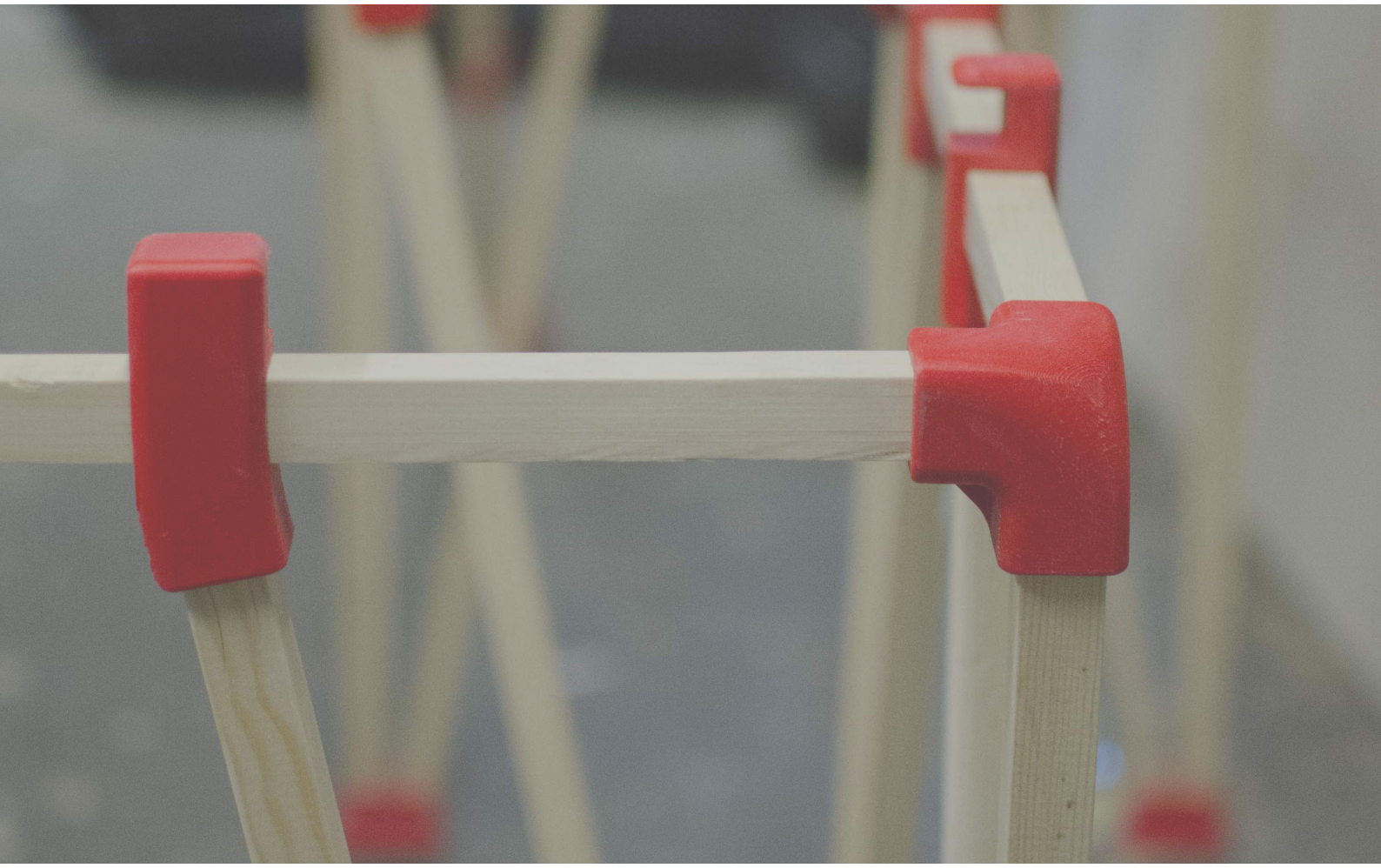
Getting Started with 3D Printing

for teachers



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http://www.makerversitydiy.com/

