Transform the Way of Learning

3D PRINTING SPARKS ENGINEERING DESIGN IDEAS IN KOREAN UNIVERSITY

"3D printing overcomes technical barriers for students. What used to be strenuous to produce by traditional methods can now be done with the press of a button. The process is simpler than we expected but the impact has been remarkable as it inspires students and induces creative thinking."

– Professor Young Choi
Department of Mechanical Engineering,
Chung-Ang University.

CASE STUDY

As 3D printing has been on the rise in South Korea, in 2014 the Korean government announced a USD 2.3 million investment plan in setting up 3D printing centers and supporting SMEs with 3D printers. Adoption of 3D printing by local enterprises keeps growing across different industries and it is essential for tertiary education institutions to better equip the young generation with necessary knowledge and professional skills before entering the competitive job market.

Envisioning the impact of 3D printing on business and manufacturing process, the Chung-Ang University set up a 3D Digital Design Laboratory (the Lab) in 2006 to offer students hands-on technical trainings while conducting a mathematics study on metamathematical expressions (visualizing algorithms and data structure by 3D shapes). Professor Young Choi, Head of the Lab, opted for a Dimension® 3D Printer to spark engineering students' interests in mechanical design and help them overcome challenges in product design coursework.

Enlighten Class Activities

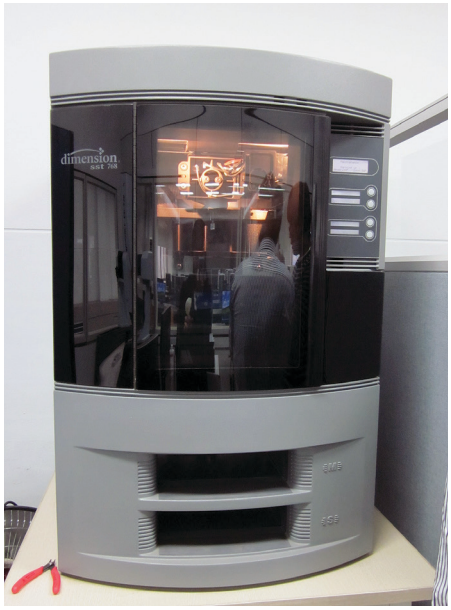
Understanding engineering theories was the first step to master mechanical design, and Professor Choi believed that hands-on demonstration was the best way to help students relate different parts and rules. “Mechanical engineering design involves a lot of meshing gears and electronic parts. Sometimes it is difficult to explain how and why they are connected, but our teaching staff can illustrate the theories with examples using 3D printed gears,” explained Professor Choi.

Throughout the engineering course, students had to apply the theories into practice. Visualizing mechanical design into working models became one of the key challenges in their learning progress.

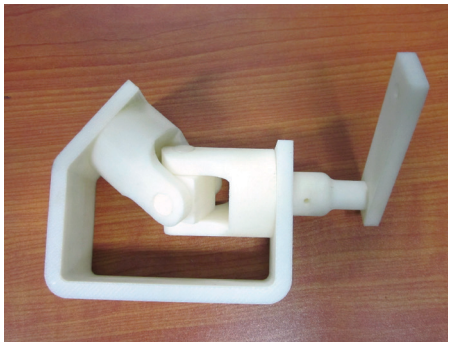
In the past, metal-cutting and handcrafting had been the most common methods to materialize a model. However, metal-cutting required advance skills and experience, at the same time it would take prolonged lead time to produce one design by handcrafting. Most of the time students could only verify the design concepts and functionalities through two-dimensional images from computer screens before producing final model. Design errors were easily overlooked, that the project might fail when flaws were only discovered after the final model had been crafted.

Alternatively, the Dimension 3D Printer converted CAD drawings into 3D models at different design stages, students were able to examine the print-out for concept validation and test-drive their designs with a working mock-up during class discussion. New design models could be easily and quickly printed after any design iteration.

“3D printing overcomes technical barriers for students. What used to be strenuous to produce by traditional methods can now be done with a press of button. The process is simpler than we expected but the impact has been remarkable as it inspires students and induces creative thinking,” Professor Choi said as he showed a knuckle joint designed by one of his undergraduate students.



Dimension SST Installed at the 3D Digital Design Laboratory of the Department of Mechanical Engineering, Chung-Ang University



3D printed knuckle joint designed by undergraduate engineering student

Student Projects Enabled by Dimension® and ABS*plus*™

The knuckle joint consisted of two buckles that were locked together by a cubicle block. One of the buckles was connected to a handle so that users could move the joint by rotating the handle. Producing this joint by metal cutting would be a tricky process because the buckles, the block and the handle all had to be produced separately and then be assembled together, which added to the risk of misalignment. It would require several days by metal-cutting to produce such a joint taking into account all assembly and post-processing steps.

The Dimension 3D printer has provided students with an assembly-free way to produce the knuckle joint. Powered by FDM® (fused deposition modeling) technology, the Dimension 3D printer builds parts by adding successive layers of material. Students could produce the whole joint in one print within 18 hours, simply removed support material through automated soluble support removal process.

In fact, Professor Choi has researched a number of 3D printing systems before deciding on the Dimension 3D Printer. One of his key considerations was the material choice. The use of ABS*plus*™ – a strong durable thermoplastic that can withstand repeated functional tests, was important to Professor Choi's decision. Models printed with ABS*plus* can be drilled, tapped, sanded or even chrome-plated that used to simulate final production parts. ABS*plus* also comes with a wide range of colors which further enhances product realism.

3D printed hair dryer produced by students to test the functionality of the grip

Moving Beyond Undergraduate Studies

In addition to undergraduate engineering courses, Professor Choi has expanded the use of the Dimension 3D Printer to mechanical engineering researches. In a project that involves merging, editing and decimating engineering data from point cloud images, researchers can convert the data into 3D printable files and print out a 3D model to verify the angular measurement of a complicated part for the study of computational algorithms and modular design methodology.

Mr. SangCheol Hwang, Researcher of the Mechanical Engineering Department, commented that 3D printing has played a pivotal role in CAD-related research projects. "3D printed mock-ups minimize research errors and help develop new algorithms."

The Lab is also conducting a study to compare between an original product and a 3D printed replica with data generated from 2D images. This is to examine methods of creating 3D CAD files, identify geometric errors that might be problematic to mechanical design and experiment on possible solutions. Professor Choi said that the Dimension 3D Printer has become one of the most popular tools in the Mechanical Engineering Department at Chung-Ang University, and it is working almost 24/7. He believed that mastering 3D printing technology early would empower students to open their minds through different 3D printing applications in the product development process.

"Concept modeling is the first step but it is fundamental in mechanical engineering. As 3D printing is getting wide-spread among Korean enterprises, by equipping students with 3D printing skills, I hope they are more ready for their career," concluded Professor Choi.

stratasys

E info@stratasys.com / STRATASYS.COM

ISO 9001:2008 Certified

HEADQUARTERS

7665 Commerce Way,
Eden Prairie, MN 55344
+1 800 801 6491 (US Toll Free)
+1 952 937-3000 (Intl)
+1 952 937-0070 (Fax)

2 Holtzman St., Science Park,
PO Box 2496
Rehovot 76124, Israel
+972 74 745 4000
+972 74 745 5000 (Fax)