Worms, Bunny-Huggers, and the Triple Bottom Line: Multidisciplinary Projects for Environmental Education

YOU WILL DIE BUT THE CARBON WILL NOT; ITS CAREER DOES NOT END WITH YOU. IT WILL RETURN TO THE SOIL, AND THERE A PLANT MAY TAKE IT UP AGAIN IN TIME, SENDING IT ONCE MORE ON A CYCLE OF PLANT AND ANIMAL LIFE.

– Jacob Bronowski, mathematician, biologist, historian of science, poet

Kai held out her hands at exactly the right distance to balance squeamishness and curiosity, peering cautiously into a squirming ball of earthworms. Awkwardly, she dropped the worms back into their worm bin and listened as the guest speaker explained the finer points of vermicomposting to the whole group of middle school students from Honolulu's School for Examining Essential Questions of Sustainability (SEEQS). Kai and her classmates were enjoying a tour of Kapiolani Community College's Culinary Arts facilities, having just come from watching the tilapia lazily swimming in the aquaponics tank, shaded by lush passion fruit vines. The water flowed over beds of crushed lava rock, as bushy green stands of basil, chard, cilantro, and kale filtered the fish waste out of the water to use as nutrients. A solar-powered pump returned the newly cleaned water back to the fish in a continuous burbling cycle.

“Sustainability is the lens we chose for this school,” explains school founder Buffy Cushman-Patz, “because it is such a pressing issue that this generation of students is going to have to solve.”

Each semester, the school’s faculty discusses, debates, and decides on an Essential Question of Sustainability that captures some fundamental issue related to sustainable living. “How does water sustain us? How does the way we get around affect where we live? How do government and economic systems affect culture and resources? What role does the ocean serve in regulating life on earth? What does it mean to live well on an island?” Cushman-Patz leans forward, a furrowed brow replacing her relaxed Hawaiian demeanor. “There are all kinds of essential questions adults think about in real life, and we want students to be digging into those questions.” Each day, the students spend the mornings learning the traditional academic core—science, history, English, math. But every afternoon, the students are given the freedom to choose their own interest within the larger Essential Question of the semester.

This semester’s Essential Question: “What do we eat, and why?” Some students may choose to study the fascinating history of foods important in Hawaiian culture; others may choose to build and maintain a small organic garden plot on the school grounds. Some, like Kai, may close the loop by maintaining a worm bin of their own to turn food waste back into nutrients for the soil.

“Sustainable development is development that meets the needs of the present without compromising the ability of future generations to meet their own needs.” This phrase, from the 1987 report from the UN-established World Commission on Environment and Development, is frequently cited as the earliest operational definition of sustainability.

At its most fundamental level, sustainability dictates a balance between rates of consumption and renewal of a resource. Use water faster than it is being replenished, and go thirsty. Harvest fish from the sea faster than they are capable of reproducing their population, and go hungry. And emit more carbon dioxide to the atmosphere beyond the earth system’s capacity to absorb the excess, then watch unpredictable changes in the planet’s climate.

As Kai (a pseudonym) investigates how worms turn vegetable scraps into worm castings—worshipped by gardeners as “black gold”—she will need to be able to navigate the human-imposed boundaries between physics, chemistry, biology, and earth science. Too often, these artificial silos of scientific knowledge are taught in isolation, obscuring the complex interactions that weave nature’s grand symphony. Kai will need to understand the progress of energy, water and carbon through the microcosm of the worm bin—from the leftovers of the vegetable harvest, to worm castings, to the soil, to the plant, to harvest, and closing the loop back to vegetable scraps. If her project is successful, Kai will feel the warm glow of success in keeping her tiny charges alive. If for some reason her herd of red wigglers does not survive, she will learn an even more poignant lesson about the pitfalls of human-managed ecosystems. In that case she clearly must have missed some influential variable, too much of one thing or not enough of another, disrupting the cycle’s delicate balance. When it comes to robust learning, nothing succeeds like failure.

Challenging students to face complex problems was a foundational philosophy for Cushman-Patz as she designed the School for Examining Essential Questions of Sustainability, conveniently abbreviated as SEEQS. “There is no concept of sustainability for which the solution doesn’t require interdisciplinary thinking.” And yet standalone science courses tend to be the rule in U.S. high schools; interdisciplinary science courses are the exception.