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PrintLab

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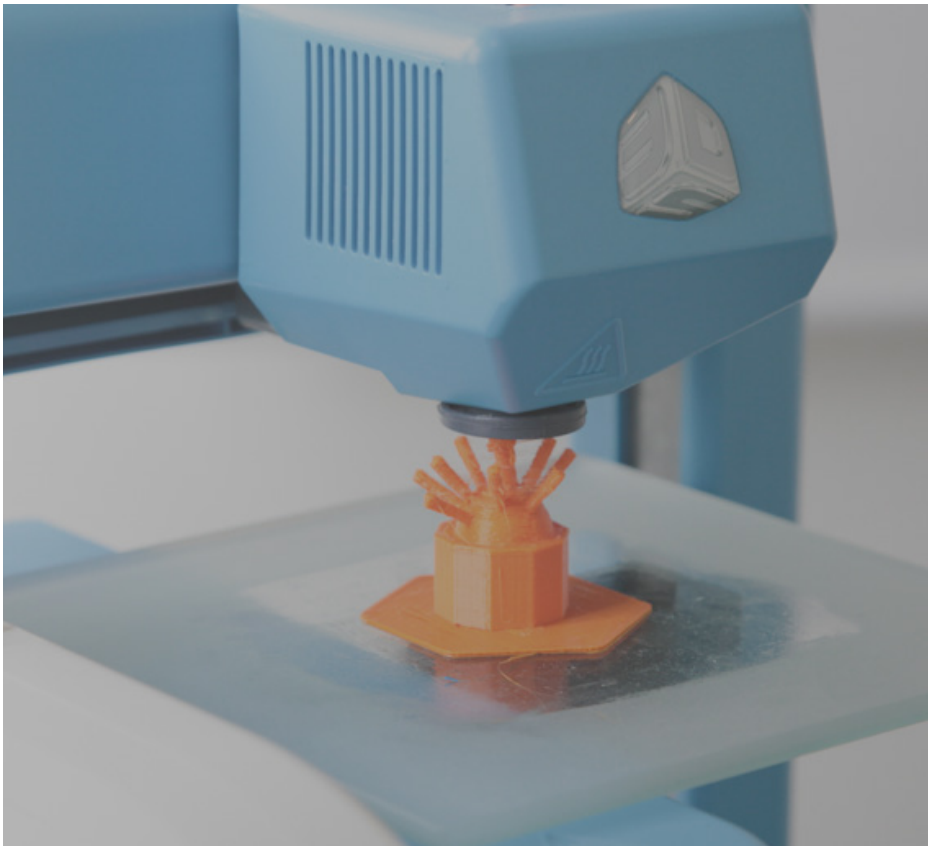
What is 3D Printing?

3D printing is a manufacturing process where successive layers of material are laid down on top of each other in an additive process. Although 3D printing is often spoken of as a new technology, it has actually been around for over 30 years. Around 8 years ago, patents around 3D printing began to expire and 3D printing opened up to mass audiences. The landmark point for its commercial adoption came from the open source RepRap project - a 3D printing initiative with the goal of creating low cost, self replicating 3D printers. Being open source, all the files were freely available online and in the following years we saw a large number of startups creating their own 3D printers, inspired by the RepRap project. Let's take a look at the steps required in the typical 3D printing process:



1. 3D model file
It all begins with a digital 3D model of a design. There are hundreds of software programs that enable you to design in 3D. Some free ones that are great for educators are SketchUp, TinkerCad and Fusion 360.

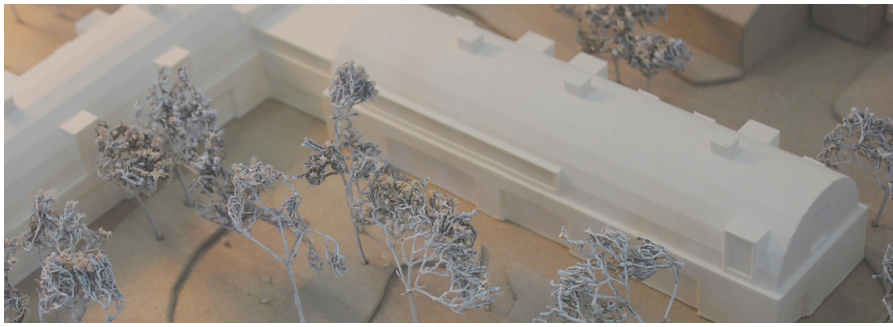
2. Slicing
The 3D model file is then split up into very fine layers in a software program called a "slicer". The output from the slicer is a file (typically GCode), which tells the 3D printer how to move and where to lay down material.

3. 3D Printing
Once the GCode is loaded to the 3D printer, it will begin the production process. One layer is created at a time until the model is complete. This can take minutes, hours or even days depending on the size of the model.

4. Post-processing
Depending on the type of 3D printer and the model file you print, there may be a requirement for some post-processing. Examples include removing support material, cleaning and sanding.

Industry Uses & Benefits

Architecture
Typically, architects can spend days creating physical models to explain their designs to clients. Using modern technology, they can use their existing CAD drawings to rapidly create a 3D model and print it in 3D. Not only do they save time but complex geometries that can't be modelled by hand can be produced efficiently and at a low cost.



Prosthetics
The amazing e-NABLE project use desktop 3D printers to create custom prosthetics for children at a cost as low as $50. Being such a low cost option benefits children in particular because they grow out of their prosthetics quickly. Additionally, 3D printing allows children to choose custom options for their prosthetics such as superhero designs!

Medical
One of the key benefits of 3D printing is the ability to customise objects at no extra cost. The medical sector is taking advantage of this in various ways and one prominent field is that of hearing aids. The process begins by taking a 3D scan of the patient's ear, which ensures an accurate 3D print can be made that has a perfect fit for that specific patient.

