

Student Showcase: Engaging the Creative Possibilities of STEM to Catalyze Cultural Change: Boston's Learn 2 Teach, Teach 2 Learn Program

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ABSTRACT

The mission of Boston's Learn 2 Teach, Teach 2 Learn (L2TT2L) is to generate a critical mass of Boston youth of color creatively engaged with technology and engineering who catalyze cultural change in their communities about what is possible to achieve with STEM. Each year, from April through August, 36 teen youth teachers use a constructivist approach to learning and building projects. During the summer, they travel throughout Boston to teach what they have learned in 3-4 week hands-on summer STEAM camps that reach over 600 children at over 25 community organizations located in the neighborhoods most in need of education resources.

L2TT2L Youth teachers and former youth teachers now in college studying STEM will present 3 types of projects

- 1) **Learn 2 Teach, Teach 2 Learn model as a community organizing project.** This 17 year old community organizing program has been developed through participatory design with teenage youth teachers and college mentors, who are former youth teachers now in college studying STEM.
- 2) **Example of a project built by a team of youth teachers.** Each summer small teams of 3 youth teachers design and build projects that solve a community issue they think important using the engineering design process.
- 3) **Examples of some of the 12-15 project-based teaching activities they design and offer to elementary and middle school youth in Summer STEAM Camps.** Returning youth teachers design teaching activity projects and mentor new youth teachers to teach.

Keywords

STEAM; maker education; social justice; under-represented youth; digital design and fabrication; educational equity; participatory program design;

1. PROJECT DESCRIPTION

2.1 Project Overview

When people look at us, do you believe they see our knowledge, our accomplishments, our ambition?

All they see are the colors, nothing more, from the color of our hair to the skin that we wear.

So let's show off! For once let's show them we too can create.

So let's show off! Let's help them not to misconstrue but to see depth in the real you.

Break barriers, pave paths, you lead the way and you change the world!

Jammy Torres, youth teacher

In Boston, we have a city full of youth like Jammy who, given opportunities and resources, show their eagerness to imagine, innovate and bring new vitality to STEM (science, technology engineering and math) and their communities!

What are our youth up against? Most of our youth go to schools where there are low expectations for their success, and where they lack access to both intellectual and emotional support for STEM learning. Their schools lack the latest tools and innovative educational approaches that go beyond the teaching of separate subject content, a method that has not worked for them.

What do our youth tell us works? Our youth thrive with the same cooperative creating/learning model pioneered in Silicon Valley to solve real problems. To sustain interest and become resilient in STEM, they need “technologies of the heart”: opportunities for collaborative learning and creating, experiences which develop a foundational belief that they are deserving and smart, an appetite for high expectations, and a positive approach to risk-taking. They themselves say their learning is magnified through community service as STEM Ambassadors teaching Boston children.

Learn 2 Teach, Teach 2 Learn. Since 2001, the Learn 2 Teach, Teach 2 Learn (L2TT2L) model program has been working to create a critical mass of Boston youth creatively engaged in the latest STEAM (STEM + Arts) education who can help catalyze deep cultural change in their communities. From April - August each year, 36 teen youth teachers who represent Boston’s neighborhoods, schools and family cultural roots learn, build and teach with creative technology and engineering. They learn computer and physical programming, digital design and fabrication, electronics, mechanical engineering and alternative energy. The last three weeks of the program, these youth teachers travel to the neighborhoods most in need of education resources offering free 3-4 week summer STEAM camps to over 600 children at 25 community organizations.

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2.2 Lessons Learned

Through our “How Teens Make (Almost) Anything” training, youth teachers learn skills in computer programming with Scratch; physical programming with micro:bits, Arduinos and Makey Makeys used with sensors, motors and other output devices; basic electronics and soldering digital design and fabrication with lasercutters, 3D printers, vinylcutter and PCB Milling Machine; a special topic in mechanical engineering, and; alternative energy, including solar energy. They also use the engineering design process, including rapid and proof of concept prototypes that are presented in design reviews. Their project journeys are documented in ePortfolios. At the end of the summer, youth create presentations for our annual Project Expo. For teaching projects, youth learn to teach using a constructionist approach and how to highlight and reinforce big ideas for the children they teach. Youth also shape the program -- from recruitment and selection to teaching projects -- through a participatory design process.

3. BIOS

Susan Klimczak is the Education Organizer of Learn 2 Teach, Teach 2 Learn. She has a bachelor’s degree in electrical engineering, two masters degrees in environmental education and education and a doctorate in learning and teaching. She is also a Senior Fab Learn Fellow.

Youth teachers represent the range of Boston schools from public to private. One is a former youth teacher now a freshman in college studying computer science at Princeton. They have 1-5 years experience with Learn 2 Teach, Teach 2 Learn.