California offers a potentially instructive example of the dearth of interdisciplinary sciences. At the high school level, the state offers standards and tests for each of the standalone sciences, each an isolated movement of Nature’s complex symphony. In addition, California has created not one, but four levels of integrated science standards, “remixed” from the standalones, but with no apparent effort at framing a coherent melody line to provide necessary context. In 2013, some 1.2 million California high school students took standardized tests in science. [1]Yet fewer than one in 25 of these students were tested in an integrated science. Trends in the past 10 years show participation in integrated sciences decreasing, even as overall science enrollment increases rapidly.

Of the students tested in one of the standalone sciences, nearly half achieved a “proficient” or “advanced” score, the targets set by the state. Of the students tested in an integrated science, only one in four demonstrated the same level of proficiency. This poor student performance almost certainly reflects the populations of students and teachers: all too frequently, integrated science courses are offered as remedial science for the lowest-performing students; and all too frequently, these courses are thrust upon the newest teachers, with the least preparation and experience. This poor student performance may also reflect the difficulty of teaching such a class; even an experienced teacher might struggle with the depth of content knowledge needed to connect the disparate topics into a coherent storyline.

THAT LAND IS A COMMUNITY IS THE BASIC CONCEPT OF ECOLOGY, BUT THAT LAND IS TO BE LOVED AND RESPECTED IS AN EXTENSION OF ETHICS.

*– Aldo Leopold, author, ecologis*t

At six foot four, sporting cop shades and aggressive muttonchop sideburns, KSTF Senior Fellow and biology teacher Jim Lane bears little resemblance to the "hippie bunny hugger" he has sometimes been called. Mirrored eyes suggest Strother Martin in Cool Hand Luke, as Lane surveys his students laboring like a chain gang in a large open field beneath the midday sun. He would be an intimidating figure but for his loud laugh and goofy sense of humor. And these kids are enthusiastic participants in Lane's high school environmental science class. Where his students have yet to work, the field looks like a featureless monoculture of Kentucky bluegrass lawn, but in the wake of his students' progress, the field is dotted with a haphazard pattern of shallow holes filled with seedlings diverse in leaf, stem, and flower.

Inspecting the plantings, Lane seems pleased. Inspired by Aldo Leopold's concept of the Land Ethic, Lane and his class had decided to restore this half-acre field to its natural state, recreating a critical habitat that used to typify Minnesota's prairie. The restored field would serve as a living laboratory, demonstrating how low maintenance landscaping can improve habitat for native pollinators, birds, and insects.

Andropogon gerardii, Bouteloua curtipendula, Bouteloua hirsuta, Bromus ciliatus, Carex alopecoidea, Eragrostis spectabilis, Schoenoplectus fluviatilis: these are just a few of the native prairie plants and grasses that Lane's class will replace. These plants provide food and shelter for animals, birds, and pollinating insects. They provide structure under the weight of snowfall to provide areas for spring nesting. The roots of these prairie plants provide erosion control during the strong rains and winds of late spring and early summer, and dig deep into the soil for water access during the dry months to provide excellent food supplies for herbivores. Prairie biodiversity improves the ability of the soil to retain water and nutrients, and to hold on to carbon in the form of organic matter, all of which help maintain the health and abundance of the interconnected species.

In short, the restored prairie represents a self-sustaining ecosystem—one that used to cover large swaths of the country, but has been largely mown down to make room for human development.

“Sustainability is a word that has been grossly overused in recent years,” says Lane. “From a human perspective we have been growing exponentially as if the resources truly are infinite.” Fossil fuel consumption drives controversial extraction techniques such as fracking and mountaintop removal. Demand for biofuels and livestock feed drive deforestation to make room for corn and sugar cane. Barely restrained fishing pressure drives once plentiful marine populations to the brink of extinction. “We want it all but we don’t want to sacrifice anything to ensure the future of our species on our planet.”

The Kentucky bluegrass field that Lane’s students are replacing is an entirely artificial construct, unfamiliar in the grand history of the American plains. Ten thousand years ago, as the ice sheets retreated from Minnesota’s surface after the last ice age, the freshly exposed virgin soil developed a complex prairie ecosystem of grasses, shrubs, insects, microbes, animals, birds, and predators. Human development in the last hundred years has essentially eradicated the prairie ecosystem in favor of weed-free lawns, carefully groomed public parks, intensively grazed pastures, and vast acres of single-crop agriculture. Irrigation, fertilization, and flood control have fundamentally altered the flow of water and nutrients to, from, and within the ecosystem.