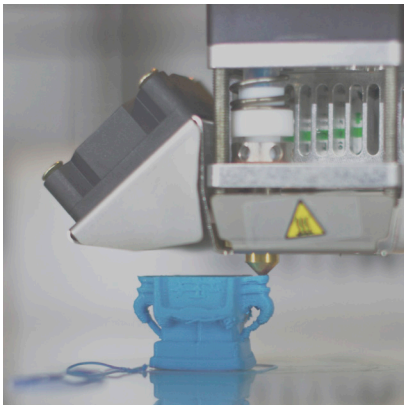
Dental
Combined with 3D scanning technologies, dentists can now 3D print moulds, visual aids, bridges, crowns, guards and more. 3D printing eliminates the need for manual tasks, which saves weeks of time and similarly to hearing aids, each product is accurately tailored to the patient. There are many 3D printers designed specifically for dentists.

Product Design
3D printing enables product and industrial designers to create prototypes within hours as opposed to weeks through traditional methods. The cost to create a prototype can be in excess of $10,000 when you consider the tooling and moulds required for processes like injection moulding. 3D printing can be achieved at a fraction of the cost.

Aerospace
3D printing for aerospace purposes allows complex geometries to be created with no waste material and no tooling required. This results in innovative functional parts and millions of dollars are saved. GE aviation have even started testing the largest jet engine ever built. The engine is said to be more efficient, advanced and powerful due to its 3D printed components.

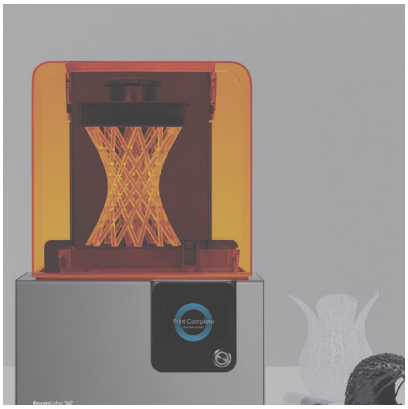
Hobbyists
Desktop 3D printers can be acquired for as little as $200-$300, which has gained the interest of many hobbyists. From 3D printing toy characters to functional items for the home, we're seeing anyone and everyone becoming part of the "maker movement". Many industry experts have predicted that in the next ten years, most households will have a 3D printer.

Common Types of 3D Printers



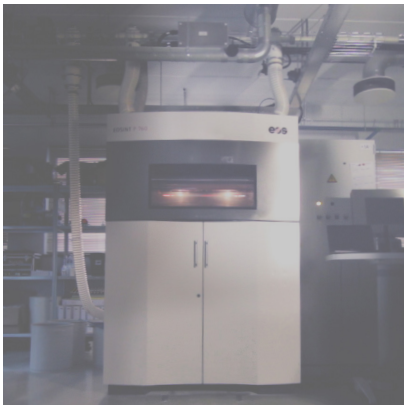
FFF

Fused Filament Fabrication is the most common 3D printing method for educators. A thin strand of filament is fed into the printer and is melted at the hot end (nozzle). The melted filament is laid onto a print bed, where it instantly solidifies. Subsequent layers are printed on top of each other until the model has finished. Materials used include PLA, ABS, Nylon and composites such as bronze and wood particles mixed with plastic. FFF 3D printers are the cheapest of all types in terms of hardware and running costs. For extremely intricate designs, FFF 3D printers may carry some limitations, but for prototyping and educational purposes, they prove to be the leading technology.



SLA and DLP

Stereolithography and Digital Light Processing technologies involve using a light source to harden a liquid photopolymer. A build platform is submerged into a vat of liquid photopolymer resin before a light source (laser for SLA and projector for DLP) traces out an image onto the resin to harden it. As with FFF, one layer is created at a time until the object is complete. The advantage of this type of technology is that they can create highly detailed and accurate parts. However there are limitations in materials and the price tag is generally higher than that of FFF 3D printers.



SLS

Selective Laser Sintering is a technique similar to that of SLA, in that it uses a laser to trace over a material. Instead of a photopolymer resin, SLS machines are filled with powdered materials that are fused together by the laser. Models must be cleaned with compressed air through this method and common materials include a range of plastics and metals. The biggest advantage of SLS is that no support material is required so designs can be as complex as required with no effect on surface quality.

Image Credits

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Right: Shapeways - http://bit.ly/2o6xd09

Free 3D Modelling Software

Tinkercad

Tinkercad is a simple, online 3D design and 3D printing app that can be used through a web browser. It is a great tool for educators at the beginner/ intermediate level. Shapes are the basic building blocks of Tinkercad. A shape can add or remove material and you can import your own or work with existing shapes. Shapes can then be moved, rotated or adjusted freely in space. You can also group shapes together to create detailed objects as complicated as you like.

https://www.tinkercad.com/

SketchUp

SketchUp is another simple design software that differs from Tinkercad in various ways. Firstly it is an offline software, meaning you can work directly from your desktop with no internet connection. In SketchUp you start by drawing lines and shapes before pushing and pulling surfaces to turn them into 3D forms. You can stretch, copy, rotate and paint to make anything you like. SketchUp is used by a wide range of people, from complete beginners to architects and product designers.

https://www.sketchup.com/

Fusion 360

Fusion 360 is a cloud-based 3D CAD, CAM, and CAE platform for product development. It combines industrial and mechanical design, simulation, collaboration, and machining in a single package. The tools in Fusion 360 enable fast and easy exploration of design ideas with an integrated concept to production toolset. Fusion 360 is a more advanced design software but the amazing tools it provides makes it a top choice for educators.

http://www.autodesk.com/products/fusion-360/overview

Why 3D Printing in the Classroom?

