

- Home
- Hardware
- Services
- Processes
- Technology
- Comment
- Case studies
- Gallery
- Database
- News
  - 3D systems unveils new hearing aid machine
  - Blueprint realises underwater vision
  - 3D systems launches DuraForm HST plastic
  - Materialise releases Magics 12 for RP&M
  - New Z Corp distributor to offer free 3D printed parts
  - Objet unveils new rubber like flexible material
  - DSM Somos introduces near colourless WaterShed XC
  - Objet introduces dual material RP
- Magazine pdfs
- Media pack
- Site rate card
- Contacts
- Subscriptions
- Search Prototype



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## Design the next generation

Monday, 26 November 2007

**Students at the University of Huddersfield are using the very latest 3D printing technologies to bring their 3D CAD designs to life**

At the University of Huddersfield the pinnacle of a design student's career is the final project. Alongside the thesis, it reflects everything students have learned over the course of their education. The final project can thus be a key factor in winning a job or admission for post-graduate learning.

For a transportation design student, the final project could be creating a next-generation car, boat, bike or train. For a product design student, it could be developing any sort of innovative machine or merchandise. For an architecture student, it could be planning a futuristic building or a city. For an interior designer, it could be creating a dazzling room. These are the most important statements that students will make before moving on to careers or further education.

### Handcrafted models

Presenting the final project at Huddersfield has traditionally required students to invest weeks of painstaking hand construction into their 3D models. In the eyes of educators, it was time that could be better spent on core learning.

Conceiving and refining designs are the key competencies of design education, not the crafting required to present ideas. Handcrafting also exposed students to dangerous machinery like power saws, and it resulted in finished objects that weren't true to the designs.

The university needed a way to use time more wisely, to ensure student safety, to produce accurate models, and, perhaps most importantly, to expose students to the same technologies they will use in their design careers.

### Printing CAD Designs in 3D

The institution began meeting these goals three years ago when it began "printing" 3D physical models directly from the electronic designs students created in their CAD software. This automated process employs a 3D printer which produces 3D physical models in solid composite material.

3D printing is becoming more common in universities as 3D printers follow the pattern set by 2D printers: capabilities are increasing, prices are falling, and machines are becoming more classroom-friendly.

Students at the University of Huddersfield first create their designs in SolidWorks, AutoCAD, Alias, 3ds Max or Rhino. The printer accepts that data and produces a 3D physical model students can hold in their hands.

"Students love watching it work, and they love watching their parts come to life," says Chris Charlesworth, Technical Team Leader at the University of Huddersfield School of Art & Design and manager of the University's 3D Design Workshop. "They're very intrigued by the technology, which allows them to produce parts they wouldn't have the time or skills to craft by hand."

The University of Huddersfield purchased its first 3D printer in 2004, a ZPrinter 310 monochrome



University of Huddersfield student designs incorporating 3D printed parts, and features developed using 3D printed prototypes.

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ZPrinter 310 because of its superior speed, cost-effectiveness and ease of use compared with a fused deposition modeling system from Stratasys. Says Charlesworth, "We hit the ground running. We didn't want a machine so complex, slow and costly it would gather dust. As it turns out, we obtained one that's easy, fast and affordable to operate without making any trade-offs."

One design student, Marcus Hartley, used the ZPrinter 310 to print the pattern for a revolutionary hammer design that won him a James Dyson Foundation Award for Product Design 2004. The James Dyson Award is an annual design competition which recognises young designers and engineers who demonstrate acclaimed vacuum cleaner maker Dyson's design philosophy – the ability to think differently, persist in the face of setbacks and create functional, innovative products that improve the way we live.

The ZPrinter 310 has worked so successfully that the University in 2007 invested in a high-definition colour 3D printer, the Spectrum Z510 from Z Corp. The Spectrum Z510 prints in 24-bit colour at a 600 x 540 dpi resolution with an impressive build area of 254 mm x 356 mm x 203 mm.

"Multiple colours will give students a whole new perspective on their creations, both viscerally and objectively," says Charlesworth. "They will be able to label, annotate or apply texture maps to their creations. They will also be able to highlight regions of their parts that are subject to high stress or heat."

3D printing has addressed some University health and safety concerns. With students making more use of 3D print technology they are less exposed to band saws and other heavy machinery, resulting in a safer working environment. Producing final projects is now easy, clean and green – one just presses the print button. Z Corp. continues to refine the technology to improve automation and reduce materials handling.

Experience with 3D printing is helping students win prized jobs at companies like Dyson, Lego and Black & Decker, as well as admission to exclusive higher education institutions like the Royal College of Art, says Charlesworth. Once there, former students distinguish themselves with their experience.

In fact, the university's 3D Design Workshop has been hired to create product prototypes for ex-students now working as highly paid professionals and receives frequent enquiries from other external clients.

In addition to capturing the imagination of current and former students, the 3D printing program makes a powerful recruitment tool for prospective design students. When they tour the campus, they stop by to see the 3D printer churning out prototypes, including some of great complexity.

"3D printing has opened some important new doors for our educational community," Charlesworth says. "Students are learning to use the very latest technology even before some of their future employers have it. They're saving weeks of potentially dangerous labour that isn't at the core of their design work. And they're emerging from the process inspired, and with artefacts that can make a profound impact on admissions and hiring decisions."

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