A View from the Tower

The Fab Lab of The Three Lakes Model Railroad Club along with the Demmer, WI Library hosted a Maker Camp for local area students; Tuesday, August 9 and Wednesday, August 10 2016. Those participating in the camp programmed an Arduino microprocessor to control tri-colored signal lights on a model railroad layout to simulate the Automatic Block Signals lights a railroad engineer would see from their train cab. (ABS)

Check out the photos of the layout, the buildings & railroad car interiors that have been made and the Arduino microprocessor that makes it all run 1000 times per second.


Students observing the operation of Automatic Block Signals before they started to develop a Truth Table for the operation of these signals and transfer the Truth Table into code to operate the signals via an Arduino Controller.

Website: http://www.tlmrc.org

The first day was an introduction to Adobe Illustrator and the Epilog Laser making a key fob - thank you to Ms. Grappa!!
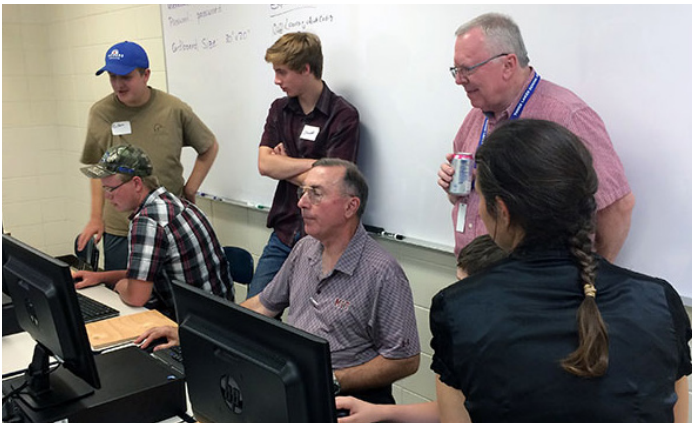
The second day was programming an Arduino microprocessor to solve a real world engineering challenge - keeping railroad trains safely separated on a single track.
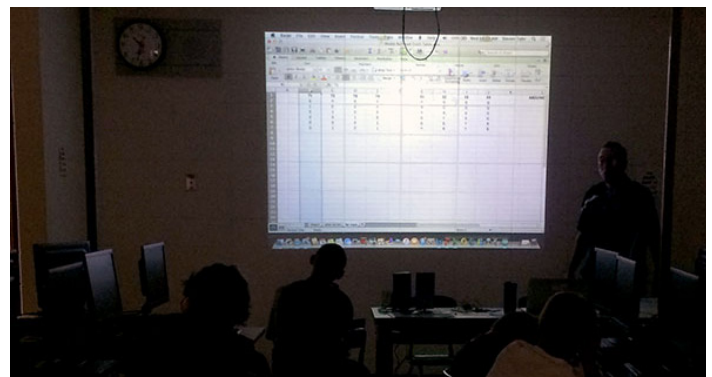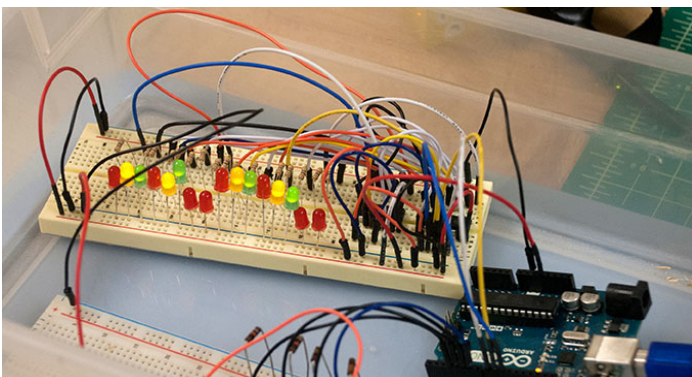
After developing the Truth Table for what signals should show depending on track occupancy the students applied the elements of the Truth Table to code that would set the signals to the correct color depending on if the track was occupied.

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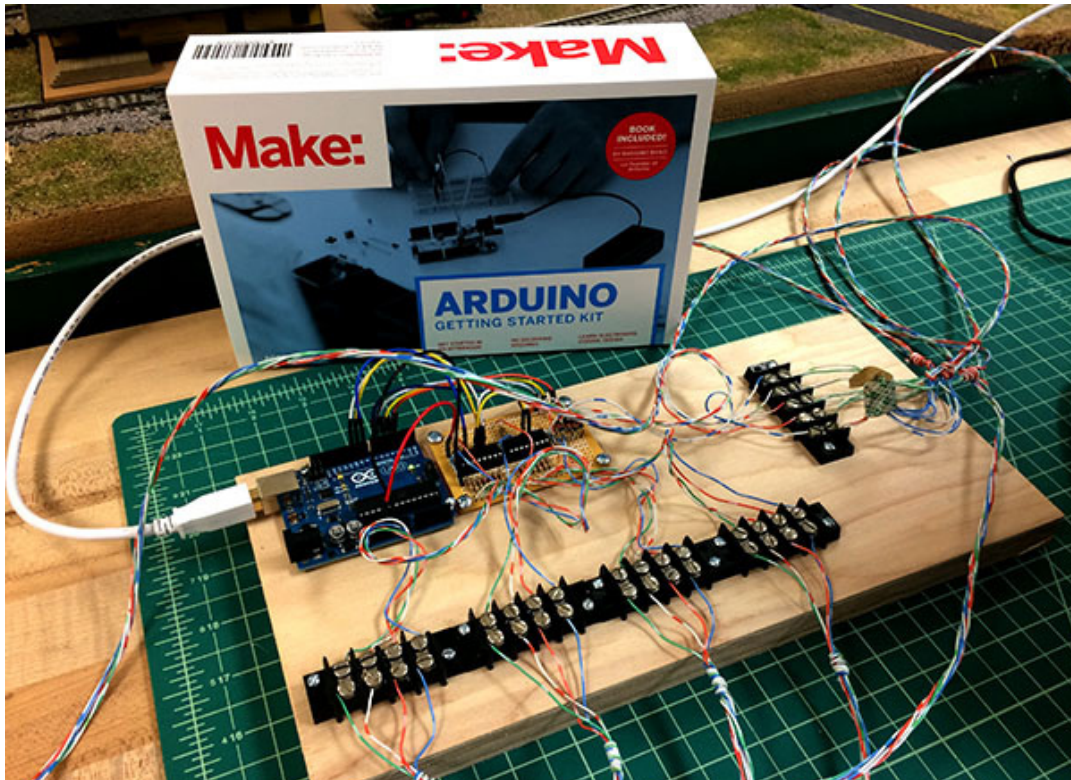
The program was loaded on to the model railroad Arduino which had 4 inputs from the blocks and 12 outputs to the signals.

