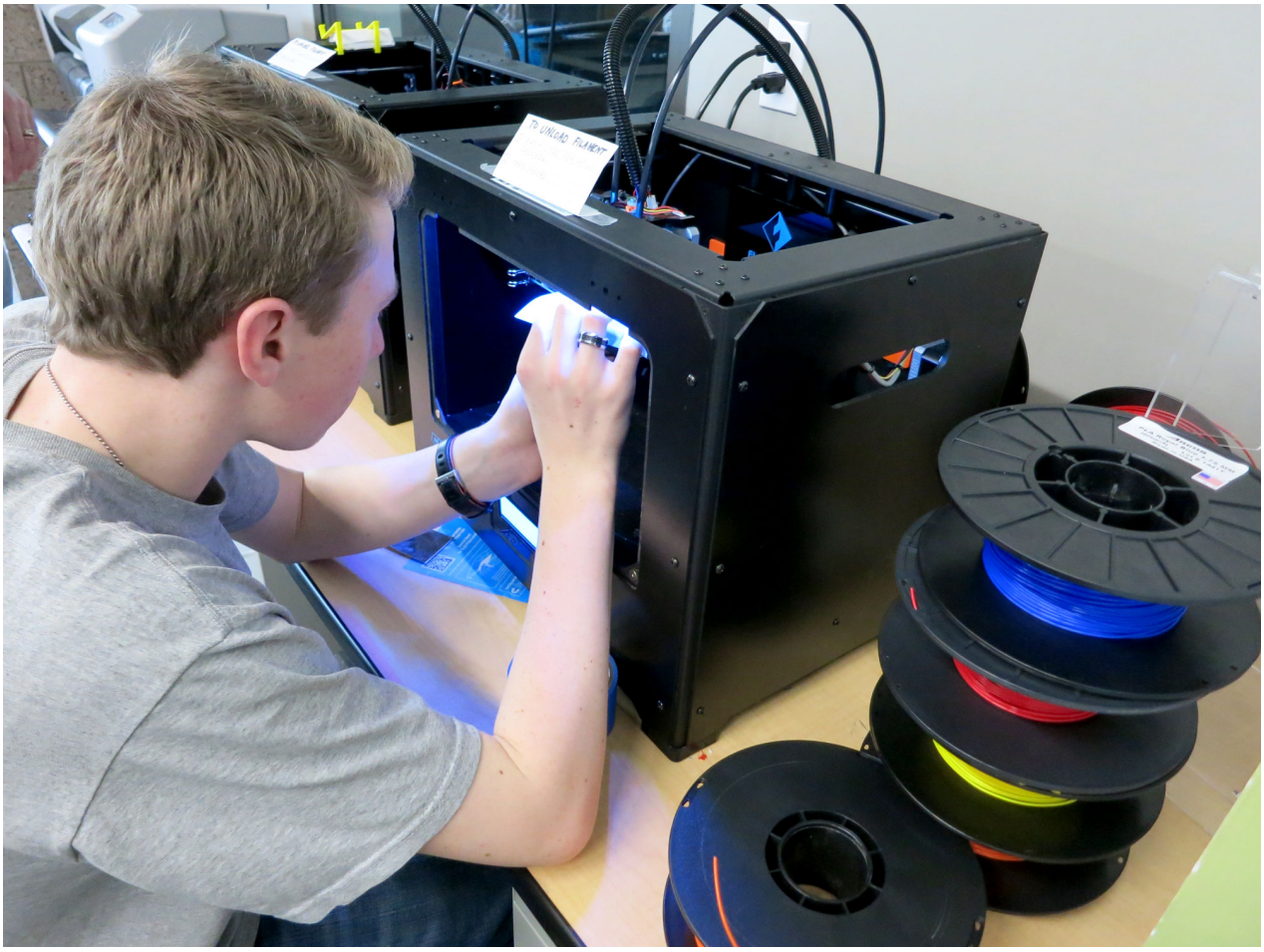
# STHS 3D printers bring out ingenuity



STHS senior Hawley Jarrett sets up one of the 3D printers to start printing an object. Photo/Jessie Marchesseau