The 3D printing industry is set to grow from $7.3 billion in 2016 to $21 billion in 2020, and 3D printing expenditure in education is set to grow from $200 million in 2015 to $500 million by 2019. But what is the relevance of the macro scale for you, as a teacher? These facts are important because they will have a direct effect on the very students you teach. As you saw on the previous page, 3D printing is making huge waves in so many different sectors. The innovative technology is going to disrupt the design process and the supply chain that we see today.

Because of this, it is essential that we prepare students for the challenges of tomorrow. Over the next 5-10 years, we'll begin to see further advances, particularly with materials, software and printing speed. These advances will bring on what has been described as the next "industrial revolution" and the people heading up this revolution will be those who are currently in education.

In addition to preparing students for their future careers, 3D printing revolutionises the way students engage in the classroom.

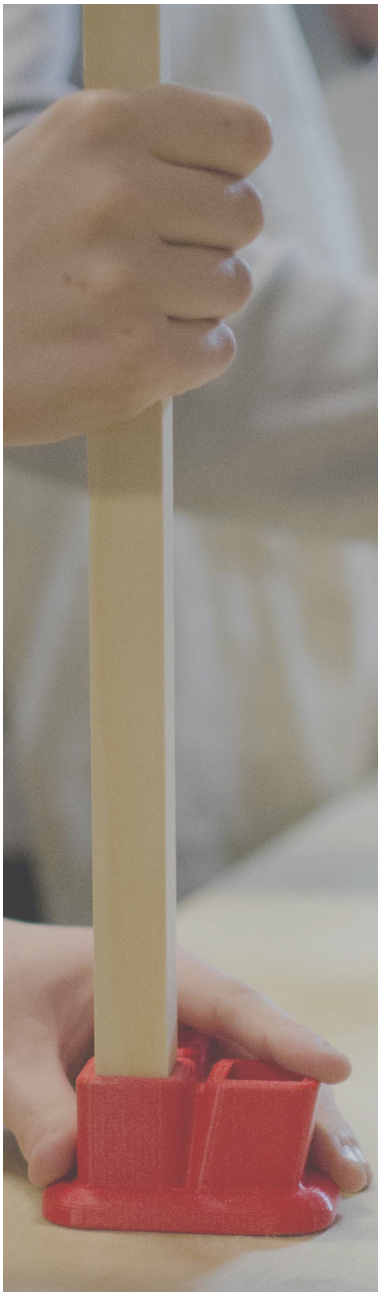
The fact that 3D printing is not yet "plug and play" actually plays to our advantage - why? Because it empowers students to solve problems and truly learn the ins and outs of how this exciting technology works.

One of the biggest questions we get asked is "what can I do with a 3D printer?" - and we usually answer this question with, "what can't you do with a 3D printer!".

Many people seem to think that a 3D printer belongs in a D&T classroom, but what they fail to recognise is that 3D printing is seeing massive success in all areas of education. Take exploration of fossils in a History lesson for example, what better way to teach this than to 3D print examples that students can examine, hold and understand. Physics is another example, where students could print their own model boats, some hollow and some solid, to experiment with what floats, what doesn't and why.

There is an enormous scope of opportunity with 3D printing and we are excited to assist you in your journey.

3D Printing by Subject



Maths
Models of equations and volumes can be 3D printed to assist students in understanding maths for real life applications. Imagine printing a Fibonacci spiral that students can observe and hold!

History
Help students understand what it was like to live in various eras by 3D printing replica artefacts and statues. There are hundreds freely available from websites such as Thingiverse and YouMagine.

Geography
Understanding topography can be difficult by reading 2D maps, so why not recreate them in 3D. Take a look at PrintLab's resources to find a free lesson plan where students create a model of Mount Everest.

Science
Molecules are 3D objects that are regularly portrayed as 2D drawings. By using free models available online, you can enhance the visual experience to truly represent any type of molecule.

Design Technology
Combine traditional woodworking with 3D printing, offering a fresh and modern way of designing. The image on this page shows a student making a workshop stool with 3D printed connectors.

Engineering
Prototyping is a huge part of any engineering process. With 3D printing students can bring their ideas to life and create several iterations of their designs to achieve the best functional results.

Art
3D printing enables us to create complicated artistic forms that can't be produced by using traditional methods. This opens up new innovative opportunities for students to explore.

Food Technology
Food moulds and cookie cutters are a great way to engage students, whilst teaching them new design skills. We are also beginning to see a range of food specific printers such as chocolate 3D printers!

The Challenges

3D Printing is new to most people. Although 3D printing has been around for over 30 years, the industry is still in its infancy. It will take time for both students and teachers to become familiar and confident with the technology. The key to success is perseverance and patience.

