

How to Build a 3D Printing Center

Experts share their advice for setting up a campus 3D printing lab from the ground up.

- By David Weldon, 10/27/16



Just about every higher education institution wants to get in on 3D printing these days, but what does that really involve in a campus setting? With a plethora of 3D printers available on the market for a wide range of price points, it can be hard to know where to start.

Ray Uzwyshyn, director of collections and digital services at [Texas State University](#), has some experience in the matter: His institution planned and designed a 3D printing center

from the ground up as part of a \$40 million dollar remodeling of the campus library. To help others understand the process, Uzwyshyn offered his advice in the session "From Zero to Hero: Setting Up a 3D Printing Infrastructure," this summer at the [Campus Technology Conference](#) in Boston.

Determine Your Needs

According to Uzwyshyn, a crucial first step is to conduct a needs assessment: Determine who needs or wants 3D printing capability; what they will use it for; what resources already exist; and what those who may already have 3D printing capability would like to do if given more. "We found there were four areas on campus already using 3D printing: education, art and design, engineering, and forensic anthropology," he said. And there were plenty of other areas on campus eager to get in on it.

Maintaining four separate areas for 3D printing didn't make sense, so the goal was for the library's new center to serve everyone. By consolidating with the new center, three of those areas could upgrade, while the fourth could make a desirable "downgrade" in what they were supporting. For instance, while the education center was paying under \$2,000 for their 3D printing capability, the forensic anthropology department was paying more than \$150,000. That area jumped at the chance to go with something less high-end.

Evaluate Equipment

Texas State created two subcommittees to handle the project: a 3D printer selection subcommittee; and a 3D printer policy and infrastructure subcommittee. While one searched for the right printers, the other made sure everything in the center was up to spec.

The search committee set out to examine what would be a robust printer at an affordable price, with software and licenses factored in. They eventually recommended the [MakerBot Replicator 218](#). The printer and warranty would cost \$7,964; additional equipment, software and licensing would cost \$6,761 more.

The overall time frame, from needs assessment to the subcommittee's recommendation, was six months. The school spent the next three months acquiring the printer hardware and the subsequent four months training staff during the "soft launch." The formal launch took place from January to May, 2016.

Promote the Possibilities

A key part of the launch was promoting 3D printing throughout the university. The center created a web page that discussed the possibilities with 3D printing, and it invited others on campus to "send us what you want printed." The idea was to create work that would help train the staff with a variety of projects.

But that is only the beginning, Uzwyszyn said. "The next step for us is to get a \$50,000 lab. We're doing the assessment and evaluation of what is needed now." After that, he said, "We're moving to the \$500,000 lab."

3D Printing on a Budget

If your institution doesn't have \$500,000 to spend on a high-end 3D printing lab, fear not: 3D printing can be done on the cheap, or reasonably so.

A number of factors have brought down the cost of 3D printing, according to Jason Larkin, a 3D printing instructor and consultant with Vocademy. "[The technology] is becoming more popular due in major part to two reasons: the expiration of the patent held by MakerBot, allowing for other companies to produce and sell their own 3D printers, and the onset of RepRap, which is an open source movement that was started in 2008 to try to get more people involved in 3D printing by making the designs available online for 3D printers, allowing people to build their own at home," said Larkin. "The combination of these two things has made 3D printing decrease exponentially in cost over the past few years and has allowed more people to have access to 3D printers."

The technology has become more user-friendly as well. "You do not need to have a degree in engineering to be able to 3D print something," Larkin noted. "There are dozens of free programs that you can use to design a model, and certain ones, such as Tinkercad, are made to be simple enough for children to learn how to use and become proficient in a short period of time. I have taught hundreds of children how to use Tinkercad, and was able to get them from having no knowledge of 3D printing to being able to design their own things with moving parts."

He continued, "As long as you can use a computer with moderate proficiency, you can learn how to do 3D printing. Also, due to the decreasing costs, it is becoming more and more accessible for the average person to buy a 3D printer, as well as many libraries that are providing access to 3D printers for people who would not be able to get access otherwise."

While the price of 3D printers has been coming down, the number of features and capabilities has been going up. "The capabilities of 3D printing are growing exponentially due to the expanded availability and the heightened popularity in recent years," according to Larkin. "There are now a large variety of different types of 3D printers that can print in a multitude of different materials, in a variety of different methods." For example, he said, "The most well-known types of 3D printers use plastic, specifically ABS or PLA; however, there are other types of printers that print with a liquid plastic resin, various types of metals, and there are even printers that are coming out with capabilities of printing edible food."

Some 3D printers even verge on the realm of science fiction. "One of the most interesting things with 3D printing recently was the printing of model of Vincent Van Gogh's ear, using cells from a descendant of his," Larkin said. "The ear is now in a museum where you can actually speak to it through a microphone. As the technology increases there are more and more applications that 3D printing will be used for, allowing pretty much anything to be 3D printed."

What Does It Cost?

Of course, the typical campus IT director isn't likely to be called on to print a copy of Van Gogh's ear. So what should universities expect to do with their 3D printing labs, and how much they should spend to do so?

"Obviously, the main thing that is necessary for a 3D printing lab is 3D printers, but the type and number of 3D printers would depend on the intended applications," Larkin said. "If the lab is intended to be used for people to be able to produce small models in the range of 6"x6"x6", it would be possible to get a few inexpensive printers — such as a few Flashforges, which cost around \$900 each. However, if the purpose of the print lab is for larger prints, anything above 8" would require a much larger printer, as well as generally requiring quotes for costs."

The other main ingredient is material to print with — "most likely either ABS or PLA filament, which generally cost around \$20 to \$30 per kilogram and are available in a variety of colors," Larkin explained. "Other various things that are useful, but not essential, for a 3D printing lab would be a print cleaning station with tools for cleaning off support material, which could be easily purchased for around \$100 total. The approximate start-up cost for a lab with at least the basics for approximately six printers would be in the range of \$8,000 for the smaller print lab, and in the range of \$10,000-20,000 for the larger print lab."

Finally, Larkin addressed the issue of how a college or university can use a 3D printing center as a revenue center. "It would be possible to use a 3D printing lab as a revenue center by selling print commissions," he said. "For example, if someone wants to have something printed, they can commission someone from the lab to check the print for any flaws, print the piece, clean it and ship it to the person who requested it. If you charge based off of the time it takes to complete the print, plus a flat fee for the cleaning and checking, it is very possible to make money."