How 3-D Printing Will Change Education

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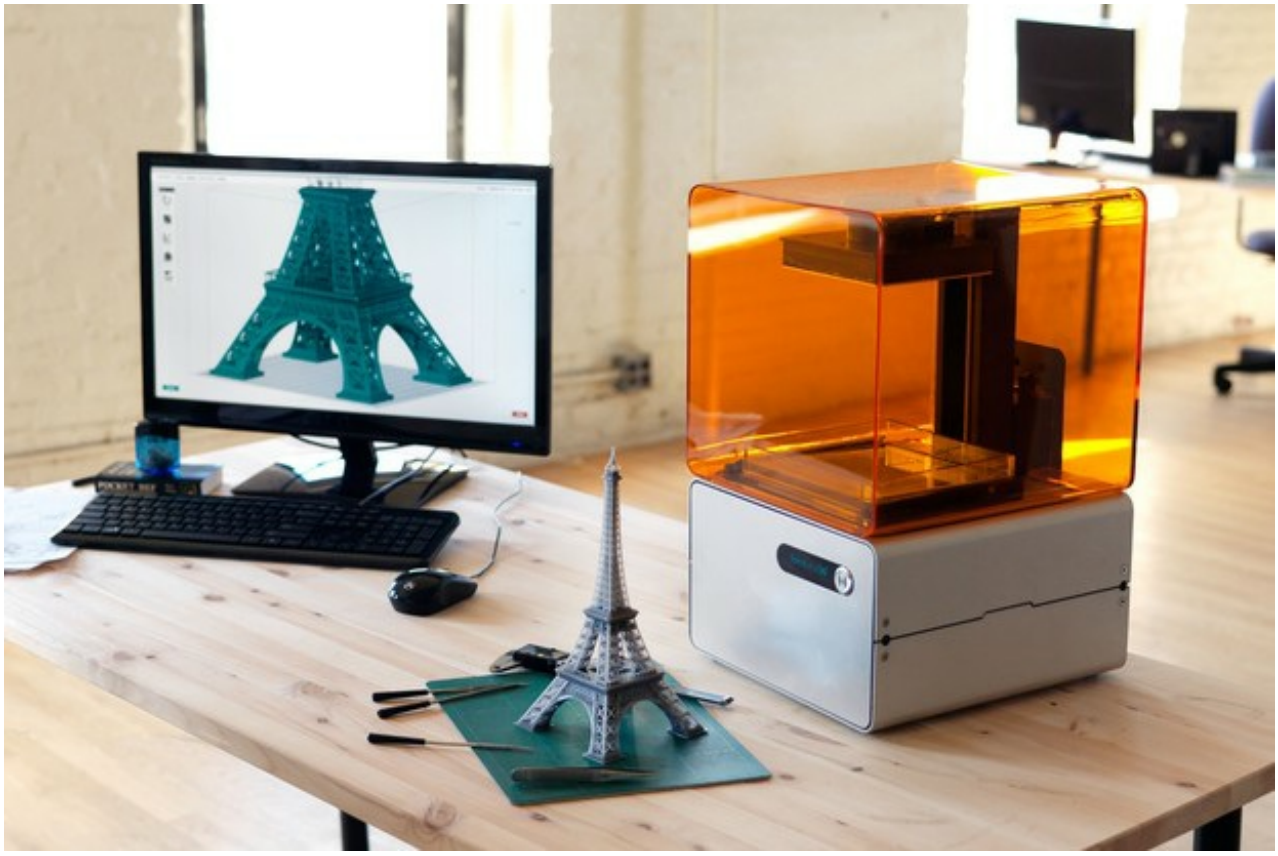

Also known as rapid prototyping, 3-D printing is a technology that allows users to create three-dimensional physical products from a digital file.

Each product is created one layer at a time, using an inkjet-like process that sprays a bonding agent onto a very thin layer of fixable powder. The bonding agent can be applied very accurately to build an object from the bottom up, layer by layer. The process even accommodates moving parts within the object. Using different powders and bonding agents, color can be applied, and prototype parts can be rendered in plastic, resin, or metal. In fact, this technology is commonly used in manufacturing to build prototypes of almost any object (scaled to fit the printer, of course)models, plastic and metal parts, or any object that can be described in three dimensions.

