Education *for* INNOVATION

TEACHING CHILDREN HOW TO CHANGE THE WORLD

Working in independent schools presents plenty of challenges, but as teachers and administrators, we can take solace in the fact that we don't have to solve the world's problems. What we *do* have to do is give our students the tools they will need to be able to solve them one day.

Ours is a country long obsessed with innovation. Among our forefathers' pivotal inventions were electricity, the cotton gin, and the telephone. Even in times of political discord, our inventors found the energy to come up with answers to everyday problems. In the process, they made life better for all of us.

Pick up a national newsmagazine today, however, and you'll find more than a few articles bemoaning America's innovation crisis, pondering whether we've all become too comfortable and too complacent to continue to innovate. Is America's innovation heyday behind us, and if so, how can we turn things around?

BY CHRIS LUNDBERG AND KEN SEWARD • ILLUSTRATION BY LUKE BEST

Technology journalist Erica Swallow recently wrote an article for *Forbes*, "Creating Innovators: Why America's Education System Is Obsolete," that serves as a wake-up call. In the piece, she summarizes Harvard Innovation Education Fellow Tony Wagner's research, which calls for American schools to focus on "developing students' innovation skills and motivation to succeed" rather than simply filling children with knowledge.

If necessity is the mother of invention, then innovation is the father. But what is innovation really? To innovate is to constantly improve on the products, processes, services, and technologies that make the world go round. Innovation isn't just about grabbing at the next big idea. To be an innovator, you have to have two things in spades — the freedom to be creative and the drive to be productive.

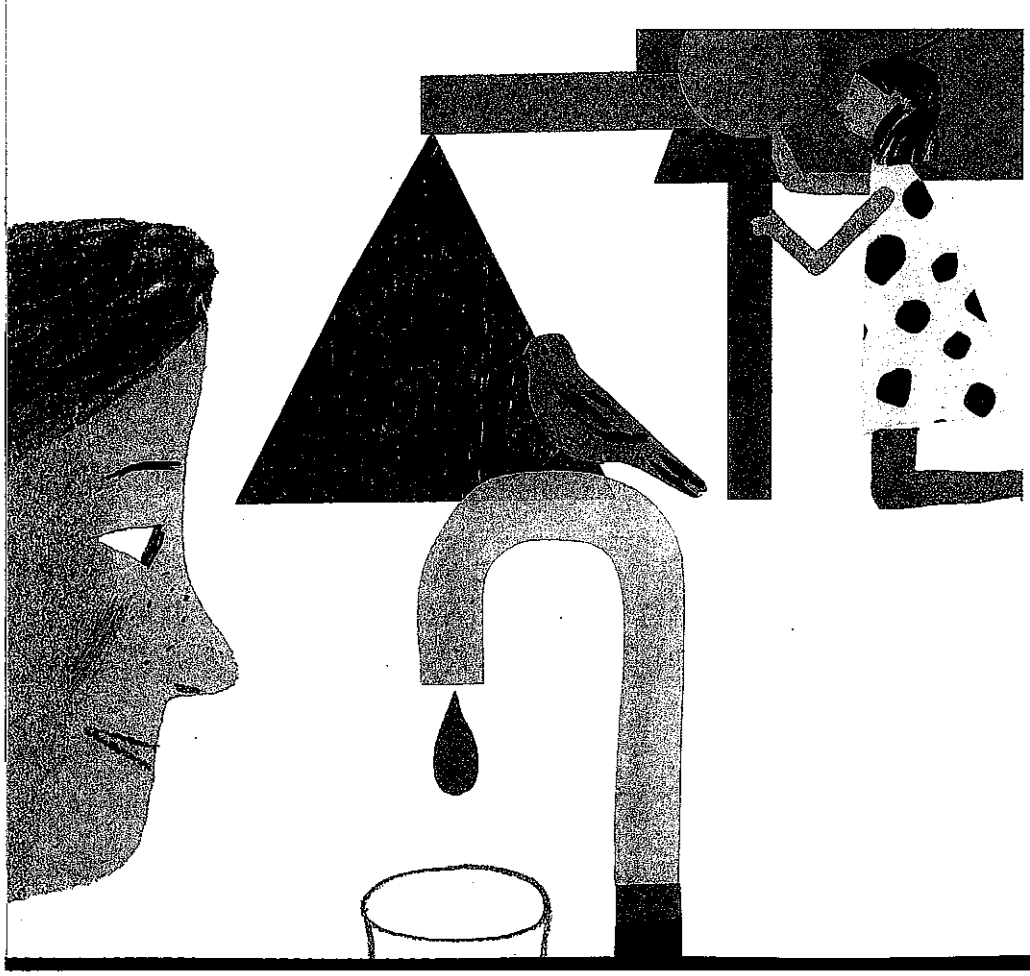
Drive is the part of the equation that often gets overlooked. At The Steward School (Virginia), we recently invited Evan Edwards, vice president of product development for Kaleo, a Richmond-based start-up that specializes in medical devices, to talk about innovation with our students. Edwards and his twin brother, Eric, suffered from life-threatening allergies as children. As teenagers, they found it cumbersome to carry their life-saving epinephrine with them at all times and imagined an alternative to the standard EpiPen. In 2004, they founded Kaleo (initially called Intelliject) with a prototype and a dream. A credit card–sized device called the Auvi-Q, which is easier to carry and provides both visual and audio instructions to users, went to market last year and has already saved lives. Sure, Evan and Eric had a big creative idea. But what got them through the nine years of hard work that followed was pure drive.

