D&T PRACTICE

The Design and Technology publication for professionals
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Issue 3 – September 2022 **www.data.org.uk**

The Future of D&T – you had your say

D&T the design and technology association

Posters:

- **Flumps**
- **Get Inspired!**

D&T Practice Issue 3.2022

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Posters
- **Flumps**
- **Get inspired!**

D&T Practice

This publication is intended to update members on what is happening in design and technology and related areas of the curriculum. We welcome contributions highlighting the practical aspects of design and technology teaching, including case studies of good practice and resources used. Articles are approximately 900 to 1,400 words in length and accompanied by pictures illustrating the process described.

Outline summaries, or completed articles should be accompanied by images to be included and sent in the first instance to the Editor, Willy Adam: willy.adam@data.org.uk

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Letters in connection with D&T Practice should be addressed to the Editor. The contents may not be reproduced without the permission of the Editor.

THE FUTURE OF D&T – YOU HAD YOUR SAY

As many of you will know, we were approached by the Education Policy Institute (EPI) some eighteen months ago as they had identified a potential need for research into design and technology education in England. Following discussion, we agreed the scope of the research and set about raising the funding to make this research happen. Partners from the IET, Foster + Partners Architects, ERA Foundation and The James Dyson Foundation joined us to fund this project.

The resulting EPI report *'Spotlight on D&T education in England'* paints a pretty bleak picture of the subject's current status in English schools. As I have stated so many times, it's becoming a bit of a personal mantra; you don't encourage change by grieving where you are now; instead, you look ahead to what you might become. We need to learn from what has happened in the past, but we must be led by what we can and must become in the near future.

Roundtable outcomes

Following the release of the EPI paper in late March 2022, we held a series of roundtable discussions with school, business, and sector leaders to look at the baseline that the research has provided, but more importantly, to explore what actions need to be taken to set the subject on a pathway to recovery. The direction was set by these meetings, specifically through a four-hour workshop at the Royal Academy of Engineering in London.

We have been testing the suggested outcomes emerging from these discussions in conversation with teachers across the country as I took to the road and toured UK cities. I met teachers in Birmingham, London, Brighton, Liverpool, Manchester, Newcastle, Cardiff, Bristol and Norwich. This finished with a busy online session on the 19th July.

The main direction emerging from all these conversations can be summed up as:

1. A desire for focused research relevant to the subject's growth that helps transform practice within schools. The Design and Technology Association will take the lead in identifying suitable research areas, gathering the required funding, commissioning the study and most importantly, sharing the findings with teachers, school leaders and the wider supportive community.
2. A need to showcase good and outstanding practice – despite the pressure on the subject and teachers nationally, some fantastic work is going on that often rarely gets seen. We need to showcase this work in public forums demonstrating the relevance and beauty of our subject.
3. Grow our **Blueprint1000** education/business programme from its current membership to 150 over the next two years, meaning there will be an active Blueprint industry/business connection within reach of most D&T departments across England and Wales.
4. Revision of our national KS3 curriculum offer from one often focused on outcomes and making to one heavily grounded in process and the pedagogical journey from concept to prototype. In doing so, create the next generation of thinkers, innovators, problem solvers, designers, engineers and young people with a broad appreciation and respect for the power of design to change our world for the better.

With this, there is an accepted urgency for the Government to work with the Association to improve teacher training numbers in our subject. We are, and for eight years have been the worst recruited of all curriculum subjects; if we do not urgently address the need to grow the workforce, then anything else we do is destined to fail.

We must also recognise the need for teacher training to allow change to embed itself over the next four years successfully. The transition to the new specifications from 2017 has been managed with minimum workforce training, leaving so many teachers desperately trying to keep up and fighting a fear that they would fall behind and let their students down. We simply should not be placing teachers in this position.

By this editorial's publication, we will have released a full report on our findings, within which we will signpost a way forward for the subject. I firmly believe this is our last opportunity as a community to come together and resurrect the subject that we treasure and value so highly.

I look forward to the challenges that lie ahead.

Yours,
Tony Ryan
Chief Executive Officer

Links

Education Policy Institute | **Foster + Partners Architects** | **The James Dyson Foundation** | **IET** | **ERA Foundation** | **Blueprint1000**

Design and Technology Teacher CPD – Many ways to improve your skills

Choice is a fabulous thing! We can offer you a variety of ways to train, making it as easy for you and your schools to accommodate your training and development with limited disruption: full day face-to-face training, live online training, E-Learning in your own time and at your own pace and bespoke INSET training for your whole school, MAT or trust.

Face-to-face CPD

Primary and Secondary full-day courses at venues across the country. Our full-day courses are full of content, making sure you can take away as much knowledge and new practical skills as possible, to implement straight back into your class. Subject areas range from curriculum development and improvement, CAD and control, sustainable designing, and subject leadership, through to practical D&T.

Live online training

Full or half day, our live online courses pack as much theory into the course content as possible. Interact and ask questions with the trainer and the other delegates, who are all live on the course. Primary and Secondary subject areas are covered with content similar to face-to-face training. The perfect way to gain as much information as possible in a short amount of time without the need to travel; often also avoiding the need for supply cover.

E-Learning

A highly flexible option! Book onto the course and study at a time that suits you and at your own pace. All our courses have a six-month expiry date, giving you plenty of time to study. All our E-Learning courses have downloadable resources for you to keep, and on completion, you will receive a digital certificate as proof of your successful continual professional development. Highly affordable Primary and Secondary courses available.
Members £30 / Non-members £45

Bespoke INSET

A convenient way for your school to train multiple teachers at the same time and at a location of your choice. We will build you a training course based on your personal requirements. Get all your teaching and support staff up to speed, on the same level, and deliver consistently inspiring D&T all through your school.

- Address arising challenges within your department.
- Improve skills and knowledge across the whole team.
- Support all your teachers to implement changes and new schemes of work.

Free webinars

We have a varied programme of free webinars on a range of topics, enabling members and non-members to network and learn from each other and our trainers. Our online networking events connect the D&T community, enabling teachers to share ideas and learn from others. We have a range of webinars from:

- D&T departmental tours (see how other D&T departments are organised).
- Primary Projects on the Page webinars giving an overview of the resource.
- ResearchMeets with tutors from UK universities.
- Q&A webinars with D&T experts answering a variety of queries on a broad range of topical issues.
- Webinars supporting teachers new to the profession.
- Webinars for teachers specialising in Special, Educational, Needs & Disabilities.

Contact events@data.org.uk

See www.data.org.uk/training-and-events for the training course schedule.

