The FabLab Classroom
Learning Middle School Science through Engineering Design and Manufacturing
The FabLab Classroom

The FabLab Classroom adapts Gershenfeld’s concept of a fabrication laboratory (Fab Lab) for integration into K-12 classrooms.

A full fledged Fab Lab for a university or community can cost more than $100,000.

A new generation of inexpensive fabrication technologies suitable for K-12 classrooms is now emerging.
The FabLab Classroom

- Advanced Manufacturing
- Desktop Manufacturing
- Digital Fabrication
The FabLab Classroom

The Fab@School 3D printer developed through the FabLab Classroom initiative was the first 3D printer designed explicitly for K-12 schools.

It could be assembled in less than a day with only $1,000 in parts.
The FabLab Classroom

Today, compact desktop 3D printers suitable for K-12 classrooms can be acquired fully assembled for less than $2,000.
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Other affordable desktop manufacturing technologies such as computer controlled die cutters extend possibilities for advanced manufacturing in the K-12 classroom.
The FabLab Classroom

Integrate engineering concepts into science instruction to allow students to learn science in a meaningful context.

Prepare students for high-tech jobs in a competitive global economy:

- The Commonwealth of Virginia forecasts over 6,800 jobs in advanced manufacturing by 2017.
- Each of these positions is estimated to generate an additional 16 ancillary jobs.
Laboratory School for Advanced Manufacturing

- Funding provided through the NSF FabLab Classroom, the Commonwealth of Virginia, and Charlottesville City Council (federal, state, and local funding)

- Construction will begin June 6, on Buford Middle School and open, August 21, 2013

- It is not designed as a magnet school; all students will have the opportunity to participate.

- The high school will open a year later; the same technologies found in the University’s Center for Advanced Manufacturing – 3D printers and mechatronics systems – will be replicated in the Laboratory School
Laboratory School for Advanced Manufacturing

The high school, middle school, and university will be connected by an always-on video conferencing link.
Current Curricular Activities

- Force and motion
- Electricity and magnetism
- Periodic motion
Periodic Motion

• Sound Waves unit
• 8th Grade Physical Science
• Physical Representations
• Mixed Reality Systems
• Engineering Design through Advanced Manufacturing
Paint Pendulum

Procedure

• Predict
• Communicate
• Test
• Compare
Paint Pendulum

- **Knowledge**
  - Frequency
  - Amplitude
  - Wavelength

- **Scientific Application**
  - Measurement
  - Physical representation
Paint Pendulum
Paint Pendulum
Mixed Reality Pendulum
Mixed Reality Pendulum

Dual Wave Representation
Speaker Systems

- Design Phase
  - Engineering principles

- Build Phase
  - Advanced manufacturing

- Test Phase
  - Scientific tools
Design Phase
Build Phase
Test Phase
Test Phase
Future Plans and Applications

- Continued Collaboration
  - Engineering and education collaboration
  - Undergraduate curriculum
  - Professional development for teachers
  - Digital Fabrication Laboratory

- Lab School Development
  - K-12 curriculum development
  - Congruent with Next Generation Science Standards
  - Continued implementation of advanced manufacturing in K-12 schools
Learn More

• Websites
  • http://wisengineering.org/soundwaves/
  • http://www.maketolearn.org/
  • http://tpackcases.org/elementary-cases/science/

• Flyer