The first working 3-D printer was created in 1984 by Charles W. Hull of 3-D Systems Corp. Hull published a number of patents on the concept of 3-D printing, many of which are used in todays additive manufacturing processes. Since becoming mainstream, 3-D printing has worked its way into a number of markets. The technology is now used in architecture, construction, industrial design, automotive design, aerospace, military, engineering, medical technology, fashion, footwear, jewelry, eyewear, and more.

Educational institutions are still in the early stages of adopting this groundbreaking new technology, but a few early pioneers have shown us just how feasible–and useful–it can become.

Developments in the Sciences

One of the areas that 3-D printing has had its biggest impact is in the science field, where the ability to customize and instantly create a tool or new medical device has proven to be quite powerful. From small labs to NASA, researchers are using the technology to advance their knowledge and perform their jobs more easily.

University of Wollongong researchers have created some of the first fabricated human skin with a 3-D bio-plotter, the first of its kind in Australia.

Research Fellow Dr. Robert Gorkin said that while the bio-plotter worked in much the same way as other 3-D printers, it could potentially be used to create patient-specific implants and one day even organs for transplant.

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“This machine is able to use bio-materials to print material in a sterile environment that more accurately represents human tissue,” he said. “So instead of making a pacemaker or a cochlear implant out of metal or plastic, you will be able to make them out of a biological living material, which is better for the body.”

The Wollongong research centre is already using 3-D printing to produce prototypes and custom-ordered items for a range of industry and business partners.

Best of all, the 3-D printing movement has opened up research opportunities for students.

Last fall, the University of Delawares Department of Mechanical Engineering unveiled a new Design Studio that allows students to take design ideas from concept to prototype in one convenient space.

The studio consists of four connected work areas designed to foster integrated learning: a prototyping lab, a materials repository, a machine shop, and a collaboration laboratory. The prototyping lab contains computers, tools, and desks for students to use while developing projects, including a new 3-D printer that can produce plastic parts for testing.

According to Jenni Buckley, assistant professor of mechanical engineering, the Design Studio is one of the most advanced spaces for undergraduate mechanical engineering in the country, rivaled only by facilities at Stanford University, Pennsylvania State University, and Virginia Tech.

10 Educational Benefits to Come from 3-D Printers

1. Consumers to Creators.

3-D printing is changing the dynamic of consumer culture, transforming students from passive consumers to active creators.

2. Low Cost.

A single RepRap printer costs about $1,200–a real steal in the scheme of your institution's budgets. And according to a new study from Michigan Technological University, replacing commercially available lab equipment with items generated by 3-D printing technology could cut costs by as much as 97 percent.

3. Customization.

Parts made with 3-D printers allow for a greater level of customization to individual needs.

4. Manufacturing and Design as Common Knowledge.

With widespread adoption, 3-D printers will familiarize students from an early age with the concepts and processes behind manufacturing and design.

5. Increased Exposure.

The availability of 3-D models as open content will encourage experimentation, even for those lacking sophisticated 3-D design skills.

6. Enhanced Creativity.

The act of generating a 3-D object is highly creative, opening up opportunities for students and teachers alike.

7. Educational Technology.

Few educational institutions currently own 3-D printers. Investing in one now is a great way to put yours on the map and become a leading figure in educational technology.

8. A Constant Conversation Piece.

As 3-D printers can involve all students, they offer instructors a convenient way to capture attention and deliver information en masse without lecturing into thin air. It also provides teachers with a three-dimensional visual aid to illustrate difficult concepts.

9. A Balanced Curriculum.

3-D printing fits nicely into both the sciences and the arts. And it provides instructors with a perfect opportunity to apply interdisciplinary principles to their lesson plans.

10. Sharing and Collaboration.

As Fab Labs and Makerspaces become more widespread, students will be able to collaborate closely on projects, testing and retesting ideas and working as a team. Researchers and instructors will also be able to share designs with one another in a more efficient and collaborative manner.