BETT SHOW 2022

Ryan Ball

As briefly mentioned in the last edition of D&T Practice, March 2022 saw the Bett (British Educational Training and Technology) show return to London for the first time since 2020. Spread over three days and two conference halls, I attended to check out some of the latest educational technology available from the UK and beyond. The following caught my eye:

Small / modular machinery

There were some really interesting products on display. One was from *iMakr* who were showcasing their impressive 'Snapmaker', a 3-in-1 CNC, 3D printer and laser engraver, alongside a small lathe, rental schemes and more. Whilst impressive looking, I'd want to use one to see if it holds up to the rigours of school use and the necessary H&S requirements.

BenMaker is another brand that caught my eye, initially, it was their 5-axis milling machine whirring away in the corner, but then their small table-mounted solutions fit for small hands, including a mini lathe, reciprocating saw and drill. Having used them they seemed great, but would need H&S modifications to make them suitable for UK school use.

Redfern Electronics

Redfern had some great new products on display to accompany their popular 'Crumble' including a mini-Crumble suited to secondary, a temperature sensor, an output to play different tones, a number display and some cool non-Crumble products too, such as their *DataHive* that can monitor voltage, resistance, temperature charge and light.

Kitronik

There were a huge number of exciting micro:bit resources on the *Kitronik* stand, including air-quality boards, smart greenhouse kits and many more. They also have a growing number of resources to link with the low-cost *Raspberry Pi Pico* and a number of free teaching resources on their site that they were showcasing.

OkDo

There was a lot going on at the *OkDo* stand. From 'Strawbees' (think of a modern take on art-straws) connected to a micro controller, to Lego mechanisms kits, to a number of electronics solutions and more. An exciting range of products.

New kids on the block

Whilst not necessarily 'new', there were a few companies trying to push into a potentially crowded market of laser engravers, 3D printers and CNC machines in the education sector. *Flux* were showcasing their range of laser cutters with a number of desktop solutions. With some neat features like an inbuilt camera, they looked quite promising. It was interesting to speak with *Cricut* who, after many years in the hobby environment with their crafting machines, have seen an opportunity to break into the education sector. Their prices seemed very competitive (even without the large Bett discount) so it'll be interesting to see if they are fit for the rigours of a D&T classroom.

As ever, we will continue to showcase exciting products and resources through our magazine and other channels. However, it's their application and use that is key, so please do get in touch to share success stories in your school.

Oak Academy: next steps

The Oak National Academy was formed in April 2020 to respond to a national crisis brought about by the Covid-19 pandemic. As schools closed and the nation ground to an abrupt and unchartered halt, it quickly became apparent that this was not going to be over in a matter of weeks, and there was a need for educators to have access to free, high-quality resources that enabled all students to continue to learn across all curriculum areas.

Oak was formed on a few basic but fundamental foundational principles, these being that lessons are and will remain free to teachers, that teachers should design lessons for teachers, that they should follow national curriculum guidelines, and that all would be subject to a rigorous quality assurance process.

Design and technology at Oak

We at the Association were delighted to be involved from very early on in the process. If a curriculum was to be written and delivered online, design and technology needed to be a part of the offer. We went through the tender process and were successful in our application.

It is important to remember that all subject areas were working under extreme time pressure. The crisis was real, and there was little time for pontificating. Some criticism has been directed at the format used; I understand this, and we worked with some outstanding teachers who openly stated: "but I wouldn't teach it this way" collectively, we recognised and accepted the need for structure and consistency and pressed on.

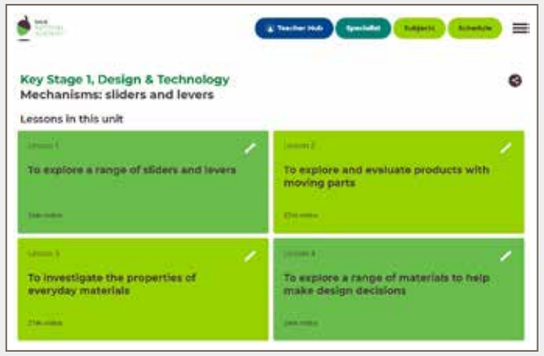
From day one, the importance of recruiting a team of serving D&T teachers was of the highest importance; we advertised the opportunity on our website and social media and interviewed a high number of teachers online to assess their areas of expertise, the year groups that they would be most comfortable writing for, and each teacher's ability to meet the very tight deadlines.

We produced over 170 lessons in just over three months, a fantastic achievement for all involved. It is fair to say that some worked out better than others, but overall, I think we can be proud of the offer that we collectively produced for teachers and students nationally.

Moving forwards: the National Academy

And so to today, and the news recently announced in the Education White Paper that the Oak Academy was to be transformed into the National Academy. Not driven by a national crisis this time, but instead intended to become a showcase for curriculum design and best practice nationally. This is still an emerging picture, especially given the current challenges in government; rest assured, we are keeping a finger on this pulse and will do all we can to ensure that whatever model emerges, design and technology will be at its heart.

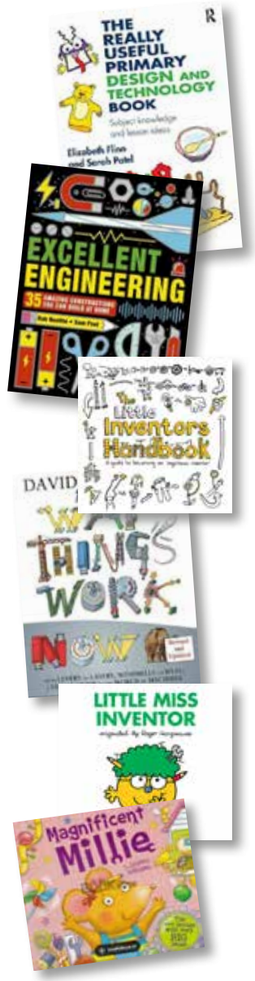
www.thenational.academy/



Recommended reading

We have compiled a list of recommended reading for Design and Technology for use in the classroom with the students to inspire them and help them establish a love of reading, for students to broaden their awareness of the subject, and also to further your own CPD and subject knowledge. There are many books that could be added to this list, but we feel these are great examples either in content or to the grab the attention and imagination of your students. The primary list has both fiction and non-fiction and just non-fiction at Secondary level. You can find further resources and book titles for sale on The Design and Technology Association website.

