mooney, "Scientists Nearly Double Sea Level Rise Projections for 2100, Because of Antarctica," *Washington Post*, March 30, 2016.

7. Carl Folke, "Respecting Planetary Boundaries and Reconnecting to the Biosphere," in Worldwatch Institute, *State of the World 2013: Is Sustainability Still Possible?* (Washington, DC: Island Press, 2013), 19–27; United Nations Population Division, *World Population Prospects: The 2015 Revision* (New York: 2015); Rakesh Kochhar, "A Global Middle Class Is More Promise Than Reality," Pew Research Center, July 8, 2015.

8. Oliver Milman, "Rate of Environmental Degradation Puts Life on Earth at Risk, Say Scientists," *The Guardian* (U.K.), January 15, 2015.

9. John Taylor Gatto, "Against School," *Harper's Magazine*, September 2003, 38; Lancy, Bock, and Gaskins, "Putting Learning in Context."

10. Jeanna Bryner, "Teaching Evolution Just Got Tougher in Tennessee," LiveScience, April 12, 2012; Deborah Zabarenko, "Tennessee Teacher Law Could Boost Creationism, Climate Denial," *Reuters*, April 13, 2012; Michael Smyth, "Smyth: Vision Vancouver Refusal to Take Corporate Cash for Schools 'Classic Case of Ideology Trumping Reality,' Says LaPointe," *The Province*, November 1, 2014; Josh Golin and Melissa Campbell, "Reining in the Commercialization of Childhood," in Worldwatch Institute, *State of the World 2017: Rethinking Education on a Changing Planet* (Washington, DC: Island Press, 2017); Common Sense Media Inc., *The Common Sense Census: Media Use by Tweens and Teens* (San Francisco, CA: 2015).

11. Erik Assadourian, "The Path to Degrowth in Overdeveloped Countries," in Worldwatch Institute, *State of the World 2012: Moving Toward Sustainable Prosperity* (Washington, DC: Island Press, 2012), 22–37; Harald Welzer, *Climate Wars* (Cambridge, U.K.: Polity Press, 2012); Potsdam Institute for Climate Impact Research and Climate Analytics, *Turn Down the Heat: Why a 4ºC Warmer World Must Be Avoided* (Washington, DC: World Bank, 2012); John Schwartz, "Paris Climate Deal Is Too Weak to Meet Goals, Report Finds," *New York Times*, November 18, 2016.

12. Michael K. Stone, "Ecoliteracy and Schooling for Sustainability," in Worldwatch Institute, *State of the World 2017*; Luis González Reyes, "Growing a New School Food Culture," in idem.

13. Buffy Cushman-Patz, School Leader, School for Examining Essential Questions of Sustainability (SEEQS), Honolulu, HI, personal communication with author, October 18, 2016; SEEQS, *Examining Our World: 2016 Yearbook* (Honolulu, HI: 2016).

14. David Sobel, "Beyond Ecophobia," *Yes! Magazine*, November 2, 1998; David Sobel, "You Can't Bounce Off the Walls If There Are No Walls: Outdoor Schools Make Kids Happier—and Smarter," *Yes! Magazine,* March 28, 2014; Timothy D. Walker, "Kindergarten, Naturally," *The Atlantic*, September 15, 2016; David Sobel, "Outdoor School for All: Reconnecting Children to Nature," in Worldwatch Institute, *State of the World 2017*; Melissa K. Nelson, "Education for the Eighth Fire: Indigeneity and Native Ways of Learning," in idem; "School's Out: Lessons from a Forest Kindergarten," a film directed by Lisa Molomot and produced by Rona Richter, 2014, www.bullfrogfims.com/catalog/school.

15. Jacob Rodenburg and Nicole Bell, "Pathway to Stewardship: A Framework for Children and Youth," in Worldwatch Institute, *State of the World 2017*.

16. Marvin W. Berkowitz, "The Centrality of Character Education for Creating and Sustaining a Just World," in Worldwatch Institute, *State of the World 2017*.

17. Pamela Barker and Amy McConnell Franklin, "Social and Emotional Learning for a Challenging Century," in Worldwatch Institute, *State of the World 2017*; Jessica Alexander, "America's Insensitive Children?" *The Atlantic*, August 9, 2016; James Gaines, "This School Replaced Detention with Meditation. The Results Are Stunning," Upworthy, September 22, 2016.