Technical Issues. It is not as simple as pressing print and watching the magic happen. There are many variables to consider, such as print settings, 3D model printability and hardware failure. All of which you will come across in your 3D printing journey.

Funding/ Accessibility. Although the price of 3D printers has dropped dramatically, they can still be quite an expensive piece of kit, not to mention materials and other parts of the ecosystem that might be required. Another challenge is giving as many students as possible access to your 3D printer(s) in an efficient and effective manner.

3D Printing is slow. Large prints can take many hours. The good news is that slicing software calculates an estimated print time so you can experiment with uploading various models to get an idea of how to structure your lessons.

Meeting Education Standards. The need to meet education standards may scare teachers away from 3D printing. It is not a "conventional" way of teaching, and it is not a requirement in most curriculum. However, there are many education standards that are starting to encourage the integration of 3D printing such as the Next Generation Science Standards.

Support from Senior Management. As always, investment requires the approval of senior management. Convincing them to buy into 3D printing may be a challenge, especially with an unfamiliar technology.

An Educator's Journey

Step 1: Learning
The first step for teachers is to understand the basics of 3D printing, the various processes and the opportunity for students. This Teacher's Guide was created as a starting point for this step.

Step 2: Getting Hands-On
The next step of the process is getting a 3D printer. There is no better way to learn and gather confidence than getting hands-on with your 3D printer as much as possible.

Step 3: Planning
Having a good understanding of 3D printing will allow you to plan a simple strategy. You don't need to plan everything but it will be useful to have a basic strategy of how you will go about integrating 3D printing in your school.

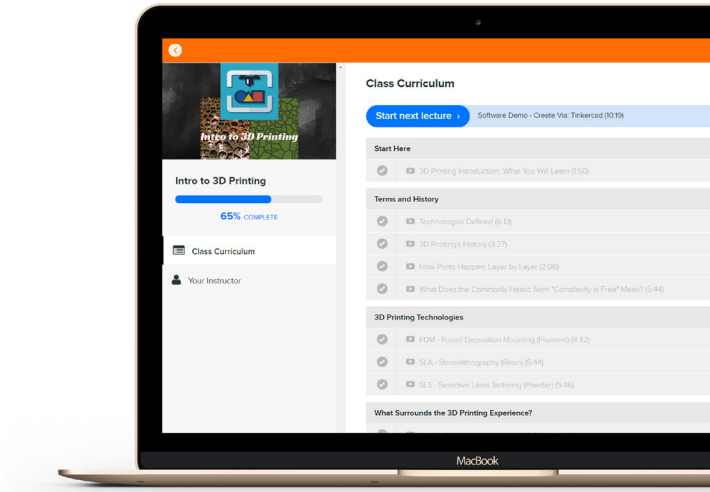
Step 4: Teaching
Introducing 3D printing to your students may seem quite daunting at first. But you'll be amazed at how well they pick it up. It is advisable to use ready made lesson plans to begin with, created by experts.

Step 5: Developing
There are many 3D printing skills you can expand on. Most importantly is developing your 3D modelling skills. This will enable you to pass your knowledge on to your students so they can unleash their creativity.

Step 6: Growing
You may wish to consider introducing other faculties/ teachers to this exciting technology. There are solutions that can assist in managing users and printers across an entire school.

Step 1: Learning

As mentioned we created this guide as a starting point to help teachers learn about 3D printing for education. Here are some great ways to expand your knowledge and get you ready for choosing your products and planning your journey:



Attend an Exhibition. There are 3D printing events and exhibitions in almost every country in the world. The Maker Faire is a “festival of invention” and you’ll be sure to find the latest 3D printing technologies at one of these events. Check out the locations here: http://makerfaire.com/map/

Visit a 3D printing store. There are also 3D printing stores opening in cities around the world. Do some research on the internet to see what’s available to you. By visiting a store, you’ll get to have one-to-one conversations with experts that can show and explain their range of 3D printers

Check out some online forums. Many others have been through the process of integrating 3D printing into their school. The great thing about this technology is that people love to share their experiences. There are many great forums on the internet - check out Ultimaker’s forum that’s full of teacher advice and experiences: https://ultimaker.com/en/community/education

Read a book. We understand that teachers can be very busy people! But if you do get chance, we highly recommend this book - Fabricated: The New World of 3D Printing by Hod Lipson and Melba Kurman. We love this book because in really examines the future of 3D printing and gives hypothetical examples that will get your creative juices flowing.

Do an Online Course. Online education seems to be the next big thing, and there are a variety of courses based around 3D printing. A great course we recommend is HoneyPoint3D’s Intro to 3D Printing course. It is a visual video based course that goes in to a lot of depth including topics like the health effects of 3D printing and the cost of running various 3D printers. Check out the course here: http://weareprintlab.com/products/intro-to-3d-printing-online-course

Step 2: Getting Hands-On - 3D Printing

We recommend getting hold of a 3D printer and getting hands-on before you plan your strategy. The reason for this is that your outlook on 3D printing in the classroom may change after you have had the chance to 3D print for yourself. You may see opportunities that you didn't see before or on the other hand you may see challenges that you need to consider in your strategy.

