From Imagine to Make: STEM learning made possible through

Fab Labs (Fabrication Labs)

Fab Labs began as the educational outreach component of MIT's Center for Bits and Atoms (CBA) and as an extension of CBA's research into digital fabrication and computation. A Fab Lab is a technical prototyping platform for innovation and invention and a place to play, to create, to learn, and to mentor. A Fab Lab is comprised of off-the-shelf, industrial-grade fabrication and electronics tools, wrapped in open source software and programs written by researchers at CBA. Currently FabLabs include a laser cutter that makes 2D and 3D structures, a sign cutter that plots in copper to make antennas and flex circuits, a high resolution NC milling machine that makes circuit boards and precision parts, a large wood router for building furniture and housing, and a suite of electronic components and programming tools for low-cost, high-speed microcontrollers for on-site rapid circuit prototyping.

In Fab Labs users learn by designing and creating objects of personal interest or import. Empowered by the experience of making something themselves, they both learn and mentor each other, gaining deep knowledge about the machines, the materials, the design process, and the engineering that goes into invention and innovation. In educational settings, learning happens in an authentic, engaging, personal context, one in which students go through a cycle of imagination, design, prototyping, reflection, and iteration as they find solutions to challenges or bring their ideas to life.

Fab Labs Connecting to STEM Education and Enhancing the Experiential Education Environment

While originally designed for communities as prototyping platforms for local entrepreneurship, Fab Labs are increasingly being adopted by schools as platforms for project-based, hands-on STEM education. For example, as a forerunner in PK-12 education-based Fab Labs the Cleveland public school system in Ohio has successfully integrated the Fab Lab into their experiential learning STEM-based curriculum. At MC^{2}STEM high school in the Cleveland public school system the Fab Lab's presence combined with General Electric's direct involvement through mentorship and employee teaching opportunities has contributed greatly to the students developing STEM skills. These skills have lead directly to the students' great successes in internship programs with other industry partners.

Fab Labs Connecting STEM Education to and Developing Partnerships with Industry

Due to the unique learning opportunities that are available within a Fab Lab, industry partners are engaging directly with Fab Labs in middle schools, high schools, community colleges, and communities across the country. In many places Fab Labs are being considered as resources for developing and retraining the local workforce. As part of these partnerships, industries are working with local schools and community colleges on projects, courses, and internships to encourage skills that empower learners to transition seamlessly between school and work in their local area. Industry partners plan to augment the program with industry-targeted equipment and expertise to mentor and engage students in apprenticeship-like training experiences for middle, high, and post secondary schools that would be integrated into their education.

Fab Labs Connecting STEM Education *To* and Collaborating *With* the World

To be a Fab Lab means connecting to a global community of learners, educators, technologists, researchers, makers and innovators--a knowledge-sharing network that spans 23 countries and 24 time zones. Because all Fab Labs share common tools and processes, the program is building a global network, a distributed campus for education and laboratory for research and invention.

For more information regarding the Fab Lab Program, please contact:

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