At The Steward School, as with other independent schools, we've long produced graduates who can think. But as we pondered this idea of innovation, it occurred to us that thinking about the world and its problems isn't enough. Students need to feel empowered to go out into the world and *solve* its problems. In essence, we wanted to figure out how to produce future innovators.

As we began to explore this idea, we spoke with CEOs and teachers, venture capitalists, and the heads of nonprofits. We always asked them the same question: Can we teach innovation? And if so, how?

In the case of our school, all of those conversations manifested themselves not just in a new curriculum but also in a new building: the Bryan Innovation Lab. This 6,200-square-foot indoor/outdoor space features a kitchen, two innovation studios, a wellness studio, gardens, outdoor classrooms, and an imagination playground. Our goal is to foster creativity by building a space that lends itself to helping students make interdisciplinary connections without introducing artificial boundaries or limitations. Students use the building's resources and the collective knowledge of teachers and visiting innovators to answer real-world problems that touch three areas: health and wellness, energy and resources, and the natural and built environment.

The building is great, but it's what we've learned inside it that all independent schools can harness and take with them. In 2011, Susan Wojcicki, Google's vice president of advertising, wrote a piece for *Think Quarterly* called "The Eight Pillars of Innovation." In it, she states that, in order to foster



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innovation, eight conditions have to be present. Whether you're inventing the next epinephrine delivery device or reimagining your own school's curriculum, her advice rings true, or at least it did for us. Below, we interpret Wojcicki's eight pillars as they apply to education.

Have a Mission That Matters

If we want our students to not only have big ideas but also to learn how to run with those ideas, we need to start talking about things that matter. Take a problem such as world hunger, for instance. It's a topic that can be approached from almost every academic angle — economics, science, the humanities, the arts. A world literature class, a history class, and a biology class are equally valid jumping-off points for creative problem solving. Solutions to issues such as world hunger aren't going to come overnight, and they're not going to be the result of work done in only one discipline.

The three areas of focus we identified (health and wellness, energy and resources, and the natural and built environment) are broad topics that we thought all teachers across all disciplines could make relatable to students. And as it turns out, most of the world's biggest problems fall into one of those three buckets.

If you think the mission doesn't matter, try telling a ninth-grader that she's learning about cell mutation. Then tell the same ninth-grader that she's figuring out how to stop cancer in its tracks. See which topic makes her eyes light up. When it comes to fostering innovative kids, we've found that the mission definitely matters.

Think Big but Start Small

When we realized, in addition to all the things we were already doing, we needed to start teaching innovation, it was tempting to gather our faculty into a room and issue a school-wide rallying cry. What worked far better, however, was to make the case for teaching innovation and then ask those faculty members who wanted to engage to step forward.

By seeking volunteers and not issuing a top-down mandate, we assembled a team of teachers who were not only interested in integrating creative problem solving into their lesson plans but who also wanted to reenvision our campus culture. The teachers met regularly and, as a group, they participated in a summer in-service program that helped them see how virtually any lecture could be reshaped into a lesson in innovation. An algebra lesson on calculating slope, for example, was transformed when a teacher proposed partnering with the nonprofit RAMPS to design a wheelchair ramp for one of its clients. When an environmental studies teacher charged her students with protecting the Eastern bluebird, the students installed a protected bluebird trail right on campus. Over the course of an academic year, our group's numbers swelled. Teachers who had initially resisted reimagining the curriculum saw that their colleagues were energized by teaching their material in a new way.

Strive for Continual Innovation, not Instant Perfection

If we want our students to become innovators, we have to inspire them to continuously improve upon their work. That's hard to do when so many young people are programmed to work for the highest grade possible, achieve it, and move on to the next assignment. We didn't want to throw grades out the window, so we wondered how we could encourage students to circle back and reexamine problems they'd already solved, particularly as new information became available.