Primary School Recommended Reading List



For Teachers

- **Excellent Engineering: 35 amazing constructions you can build at home** – Rob Beattie
- **The Really Useful Primary D&T Book** – Elizabeth Flinn and Sarah Patel
- **Mastering Primary Design and Technology** – Dr Gill Hope
- **The Little Inventors Handbook** – Dominic Wilcox and Katherine Mengardon
- **Little Inventors Mission Oceans** – Dominic Wilcox and Ellie Birkhead
- **Little Inventors In Space** – Dominic Wilcox and Katherine Mengardon

In the Classroom

- **Little People, Big Dreams** (Zaha Hadid, Vivienne Westwood, Coco Chanel, Steve Jobs etc.)
- **The Way Things Work Now: A Visual Guide to the World of Machines** – David Macaulay and Neil Ardley
- **Usborne – Look Inside How Things Work** – Rob Lloyd Jones
- **Rosie Revere, Engineer** – Andrea Beaty
- **How Was That Built? The Stories Behind Awesome Structures** – Roma Agrawal
- **Magnificent Milly** – Sienna Williams
- **Little Miss Inventor** – Roger Hargreaves
- **Little Heroes; Inventors Who Changed the World** – Heidi Poelman
- **Who Built That? Modern Houses: An Introduction to Modern Houses and Their Architects** – Didier Cornille

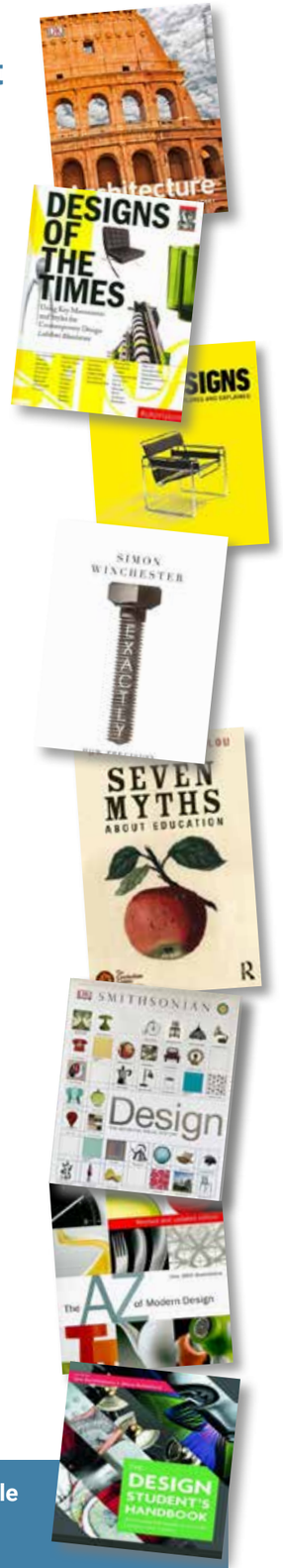
Secondary School Recommended Reading List

For Teachers

- **The Sustainability Handbook for Design and Technology Teachers** – Ian Capewell
- **Making It** – Chris Lefteri (also suitable for students)
- **Learning to teach Design and Technology in the Secondary School** – Alison Hardy
- **The A-Z of Modern Design** – Bernd Polster
- **Understanding Practice in Design and Technology** – Kimbell, Stables and Green
- **The 3D Printing Handbook: Technologies, design and applications** – Ben Redwood, Filemon Schöffer and Brian Garret
- **Stuff Matters: Exploring the Marvellous Materials That Shape Our Man-Made World** – Mark Miodownik
- **Exactly** – Simon Wincester
- **Innovating for People Handbook of Human Centered Design Methods** – LUMA Institute
- **The Genius of Design** – Penny Sparke
- **Seven Myths about Education** – Daisy Christodoulou
- **Invisible Women** – Caroline Criado Perez
- **Advanced Design and Technology** – Eddie Norman

In the Classroom

- **The Design Student's Handbook** – Jane Bartholomew
- **Making It** – Chris Lefteri
- **The A-Z of Modern Design** – Bernd Polster
- **Drawing for Product Designers** – Kevin Henry
- **How Super Cool Stuff Works** – DK
- **Delft Design Guide: Design Strategies and Methods** – Annemiek van Boeijen and Jaap Daalhuizen
- **The Total Inventors Manual: Transform Your Idea into a Top Selling Product** – Sean Michael Ragan and Rachel Nuwer
- **Great Designs** – DK
- **Design: The Definitive Visual History** – DK
- **Design of the Times: Using Key Movements and Styles for Contemporary Design** – Lakshmi Bhaskaran
- **The Design Book** – Phaidon Editors
- **The Fundamentals of Product Design** – Richard Morris
- **Architecture: A Visual History** – Jonathan Glancey



These books are suggested reading only and not currently available in our shop. Take a look at our 'resource shop' where you will find 80% of our classroom resources free to members.

> I believe by taking part in this club **I will strengthen my problem-solving and experimentation skills** and this will help me in applying for a degree in engineering when I go to college.

Magway delivers

Blueprint 1000 member Magway has delivered a six-week engineering club at Wembley Primary school to inspire pupils and showcase how a career pathway in engineering has impacted and inspired them to join the Magway team. Magway is aiming to decarbonise deliveries by developing a solution for the movement of goods using tracks in an underground network of tunnels.

The selection process for pupils to take part in the club involved detailed application forms which mirrored the principles of a job application. Many of the applications cited creativity as a main skill with others emphasising candidates' interests in maths and physics. This gave the applicants an opportunity to recognise their own skills and how this can then be translated into engineering projects.

Session one got underway with an introduction to Magway and the concepts of engineering and how this translates into the workplace. Pupils were given a live demonstration of one of the Magway carriages which caused a great deal of excitement in the room. A group activity was introduced using building blocks and assigned roles which encouraged teamwork and creative thinking. The aim was to replicate the entire delivery process, looking at the full picture from loading, unloading, managing the flow of delivery and reaching the destination safely.

The second session involved programming with Micro:bits with the class learning how to read inputs and control outputs as well as some fun group activities. Further sessions involved bridge building and making race cars.

The final session was attended by Design and Technology Association CEO Tony Ryan and parents of the young budding engineers who saw the teams' race cars finalised and put into action. The overall excitement and positivity was clear to see. All pupils received their certificate of completion of the club and their interest in the subject has been well and truly ignited.

> It's been really interesting to see how the **children are fascinated in the different aspects of engineering** and the optimism the session generated. The first session was a really good introduction and **I am excited to see how things progress.**

Blueprint 1000

Blueprint 1000 aims to connect education and industry to close the skills gap. A recent report by the IET suggests that less than half of new engineering recruits have either the necessary technical or soft skills needed for work within the industry. It is therefore schemes like this that are vital to the industry to ensure future talent is being nurtured from a young age.