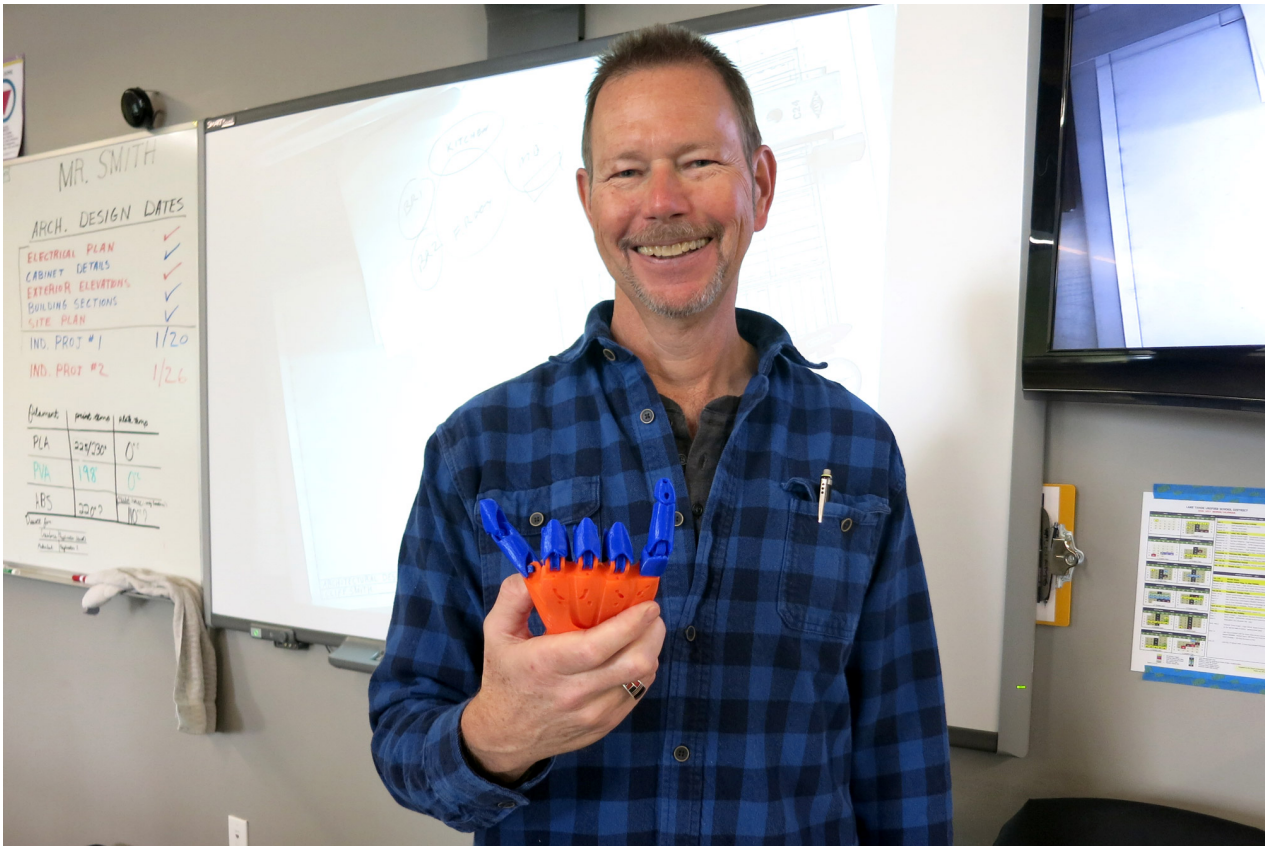
**By Jessie Marchesseau**

Students in Cliff Smith's AutoCAD class at South Tahoe High School are printing out more than just term papers. Since fall 2015, students have had the opportunity to not only design three dimensional objects with the computer aided drafting software, but watch their creations come to life with the help of in-class 3D printers.

