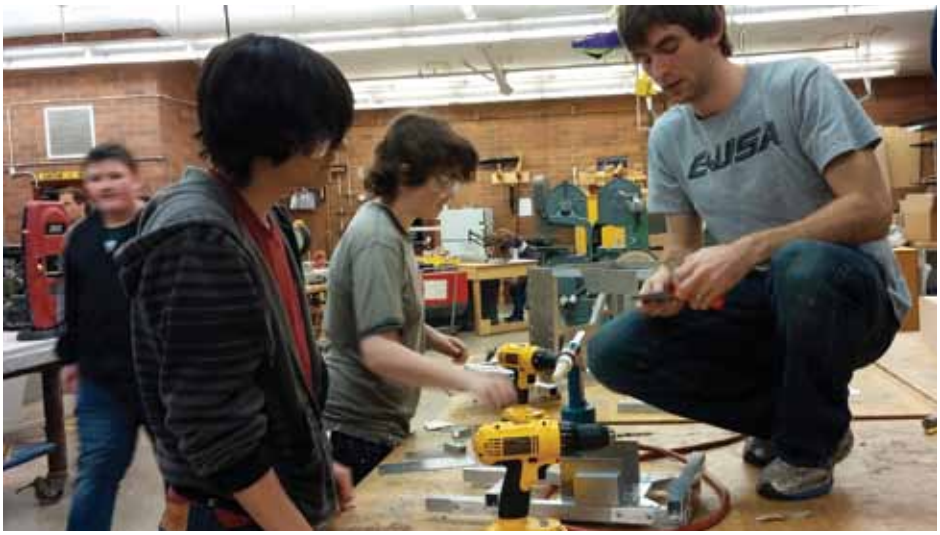
SEFW Promotes STEM Activities in Washington State

By Thomas M. Corcoran, P.E., S.E. and Angela Gottula Twining

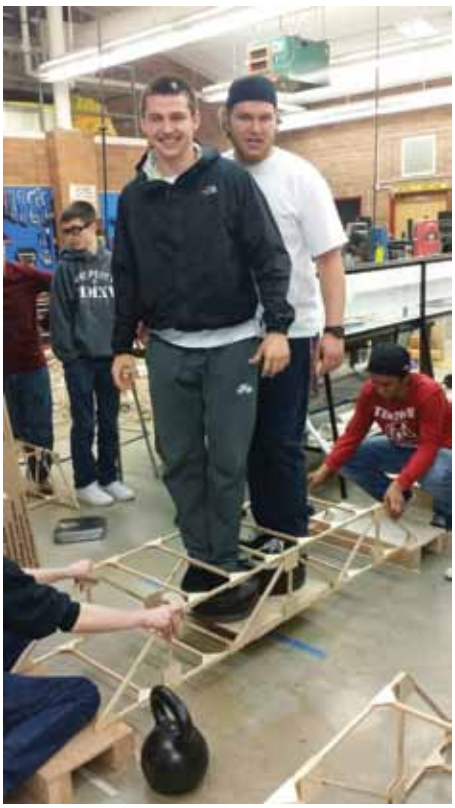
A core element of the Structural Engineers Foundation of Washington (SEFW) mission is to support an educational outreach program that provides financial assistance to Washington State high schools with quality science, technology, engineering and math (STEM) programs.

Washington's Edmonds School District was awarded financial assistance to support their STEM Program, and as a result SEFW promoted structural engineering in their STEM programs. Throughout his career, SEFW Director Tom Corcoran has visited several high school programs across Washington state, promoting structural engineering to students, and he recognized the quality of the Mountlake Terrace High School (MTHS) STEM program as well-deserving of SEFW resources.

A collaborative process was established between Corcoran and MTHS STEM teachers Craig DeVine and James Wilson, one in which they discussed two STEM projects:



Structural engineer, Dan Sloat (right), gets into the action while mentoring several Mountlake Terrace High School students as they design a FIRST Robotics Competition entry.



A team at Mountlake Terrance High School stands on their wooden bridge structure and demonstrates its load capacity.

a wood bridge building competition and the ever-popular FIRST Robotics program. SEFW fully funded the proposed projects and provided structural mentors from Seattle Chapter's SEAW Younger Member Forum (YMF) to help students with their projects during and after class.

Ninety students in the MTHS Principles of Engineering course were tasked in groups to design and construct 6-foot-long wood-framed truss bridges designed to carry a minimum of 150 pounds. In the past, students built short-span balsa wood bridges in an effort to learn statics concepts, so the SEFW funding this year allowed for an improvement to the bridge building program and many opportunities for advanced learning.