Engineering can also help a child to understand real-world technologies and problems which allows them to see how the topic is relevant to their lives and the world around them

To Femininity – and beyond!

Jude Pullen, Creative Technologist from BBC Two's Big Life Fix and winner of the 2020 IMechE (Institution of Mechanical Engineers) Alastair Graham-Bryce "Imagineering" Award, Jude often blends artistic provocation with novel application of technology in his work.

Bo Peep Figurine, standing proudly beside a real-life remote-control skunk mobile, made from 3D printed chassis and a plushy covering made from a textile template.

If you haven't seen Toy Story 4, it's fair to say Woody is still as plucky and earnest as ever – and if it ain't broke, don't fix it, right? However, the same cannot be said for Bo Peep – who in the first movie was pretty much relegated to batting eyelashes and being generally anxious about something the 'boys' were about to do. Safe to say, in the recent instalment from Pixar, Bo Peep has undergone a significant upgrade, not only in her apparent intellect but also in her aspirations as an independent character whose world does not stop and start with the actions of Woody.

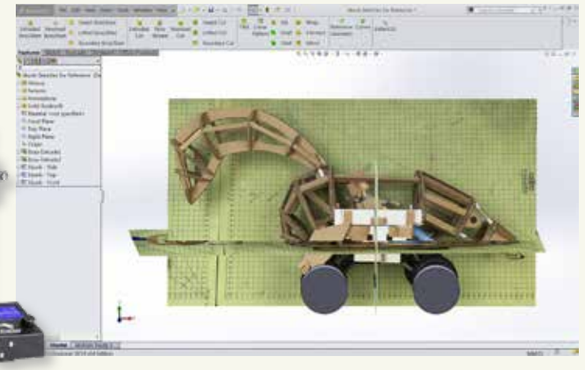
For my five-year-old son and I, this is joyously crystallised in one 'prop' – Bo Peep's Skunk Mobiles – because how else does a toy hide from humans, but in plain sight, albeit disguised in a homemade remote control Skunk Mobile? It was at this point that I was so smitten with the audacious, ingenious and hilarious invention that is this plush RC car that I uncharacteristically was ready to pony up the money and buy the merchandise so my son and I could drive our furry mobile around the park and scatter an unsuspecting public left and right!

Alas! this was not to be, because Mattel, in their wisdom of the market, clearly deemed this too expensive and/or not a viable product to sell. This is disappointing when you contrast this with the fact Woody and Buzz figurines are sold with a remote-control car named 'RC' from the first movie. Although I want to give Pixar/Mattel the benefit of the doubt and say this is simply down to cost – as a plush covering over electronics is a complex thing to get right, as anyone who has disassembled a Furby knows, I'd be lying if I said I didn't have a sinking feeling this was yet again a Catch 22 of salespeople not able to make a good return on investment, if the market was not truly clamouring for Bo Peep playsets of this level of fancy.

Rather than rant about this injustice, I saw this as an opportunity to channel my frustration and just go ahead and make it myself, for my son (and myself too, if I'm honest!).

Whilst doing my work as a creative technologist, I beavered away on the design of this on occasional evenings and weekends, over about four months, and at the end of it found I'd made not only a credible Skunk Mobile but also an award-winning guide to engage people in how to make 3D printed toys.

The RC Monster Truck, which was cannibalised to make Bo Peep's Skunk Mobile.



The CAD model of the RC car chassis (with the top removed) and the cardboard reference images.

Travel tips

Perhaps what is most helpful to educators, parents, or anyone working in design is not only the outcome of this project, but the journey it took me on. By picking a cause (no matter how niche) to get worked up about, the response to 'just do it yourself' is undoubtedly an empowering message for kids not only to hear, but also to do actively.

Although I respect that I bring considerable industry experience from the likes of Dyson and LEGO to bear on a project like this, at its heart, the project is about tinkering and getting lost in the philosophy of something. The execution, of course, needs to work, but this is not the challenge of the project, as I have borrowed an RC Chassis and built the Skunk on top of this.

Modelling

Having worked in the prototyping business for over 20 years, I know it surprises many people how much even big companies like Dyson will use humble materials like cardboard to work out the basic functionality. Bo Peep was no different.

From this initial 'sketch model' in cardboard, I was able to ensure I had the correct 'mechanics'. Critical movements, like having the skunk chassis 'flip open' (and not hit Bo's head), and that the suspension (when compressed fully) would not collide with the 'feet' of the Skunk, and of course, that Bo was seated securely in a seat with a safety belt (unlike the movie!).

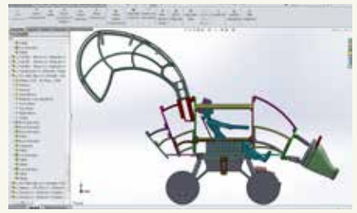
Bo Peep 'posed' in the correct seating position – which was then translated into a 3D object in CAD.

Another often overlooked (yet very standard) technique is to import a reference image/photograph into CAD to work from and create a digital 3D model. As shown, I could 'pose' Bo Peep in the proper ergonomic position, using the real-life images, and then translate that to the 3D assembly model (teal coloured) to build a 'digital twin'.

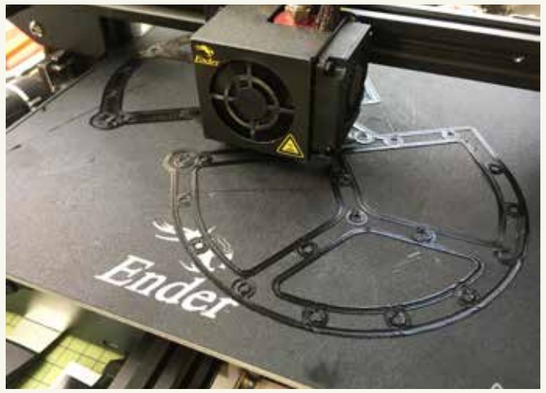
Construction

In contrast, the construction of the RC Chassis (taken from an RC Monster Truck), was, in fact, simpler to just model by taking measurements and designing only the essentials, rather than every mechanical detail. This could then be combined with the cardboard prototype which has three photos – one for each plane (x, y and z).