18. Anya Kamenetz, Steve Drummond, and Sami Yenigun, "The One-Room Schoolhouse That's a Model for the World," NPR Morning Edition, June 9, 2016; Center for Education Innovations, "Escuela Nueva," www.educationinnovations.org/program/escuela-nueva; Fundacion Escuela Nueva, "Escuela Nueva Pedagogical Concept in 3 Minutes!" video, May 7, 2013, https://www.youtube.com/watch?v=x1uMr4hI6I8; Emily Gustafsson-Wright and Eileen McGivney, "Fundación Escuela Nueva: Changing the Way Children Learn from Colombia to Southeast Asia," Brookings, April 23, 2014.

19. David Whitebread, "Crisis in Childhood: The Loss of Play," *Cambridge Primary Review*, November 16, 2015.

20. David Whitebread, "Prioritizing Play," in Worldwatch Institute, *State of the World 2017*; Timothy D. Walker, "The Junk Playground of New York City," *The Atlantic*, August 11, 2016; Claire Duffin, "Streets Are Alive with

the Sound of Children Playing," *The Telegraph* (U.K.), February 22, 2014; Sheila Wayman, "Let the Children Play: The Secret to Finnish Education," *The Irish Times*, October 4, 2016; Timothy D. Walker, "The Joyful, Illiterate Kindergartners of Finland," *The Atlantic*, October 1, 2015; Ariana Eunjung Cha, "The U.S. Recess Predicament," *Washington Post*, October 2, 2015; Adam Taylor, "Why Finland's Unorthodox Education System Is the Best in the World," *Business Insider*, November 27, 2012.

21. Marilyn Mehlmann with Esbjörn Jorsäter, Alexander Mehlmann, and Olena Pometun, "Looking the Monster in the Eye: Drawing Comics for Sustainability," in Worldwatch Institute, *State of the World 2017*.

22. "Rise of the Machines," *The Economist*, May 9, 2015.

23. Linda Booth Sweeney, "All Systems Go! Developing a Generation of 'Systems-Smart' Kids," in Worldwatch Institute, *State of the World 2017*.

24. Dennis McGrath and Monica M. Martinez, "Deeper Learning and the Future of Education," in Worldwatch Institute, *State of the World 2017*.

25. Edward O. Wilson, *Consilience: The Unity of Knowledge* (New York: Alfred A. Knopf, Inc., 1998), 269.

26. Helen Maguire and Amanda McCloat, "Home Economics Education: Preparation for a Sustainable and Healthy Future," in Worldwatch Institute, *State of the World 2017*.

27. Yudhijit Bhattacharjee, "Why Bilinguals Are Smarter," *New York Times*, March 17, 2012; Claudia Dreifus, "The Bilingual Advantage," *New York Times*, May 30, 2011; Naja Ferjan Ramírez and Patricia K. Kuhl, *Bilingual Language Learning in Children* (Seattle, WA: Institute for Learning & Brain Sciences, University of Washington, June 2016); Melinda D. Anderson, "The Economic Imperative of Bilingual Education," *The Atlantic*, November 10, 2015.

28. Mona Kaidbey and Robert Engelman, "Our Bodies, Our Future: Expanding Comprehensive Sexuality Education," in Worldwatch Institute, *State of the World 2017*.

29. Nancy Lee Wood, "Preparing Vocational Training for the Eco-Technical Transition," in Worldwatch Institute, *State of the World 2017*; Kei Franklin, "Providing Environmental Consciousness Through Life Skills Training," in idem.

30. Paulo Freire, *Pedagogy of the Oppressed* (London: Bloomsbury Academic, 2000); Paulo Freire, *Education for Critical Consciousness* (New York: Continuum, 2005).

31. The Grove Community School, "Our Core Values," http://thegrovecommunityschool.ca/#core-values; Wilma Verhagen, Principal, The Grove Community School, Toronto, ON, personal communication with author, December 2, 2016.

32. John Hardy, "My Green School Dream," TED Talk, July 2010; Melati Wijsen and Isabel Wijsen, "Our Campaign to Ban Plastic Bags in Bali," TED Talk, January 2016; Bye Bye Plastic Bags website, www.byebyeplasticbags.org, viewed November 29, 2016.

