

# A Smarter Way to Play

*Einstein's Workshop is a techie community center*

In a small office park in the Boston suburbs sits Einstein's Workshop, a bustling 7,000-ft<sup>2</sup> play space where kids of all ages can get their hands on all things science, technology, engineering, and mathematics (STEM). In the large drop-off space that anchors the workshop, there are buckets of LEGOs, K'Nex, Zome, Snap Circuits, Kapla Blocks, and Magna Tiles. In the classrooms and computer labs off of the main room, the center holds courses for all skill levels in laser cutting, Minecraft, Scratch programming, LEGO Mindstorms, and three-dimensional (3-D) computer-aided design (CAD) printing.

On the day I visit, a group of young girls huddle around one of the FIRST LEGO League (FLL) robotics tables. The table has been emptied of all FLL missions save the 2014 World Class mat, and the girls, who have carried over a handful of their own LEGO pieces, are using the board for something of their own imagining. As we pass, Founder and Co-owner Henry Houh smiles with satisfaction. "Nice," he says.

"Fun comes first," Co-owner Rebecca Rapoport tells me. "Learning is second."

## Girls and STEM

Houh holds so many graduate degrees from MIT he jokingly calls them "gradual degrees." He has logged thousands of hours as a volunteer at Boston's Museum of Science and within the school system of his hometown, Lexington, Massachusetts. He has always been the entrepreneurial type and has been involved in different high-tech startups.

The idea for Einstein's Workshop came about as a natural progression for Houh. He was coaching an FLL team in his hometown, and when the season ended the parents wanted to know what Houh could offer next. There just weren't many other opportunities out there for kids interested in STEM.

Rapoport, a Harvard graduate, math whiz, and mother of three, has years of experience at Amazon under her belt. She also was a manager for the Harvard Calculus Project, designed to reform the way we teach calculus in the United States. When she met Houh, she had quit her job and was mulling over a few start-up options herself. "None were as good as this," she says.

Houh has an older son and two younger daughters. Rapoport has an older daughter and two younger sons. Not surprisingly, Einstein's Workshop has, as Rapoport puts it, a not-so-secret agenda of engaging more girls in STEM.

"I can tell by about third or fourth grade, there is this divergence," Houh says. We are sitting at a long table in one of the empty classrooms, and from the other side of the door comes the sound of children laughing. "There are a lot of societal pressures," he adds.

"We could tell you some stories," Rapoport admits.

Through their experiences manning booths at different technology and education fairs, like the Cambridge Maker Faire, they've witnessed some confounding interactions. "A mother comes up to the booth with a daughter and a son,

and both the boy and the girl become engaged in play

with a math building toy, Zome," Rapoport begins. Good so far,

but the mother initiates a mathematical discussion

with her son and talks to her daughter

about how pretty the Zome is, then

"drags her daughter to get lunch" while leaving the

boy to play. "We see this at fairs," Rapoport says. "A mother comes up with girls. The girls are really into it, and the mother wants to know, 'What can my son do here?'"

"Her son isn't even at the table," Houh adds. "He's running around."

"Not to pick on the mothers," Rapoport says. "The fathers do it too."

There are a lot of societal norms that need to evolve for both moms and dads, but that's not to say that kids shouldn't

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appreciate the “prettiness” of a Zome construct. Maybe its beauty can be framed in reference to its symmetry or its overall geometry.

“It’s very important that we not be off-putting to the girls,” Rapoport says. “I was very much a tomboy, so if you had done a spa science class, I would’ve rolled my eyes. That said, there are definitely people on staff and that is the way they got into science—making their own perfume or hairspray.”

This is where the “A” in STEAM helps a lot, Houh mentions, referring to the more recent introduction of the arts to the STEM acronym.

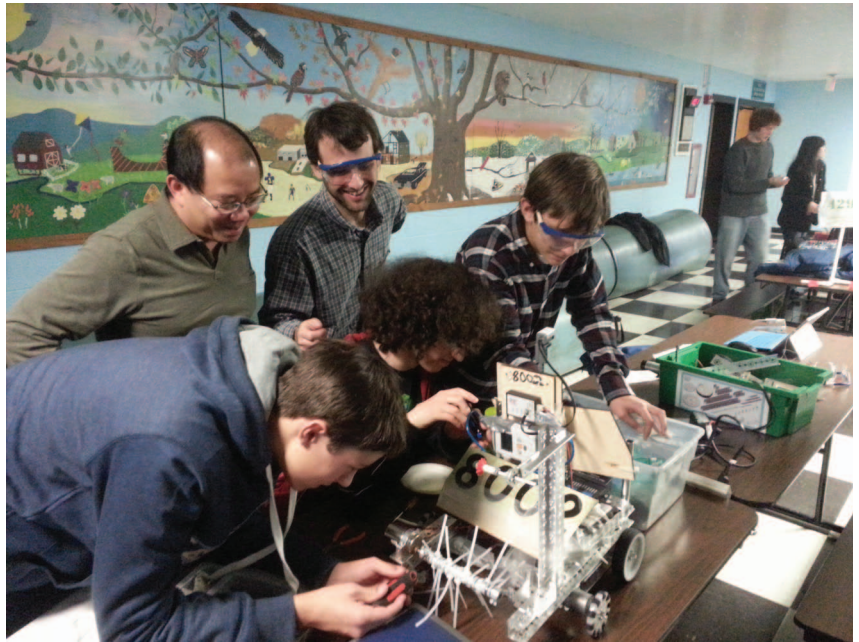
“We don’t want just art in general, but art married with technology,” Houh explains. “Frank Geary couldn’t do what he does as an architect without a massive amount of technology. Artists are leveraging the technology in really interesting ways.”