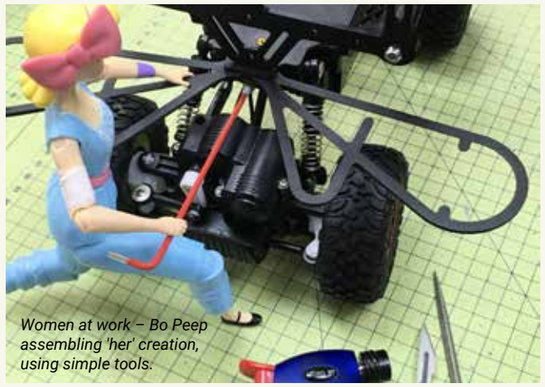
So, most of the cardboard could be turned into CAD with quick sketches, and it would be pretty close to the correct scale!



judepullen.com
@jude_pullen



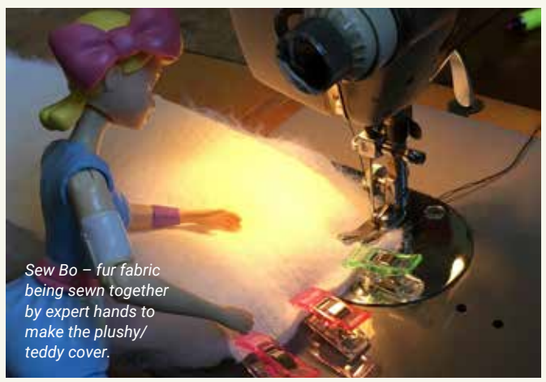
With the photos of the cardboard prototype removed, you can now see the various components of the Skunk Mobile – which have been designed for optimal 3D printing and are constructed to screw together. I can now hide the reference images and am left with the residual model, which is ready to be printed on my 3D printer.



Women at work – Bo Peep assembling 'her' creation, using simple tools.

With the Chassis and Skunk 'Skeleton' printed and assembled, I then set to work on the Plush (teddy bear material).

Safe to say, I got a little carried away with the 'toys come to life' narrative that Toy Story claims – but this in itself became a fun provocation of empowered poses of 'women at work', which at least gave me a chuckle whilst shooting the photos for the guide!



Sew Bo – fur fabric being sewn together by expert hands to make the plushy/ teddy cover.

Testing

As you can see from the full write-up on Instructables, I tested the design and made various alterations based on my son's feedback, but also obvious mistakes. Some redesigns were significant, like making the nose 'spring mounted' so it survived impacts of crashes from poor driving, and others were minor tweaks to optimise the fit of a component. To me, this project was a great learning project for my son to see, especially as a supposedly 'infallible parent' got a good few things wrong or needed to improve things as a matter of process.

Part of the reason I thought this was a good 'example' for schools was that it is technologically achievable – at a 'basic' level, you can put pretty much anything on top of these RC cars, and they will 'work' – yet if you want to make them 'better' or even 'brilliant' - then you can redesign and improve things to a remarkably high level.

A vehicle for learning

On a personal note, I think D&T as a subject offers an ideal platform to take a seemingly whimsical idea such as this and to then take it as seriously as a product designer does, and see that there are myriad challenges in the design to overcome. What may start as a 'will it work' can quickly expand into a diverse range of discrete problems to solve (much like Formula Student at University), but like BBC's Robot Wars or FIRST LEGO League, it can also be about competition to do a particular challenge. With the right support and imagination, something as quirky as a plush covering on an RC car can not only embody serious design techniques but can also make a comment on society – and judging by the 'off the record' emails and direct messages I have had from this, it is clear that something has resonated with those who work in this space – and a growing consensus that a modernisation of gender stereotypes is needed, and it starts with a prototype, and a discussion about how to 'make it better?'

I'm not sure if Bo Peep studied D&T at school, but chances are she would have aced it. We need more Bo Peeps making Skunk Mobiles in more ways than one.

View the full Instructables project online at www.instructables.com/Bo-Peeps-Skunk-Mobile-Remote-Control-Plushy

STEM CHALLENGE CARDS

Reviewed by Sam Joseph, Oatlands Junior School

Caroline Alliston is a professional design engineer and STEM educator and has 25 years working in the industry. Caroline has received both the Alastair Graham Bryce award and Stephenson Award for her "significant contributions inspiring and encouraging children towards a career in engineering". She is the author of the 'Technology for Fun' series of books incorporating her favourite and most successful projects.

I was looking forward to reviewing Caroline's STEM Challenge Cards for KS2. I believe that more resources need to be created by industry experienced teachers or experts like Caroline. As Design and Technology and Art and Design lead at Oatlands Junior School in Harrogate, I am always looking for up-to-date relevant, realistic, and challenging resources for D&T and in particular resources that inspire STEM collaboration with other subject leads within school.

The cards

STEM Challenge is an appealing product of 10 STEM projects in a set of A3 wipeable coated cards. The variety of projects from creating marble runs to an orrery give you a flexible choice on project ideas that appeal across the year groups in KS2.

The cards have a clear visual layout, making the projects easy to follow especially when working collaboratively on STEM subjects. The learning objectives are clear for each subject and include a concise STEM explanation for each project which could inspire and be the basis of good questioning and discussion within the practical sessions. The teacher notes are clear and simple to follow and have additional recommendations for each individual activity without being too cumbersome. What I found incredibly useful, and these will be appreciated by newly qualified teachers or teachers new to leading D&T, is the suggestions for risk assessments also found in the teacher notes.

The use of visual supports on each card to illustrate the outcomes, and in some cases illustrating the process of the project, makes these cards easy to absorb when time is of the essence in planning and preparing lessons.

Use by teachers

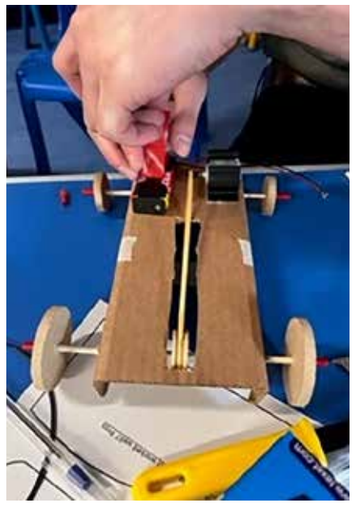
For more experienced teachers these offer a good framework to adapt or extend the projects to incorporate designers and utilising reusable alternatives to the equipment listed. The set of projects are a good starting point and could also again be extended by subject leads in relevance to D&T to encompass the Design and Evaluate components of the attainment targets in the curriculum.