All these modifications have been made in the name of improving the human condition: more food and less hardship. This ostensible convenience comes with consequences. Some are easily understood at the time of tradeoff, for example every row of corn planted means one row of soybeans that cannot be planted. Other tradeoffs have only recently begun to be appreciated. Loss of biodiversity decreases the ecosystem’s ability to resist drought, disease, and fire. Replacing soil nutrients with man-made proxies kills the natural soil ecosystem of bacteria, fungi, and countless creepy crawlies who continually replenish the topsoil for future generations. A vicious cycle begins, in which additional artificial fertilizer must be used every season to make up for the murdered soil. Excessive use of artificial fertilizer increases nitrogen and phosphorus runoff to streams and rivers, creating algae blooms that deplete the water of oxygen and create dead zones downstream.

THE ‘CONTROL OF NATURE’ IS A PHRASE CONCEIVED IN ARROGANCE, BORN OF THE NEANDERTHAL AGE OF BIOLOGY AND PHILOSOPHY, WHEN IT WAS SUPPOSED THAT NATURE EXISTS FOR THE CONVENIENCE OF MAN.

– Rachel Carson, marine biologist, conservationist

In order to properly restore this half-acre patch of ground to a sustainable ecosystem, Lane’s students had to explore far beyond the bounds of a typical biology textbook. To determine appropriate plants for the restored prairie plot, students researched the sunlight, rainfall, temperature, and soil geology—introducing ideas inherent in physics, chemistry, and earth science. “In doing the project they were required to understand many other aspects of environmental science that are often taught as independent topics,” explains Lane. “The project serves as the context in which the major content ideas are grounded.”

Projects in the classroom are nothing new. John Dewey, a principal figure in the early progressive education movement, espoused the benefits of “learning by doing” in the waning years of the 19th century. Progressive and constructivist educators have since relied on authentic projects to provide context for student learning. In the past decade, through the efforts of organizations such as the Buck Institute of Education and high-profile charter school groups such as the New Tech Network and High Tech High, formalized “project-based learning” has become an educational buzzword. But the fundamental concept is still the same: Learning by doing.

As the day winds down, Lane’s students are doing. Back in the classroom, several clusters of students work on aspects of the prairie project—perusing seed catalogs to prepare for the next round of plantings, contacting local greenhouse professionals to mine their expertise, and setting up fundraising events to engage with the community. “I get my kids outside and try to get them connected to the natural world around them,” says Lane. “How can they be inspired to save the planet if they don’t even know, or care about, their own backyard?”

A well-designed project creates an intrinsic need-to-know, an interest that drives students to explore and learn for their own sake. Lane's students will not face a multiple-choice test about the prairie project. Grades are not the motivator, but rather curiosity and the desire to make a long-term investment in the health of their natural community. Students are enabled to prioritize their objectives, to write in leaf and soil their ecological values. Nature itself becomes the test—does their "restored" ecosystem pass muster of temperature, rainfall, and soil health?

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Every interaction between humans and the environment brings with it multiple consequences, many unintended, others unforeseen, and still others that lurk undetected. As with Kai and her worms, a broader understanding of the interconnections between the scientific disciplines helps illuminate the possible consequences much more brightly than the piecemeal approach to science typical to many schools. Interdisciplinary science informs the theory, and real-world projects provide an avenue for students to explore, reflect upon, and apply that understanding in context.

"Teaching for sustainability means putting students into real-world situations that require them to think critically," explains Cushman-Patz. "It takes more than teaching ‘critical thinking skills’ in the abstract. We’re asking them to think about the consequences right now.”

IT IS HORRIFYING THAT WE HAVE TO FIGHT OUR OWN GOVERNMENT TO SAVE THE ENVIRONMENT.

– Ansel Adams, photographer

If interdisciplinary project-based learning is such an effective path to learning, why are these examples not the norm in classrooms across the country?

Any educator is familiar with the systemic inertia that resists change. Standardized testing, mandated by state and federal education policy, puts pressure on teachers to at least superficially address every one of the disparate state-mandated standards. Many states are moving toward student test scores as a means of evaluating a teacher’s performance. Political pressure from parents and school and district administration discourages innovation by all but the most secure or most adventurous educators. This onslaught of pressures leaves teachers little to no time to implement interdisciplinary projects. Narrowly focused standards leave little room for exploring the connections to other scientific disciplines.

