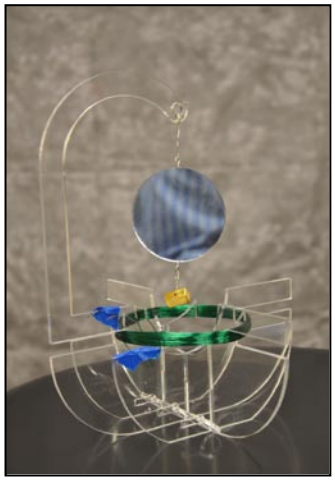
Speaker Box

The Communication Capstone is designed to give students authentic engineering team oriented work experience in which the strengths of each member of the group is utilized for the good of the common product. Work groups are composed of four students that have specific roles (Project Manager, Electrical Engineer, Acoustical Engineer, and Creative Design). The groups will work over a 10 week period to complete three major construction components to a sound system. First the groups design and construct an amplifier. Next, students use the FabLab to create a housing unit that holds the amplifier and a speaker. Lastly, students use software to write an original piece of music and may also incorporate instruments and live vocals if they so choose. Students also create light displays that are a visual interpretation of the music they have created. The groups then give "performances" using their constructed sound system in which they play their original piece of music through the speaker and amplifier, also showcasing the light display. Marketing of all components is then implemented.

T-Shirt Printing

Students create their group t-shirt design using Inkscape software, then and transfer it to the Roland Vinyl Cutter. Students print out a vinyl stencil template that was placed over a silk screen. Fabric Ink is then pushed through the stencil to reveal the students' artwork on the t-shirt.



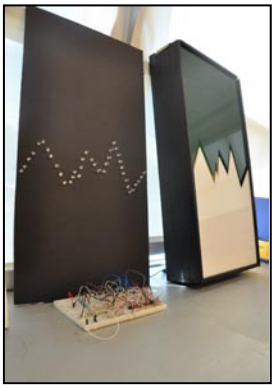
Galvanometers

Ninth grade students fabricate galvanometers in their study of optics and frequency. The galvanometer is used as a tool to measure the resonant frequency of a laser that was reflected of a mirror attached to a magnet in the middle of an electric field. Students use a copper wire coil wrapped around the base of the galvanometer about 200 times. The magnet is suspended in the center of the coiled wire with a mirror above it. When an electrical current is sent through the wire, it moves the magnet and the mirror. The laser reflects off of the mirror and produces a line on a wall. By adjusting the amount of power going through the coiled wire, students may change the frequency at which the mirror moves, and with the help of P.O.V., or persistence of vision, the way the mirror moves makes it seem as if the reflection of the laser is a steady shape. Students then use the measurement of the reflection to determine the frequency that was required to get to that point. The frequency would be different based on how many times the wire was coiled. The data iss then compared to a reading on the oscilloscope for accuracy on determining the frequency of the current.

Bird Finder

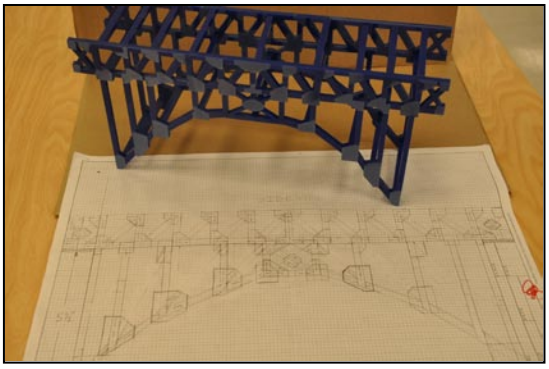
The Bird Finder is a tool conventionally used to measure the angle of inclination one must look to identify "birds" (satellites orbiting the earth) in the night sky. Usually equipped with a compass and plumb bob, an individual would obtain a directional vector by which they could chart their readings. This standard design has been both fine tuned and elaborated upon for greater efficiency, durability, and assembly ease by ninth grade students using the FABLab.

At MC2 STEM High School, Leah Russell, a ninth grade student with a knack for using many of the different tools the FABLab has to offer, has worked to design a template for cutting our own version of the Bird Finder using the Epilog Laser Cutter. Using a cardboard sheet 4x4 inch in size (the design also works perfectly for certain thicknesses of acrylic and wood), the laser cutter precisely forms the six interlocking pieces. A 90-degree protractor segment has been rendered onto opposite sides of the Bird Finder, one to measure inclination, and the other to measure declination. The pointers that help to measure the angles are punch-out components of the otherwise featureless top and bottom. Using a pin and some hot glue, these pointers are easily attached to the protractor-rendered sides, providing for easy inclination and declination readings. Slap a compass on the top, and a perfect tool to put trigonometry concepts into action is created.



Social Studies Light Box

Students were given the task to convey an Ohio Social Studies Benchmark in an abstract visual display. Students used Google SketchUp and a variety of technical plans and drawings to create and build and LED Light Display Box. Students then used machines from the FabLab to cutout and construct their designs. Circuuts, breadboards, and timers were used to program a variety of LED effects that would help in creating their visual display. Many students used the Epilog Laser Cutter to etch an image or historical photograph on acrylic for the front of their box.



Bridge Design

Students took part in a number of opportunities that explored bridges in the city of Cleveland. They studied the structural engineering as well as its metaphorical connections between two entities. Students went on to create scaled technical drawings to show an understanding of compression, tension and strength. Students were then tasked to create a model of their bridge design. Many students chose to make use of the equipment in the FabLab and build their bridge model using cut acrylic from the Epilog Laser.