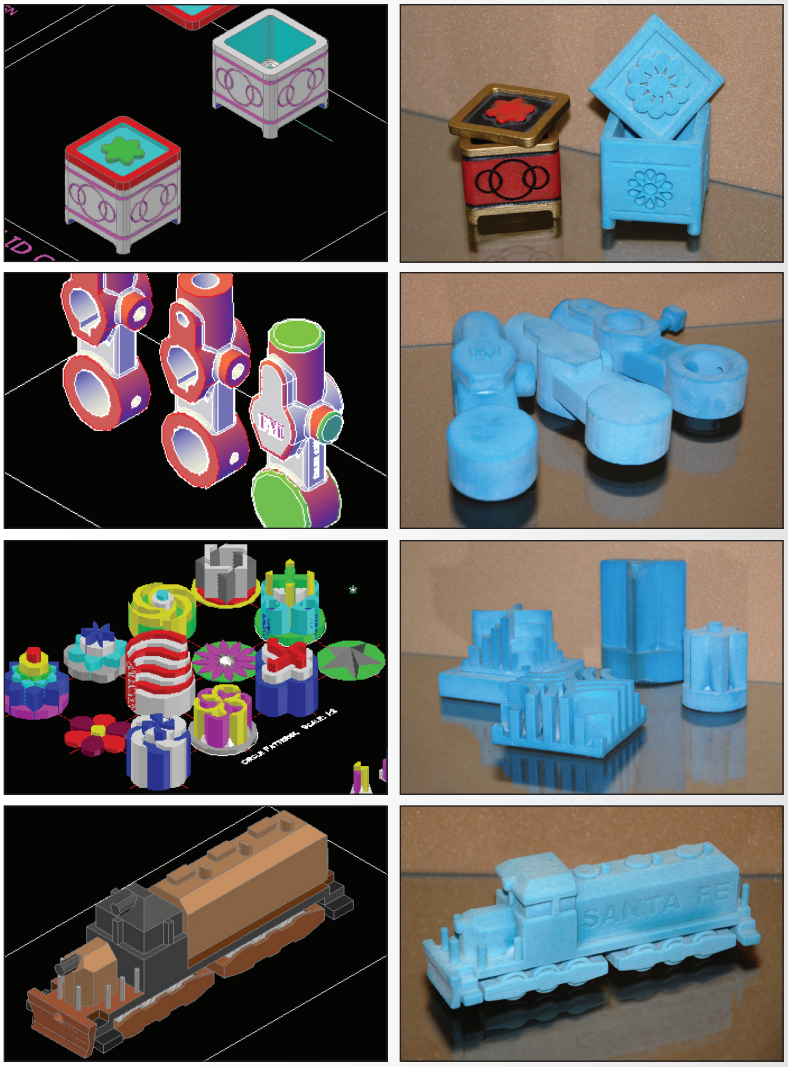
Staten Island Technical High School (SITHS)

School Turns Classroom Into Simulated Workplace with 3D Printing

- **Staten Island Technical High School** – a 900-student school for aspiring engineers
- **Challenge** – Making the learning environment mirror the professional engineering world, including enabling all students to turn their designs into physical prototypes
- **Solution** – Using low-cost 3D printing to engage students, teach a closed-loop design process, and help students advance
- **Results**
  - Students more deeply understand the implications of their design decisions
  - Students are inspired to reach higher after prominently displaying their accomplishments in the school
  - Students can better prepare for higher education by assembling powerful portfolios they can present to admissions personnel
  - Students gain early exposure to advanced engineering technology that they will use in their careers
  - SITHS maximizes resources by leveraging the fastest and most affordable way to create 3D physical models from CAD data

"3D printing gives students a better understanding of their design. What looks good on the computer screen doesn't always translate to the real world, so 3D printing is enhancing and reinforcing their CAD and conceptual skills."

– Frank Mazza
CAD Coordinator
SITHS



3D Printing Helps Students Understand How Designs Translate to the Real World

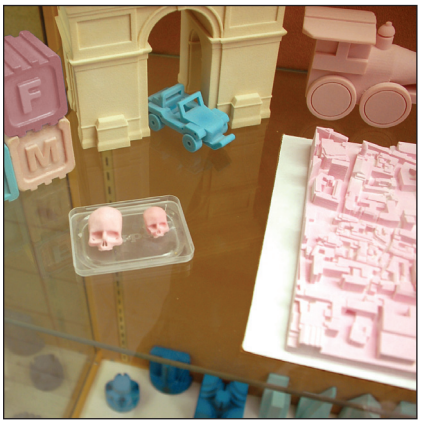
Staten Island Technical High School (SITHS), a selective New York school for aspiring engineers, aggressively immerses its 900 students in the technologies they will use in their careers. After passing a challenging entrance exam, students take a rigorous required curriculum that includes technical drawing, electronics, computer-aided design, computer science, networking and a healthy dose of liberal arts. Graduation rates approach 100 percent, and students regularly go on to the Ivy League, military academies and elite technology universities. From the moment students set foot in SITHS hallways, they "speak the language of engineering."