“It’s frustrating because sometimes decisions are made so far away from the classroom experience that by the time the rules get trickled down here,” Cushman-Patz sweeps downward with her hands, “it’s not what’s best for students.” This frustration drove her from own classroom in pursuit of a better solution. She studied School Leadership and School Development at the Harvard Graduate School of Education, earned her principal’s license, and founded SEEQS in 2013.

Political ideologies set up additional obstacles. “The biggest challenge that I have faced,” claims Lane, “is resistance to the ‘liberal agenda’ that is often perceived to exist in the content of many environmental issues.” Liberal politicians are often pilloried for environmental views: Jimmy Carter for urging people to put on a sweater to conserve energy; Al Gore for his film “An Inconvenient Truth” and his work with the Intergovernmental Panel on Climate Change. In his 2012 presidential campaign, Barack Obama’s opponents mocked his concern for sea level rise and climate change. Conservative politicians actively deny scientific evidence of climate change: “the greatest hoax ever perpetrated on the American people," according to James Inhofe, Republican Senator of Oklahoma. By immersing his students in the environmental experience rather than the words, Lane hopes to circumvent the divisiveness of hippie bunny-hugger politics. "My goal is to make conservation and environmental issues seem more common sense than the politically skewed versions that we see in the media."

Is the role of education to raise awareness and knowledge about environmental problems, allowing students to inform their own choices? Or should educators teach students to take action by promoting specific behavior changes and activities? This tension is evident in the report from the first United Nations Intergovernmental Conference on Environmental Education, called the Tblisi Declaration after the host city. The Tblisi Declaration outlined goals and objectives for environmental education, to provide guidance to nations developing environmental education programs. The declaration's first two goals promote awareness and knowledge of environmental issues—crucial and undisputed aspects of environmental education. The third goal, however, suggests advocacy: "to create new patterns of behavior of individuals, groups, and society as a whole towards the environment."

Awareness and knowledge alone can change attitudes and influence behaviors. But many teachers stop short of actively encouraging specific changes in behavior, to avoid administrative and ideological controversy. Picture a classroom in which students study worm bins, but are not encouraged to practice vermicomposting in the larger context of food waste and organic farming. Picture a classroom in which students study the workings of a prairie ecosystem, but are not encouraged to engage with their local community to recreate such a prairie on their own school grounds. But as scientific research reveals the magnitude of environmental challenges we face as a nation and as a species, will awareness and knowledge alone be enough?

WE NEED TO DEFEND THE INTERESTS OF THOSE WHOM WE'VE NEVER MET AND NEVER WILL.

– Jeffrey D. Sachs, economist

The classroom is in a state of mild disarray. Each group of high school students surrounds a table covered with bits of plastic and wood, solar cells and scavenged cell phone chargers, tools and sketches. Aryn, Byron, and Ryan are testing how changes in voltage affect the current and brightness of an LED. Andy, Sam, and

Zach are manipulating a plastic coke bottle to focus light from their own LED onto a light meter. Sammi, Mackenzie, and Connor are intricately weaving strips from a reclaimed soda can to make a tiny attractive lampshade for their own design. The students are designing low-cost light fixtures that can be powered by solar-charged batteries, to replace the kerosene lamps commonly used in many parts of the developing world. The project was inspired by John Barrie, founder of the Appropriate Technology Collaborative (ATC), which runs a workshop in the poor rural highlands of Guatemala to design affordable and clean technology that can be made and marketed locally. The classroom was my own, and this project in my Engineering & Green Technology course was my effort to actively engage students in social, economic, and environmental sustainability at a grassroots level.

When I approached Barrie about doing a project with his organization, he quoted a portion of the ATC's mission: "Market-based solutions that are culturally sensitive, environmentally responsible and locally repairable in order to improve the quality of life and reduce adverse impacts on the environment." First and foremost is empowering people and promoting dignity in low-income countries. "Poor people don't want cheap looking things," explained Barrie. "Sometimes we have seen well-intentioned nonprofits cut a Coke can in half and place an LED inside. They then nail the light to a person's ceiling. Not attractive. We try to encourage students to design lights that look like what you would want in your own home."

By the end of the project, some of my students had repurposed plastic scraps into products that would not look out of place in any home improvement store. And while other groups had crafted functional lights that might not pass the "what you would want in your own home" test, every student had been actively engaged in the science, the culture, and the economics of sustainable design. I was very proud of what my students had accomplished in such a short time.