Before choosing your 3D printer(s), think about who will be using them, how many printers you need and what functions do you require. Going through some of the ideas in the previous section should give you a good indication of the 3D printer/s that are suitable for your school. If you're looking for an innovative, professional and reliable option, Ultimaker 3D printers are the most popular choice and for good reason. If you don't need a 3D printer that uses a wide range of materials and a large build volume, Shining3D's Einstart-C may be a good option at around $500 - it even comes with added safety features where it will only print when the chamber door is closed. The EinStart-C is due to be released in the next couple months so if you want to see the brochure and have updates on availability, email us at hello@weareprintlab.com.

Once you have your 3D printing products with you, it's time to have some fun and get hands-on. If you are completely new to 3D design and printing, we would recommend you start by downloading free models to get used to the 3D printing process rather than designing yourself. One of the main reasons we suggest this is that you can learn a lot of basics from printing ready-made models. By getting familiar with existing 3D models, you can begin to appreciate what generally works and start to understand how best to design. Why not use the below steps as a guide to getting started:

1. Search for "education" models in Thingiverse (http://www.thingiverse.com/) and YouMagine (https://www.youmagine.com/).

2. Slice and 3D print them using the instructions given to you with the 3D printer you purchased. Try several versions of the same model, changing print speed, nozzle temperature and infill on each one.

3. Record what happens in each print and what settings you used.

4. Repeat the process using different models that look completely different. Again, record what happens with each print.

Step 2: Getting Hands-On - 3D Scanning

When getting started with 3D printing, something you might want to consider is 3D scanning. To print an object, a 3D file is required and to put it simply, 3D scanning an object is easier than designing one in 3D modelling software. A popular option for educators is to run a series of hands-on activities where students create models out of clay or plasticine. These objects can then be placed onto a turntable 3D scanner that will give a 3D printable output (STL file). The STL files can then be uploaded straight on to your 3D printer's slicing software, where you can explore a range of options before 3D printing your students' creations.

3D scanning opens up a world of opportunities that include:

- Preservation of artefacts
- Ability to reverse engineer products
- Ability to recreate models in a wide range of materials
- Accurate inspection of objects (e.g. precise measurements of distances and surfaces)
- Designing customised products (e.g. prosthetics that fit a patient perfectly)

By introducing students to 3D scanning at such an early stage, you can easily obtain 3D files and further down the line you can develop lessons around editing 3D scans for functional applications. It's not just the price of 3D printers that has dropped in recent years, the EinScan-S 3D scanner is highly affordable and has a scan accuracy of 0.1mm! Check it out here: http://weareprintlab.com/products/einscan-s

If you decide to try 3D scanning in the "getting hands-on" stage, experiment with clay and plasticine models yourself, which will then give you ideas for when you introduce your students to 3D scanning. Some ideas you can try are making a cookie cutter, architectural model, terrain models or art sculptures.

Step 3: Planning

At this point you should have had some experience in 3D printing a range of different models. Each school's strategy for integrating 3D printing will depend upon many factors - Here are some questions to consider when planning your strategy:

1. What age group and subjects will 3D printing be introduced to? Do you predict this will change over time?

2. Will your 3D printer(s) stay in one location? Will moving them round the school give access to more students?

3. Who can assist you in your 3D printing journey? Are you able to collaborate with other teachers and work together on your strategy?

4. How can you manage your own time to enable you to develop 3D printing in your school?

5. Do you want to introduce 3D printing to your own class or to fellow teachers as well?

6. Who are your support contacts for technical support and general advice? Can they help you plan your strategy?

7. How can you record success? This may assist you in communicating results to senior management.

8. How can you combine 3D printing with core curriculum subjects?

9. Are there additional products and resources that can assist you?

10. How can you develop 3D scanning in your curriculum?

11. Would it be beneficial to introduce 3D printing to an after-school club to allow you to experiment, develop and gain feedback, without having to worry too much about meeting education standards

12. Once you have implemented your plan of introducing 3D printing to students, how will you continue to expand and develop 3D printing in your school?

Step 4: Teaching

When first introducing 3D printing to a lesson, it is advisable to start with ready-made lessons that have been tried and tested in schools around the world. By doing this you will learn not just about 3D printing, but how to communicate and deliver 3D printing lessons. Learning these skills will help you out in the long-term when you create your own. There are a range of curriculum products available from PrintLab, you can view them on our website here: http://weareprintlab.com/products. Here are our top 5 tips for teaching 3D printing in the classroom:

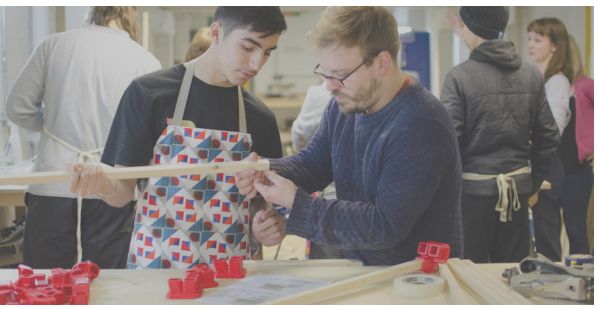
Let students handle 3D printers
We previously mentioned that there is no better way to learn about 3D printing than to get hands-on. This especially applies to students! So make sure they have access to the printers - let them tinker and fix technical problems themselves. Having said that, keep a close eye on the safety aspect and make sure your students know where the heated elements of a printer are.