At the project onset, the teachers envisioned young engineers in the industry working with the students to improve their bridge designs and to help them understand likely failure mechanisms. YMF engineers Gino Mazzotti and Brent Olson fulfilled that role, mentoring students during the design process.

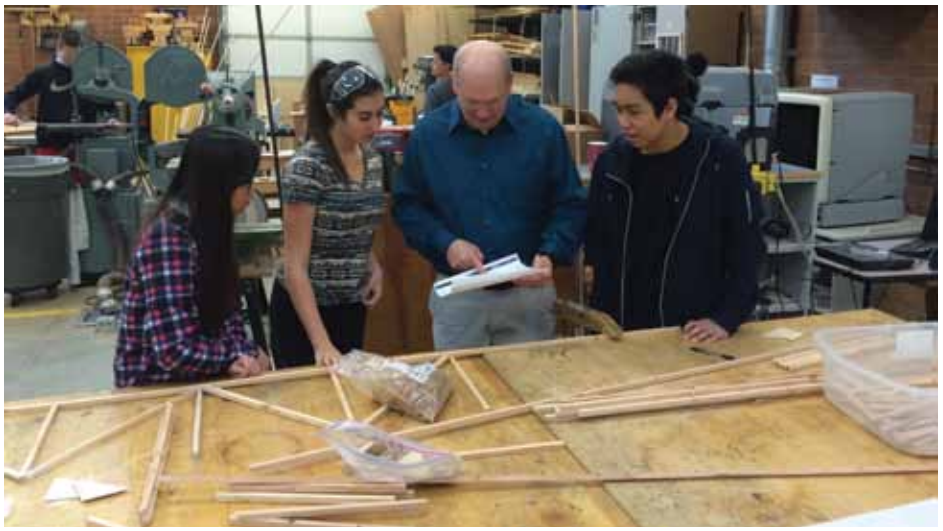
Once the students were familiar with free body diagrams and the method of joints, principles currently taught in the class, Mazzotti and Olson presented information about additional advanced bridge topics to consider. Through the presentation and discussions, the students were given insight into the engineering profession and challenges many young practicing engineers face today.

Next, the students were tasked to design and build their bridges. Modeling in MD Solids helped students determine the member forces and whether members would fail in tension, compression, or buckling. Upon completion, the bridges were tested. To the surprise of many students, several bridges weighing less than four pounds supported a load of more than 150 pounds. Some bridges even held loads of 600 pounds before failing.

Bridges were not the only structures built at MTHS this year. Every year, the after-school FIRST Robotics Competition (FRC) team builds a robot, and SEFW realized it could also incorporate structural engineering practices into the classroom by assisting the robotics team.

YMF member Dan Sloat joined the MTHS group of 25 students in the FRC program, working four nights a week and Saturdays for six weeks to build a 120-pound robot that is fast, agile, and competitive in games. The design of the frames and moving arms for robots like these require thoughtful engineering to be both light and strong enough to endure the demands of competition. Sloat's experience and structural engineering abilities provided insight for the design of the robot structure and its moving arms.

Sloat's role included teaching students how to use tools as well as discussing design and fabrication options with them. Part of the project was designing and constructing a lifting mechanism and supporting tower for



SEFW Director Tom Corcoran helps three Mountlake Terrace High School students work on their wood bridge structure.

their robot, which needed to stack plastic crates and bins.

The MTHS FRC team competed through several regional events, and made it to the 2015 state championship event in Cheney, WA, held in April.

In addition to mentoring for the specific engineering design activities, the three YMF volunteer mentors, as well as Tom Corcoran of the SEFW Board, were able to share their education and work experience as structural engineers, encouraging students to consider the structural engineering profession.

In total, 115 STEM-oriented high school students in the cutting-edge MTHS STEM program learned about structural engineering from passionate, local engineering professionals. SEFW truly lived up to its mission to promote structural engineering by partnering with the MTHS program.▪

SEFW was created as a 501(c)(3) charitable organization to advance the profession of structural engineering through scholarship, research, education, and outreach. SEFW promotes a major lecture event every fall, funds the SEAW scholarship program, and is always seeking more opportunities to support and promote the structural engineering profession. SEFW has eight directors on the Board, plus one part-time administrator and a communications liaison.

If any organization is interested in starting a local SEF program, the Board of SEFW would be happy to share lessons learned and can be reached at ***admin@sefw.org****.*

Tom Corcoran presently leads the Structural Engineering group at Integrus Architecture, serving as Principal since 2006. He is a Past President of SEAW Seattle Chapter and serves on the SEFW Board of Directors. Tom may be contacted at ***tcorcoran@integrusarch.com****.*

Angela Gottula Twining has been involved with SEFW for several years, and is currently the SEFW Administrator. Angela may be contacted at ***admin@sefw.org****.*