On a recent winter afternoon, the trio of printers was busy cranking out a space ship, a three-dimensional chess board and

a set of working gears. A single object can take anywhere from 30 minutes to more than 24 hours to complete, depending on its complexity.

Meanwhile, students were working on their final semester projects: action figures containing at least two types of working joints.




Cliff Smith, STHS career tech education and math teacher, holds a model of a prosthetic hand he printed with the 3D printers in his classroom. Photo/Jessie Marchesseau

In place of ink cartridges, the printers have spools of polylactic acid filament. It basically looks like the spool of weed whacker line. PLA is a thermoplastic, meaning when you heat it, it melts, and when it cools it becomes solid again. So essentially, the printer melts the PLA and “prints” it in the desired form where it cools.

The melting process is especially obvious in the classroom graveyard of misprinted objects (which they are trying to

figure out a way to recycle). It’s not uncommon for a student to send an object to print one day, then come in the next day to find a plastic blob where their design should be.

“It’s funny to watch other people, but it’s super-frustrating when you keep failing,” said Jessie Brown, a junior in Smith’s 3D AutoCAD class. She was laughing with a classmate whose gear project had misprinted 14 times so far. “It’s just luck,” she said, “a lot of luck.”

Brown explained that every time someone’s project fails, they have to figure out why and add it to a running list of printer tips and instructions. Sometimes it has to do with the design, sometimes it’s the printer. For example, they discovered wiping the plate with alcohol helps the plastic stick, thereby reducing mess ups, and how needles and unfolded paperclips work wonders for cleaning a clogged tip.

Smith insists the students repair and maintain the printers.

“The more toys they get to play with, the more ways they can come up with to solve problems,” he told *Lake Tahoe News.*

STHS students have printed a variety of objects on the classroom 3D printers, including fully-functioning gears and chess pieces. Photo/Jessie Marchesseau

For example, when a part broke on one of the printers, the students designed a new part to fix it, and then printed it with one of the other printers.

Smith said problem-solving is his No. 1 goal for his students. “To me, that’s the key, is allowing them to troubleshoot, problem solve, but in a fun way. Whether they go into engineering or not, they’ll be good problem-solvers.”

And it sounds like it’s working.

Most of the class projects are fairly broad, allowing students to be creative with their designs. They’ve created dice, chess pieces, various working gears, functioning joints, and puzzles. And once students have finished the required projects, they are free to create and print their own designs. Smith has seen a Star Trek badge, a Harry Potter wand, Lake Tahoe keychains and a smartphone stand to name a few. One

student even purchased a special type of filament in order to print out custom skateboard wheels.

“You come up with a problem, and you find a way to fix it,” Brown said of objects she has created for family and friends.

Other students, like Hawley Jarrett and Sam Satin, both seniors, are less focused on the problem-solving aspect, and more into just creating cool stuff. Jarrett said his favorite part of the class is having the opportunity to design and create new things. Satin, an aspiring architect, enjoys designing and working with the CAD software, calling the 3D printers “the icing on top.”

Though he may not be consciously focused on problem-solving, Satin said, laughing, that he wasn’t sure anyone had anything work the first time around all semester, an indication that problems are being addressed and solved by nearly everyone on every project.

And the experimental printing and designing doesn’t stop with plastic. The 3D printers can also print a type of dissolving filament which, when placed in water, will disappear, creating voids within the plastic part of the printed object. Students can also hop across the hall to the laser cutter/etcher/engraver which can create intricate designs on and out of wood. Figuring out what kinds of wood and what thicknesses work has been a problem-solving experience in itself. Pieces of burned and cracked wood in the printing room are evidence of the experimentation.

Though not all of these students expect to be using this type of technology in their future careers, the rate at which 3D printing technology is advancing makes it nearly impossible to tell what we may be printing a year or 10 years from now.

But even if they never use a 3D printer again, at the very least they have gained some problem-solving skills … and printed some cool stuff.