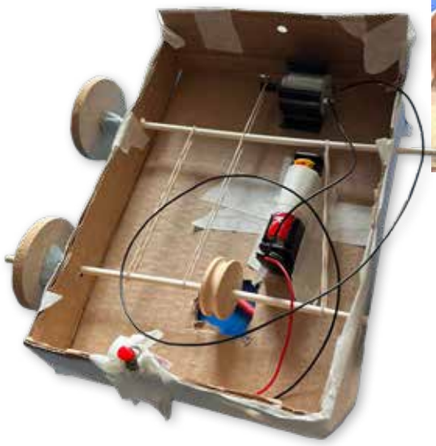
Even though we were unable to test these out due to our scheduled timetabled projects, I know our wonderful subject leads at Oatlands Junior School will find these useful in the future. New teachers or subject leads can be reassured by Caroline's experience in being able to deliver these projects as part of the curriculum or even as part of a D&T extra-curricular club or STEM theme week.

The cards are available from TTS-Group

Racing CPD

Sarah McCann, St Elphege's Catholic School



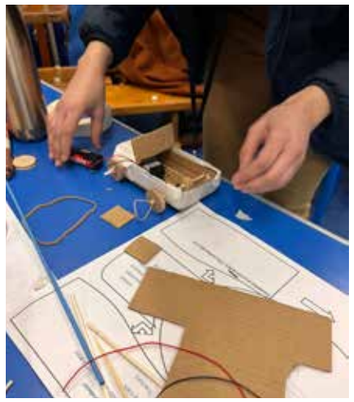


I loved D&T when I was in school and whilst I don't remember much about primary school, I do have fond memories of making a keyring out of acrylic in secondary school. Design was my passion and I remember digging my heels in when my mum wanted to send me to an all-girls secondary school that didn't teach D&T, as it was seen as a 'boys' subject. Luckily, my mum listened to me and sent me to a mixed school, which taught everyone D&T, regardless of gender. Thankfully, education has moved on a lot since then and D&T is taught to everyone as part of the National Curriculum.

New subject lead

I have now been appointed the Design and Technology subject lead for a large Catholic primary school in Outer London. When I was asked to take on the role I was nervous, as the pandemic had hit the creative subjects hard. D&T is a challenging subject to teach remotely, where resources in the home are limited, so I needed to raise its profile and my subject knowledge quickly. I found a subject leadership course run by the Design and Technology Association and booked myself on. This really helped me to understand the fundamentals of the subject leadership of D&T, learning how to plan D&T effectively and discovering first-hand how it should be taught. Despite the effective training, I still faced a major problem: D&T is resource-heavy and time-heavy. Previous experience of teaching 90 six-year-olds to sew finger puppets not only brought me to tears but made me realise we needed to do things differently. Raising the profile of my subject, whilst getting people enthusiastic about D&T was going to be tricky, but then the solution came to me in a flash... remote control cars and races across the hall!

On the training course I experienced D&T as a student and it was eye-opening, so I decided to run a CPD session for all staff on the next INSET day, to enable them to experience what I had – taking part in a lesson where they would be the children. I explained the principles of D&T, that we were looking for teamwork, innovation, problem-solving and creativity, and set them a challenge to create an axel and wheelbase for



a toy car. Some very elaborate cars were designed initially, some with racing stripes and even a horse-drawn carriage which seemed great until I told them to add a motor and battery pack! Setting new challenges along the way required the 'students' to think on their feet and problem-solve. I gave them a variety of different ways to connect and fix their cars in order to support those who needed help, but ultimately the resources they chose were up to them. When they were almost finished, I added the requirement of a switch. By this point however, the staff were so enthusiastic, determined and competitive that they quickly set about making the necessary modifications.

Finally, with the furniture cleared and a masking tape finish line in place, the race was on!

The day was so much fun and by allowing the staff to experience what D&T should be – trial and error, problem-solving, innovation and teamwork – I hope to have created a new enthusiasm for a sometimes over-looked subject.

Learning curves

So, what was the point of racing cars across the hall? D&T can easily become prescriptive, asking children to 'copy' building models step-by-step and resulting in 30 identical models but sadly no thought for the user, function or purpose. This CPD session aimed to show everyone that D&T could be innovative and enabled great teamwork through creating problems for them to solve. One learning point for me was that while everyone was having fun, concentrating their efforts on making the cars, nobody completed the 'design, evaluate template' that I had given them, so this is something to address in future lessons with the children.

Everyone had approached the task differently: some sat and talked in their teams, designing the wheelbase before making it; others dived straight in and started building; some went for strong aesthetics; some focused on the 'bones' of the car. Some people found the challenge easy whilst some struggled. The teachers could see how each of them represented a child in a D&T lesson: the child that loves to build and invent; the child that struggles with fiddly bits; the child that wants to be in charge and the child that sits back and is shy. They are now going forward ensuring their teaching meets the needs of all of those children.

Moving forward, we have adapted the long-term planning to ensure full coverage of D&T across every key stage. Knowledge organisers and lesson sequences are in the process of being re-written to support the teachers in their planning and to ensure full coverage of the different aspects of D&T. Prescriptive lessons are a thing of the past. There is a strong focus on the progression of skills throughout the school, from Reception to Year 6 and teachers are planning exciting lessons that allow us to work around the constraints of time and money. We are inspiring our children to be innovative and creative and as a result of this, our children and staff are excited about D&T again, and I am proud to be leading this positive change.

I like the whole process: making a plan, testing it out with a prototype and then making a final product (Year 4 pupil)

I love trying different things (Year 2 pupil)

We can apply lots of the skills we learnt in the subject to our everyday life! (Year 3 pupil)

I enjoy D&T because its interactive and you learn life skills (Year 6 pupil)

Link

Primary Subject Leadership course: www.data.org.uk/event-sessions/primary-dt-subject-leadership-full-day

Design Day 2022

Lucy Rowe, Design Day Leader & D&T Teacher, The Fernwood School

The Fernwood School is an Outstanding stand-alone academy based in Nottingham City, with 1200 students from Years 7-11. The 'Leading Edge' Art, Design and Technology department is made up of a wealth of experienced, creative and dedicated staff who are devoted to creating unique opportunities to give students the very best insight into the creative industries as possible.

What is Design Day?

Design Day is a hands-on careers day for all our students, based entirely around giving students real-world experiences of what it might look and feel like to work within the creative industries. The day gives students a realistic and engaging 'day in the life' experience within a chosen ADT area. It usually takes place in January of Year 9, bringing all students off timetable for the day to focus exclusively on potential careers.

