

3D printing is changing the way children think about making things. And teachers are taking on the challenge of showing them how

The new mother of invention

LAST year, Oxfordshire-based teacher David Murphy found a huge unopened box in the corner of a storeroom. His colleagues told him they thought it contained a coffee machine. Intrigued, he opened it. The box contained a forgotten gift to the school: a £20,000 3D printer. Suddenly, Murphy had to decide how to put his new machine to work.

That's a challenge that educators around the world are facing. 3D printing is rapidly changing the way we think about objects and how they are made. And that raises important questions for teachers. How should they let children loose on this mind-changing technology? How can they use it to challenge students, teach them and prepare them for the brave new age of digital design?

Freed minds

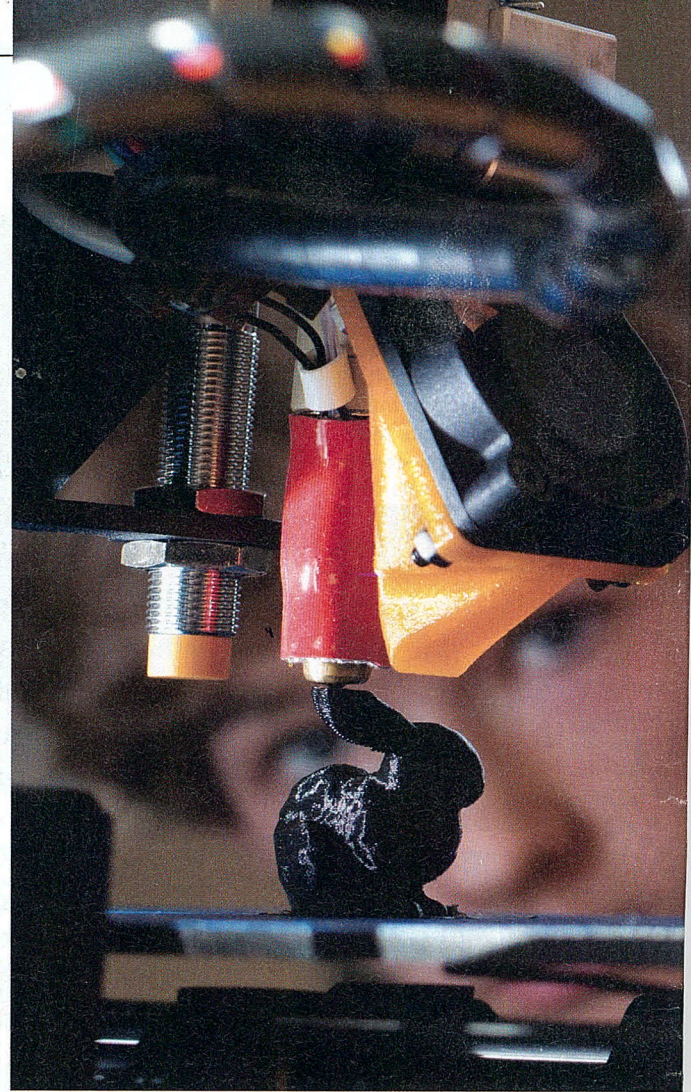
The answers are by no means clear and so teachers are experimenting. In schools and colleges all over the UK, educators are testing new approaches to teaching design and technology. "Now that the hype over digital manufacturing has died down, it's the right time for us to figure out what will work best in schools," says Joe Hallgarten, head of education at the Royal Society for the

Encouragement of Arts, Manufactures and Commerce (RSA) in London.

3D printing is one of a suite of new digital manufacturing technologies that brings computer models of objects into reality. Most commercially available 3D printers do this by using a laser to melt and bind powdered resin or by precisely positioning tiny beads of melted plastic to build up a 3D object.

These printers are becoming ubiquitous in business and industry. However, today's students should be given the chance to do more than copy what is already happening – they can innovate, says Iain Major, CEO of You Invent, a Clevedon-based company that enables schools to get to grips with 3D printing technology. He believes in putting the technology in students' hands and seeing what they do with it. "It is always fascinating to see what students design and make," he says. "Their creativity is often inspirational."

There are still big hurdles to overcome before this happens more widely, says Richard Green, chief executive of the Design and Technology Association (D&TA) in Wellesbourne, which also champions manufacturing skills in schools. "Although it is



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becoming ever more widely used in industry, many teachers still lack access to this technology," he says.