Organise your time & printing
Time is probably the most important aspect of your journey. It takes time to learn and plan - and as a teacher, this will be very limited with all the other things you have going on. Be organised and have a schedule that includes lesson planning and self development. Don't forget to make use of the "estimated time" function on your slicing software to help you organise your own time.

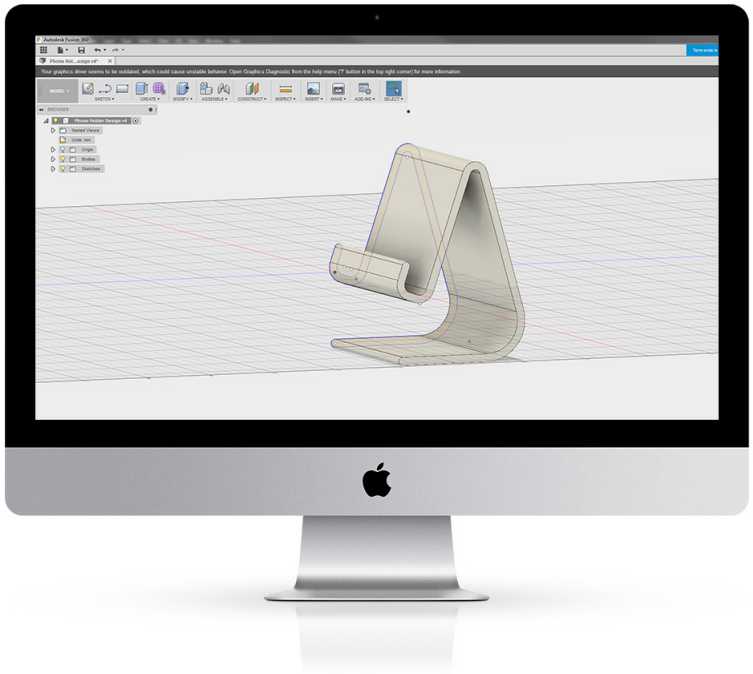
Work together with students
Don't be afraid to admit to your students that you don't know everything about 3D printing. Work together with them in solving problems and keep your lessons open ended. What we mean by this is that although lessons should have set criteria and learning outcomes – there is a world of opportunity beyond this if you allow students some freedom to explore.

Don't isolate 3D printing
In modern day industry, it is rare that 3D printing is used as a tool on its own. It compliments other forms of design and manufacturing, such as laser cutting, CNC machining and 3D scanning, to enhance the outcome. Keep this in mind when planning your lessons and integrate 3D printing with core curriculum topics.

Be flexible and open to change
Something just as important as having a plan, is the need to be flexible and open to change. It is highly likely that the way you do things when you first begin your journey will be completely different to a year down the line. This is all part of the development process, so always try new techniques and keep an open mind.



Step 5: Developing



After using a range of ready made lesson plans and getting used to delivering 3D printing lessons, the next step is to develop your own skills in view of creating your own lessons. Here are some development ideas:

1. Develop your 3D modelling skills. This is the most essential step to unlocking yours and your students' creative potential. It is recommended to start off with simple modelling programs such as Tinkercad or SketchUp, and when you are confident in these you may want to give Fusion 360 a try. For Tinkercad and Sketchup there are a range of YouTube tutorials to get you started. In the case of Fusion 360, we highly recommend this amazing online course by HoneyPoint3D - http://weareprintlab.com/products/fusion-360-online-course. It is the most detailed course for Fusion out there and it has 15+ hours of instructional video from industry expert Nick Kloski.

2. Experiment with materials. One of the biggest advancements in 3D printing over recent years is that of materials. A few years ago desktop 3D printers were only capable of printing with PLA plastic, which is great for prototyping, but there's now a whole range of options that fit decorative and functional purposes. A notable example is bronze and copper being mixed with plastic particles to create metallic objects.

3. Connect with others. By contributing to an online forum or live webinar, you can share your experiences with others and bounce ideas off people to get inspiration. As previously mentioned, in the world of 3D printing people love to share and you can learn a lot by connecting with other teachers, enthusiasts and experts.

4. Develop 3D scanning skills. 3D scanning isn't just an easy option to introduce 3D printing to students, it is an innovative technology used in various industries. Experiment with editing 3D scans using a free software called Meshmixer (http://meshmixer.com/). HoneyPoint3D have also created an award-winning online course to help people learn every tool inside this powerful sculpting software. Check it out here:
http://weareprintlab.com/products/honeypoint3d-autodesk-meshmixer-online-course

Step 6: Growing

When 3D printing starts to gain popularity you may wish to consider growing your lab to enjoy multiple 3D printers across different faculties. A big consideration here is whether you want to have 3D printers spread around your school or locate them all in one location.