One year later, I had left the classroom indefinitely.

WHY ARE ECOLOGISTS AND ENVIRONMENTALISTS SO FEARED AND HATED? THIS IS BECAUSE IN PART WHAT THEY HAVE TO SAY IS NEW TO THE GENERAL PUBLIC, AND THE NEW IS ALWAYS ALARMING.

– Garrett Hardin, ecologist

I had worked for years to build up the classroom capital to create my own course, wrangled grants and awards to help fund the projects, and created an atmosphere where students were empowered to explore sustainability outside the bounds of standardized testing. But a question still nagged at me. My students, and those of Cushman-Patz and Lane and many other fantastic teachers in other parts of the country, are achieving the stated objectives of the Tblisi Declaration—awareness, knowledge, and action with respect to environmental issues. The basic scientific underpinnings of sustainability are understood by all but the most intractable of climate-change deniers. So why, despite this understanding, are we as a nation and as a species, still rapidly depleting our valuable resources and polluting our precious planet?

“It’s not just a science question, it’s also a question about the way people and self-interest and collective benefits interact with each other.” Steve Gaines speaks as much with his hands as with his voice. Gaines earns a sense of authority as much from his crisp enunciation and neatly-trimmed salt-and-pepper goatee as he does from his title: dean of the Bren School of Environmental Science and Management at the University of California, Santa Barbara.

Environmental management is fundamentally about human management. Human institutions manipulate our natural resources to meet our physical, cultural, and emotional needs. Human beings are not entirely irrational in their behavior; they generally act in what they perceive as their own best interest. An understanding of environmental issues requires an understanding of the incentives that drive human behavior.

“If you want to teach sustainability,” Gaines emphasizes, “you have to teach economics.” And this is why I left the classroom: to immerse myself in the Bren School, to further my own understanding of environmental economics, policy, law, and science. Environmental philosophers and ethicists have proposed many variations on the role of humans with respect to the resources of the Earth. Some argue that the resources were placed, by God or by chance, to be exploited by individuals for fun and profit. Others argue that the bounty of nature belongs to the human race as a whole. Still others argue that nature bears its own inherent rights, and that humans must act as stewards to preserve nature for future generations. The current reality, however, pays little heed to environmental philosophy, and instead follows the economic philosophy of capitalism to drive action.

A foundational concept of resource economics is commonly known as “Tragedy of the Commons,” based on an influential essay by ecologist Garrett Hardin. Hardin’s essay described a scenario in which a number of herdsmen graze their cattle on a public pasture, or “commons.” The pasture, while limited, is plentiful enough to sustain a certain number of cattle indefinitely. However, a rational herdsman will realize that by adding an extra cow to his herd, he will gain all profit from the additional sale, while the harm caused by the additional cow’s grazing is shared equally among all the herdsmen. The herdsman sees an incentive to continue adding cattle to his herd; the other herdsmen reach the same conclusion. Quickly the cattle population increases beyond the capacity of the pasture to feed them. Soon, the pasture is a barren wasteland, the cows are starving, and the herdsmen are out of business.

The plight of cattle and herdsmen wasn’t Hardin’s main concern. His allegory is a lesson that can be applied to any publicly available resource. One of the clearest examples of tragedy of the commons can be seen in the collapse of historical fishing grounds. Unrestricted fishing pressure caused the collapse of Pacific sardines in the 1950s and Atlantic cod in the 1990s, and overfishing currently threatens 85 percent of species worldwide, including the Atlantic bluefin tuna and the Patagonian toothfish (more appetizingly re-marketed as Chilean sea bass).[2]“Self-interest is a gigantic motivator,” explains Gaines. “Unsustainable practices offer an opportunity for people to succeed as individuals at the expense of others.”

It is a fact of life that our global economy is driven by financial considerations. This includes our interactions with our environment, the reaping of natural resources, all too frequently for short-term gain without regard to long-term consequences. Considering economics in environmental policy is seen as the key by most economists, frequently by creating “property rights” for otherwise public resources. To prevent overfishing, a limited number of “catch shares” allow individual fishermen to harvest a certain amount of fish, while the overall harvest is limited to a level that allows the fish population to recover fully each year. To rein in pollution from fossil fuel power plants, “cap and trade” policies establish an “allowable” amount of pollution (the “cap”), and power plants must purchase shares to allow them to pollute (the “trade”). Over time, the “cap” is lowered, increasing the value of the remaining credits; the increasing price creates an economic incentive for power plants to invest in cleaner technologies.

