

UNIVERSITY STUDENTS TURN IMAGINATION INTO REALITY

uPrint Helps Singularity University Students See the Results of Their Designs

"The greatest value is that 3D printing with uPrint is driving creativity. Students can go from imagination to a physical object in just a couple of hours."

— Dan Barry, Head of Faculty

An image of one student's CAD drawing depicts a complex design that can not be milled.

Summertime can be a grand time to address grand challenges, and that's just what Singularity University is enabling students from around the world to do.

Bringing Smart People Together to Solve Problems

The mission of Singularity University, founded in 2009, is "to assemble, educate and inspire leaders who understand and develop exponentially advancing technologies to address humanity's grand challenges." These technologies include biotechnology, supercomputing and robotics. The university hopes to stimulate ground-breaking, disruptive thinking that will solve some of the world's greatest problems.

Eighty students from 35 countries attended Singularity University's 2010 ten-week Graduate Studies Program. They were divided into five groups to look at challenges in such areas as energy, food, water and space. "Our objective is to bring smart people together who are interested in these problems," said Dan Barry, Head of Faculty. "We bring them up to speed on current technologies, as well as technologies that might be available in five to ten years. Then we help them organize into projects to address grand challenges."

Starting Small Not Good Enough

Recognizing the value of being able to touch and feel the output of a design project, faculty at Singularity University originally built their own 3D printer from a kit over a weekend. It gave students the benefit of seeing their ideas take shape, but it was not a solution worthy of grand challenges.

"We could only make small things," said Barry, "and we had to watch the machine every moment. The resolution was low. It had limitations. Nevertheless, it represented a way for students to get away from just thinking and writing. It enabled them to get their hands on something and start building." The next step for Singularity University was to upgrade to a uPrint Personal 3D Printer from Stratasys.

"Having a printer on site at the university provides quick turnaround for student projects," said Jesse Roitenberg, Educational Channel Manager, Stratasys. "It also makes the cost acceptable. An outsourced prototype might cost as much as \$50 to \$100, while the same part can be produced by the uPrint for \$5 or less. With the uPrint on site, students can work in greater detail than before and be assured of high durability for the end product. The ABS material is ideal for testing form, fit and function."

The uPrint housed in Singularity's Innovations Lab enables students to hold their ideas in their hands. "People who have used pencils and paper their entire lives are now sitting down and designing 3D models," said Barry. "Once they can build things, they look at design in a whole new way."

For one student, that meant combining artificial intelligence with robotics to design emotion into a robot. With the help of the sophisticated Lego® Mindstorms® NXT software designed for creating robotics, and printed parts from uPrint, she created a robot that could express happiness by extending and moving its ears, and show fright upon coming too close to someone by turning its head and ears down.

Barry said he believes rapid prototyping, such as can be done with the uPrint, will be a huge factor in Mars and moon explorations. "The International Space Station today is one-third spare parts because astronauts don't know which parts might need replacing," he said. "Ninety percent will never be used. In the future, astronauts will bring 3D printers and raw materials to make the parts they need. There is no question space exploration will incorporate 3D printing."

Transforming the Design Process

"Stratasys FDM technology has been transformative in the things we design," said Barry. "The models are so much more accurate. They are stronger. The quality is better. And the printer interacts with programs in much superior detail. With the uPrint, students are able to show the fine detail and beauty of what they can design."

"The greatest value is that it is driving creativity," he added. "Students can put their imagination into a software package that lets them visualize and manipulate in three dimensions. They can go from imagination to a physical object in just a couple of hours. Turning someone's ideas into real structures enables that person to implement his or her ideas creatively. Without this capability, we tend to be conservative. If it takes \$10,000 to build something, I'm just interested in making sure it works. I'm not going out on a limb. With a 3D printer, I can go ahead and try something else." The uPrint also supports the Innovation Lab's encouragement of students to "fail early, fail often," Barry said. "We encourage students to keep going until they get what they want. That's what this printer enables them to do."

While the uPrint is providing immediate value to Singularity University students, its real return on investment might come later. "The greatest value will be when these students return home to their companies or to other academic institutions," said Roitenberg. "They will bring their ideas with them."

"It's difficult to know whether one's imaginative idea can be turned into reality," Barry added. "Modeling it on a computer gives more insight, but that pales in comparison to holding it in one's hand and applying it to what someone is trying to solve. I am immensely grateful for this printer," he added.



Dan Barry, Head of Faculty for Singularity University, holds 3D replicas of student faces right out of the printer, along with a globe containing a rolling ball which, in turn, contains a model of DNA.

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