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Troubleshooting Prototype Prepares Students for STEM Careers

ROCKLIN – It isn't often that a college student reaches down to a high school for help. When Sierra College student Ray Billings needed to make a prototype for a class project, Rocklin High School had the necessary lab, equipment, willing teacher and engaged student. It was a great opportunity for 17-year-old Jeff Clark to apply his design, programming and machining skills according to Dan Frank, Rocklin High School Engineering Support Technology teacher. Clark turned Billings' robot motor mount design into a prototype using automated manufacturing equipment.

"Our lab was upgraded with a grant provided through the Sierra STEM Community Collaborative," said Frank. "Connecting these students was an extension of that partnership. Converting a design into a part using industrial quality equipment is the kind of experience that encourages students to consider technical careers. These students developed technical skills through troubleshooting and teamwork -- exactly what businesses want in employees."

In addition to attending Sierra College (www.sierracollege.edu), Billings works in Engineering Services at Intel, is a top ranked combat robot competitor and mentors the Sierra College Mechatronics Robotics Club. He wanted to build a better motor mounting for his robot. The motor was designed for wheelchairs and was not meant to propel a 220 pound combat robot.

"The mounting plates for these motors are made from cast aluminum, and they crack under impact during robot battles," said Billings. His project was to design a solution using Computer-Aided Design (CAD) and develop a prototype. It was the capstone project for the Sierra College Drafting & Engineering Support class, "Managing the Computer-Aided Design Environment."

Billings gave his CAD drawings to Clark who agreed to convert the mounting plate design using MasterCAM design software. The Computer Numerical Controlled (CNC) machining equipment that produces the prototype can read the milling instructions from the MasterCAM file.

It is not as easy as it sounds according to Clark. "We ran into a lot of difficulties," said Clark. "The file was too large, the zero point set up was opposite of what I expected and the tools got stuck."

The troubleshooting experience gave the students a taste of industrial realities. "There is always some kind of problem, like when the machine can't read the G code," said Clark. "Businesses that are successful depend on employees who know how to troubleshoot."

Although the part was only partially cut out, the partnership resulted in a rich experience for both students. Clark will study aerospace engineering at University of Kansas this fall. "I'd always

been interested in airplanes and taking classes where I could work on the computer and then see the part being made attracted me to engineering," said Clark.

For Billings, the experience refined his ideas for building a stronger robot. "I really appreciated Mr. Frank's support and Jeff's commitment to working with me to overcome the challenges," said Billings. "I'm already working on some new designs based on what we learned."

This unique student partnership was the result of support from the Sierra STEM Collaborative Grant (www.sierraschoolworks.com), managed by Carol Pepper-Kittredge, Center for Applied Competitive Technologies Director, Sierra College. The goal of the grant is to develop a pipeline of students pursing Science, Technology, Engineering and Math (STEM) education and careers.

"The Sierra STEM grant encourages college and high school faculty to collaborate, host workshops and visit each other's labs," said Pepper-Kittredge. "The two students connected as a result of Sierra College faculty member Ed Mojica bringing his architecture students to tour the Rocklin High School lab. You never know what connection may change a student's plans for the future."

For more information about Sierra STEM Collaborative, go to www.sierraschoolworks.com, or contact Carol Pepper-Kittredge, director, Center for Applied Competitive Technologies, Sierra College, at cpepper-kittredge@sierracollege.edu or (916) 660-7517.

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