



Fifth-graders in Jason Davis' class at Chaparral Elementary School in Chino Hills work on pieces of a prosthetic hand made with a 3-D printer.

## **Chaparral Elementary teacher, students plan to donate prosthetic hand they built**

A group of Chaparral Elementary School fifth-graders and their teacher plan to present a prosthetic hand they built to a young man in the community next week. Teacher Jason Davis recently began searching for a recipient for the hand, through people at Chaparral and by sharing a video of the hand on Facebook. The son of a staff member at Chaparral has been selected to receive the hand and is scheduled next week for a fitting and training. The teenager was born with a congenital birth defect that affected his right hand. If the young man likes the prosthetic hand, Davis and his students plan to build other hands for him to use for different activities: a rugged hand for outdoor work, a sleeker hand for dates and job interviews.

Through the Facebook video, Davis was contacted by Jessica Sandoval of Chino Hills, who lost three fingers while serving in the U.S. military.

Davis and his students researched and found designs for single fingers, settling on a design known as Knick Finger. On Jan. 23, the students printed all the parts of the Knick Finger, only to learn that some of the plastic materials were not suitable for certain parts of the design.

“We are now ordering a type of elastic plastic called TPU which will allow the finger to bend at the joints and we will make a second attempt at the Knick Finger prototype,” he said.

Davis and his students built the hand using a three-dimensional printer they received through a grant in winter 2015.

Davis got the idea for making the prosthetic hand after reading about a website called e-nable ([enablingthefuture.org](http://enablingthefuture.org)) that was assisting owners of 3-D printers in printing prosthetic hand devices for children in need.

“I thought it was such an interesting idea and considered how my own fifth-grade students could benefit from building a functional prosthetic for a person or child in need in our own community,” Davis said. “I was particularly excited about how my students could integrate the 4 C’s (collaboration, communication, creativity, and critical thinking) and using a real-life application of math and science through working together on a project like this.” He was also thrilled about the possibility of improving the life of a local resident.

Davis and Chaparral Intervention Specialist Mark Mann collaborated on the grant request for the printer with Voya Financial in fall 2015. Davis received the printer in winter 2015, but wasn’t ready yet to begin the prosthetic hand project.

“At that time, my students were heavily invested in preparing for our first ever Chaparral Robotics Competition, so the 3-D printer took a back seat for the remainder of the school year,” Davis said. This school year, Davis focused on learning the software for the 3-D printer and getting the prosthetics program up and running. He calls it PKK (Prosthetics for Kids, by Kids).

Intervention Specialist Mann continued to support the endeavor by going into Davis’ classroom to teach math to the students for a couple of hours each day, allowing Davis to learn the Replicator G software and practice using the 3-D printer.

Within three days, he had learned the software well enough to begin printing, and began incorporating 3-D printing into the students’ weekly STEM (Science, Technology, Engineering, Math) work. By the end of the week, students printed and built a functioning prototype hand based on the Raptor design obtained

through [enablingthefuture.org](http://enablingthefuture.org). Davis handled the more technical aspects of threading and tensioning the device.

In mid-January of this year, the class experimented with scaling software to create a hand 125% of the size of the initial prototype. That printing was successful and the Chaparral team has since completed 90% of the hand. Students assisted with the stringing and tensioning of the second hand.

“When we get to our third hand, I expect the students to build and assist with every aspect of building the device,” Davis said. “Ideally, after our third build, I would like to give each of the (student teams) their own hands to build, which they will work on together as a project-based learning activity.”

“As STEM is a huge focus in my classroom, using our 3-D printer has really allowed my students to learn about and engage in the engineering and design process in a way that is innovative and meaningful, both to my students and to members of our community,” Davis said.

Control click on the links below to see the 3-D printer in action and a close view of the prosthetic hand:

[Click to Download](#)

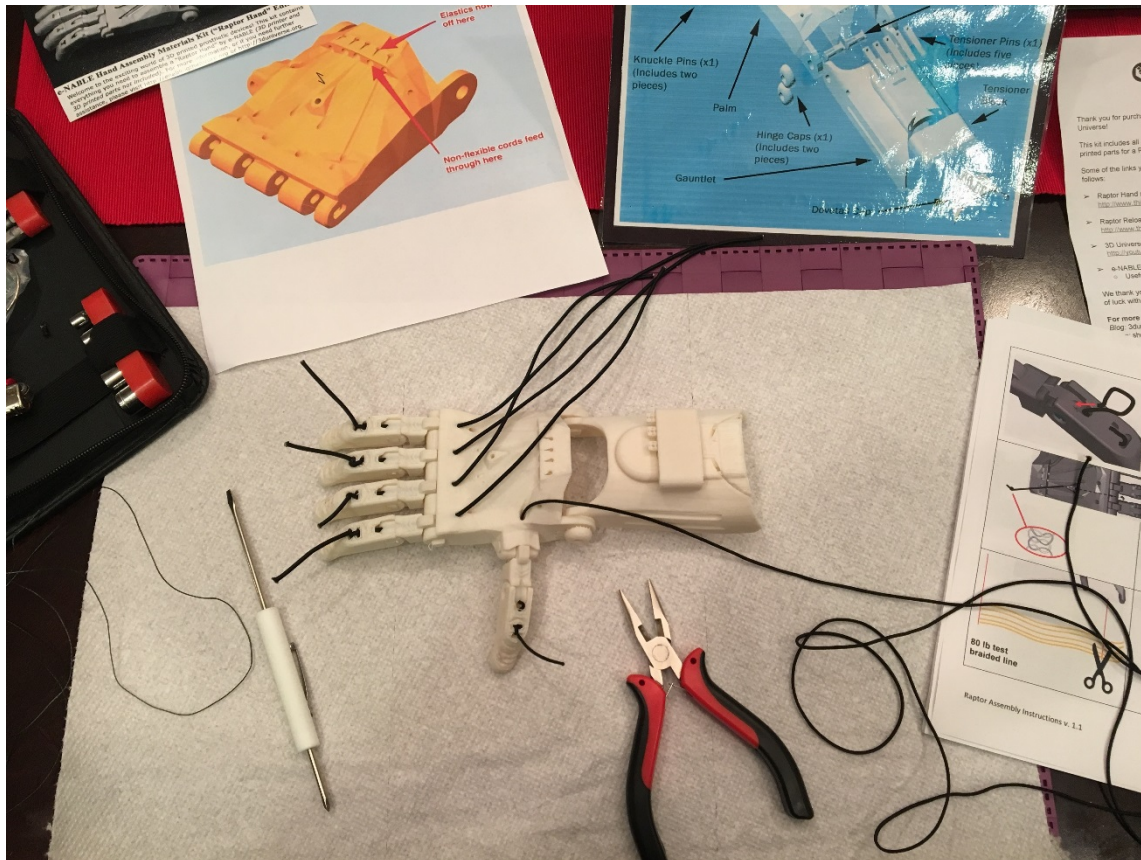
[Click to Download](#)



Pieces of the prosthetic hand, tools and designs for the hand are laid out on a table.



Student Kaitlyn Ortega works on a computer program to print the prosthetic hand.



The hand during the threading and tensioning portion of construction.



Students in Jason Davis' fifth-grade class at Chaparral Elementary School have their photo taken with the prosthetic hand they helped build.