A strange thing happened when their program, that was developed using a bread board was loaded into the Arduino controlling the signals. With no trains on the track the signals were...
...Orange????

Look at the Engineering process posted on the wall of the lab they knew they needed to make some adjustment. But what needed to be changed??? When they realized that Orange signals indicated that the Red and Yellow LEDs were on when the Green should have been on they knew something was wrong with the output.

Three Lakes Model Railroad Club president Paul Wussow gave them a hint that the LEDs on the bread board were common to ground (Cathode) and the model signals were common positive (Anode). This required that the inverse of the data output would put things right. By inverting the values of the outputs the signals turned Green and the layout was tested. As a locomotive moved down the track entering Block #1 passing a signal #1 it turned Red then when the Loco moved into block #2 signal #2 turned Red and signal #1 turned Yellow. This continued all the way down the track.

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The Camp was introduced to the NMRA BSA Cars program and were able to see how we 3D printed our own frames for the 50' Box cars.
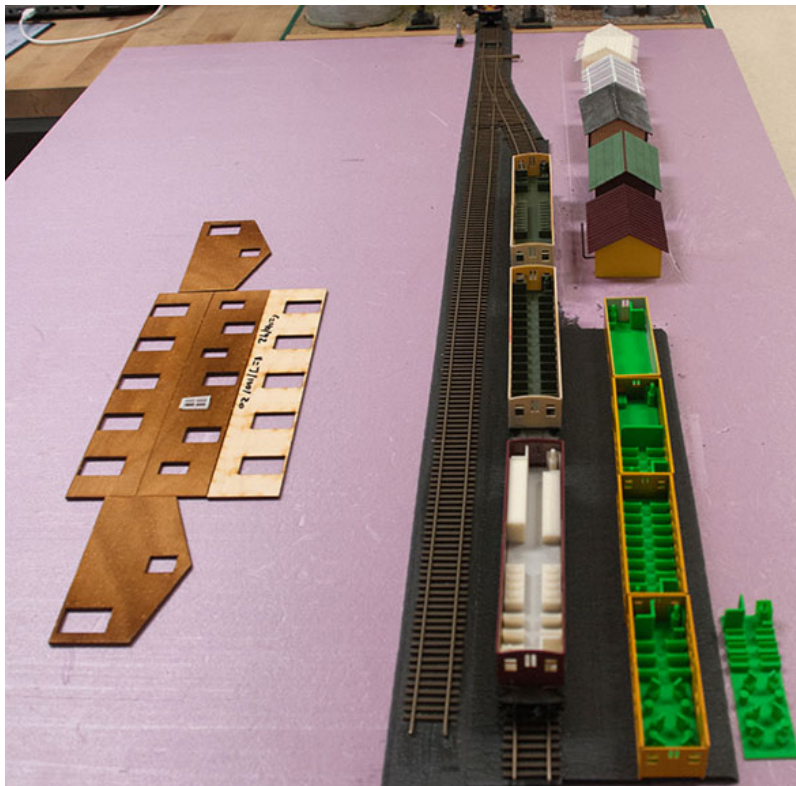
At the other end of the layout there were more examples of things the Three Lakes Model Railroad Club created at the Fab Lab.

NBC 12 sent a reporter out to record the camp and we had 3 different segments on the 6:00PM 11:00 PM and the 6:45AM news Wednesday night and Thursday morning. The camper shown above told how the best part was the trains were creating code that you could see actually work.

Demmer Director Brewster realized her fantasy of crashing two trains into each other after we inserted some defective code!! A good time was had by all, and we hear you, so we are working on inserting 3D printing into next summer's camp. A big shout out to the Demmer Library for organizing the event and to the Three Lakes Model Railroad Club for bringing they layout into the lab - perhaps we will make a layout of our own someday??

The Railroad Modules were also operating for the Tuesday night Open Fab Lab session with demonstrations of items made in the Fab Lab on lasers and 3D printers for model railroading.

We had to remove the modules on Thursday morning because the school is getting ready for the coming year and needed to buff the floor. People attending the Thursday night Open Fab Lab were disappointed to find the layout they saw on TV the night before was gone.

Text by Dr. Yahr and Paul Wussow, photos by Paul Wussow
and Demmer Library Director Brewster

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