As a faculty, we feel strongly students need preparing for the technologies of today and those of tomorrow. Learning from actual local and international design professionals helps them to have a truly real-life view of working practices, bringing to life their passions and creativity. Each year we invite companies from all areas of ADT into school to run a 'design context' relating to their companies' specialism, with a group of 25 students per company. These incredible companies vary from freelance designers to international corporations, all with the focus of showing students what a creative career would truly look like. This year's companies included; Annie's Burger Shack, The Wollaton Kitchen, The James Dyson Foundation, GESA design, Trivium packaging, ARUP, Nially Cat, Pelham Architects and many more.

Students are given a list of specialism areas in advance of Design Day, such as: engineering, food service, graphic design and more. These areas directly relate to the specialist skills of the companies joining us each year and are designed to cover a wide range of skills/subjects. Students are then allocated to work with one of the companies based on their preferences, ensuring each gets the most informative and relevant experience possible.

What does a 'Design Day' look like?

The day kicks off with a year group assembly to introduce the companies and the purpose of the day, designed to get them in the creative spirit, before students are disbanded into their smaller pre-arranged groups. Students then spend the majority of the day working with a company within their chosen field. This starts with an introduction to the company, and a tour of what a 'day in the life' of working at that company would look like.

Students are then given a design context that they will be working on throughout the day, written and built by each company, specifically tailored around their skill sets and resources. The intended outcomes differ greatly for each company, ranging from: blueprints, 3D sketch skills, CAD, 3D modelling, marketing, programming, practical skills, engineering and many more. Companies then work through a mini version of their own design process, teaching the students about the skills and attributes that go hand in hand with this. This often involves working with others, presenting design solutions, and meeting the needs specific consumer groups.

"I'D REALLY LIKE TO BE A GRAPHIC DESIGNER, IT'S A REALLY CREATIVE CAREER!"

DESIGN DAY IS A TRULY ONE OF A KIND, ENGAGING, INFORMATIVE AND AN OVERALL UNFORGETTABLE EXPERIENCE!

To finish the day, students and staff come back for a closing assembly, in which we reflect on the incredible student outcomes from across the day. This is used as a link to the wider industry, and further career opportunities are looked at and discussed. This time is especially important for recognising the utterly fantastic student work, engagement, and creative prowess, as well as an opportunity to say a huge thank you to all our companies or their time, effort and guidance.

STEM ambassadors

Throughout the day we also invite a team of STEM Ambassadors in to join us. This team of industry experts circulate each group of students, answering questions on industry and discussing the impact of STEM within each company's field. STEM Ambassadors are usually a mixture of school governors, industrial companies, and relevant school-associated links (such as the D&T Association). They give students a further opportunity to talk to as many people within the creative sector as possible which allows them to compare different material areas, as well as seeing how they link together. It also allows students to see the diversity of experts in each area, with ambassadors from all walks of life, helping to break down 'social divides' by challenging preconceptions such as the roles of gender and age within an industrial setting.

Design careers

Design Day first came about around 10 years ago when ADT subjects started to change direction within the national curriculum. As staff we felt we needed to further emphasise the links to careers, filling a missing link between education and industry. We felt that as teachers we were able to tell students about careers, and how their courses linked to them, but that more could be done to show

students what this would look like in action. Creative subjects are, after all, largely based on expression and feel as well as theoretical understanding. Over the years this has developed and changed in line with the ever-changing curriculum and new and emerging technologies.

Whilst Art and D&T has been lessened within the national curriculum, it is clear of its importance within the wider world. It is undeniable that the industry contributes not only to the food, engineering, and design sectors, but also contributes so much to the engagement in creative group ventures, which are the hallmark of today's emerging job opportunities and changing labour markets. We felt that as creative leaders it was our responsibility to not only discuss this with students in a classroom setting, but to give them the opportunity to witness such an inspiring industry for themselves.

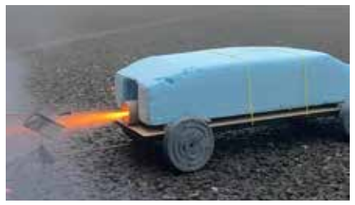
Learning from professionals via industry links helps students envision their future and what is required for jobs in the creative sector, as well as introducing them to areas of the industry they may not have been previously aware of. The day provides insight into professions, spurring their passions and giving them a real-world view into the inner workings of their potential career paths.

"YESSSSSSSS DESIGN DAY!!!"

"OMG I WANT TO BE AN ARCHITECT NOW"

"I FANCY BEING AN APPRENTICE"

One of the additional benefits of creating these industry links is in creating opportunities for students to make the connections between the abstract concept of their schoolwork, and potential GCSE courses, and the reality of working in a creative, yet disciplined environment. The day is timed strategically in the academic calendar to allow students to experience Design Day during the process of choosing their option subjects, so they can make tangible links to potential future careers, as well as having a deeper understanding of the courses they may later choose to embark on.



Impact on GCSE numbers and career interest

The opportunity to learn from real life industry giants and specialists has directly reflected in the numbers opting to study ADT at GCSE. This year we reintroduced Design Day to Fernwood with a new lease of life, following a two-year break, and have since seen a 26% increase in numbers for next year's GCSE intake. It is also notable that following the strategic involvement of a range of diverse role models, challenging 'social stereotypes', we have seen a significant reduction in our gender divide within all areas of the faculty.

Most importantly however, those students who have opted to take an ADT subject for GCSE have a much deeper understanding of both the course itself, and where it could take them in later life. Students are able to comprehend the 'why' when learning core theory and make well informed decisions when choosing between creative courses.

Design & Technology KS2

Reviewed by Peter Williams, Curriculum Leader of Design & Technology, Wootton Park School

This 'gem of a teaching toolbox' was created following ICSATs work in local primary schools. *Design & Technology KS2* is a fantastic creative handbook for all levels of practitioner who are delivering the Primary curriculum. The book identifies the key aspects and learning requirements of design and technology with suggestions on how to implement and include them in the primary curriculum.

Potential audience

The book covers a broad expanse of information and resources with the blend of assets being tailored for all levels of experience from Early Career Teachers to educators experienced in teaching Design and Technology. The resources and information covered in the book enable educators to maximise D&T teaching by being provided with the knowledge of what information is required to teach design and technology to primary learners.

Whilst the book covers design and technology in-depth, food and nutrition has not been covered in this book which is often included in the 'Design and Technology' subject umbrella in primary.

Content

The resources are fully packed into this book, providing teachers with a clear and detailed breakdown on the National Curriculum requirements for KS2 as well as a curriculum overview from Ofsted's Amanda Spielman. There is a wide range of resources throughout, covering design, making, evaluating and technical knowledge, and there is the opportunity to purchase a resources pack with these resources outlined within.