One way we did this was by introducing a yearlong problem that all students, regardless of grade level, could address through their coursework and extracurricular programming. This past academic year, with the help of David Berdish, Ford Motor Company's manager of social sustainability, we produced a metropolitan transportation plan for the Greater Richmond region. In particular, students learned the systems dimensions Berdish

described for the bike race in the city and applied those concepts to a local problem — how to get to and from the Bryan Innovation Lab on time. Their solutions included a bike share system, bicycle taxis, and improved desired routes for walking to the lab.

Look for Ideas Everywhere

If we really believe that good ideas can come from anywhere, we've got to be open to listening to even the smallest voices. We wanted our curriculum and the Bryan Innovation Lab to encourage kids to ask questions. When writing their lesson plans, teachers are learning to build in extra time for diversions. In some cases, those diversions become lesson plans of their own. When a guest lecture by a City of Richmond engineer got students thinking about whether they might be able to build a water filtration system for the Bryan Innovation Lab's well, physics teacher Laura Akesson didn't just nod and smile. She told them to try to build one. We're giving our students permission to hijack instruction time for productive purposes.

Share Everything

The Steward School is an independent school that serves fewer than 700 students in junior kindergarten through 12th grade, but our goal is for the way we teach innovation to affect our entire community. From day one, we've viewed the Bryan Innovation Lab and its visiting scholar program as a community resource, and our programming reflects that desire. We hired a director for the lab because we wanted a point person who could not only develop programming but also reach out to community partners to build relationships and help our students harness the knowledge and experience of our neighbors. In exchange for all the time they give our students, we're giving it back to the community tenfold — hosting teacher training sessions, summer camps, and lecture series that make innovation feel like it's within everyone's grasp.

Spark with Imagination, Fuel with Data

We want our students to learn to listen to their hearts and their heads in equal measure, and that's what we teach at the lab every day. Windows and walls in the building double as whiteboards, and the scribbles, which on some days look as dense as wallpaper, show us that our students' imaginations are always working.

To complement their creativity, we know we have to give them the facts and figures that can help separate the good ideas from the great ones. Those numbers are delivered in the form of online resources, books, field trips, special programming, and Q&As with visiting innovators. It's amazing what you can get if you just ask for it. There may be other schools that have launched conversations about sustainable transportation, but when we pick

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up the phone and ask Ford's manager of social sustainability to not only pay us a visit but also to serve as an innovator in residence, we're teaching our students to go to the source. For all schools, the lesson is clear: data can be delivered via a variety of interesting (and entertaining) means.

Be an Open Platform

If we were running a technology company, this is where we'd tell you to give away your source code. Company secrets may contribute to high stock prices, but innovation thrives in an environment of openness, where we can all contribute our best work. Rather than protect our intellectual property, let's layer our ideas on top of each other and see if we can produce a generation of innovators who make breakthroughs that matter. At Steward, we're running more summer workshops for teachers from near and far, and we're going on the road, presenting what we've learned at conferences such as the Virginia Association of Independent Schools Technology Conference.

Never Fail to Fail

Harvard's Tony Wagner criticizes our current educational system as being

extrinsically motivated. Innovators are motivated from within, which is what inspires them to keep working, even through setbacks. Exploratory play can help very young children develop this skill, and exploratory learning does much the same thing. If, as educators, we stop asking each individual child to deliver the "right" answer and instead ask a team of children to work together to deliver the "best" answer, we'll go a long way toward eliminating the stigma of delivering the "wrong" one.

At Steward, we're systematically integrating innovation into the curriculum. The Bryan Innovation Lab acts as a physical question mark on campus — reminding us to always ask ourselves whether we're pushing our lessons far enough. When our teachers write lesson plans, they indicate how they plan to connect what they're teaching to the lab and its resources. Our three focus areas — the natural and built environment, energy and resources, and health and wellness — are so broad that it's a challenge to find a topic that *doesn't* connect. Some of our classes, such as biomedical engineering, meet in the lab every weekday. An art class might schedule a week's worth of lessons in the lab to tie in with a unit the class is doing on botanical illustration. A kindergarten class might visit once a week, yearlong, for yoga in the wellness studio. On any given day, students in JK–12 use the building. The space was designed to be as fluid as it needs to be — and teachers love that there's no wrong way to use it.

When it comes to teaching innovation, we're playing the long game at Steward. There's not one quick assessment that's going to tell us these new curricular components are making our students more innovative. The true test will come long after our students graduate and go out into the world. Do they solve the kinds of problems that matter? In their careers and their personal pursuits, are they capable of assessing problems? Determining the talents and abilities of the people they'll need on their team? Identifying the resources and roadblocks that need to be acquired or overcome? We hope they'll be testing their results against the one measuring stick that really matters — the progress of humankind.

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