Challenge

Simulating the Professional World

Since the language of engineering translates into the constant quest for better products, computer-aided design (CAD) coordinator Frank Mazza brings that ethos into his classroom, making the education environment mirror a corporate design engineering department. "It's a simulated workplace, and my students are the designers," he says. "I issue design challenges, and they find solutions. It may be a simple jewelry box, a

3D SYSTEMS™



Displaying Innovations in the Trophy Case is a Point of Pride for SITHS Students

"There's just something very valuable from an educational standpoint, to hold an object in your hands at the end of the design process – especially for engineering-oriented students anchored in the physical world."

– Frank Mazza
CAD Coordinator
SITHS

complex toy, a building, or a machine part with gears, pistons and threads. We never do the same thing twice."

SITHS's challenge is to fill that dynamic learning environment with the technologies that drive real-world engineering departments. Like professional engineers, SITHS students start with a concept, move to a 2D sketch and progress to a 3D CAD model.

Since design doesn't end with the 3D CAD model in professional engineering departments, it doesn't end with a 3D CAD model in the SITHS classroom. Engineers take ideas beyond 3D CAD designs to prototypes, enabling them to gather real-world design feedback and conduct fit and functional testing. To prepare students for this environment, SITHS needed a way to quickly and affordably put prototypes into students' hands.

Solution

3D Printing

SITHS, like so many real-world companies, has discovered a cost-effective way to rapidly transform designs into physical objects: 3D printing. A 3D printer is an output device for 3D CAD data in the same way that a 2D printer is an output device for the words and pictures on a computer screen. The primary difference is that a 3D printer produces three-dimensional models and prototypes in composite material. 3D printing is gaining popularity as the equipment follows the pattern of 2D printers: capabilities are increasing as prices fall.

The 3D printing breakthrough at SITHS occurred in 2005, when Mazza, a professional engineer, discovered the technology in trade journals. "I thought, 'I can use and apply this in the classroom.' " Low operating costs, high conservation of materials and minimal post-processing effort were key criteria. After researching all the standard 3D printing technologies, the school selected the ZPrinter® 310 from 3D Systems, maker of the fastest 3D printers with the lowest operating costs.

Results

Portfolios, Pride and Deeper Understanding

Today, the printer is a busy hub of creative activity. Mazza hits the print button at the end of the school day and the next morning removes finished objects from the printer. The best ones are placed in a trophy case outside the classroom, sometimes with the AutoCAD® drawings that spawned them. Mazza also uses the printer to create prototypes that help him explain design challenges at the outset of an assignment. Students enhance these designs as they meet the assigned challenges.

3D printing enriches engineering education in a number of ways, according to Mazza. First, it gives students an impressive portfolio they can present to admissions personnel at colleges and universities. Second, it familiarizes them with equipment that's on industry's leading edge and rapidly becoming standard for competitive companies. "Perhaps most importantly," he says, "3D printing gives students a better understanding of their design. What looks good on the computer screen doesn't always translate to the real world, so 3D printing is enhancing and reinforcing their CAD and conceptual skills. There's just something very valuable from an educational standpoint, to hold an object in your hands at the end of the design process – especially for engineering-oriented students anchored in the physical world. Showing off their innovations in the trophy case is a point of pride for SITHS students and keeps them inspired to continually improve their work."

SITHS students can expect to expand their use of 3D printing in the future. Science classes, for example, will use it to print out microscopic objects like DNA molecules. Electronics students will use it to better understand electrical designs. There will be public-private interaction, such as printing models of buildings for nearby architectural firms.

"It's a distinct advantage for our students to be able to use 3D printing technology that is important and current in industry," Mazza says. "Students leave us smarter and better prepared to succeed in their careers."

Staten Island Technical High School
485 Clawson Street,
Staten Island, NY 10306
USA

www.printin3d.com

333 Three D Systems Circle
Rock Hill, SC 29730 USA
Telephone +1 (803) 326-3948
moreinfo@3dsystems.com

Issue Date January 2012