High School Students Lend a Hand to a Worthy Cause with 3D Printing

Hardin-Jefferson high school students use 3D printing technology to build and donate prosthetic limbs.

When her principal asked veteran mathematics teacher Joy Schwartz to teach a printing and imaging technology course for high school students, there might have been an ulterior – and heartwarming – motive. Since Hardin-Jefferson High School in Sour Lake, Texas has introduced 3D printing technology through the adoption of two Dremel 3D Idea Builders, students have built and donated prosthetic limbs to two local families.

With no experience in 3D printing, Schwartz built her first semester syllabus beginning with entry-level instruction about imaging and ended by building and testing functional 3D models. But she had one clear learning objective for implementing 3D printing technology. One assignment Schwartz gave her students was to build a 3D-printed prosthetic hand for a local seven-year-old girl. “When my students graduate, I want them to enter the workforce with the ability to solve problems that will make a difference in the lives of others,” Schwartz said. So far, so good.

Learning "Life Lessons" Together

After receiving the directive from her principal, Schwartz immediately began researching 3D printing in August of 2015. She first encountered the Dremel 3D Idea Builder while attending a nearby workshop about 3D printing.
“The Idea Builder seemed like a plug-and-play tool for the classroom,” Schwartz said. “I had never used a 3D printer in my 27 years teaching mathematics, but [my students and I] just did it.”

Students in the printing and imaging technology course began by exploring computer-aided design (CAD) at the top of September. Within the next month, Schwartz was already able to incorporate “little projects” with 3D printing, like building and racing cars and building and launching rockets.

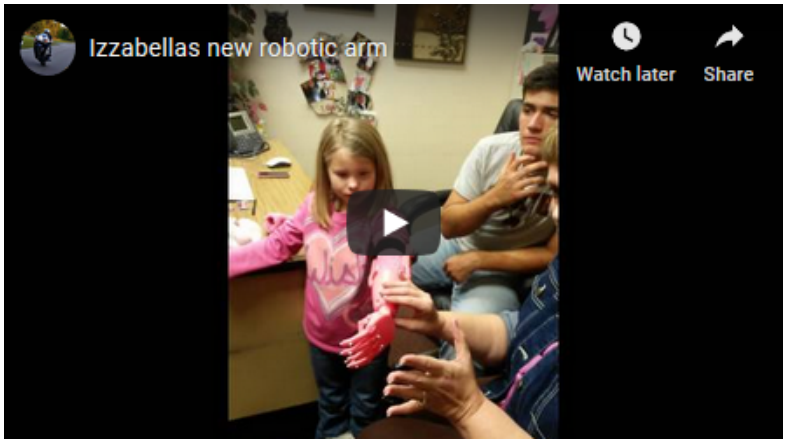
Working toward a quickly approaching deadline to complete the prosthetic arm by Christmas, Schwartz introduced her students to 3D printed prosthetics through instructional videos. The students explored these resources through Enabling the Future, a global network connecting makers and recipients in need of prosthetic limbs.

Designing and building the elbow-actuated prosthetic for seven-year-old Izzy didn’t come without its challenges, or as Schwartz calls them, “teaching moments.”

“Our first attempt to print Izzy’s design, we ended up with a bird’s nest instead of a hand,” Schwartz said. “I made the point of showing my students the scraps to illustrate a life lesson. Sometimes planning and preparation can still create a mess, but we clean it up and try again.”

After about 30 hours of printing time and a week of classroom time for assembly, the prosthetic arm was complete. Filament for the Dremel 3D Idea Builder and supplies for the prosthetic cost under $50, which Schwartz found room for in her classroom budget. Made nearly entirely of 3D printed parts, the prosthetic operates without a motor. Adduction and abduction of Izzy’s elbow activates two connected, string-like filaments that create movement in her fingers. Schwartz says that presenting Izzy and her family with the completed prosthetic was one of the most rewarding experiences for her students.

“Adolescent years are typically centered around the self. For my high school students to complete a difficult assignment for the joy of someone else is truly amazing,” Schwartz said. Shortly after Izzy received her prosthetic arm, the family of five-year-old Eli in need of a prosthetic arm reached out directly to Schwartz. Her response was an immediate “yes.”



How Prosthetics Extended Creativity, Career Aspirations

Experience in printing not one, but two, prosthetics has a few of Schwartz’s students researching universities across the country to pursue degrees in technology and 3D printing. Schwartz believes her students’ newfound career aspirations are due in part to using 3D printing to solve real problems.

Hardin-Jefferson students aren't the only community members that are lending a hand to the production of 3D printed prosthetics. Representatives from the local hospital toured Schwartz classroom and offered donations for the printing filament and supplies.
"The local medical community was impressed that high school students could design and assemble a prosthetic that makes it possible to pick up a bottle, hold a game controller or have two hands on a bicycle," Schwartz said.

Undertaking 3D printed prosthetics has been nothing short of "amazing" for Schwartz. Witnessing how extensions of STEM has borne unknown creativity within her students are humbling moments that she cherishes as a life-long educator.
"Each time we complete [a prosthetic], I reflect upon how this experience is making the future a little brighter for these children, but its also doing the same for my students," Schwartz said. "Even if they don't realize it just yet."