While the finer details of environmental economics may be beyond the reach of most high schoolers, the basic concepts of public vs. private goods, exclusive vs. open access, and supply vs. demand are already taught many high school economics courses. Economics taught in the abstract ("widgets," anyone?) or in isolation, however, does little to further student understanding of sustainability, any more than physics taught in the abstract or biology taught in isolation. In fact, says Gaines, "A lot of people think economics is the problem, but that's because they don't understand that economics is not just how do you maximize profitability. Economics is all about understanding what are the incentives, what are the motivators of behavior. By understanding those things, you may make better choices." Empowering students to make better choices—isn't that a fundamental goal of environmental education?

THE GREAT CHALLENGE OF THE TWENTY-FIRST CENTURY IS TO RAISE PEOPLE EVERYWHERE TO A DECENT STANDARD OF LIVING WHILE PRESERVING AS MUCH OF THE REST OF LIFE AS POSSIBLE.

– *Edward O. Wilson, biologist, conservationist, author*

In November 2013, negotiators from nearly 200 nations worldwide met in Warsaw, Poland to discuss future actions to avert climate change. "Climate change is the greatest single threat to peace, prosperity and sustainable development," remarked UN Secretary General Ban-Ki Moon. The audience was well aware of the devastating effects of Typhoon Haiyan, which only days before had wreaked massive destruction and loss of life in the Philippines. Developing countries demanded that developed nations, having gained the benefit of unrestricted carbon pollution, bear the brunt of the cost of mitigating the effects of climate change. Developed nations, of course balked at this. Meanwhile, environmental and development groups walked out of the proceedings in frustration at the lack of meaningful progress.

Environmental issues are complicated and intimidating: climate change, ocean acidification, deforestation, food and water scarcity, sea level rise. These issues are inextricably woven into scientific, economic, social, and political structures. And they are likely to be the most important issues for the human race in the next century. It will not be easy to get the human race back on a sustainable path. There is no technological solution in sight that does not require economic sacrifice, social compromise, and political willpower.

But solutions will be found. Any real solution must reestablish environmental sustainability, of course. A real solution must also be socially and culturally sustainable, accommodating the preferences and needs of the people who must live with it. And of course, in our money-driven society, a real solution must be economically sustainable. This combination of “planet, people, and profit” is sometimes referred to as the “triple bottom line.”

For many students, high school will be the last exposure to these subjects, the last real opportunity to develop a holistic understanding of sustainability necessary to become a well-informed voter, consumer, and citizen. Enabling our students to consider real-world problems from the perspective of a sustainable triple bottom line requires an understanding of the complexity of environmental systems; the multiple, often unpredicted or unseen, consequences of human interaction with the environment; and the incentives and motivators of human behavior. Integrating science, math, economics, and other social sciences into multidisciplinary projects is one possible path to reach this goal.

This is not an insurmountable task, but it is admittedly a tough change to make for the average classroom teacher. A more effective model would almost certainly involve a whole team of teachers working in close cooperation. SEEQS, though still a brand new school, may provide an instructive model to watch. Guided by the vision of Cushman-Patz, the Essential Question of Sustainability projects provide an opportunity for every student to explore a broad environmental issue through a lens of their own design, able to leverage the expertise of the entire faculty—science, math, social studies, English, technology, and art. For Kai, her worms are just the tip of the iceberg. Kai is just starting out in the inaugural year of SEEQS. By the time she graduates, six years from now, she will have experienced a dozen semester-long multidisciplinary projects, each one asking and answering its own essential question of sustainability.

Cushman-Patz likes to quote another influential educator, Karl Fisch: “We are currently preparing students for jobs that don’t yet exist… using technologies that haven’t been invented… in order to solve problems we don’t even know are problems yet.” She continues, “This next generation of students has to solve these problems, or else. In the next half a century if things don’t change significantly, if we don’t change our ways…” She trails off with a shake of her head.

Don’t worry, Kai’s got this.

FOOTNOTES

[1]California Department of Education (2014). 2013 STAR Test Results, California STAR Program. Retrieved from http://star.cde.ca.gov/star2013/ index.aspx

[2]UN FAO (2010). The State of World Fisheries and Aquaculture 2010. Rome: FAO.

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