With all of the different interests and personalities, figuring out how to market courses in order to appeal to the full range of boys and girls has been a challenge. A workshop motto is “to meet the kids where they’re at,” but first you need to get them to enroll. Houh and Rapoport learned early of the importance of a course’s title. Naming a creative, stereotypically girl course “Doll House” as opposed to “Model Home,” for example, means the difference between attracting only a certain type of girl versus attracting a much wider audience to a course full of CAD and soldering.

### 3-D Printing

One class in particular—CAD and 3-D Printing—has had remarkable success, and Houh and Rapoport talk about the class with great enthusiasm. For kids who sign up, this class can be transformational. “You can take something that you think about and then physically hold it three hours later,” Houh says. And then you are hooked.

Rapoport tells the story of a ninth-grade “techie” girl who did not like math and swore she



**Einstein's Workshop founder and co-owner Henry Houh, left, aimed to build a techie community center.**

wasn’t good at it until she took the CAD and 3-D Printing class. “She went from ‘Math is so boring, I hate math,’ to ‘I love math, math is awesome,’ because she was seeing the application,” Rapoport recalls.

Based on the success of older kids in the CAD and 3-D Printing program, the staff at Einstein’s Workshop wanted to teach it to younger kids, but the tools are only appropriate for middle school age

and up. Kids need to understand the syntax of the language-based program and also need to know geometry and algebra.

Instructors began evaluating tools for teaching younger kids, but when none were quite appropriate, they decided to build their own. (“We are very lucky,” Rapoport says, referring to a staff that is made up of innovative software developers and engineers.)



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They wanted to model the new software on MIT's Scratch, a drag-and-drop block-based language that has brought programming to those as young as second grade. Two staff members built BlocksCAD as a visual interface on top of the open source CAD software OpenSCAD, and today they use BlocksCAD in workshops and for off-site school groups.

"All the math is still there," Houh says. "We hid nothing. It is still fully featured. It's built on a more advanced tool. It's more visual and helps them learn the math."

The reception of BlocksCAD has been great, and their goal is to release it publicly as open source software. They initiated a Kickstarter campaign but were unable to reach their funding goal of US\$42,000 to take the existing BlocksCAD prototype to the next level by making it Web based and open sourced as well as refining the interface, making the software more robust, and creating documentation. Today, bolstered by the enthusiasm of both educators and parents, they are working on alternative ways to fund it.

"Here's the nice thing about it," Houh explains. "It's a pedagogical tool. Kids are really motivated to learn more math."

### The Einstein Model

"We are trying to build a techie community center," Rapoport says. The goal is a space where younger kids can see what older kids are working on, and older kids can see what adults are working on. Einstein's Workshop employs a "small army" of high school students to teach classes and coach FLL teams.

Much of the effort in STEM that people are talking about are really focused toward older kids, but by that time, Houh says, "We've lost a lot of human capital." Houh hopes that if younger kids receive more support outside of school, they will stay interested longer. There are not that many opportuni-

ties for younger kids to stay engaged, but places like Einstein's Workshop help fill the void.

—Katieanne Williams

## Girls, Boys, and 'Bots

### The St. Clare's robotics team

At St. Clare's School in Staten Island, New York, science, technology, engineering, and mathematics (STEM) education starts early. With the school's strong focus on STEM, by the time students

York City to bring home the trophy (appropriately made out of LEGOs) for research, robot, and all-around teamwork.

Team members Chris, Brianna, and Melissa have known each other for years. Tommy joined St. Clare's in sixth grade. All four are close friends, and the 2013–2014 season was their first year together as an FLL team. Now eighth graders, the team is preparing for their final season before aging out and scattering to different high schools in the New York area.

Although the kids say that they notice no difference between the girls and boys in their school when it comes to interest and engagement in all things math



FLL team members Melissa and Brianna are both considering engineering careers.

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are old enough to join a FIRST LEGO League (FLL) team in fourth grade, they've already learned some basic robotics and cultivated strategies for developing and presenting a scientific research project. Last year, St. Clare's Robotics Team 2 capitalized on those opportunities by beating out over 75 other FLL teams at the Jacob Javits Convention Center in New

and science, FLL participation numbers seem to indicate that at least the areas of robotics is still a boys domain. FLL participation numbers are typically about 70% male and 30% female.

For those girls who do join, concerns with mixed-gender FLL teams can echo those raised in lab courses at colleges across the country—are girls actively engaging in robot build and project invention, or are they being confined to other assignments like fundraising, researching, and poster making, while the boys take the STEM helm?

Fortunately, this close-knit team seemed appropriately confused by such gender parity questions as if such divisions had never occurred to them.

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