



Digital Design and Fabrication

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As we all know, 21st century manufacturing is an interconnected global activity. A manufacturing team may consist of an assembly facility in Vietnam working with a designer in Boston, a banker in London, and a distribution company in Brazil. The members of this team may never actually meet face to face.

The CTE staff at Sitka High School, through a Department of Labor Alaska Career and Technical Education Plan Implementation Grant, set out to simulate these conditions with Rural Alaskan students and to demonstrate that small, remote schools can participate in manufacturing with only modestly trained faculty and without having a particularly specialized facility.

A regular Sitka High classroom was outfitted with a conventional computer lab, 3D design software, a 3D printer, a laser cutter/engraver, and a CNC vinyl cutter. The Design and Fabrication Laboratory quickly became known as the Fab Lab. Teachers from Haines, Mount Edgecumbe, and Sitka High met in Sitka and were trained in the use of Rhino, a slick but inexpensive 3D design software. After the 3 day course, these teachers went home and taught their students the basics of Rhino.

Next, students were organized into remote design groups and given a manufacturing problem to solve. One student each from Haines, Sitka, Mount Edgecumbe, and a partner school in Oregon, Sherwood High, were formed into teams. Students were given accounts in a new piece of software called Edmodo – think of Edmodo as Facebook where the teacher defines who the friends are. Using Edmodo to communicate, each 4-student remote design group got to know each other a bit, organized the work, and did a design and fabrication process together. Each member of the team had to develop one square gear of a 4-gear, interlocking, working model. The file was then sent via Edmodo to the fabrication plant in Sitka, where it was prototyped and, if necessary, sent back for modification. When all of the parts of the project were within tolerance, they were mass-produced on the laser cutter out of acrylic. Each student was then sent a complete project.

At the end of the project, we teachers felt that we had provided a challenging educational experience that had simulated the modern world more closely than anything we had ever done. We were pleased. The kids certainly they liked the cool new tools and working with other kids over Edmodo seemed entirely routine to them.

What we accomplished at Sitka High would not have been possible without the technical support we received from John Niebergall of Sherwood High in Sherwood, Oregon and from Pat Kraft, Rapid Prototyping instructor at Portland Community College, Sylvania Campus.

There is a great deal of educational potential in digital design and fabrication in Alaska. The following are some lessons in this demonstration project for Career and Tech Ed in Alaska:

- First, students do not need a fabrication shop in their school in order to manufacture things. Not only are there school partners who will help, there are scores of web based fabrication businesses who can do fabrication for anyone.
- Secondly, good ideas and good designs can come from anywhere in the world and make it to a manufacturer and to the marketplace, even from rural Alaska. The digital world is very flat.
- Lastly, the new pieces of equipment used in this project - 3D printers, laser cutters, and CNC vinyl cutter - are very fun and attractive but they require very little intellectual or physical skill to operate. The thing that can be taught, the thing that demands the most creative thought and perseverance, however, is design. Teaching kids to think as designers of solutions to problems is a worthy educational endeavor.

In conclusion, there is a great deal of educational potential in digital design and fabrication in Alaska. What we accomplished at Sitka High would not have been possible without the technical support we received from John Niebergall of Sherwood High in Sherwood, Oregon and from Pat Kraft, Rapid Prototyping instructor at Portland Community College, Sylvania Campus.