The above image shows Duke University's Co-Lab. As you can see they have a very large setup in one area of the school. All prints, users and machines are managed through a cloud platform called 3DPrinterOS. This powerful tool enables the lab admin to monitor everything that goes on within the school, such as filament usage per student so they can be billed for materials used. Unique sign-ins are also given to students so they can print/ queue from anywhere and watch their prints live through webcams attached to the printers.

If you reach this stage and want to give 3DPrinterOS a try, simply email us for a free 14-day trial at hello@weareprintlab.com. Details of the cloud management software can be found here:
http://weareprintlab.com/products/3dprinteros-education-license

Use Case: St Andrew's College - NZ

Vicki Pettit is a maths teacher and head of education at St Andrew's College in Christchurch, NZ. She wanted to reinforce her maths lesson by incorporating hands-on making and saw Makerversity DIY's 3D printing sandtimer lesson as a perfect fit. The lesson uses bespoke 3D printed components alongside everyday household items to enable children to produce their very own timer. In this case, teacher and students opted to use salt rather than sand which shows some flexibility in the lesson and could be used as an opportunity to explore a discussion on materials, density, mass and alternative suitable materials that could be used to measure time.

"Students have loved making. It has been a great learning curve. The students are deservedly proud of their work"

Vicki Pettit, Head of Education

Get the free sandtimer lesson here: http://bit.ly/2oy21rj

Use Case: Kideville Curriculum in the UAE

The ADEC school workshops comprised of 6 different Abu Dhabi schools participating in the Kideville Curriculum. It is a collaborative city design project for children, with a full curriculum for teachers. Each student gets a design brief for a building, and they are guided through a term-long process of research, ideation, sketching, urban planning, 3D design and printing. The curriculum includes teamwork, project management and practical skills that equip children for jobs of the future. Design and engineering teachers delivered the 14 lesson activity to a total of 150 students that made 6 unique Kideville Islands. None of them had ever used 3D software or 3D printers before.

"The Kideville experience has been one of a kind for me as an instructor and for the kids as their first hands on experience with delicate machines like the 3D printers"

Yousteena William, Teacher

Learn more about the Kideville Curriculum here: http://bit.ly/2orTQw6

Use Case: Functional 3D Printing

In this example, 12 year old Kepa, a student from Txantxiku Ikastola School in Basque Country 3D printed a window handle for his teacher, Jokin. Jokin explained how it all began with a simple problem at the school when he first started teaching there:

“One of the first things that called my attention in my school was that all handles of the windows were missing. I asked about them to some of colleagues and they told me that, some time ago, there were problems related to objects thrown from the windows by the students. So they decided to take them off from the classes. Each teacher has their own handle, so when it is hot inside they can open the windows”.

Jokin challenged Kepa to design and 3D print him a new handle. Using a calliper, Kepa started measuring an original handle and in a few days, the design was completed. Jokin 3D printed the handle and to everyone’s joy, it worked first time!

Use Case: 3D Scanning for Product Design

This 3D scanning use case was produced by ourselves and involves some simple steps to creating an organic candle holder. We placed a sea shell onto the EinScan-S 3D scanner turntable, selected a brightness setting and clicked “start scan”. In as little as 3 minutes, the first scan was created. In order to gather more scan data, we placed the shell at a different angle and started a second scan. After another 3 minutes our second scan was finished and EinScan’s software automatically stitched the 2 scans together.

The 3D scan was then manipulated in Meshmixer software. With just a few simple steps we cut a hole into the 3D model for our candle. In less than one day we had scanned and edited the sea shell and 3D printed ourselves the organic candle holder!

Learn more about the EinScan-S here: http://bit.ly/2p6Zz8S

Free Lesson: Make a 3D Contour Model

In this lesson students will collaboratively design and 3D print a 1:50,000 scale model of Mount Everest and its surroundings. The lesson involves mathematical calculations along with CAD design tasks, mapping skills and 3D printing. The lesson can be incorporated into the study of mathematics, geography, design technology or ICT and can be adapted for ages 7-15.

The process begins with a short presentation and discussion session, where the teacher will give an overview of topography maps and 3D printing. This will then be followed by the main part of the lesson - the student workbook. Each student will use 3D CAD software to design a section of the contour model and prepare it for 3D printing, whilst the teacher acts as a facilitator in assisting the students.

The final stage will be a 3D printing demonstration of one section of the contour model. Following the lesson, the teacher can send all models to the 3D printer to complete the 3D contour model.

Free Guide: Logo to 3D Print

In this free guide we show you how to turn a 2D logo into a 3D print using Adobe Illustrator and SketchUp Pro software. With a few simple steps you could turn your school logo into a 3D printed model!

In addition to the software packages listed above, you will require your school logo in vector format for this tutorial.

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View the video tutorial here: http://bit.ly/2o4hrQ9

Say Hello!

We hope you enjoyed reading this Teacher's Guide and we'd love to hear from you. For any advice, support or products you can get in touch by emailing:

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To learn about the solutions and resources we offer, head to:

http://weareprintlab.com

Let's inspire the next generation, together