33. Celia Oyler, *Actions Speak Louder Than Words: Community Activism as Curriculum* (New York: Routledge: 2012), 12–24.

34. Sobel, "Outdoor School for All"; Mehlmann with Jorsäter, Mehlmann, and Pometun, "Looking the Monster in the Eye"; Sweeney, "All Systems Go!"; Maguire and McCloat, "Home Economics Education."

35. Wood, "Preparing Vocational Training for the Eco-Technical Transition"; Joslyn Rose Trivett et al., "Sustainability Education in Prisons: Transforming Lives, Transforming the World," in Worldwatch Institute, *State of the World 2017*; Bunker Roy, "The Barefoot Model," in idem; "What Is a Danish Folk High School," a film by denmark.dk, http://danishfolkhighschools.com/about.

36. College of the Atlantic, "Areas of Study," www.coa.edu/academics/areas-of-study.

37. American Association for the Advancement of Sustainability in Higher Education (AASHE), *Sustainable Campus Index: 2016 Top Performers & Highlights* (Philadelphia, PA: October 2016); Elisabeth B. Wall, "Appalachian Earns AASHE's Top Overall Sustainability Ranking," *Appalachian Magazine*, November 16, 2016; Appalachian State University, "Student Learning Outcomes," https://sd.appstate.edu/academics/internships/student-learning-outcomes, viewed November 29, 2016.

38. Jennifer Washburn, *University Inc.: The Corporate Corruption of Higher Education* (New York: Basic Books, 2005); Michael Maniates, "Suddenly More Than Academic: Higher Education for a Post-Growth World," in Worldwatch Institute, *State of the World 2017*.

39. Jonathan Dawson and Hugo Oliveira, "Bringing the Classroom Back to Life," in Worldwatch Institute, *State of the World 2017*.

40. Daniel Hoornweg, Nadine Ibrahim, and Chibulu Luo, "Educating Engineers for the Anthropocene," in Worldwatch Institute, *State of the World 2017*.

41. Laura Lengnick, "New Times, New Tools: Agricultural Education for the Twenty-First Century," in Worldwatch Institute, *State of the World 2017*.

42. Joshua Farley, "Bringing the Earth Back into Economics," in Worldwatch Institute, *State of the World 2017*.

43. Andrew J. Hoffman, "The Evolving Focus of Business Sustainability Education," in Worldwatch Institute, *State of the World 2017*; Jessica Pierce, "Teaching Doctors to Care for Patient and Planet," in idem.

44. Michael K. Stone, "Ecoliteracy and Schooling for Sustainability," in Worldwatch Institute, *State of the World 2017*.

45. The Annie E. Casey Foundation, *Theory of Change: A Practical Tool for Action, Results and Learning* (Baltimore, MD: 2004).

46. Barbara Chow, "Policy as Opportunity – Your Best and Worst Friend," video, February 15, 2012, https://www.youtube.com/watch?time_continue=17&v=zMfmvJ1feCw; United Nations Educational, Scientific and Cultural Organization, *National Journeys Towards Education for Sustainable Development 2013* (Paris: 2013).

47. United Nations Sustainable Development Goals, "Goal 4: Ensure Inclusive and Quality Education for All and Promote Lifelong Learning," www.un.org/sustainabledevelopment/education.

48. Erik Assadourian, "The Future of Education: A Glimpse from 2030," in Worldwatch Institute, *State of the World 2017*.

Chapter 2. Outdoor School for All: Reconnecting Children to Nature

1. Victoria J. Rideout, Ulla G. Foehr, and Donald F. Roberts, *Generation M²: Media in the Lives of 8- to 18-Year-Olds* (Menlo Park, CA: Kaiser Family Foundation, January 2010), 2.

2. David Sobel, *Childhood and Nature: Design Principles for Educators* (Portland, ME: Stenhouse Publishers, 2008), 114.

3. Louise Chawla and Victoria Derr, "The Development of Conservation Behaviors in Childhood and Youth," in Susan Clayton, ed., *Oxford Handbook of Environmental and Conservation Psychology* (Oxford, U.K.: Oxford University Press, 2012), 30–31.

4. Ibid.

5. "School's Out: Lessons from a Forest Kindergarten," a film directed by Lisa Molomot and produced by Rona Richter, 2014, www.bullfrogfilms.com/catalog/school; Rosemary Bennett, "If You Go Down to the Woods Today,"

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