You Invent, the RSA and the D&TA are hoping to change that by improving schools' access to 3D printing. Earlier this year, they asked teachers to share their experience and ideas about the technology at a day-long event at

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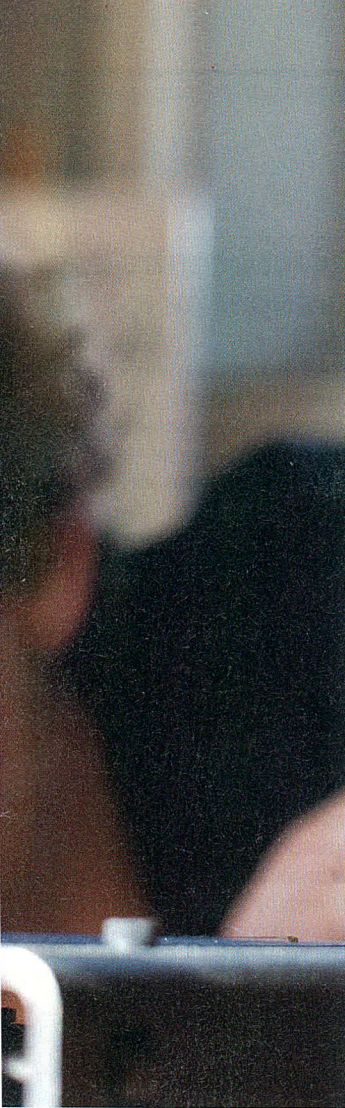


the RSA's FabLab headquarters in London.

It was here that Murphy told of discovering his £20,000 "coffee machine" and about what he did to press it into action. He said he began by establishing relationships with local firms that use the technology, such as the Lotus F1 racing car manufacturer and a local drinks factory.

That has resulted in great engagement with his school. Murphy's students are now regularly involved in helping the drinks-maker tackle its design and production-line problems – with and without 3D printing technology. This has given them real-world experience of the manufacturing industry. "It is amazing to see how our students are rising to the challenges the company sets them," Murphy says.

Other schools have taken a different approach. Sarah Pearce



is a design and technology teacher at the Dove House School Academy in Basingstoke. She has used 3D printing to engage pupils with moderate



learning difficulties and autistic-spectrum conditions. "We have students doing prototyping and development of their own designs," she says.

An important part of the design process is iteration – creating a design, building and testing a prototype and then using this experience to improve the design. That's always been difficult to teach in schools because conventional prototyping techniques are time-consuming and expensive. But Pearce says this has suddenly become much easier for her students.

She is particularly pleased with one project in which they made a model of the mouth that helps speech-and-language therapists teach students how to position their tongues to make

"WE CAN DESIGN AND MAKE STUFF CHEAPLY AND QUICKLY"

certain sounds. Commercial models cost £2000 – far more than the school could afford. "But we were able to design and make it quickly and cheaply," says Pearce.

At Pontypridd High School, design and technology teacher Mark Saltmarsh is collaborating with education researchers at Cardiff Metropolitan University. Together they are establishing links with local primary schools. Taking the 3D printer – and some secondary pupils – into primary schools is rewarding for everyone, Saltmarsh says. "Our students get to teach



and demonstrate the technology, the primary students are inspired to create new things, and the university's designers-in-residence act as a catalyst for the whole thing. It's really inspiring to be part of something that reaches across so many institutions and generations."

Proceed with caution

As with every new technology, there are reasons to proceed with caution. Some teachers have expressed concerns that 3D printing will stifle the development of "hand skills" such as woodworking. Others worry students might be tempted to download and tweak other people's designs, circumventing creativity and opening themselves to accusations of plagiarism. Some have also come up against problems with exam boards, most of which have yet to work out how to assess 3D printing projects.

These problems are all solvable, says Green. "Students can leave school with experience of exactly the same technology that is used in the workplace," he says. "If we want to make sure that they are highly desirable as employees, we have to turn schools into places where the business and industry experience begins. Simple measures like these will put UK schools and their students into a position where their creativity, innovation and problem-solving skills will bolster the world-leading industries we have already created." ■

CROWDFUNDING: YOU INVENT'S SECRET SAUCE

You Invent started out as a group of technology enthusiasts keen to find out what young people might do when given 3D printers. The company has installed 3D printers and scanners across the UK and Ireland and is working with teachers to develop tools and resources to support the technology.

You Invent provides online crowdfunding resources to make it easier for schools to raise the money required without any

impact on tight department budgets. Forest School in Wokingham, for instance, crowdfunded £2800 in a fortnight to buy equipment and resources for their 3D printing club.

Contributors to such campaigns can include parents and grandparents, local businesses, Rotary and Round Table clubs and even members of parliament. Liam Fox, the MP for North Somerset, has made donations to schools' crowdfunding campaigns in his constituency. And Atkins, an international engineering group, has contributed funds to a group of schools in the Bristol area to

kickstart You Invent clubs. The company's engineers are also working up projects for students.

You Invent's partners from industry persuaded them to provide a route for schools to engage for the longer-term. "They recognise, as we do, that schools need time and support to embed new technology," says CEO Iain Major. You Invent has launched five-year programmes to allow businesses to use their social-responsibility funds to partner with schools for the long term, enabling the purchase of equipment, training, support and access to resources.

Find out more at www.youinvent.co