The book also sets out the learning outcomes for each year, with an overview of the progression strands which provides teachers with a comprehensive and easy to follow guide for curriculum planning. It covers 20 sections for D&T knowledge, with an amazing range of creative and practical activities, which underpin what learners should be taught. These fundamentals include knowledge, understanding and skills for learners to engage in an iterative process of designing and making. The projects are packed with step-by-step guides, textiles and construction materials as well as great value class kits for all projects.

Not only are there excellent resources throughout the book, ICSAT also provides additional support opportunities through their ideas hub CPD programme.

Summary

This book and its resources provide an excellent starting point to build a knowledge base to enable primary practitioners to implement an interesting and successful primary design and technology curriculum. Its use in primary schools will ensure primary learners have vast underpinned knowledge and skills in design and technology which will stand them in good stead for starting Key Stage 3 – STEM starts here!

Design & Technology KS2 is available from: www.icsat.co.uk

Testing students' sailboat designs on the CEC sailing ponds.

Maritime futures

Andy Green, Head of Design Technology, Cowes Enterprise College

In September 2019, Cowes Enterprise College launched their Maritime Futures curriculum. The curriculum aims to embrace the college's rich local heritage and place demanding academic concepts and techniques into 'real life' settings using their close ties with the maritime industry. The project is part-funded through a grant from the Edge Foundation and aims to help meet the skills gaps within the industry. It is also supported by a specialist maritime panel made up of people working locally in various maritime-related roles.

A local connection

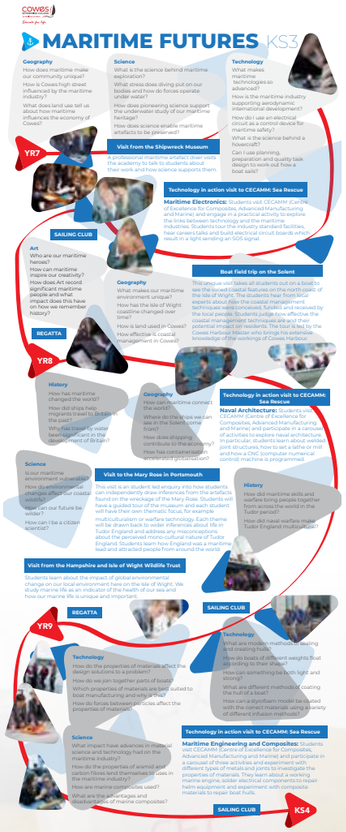
Through a thematic approach, the current National Curriculum is underpinned by linking concepts to real-life maritime examples where the children are able to apply their new learning in different ways. Across the year, students will be exploring boat-building, including design and specifications; tides; shipping forecasts; and attend a Cowes Regatta to celebrate the production of boats. Although every subject in KS3 still follows a rigorous academic journey where the children make exceptional progress, the new maritime curriculum offers further links and opens up our successful, local enterprise. The Maritime Skills Alliance and CECAMM, part of the Isle of Wight College, are among the partners supporting curriculum development.

The curriculum launched with a Geography project-based-learning scheme of work in Year 7 where the whole year group applied their core learning of coastal erosion to the northern coastline of the Isle of Wight with the ultimate aim of answering the question: *Is coastal management in Cowes effective?* During the first few weeks of the half term, all 270 Year 7 students went on a boat trip on the Solent to observe and make strategic notes on the different coastal features combating erosion. They were guided on board by the expert knowledge of the Cowes Harbour Master and our school's maritime consultant – who is a local industry expert and supports the students in their learning on site.

Andy Green leading one of the Year 7 sailboat maritime showcase lessons.

Nigel Harley of Harley Raceboats discussing with a student how to mark out their design.

Students have opportunities to meet maritime heroes like William Hodshon who sailed around the UK clockwise in his family wayfarer Nipegegi.



Across the curriculum

Each director of learning within the school has taken a fresh look at their own area of the curriculum and developed ways in which specific units can be linked thematically, conceptually and with interdisciplinary links of value to the maritime industry. In design and technology, for example, the children have already used their textiles skills to produce windsocks, built different styles of boats from CAD to the testing of materials and linked this to a number of different careers within the industry. The students also use their theoretical understanding, underpinned by other subjects, to apply and test their concepts which further develops their understanding of the curriculum. In addition, all students in KS3 all attend a number of lessons linked to the Isle of Wight College's CECAMM site (Centre for Excellence for Composites, Advanced Manufacturing and Marine) where they learn key skills and techniques currently used in the Maritime Industry which support their lessons being delivered at school.

These are just a few of the ways in which subjects have embraced the Maritime theme and are innovatively planning lessons to ensure not only rigorous academic success but also an understanding of the industry and linked careers.

Building on success

Now in its third year, CEC has been awarded a prestigious National Award for its innovate approach to its curriculum. There are also now six different subjects, each with their own Maritime learning journey and it continues to go from strength to strength.

As the new curriculum continues to develop over the course the year, it is the intention to build on the successes in Year 7 and support learning in the same way in all other year groups. This is an exciting development for Cowes Enterprise College and something that is well-worth being part of.

COWES ENTERPRISE COLLEGE
AN ORMISTON ACADEMY
Educate for life

WHAT TO DO IN YEAR 10 THEN?

John Donnelly, Head of D&T at St James's C of E High School and director of DTResources ltd

With the non-examined assessment (NEA) counting for 50% of the final GCSE grade, it's important to provide students with the knowledge and skills they need to be able to 'just crack on' after the contexts are released in June. The unit of work I write about here does not provide the students with much technical knowledge but helps them develop a set of skills to help them tackle the NEA with greater independence.

This is what I do with my classes in Year 10 from Easter onwards. I hope it helps, and as always, I am happy to take any questions you may have via email john@dtresources.co.uk

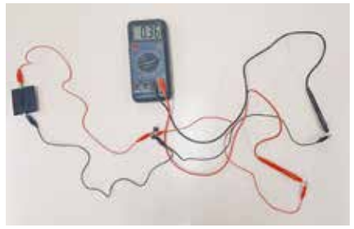
www.dtresources.co.uk

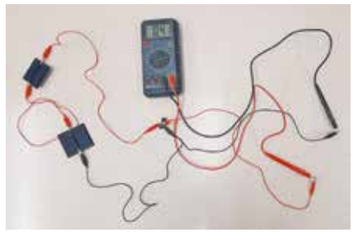
SO, WHAT'S THE TASK?

In simple terms, the students design and make a two-part prototype. Firstly, they design a product that will charge USB power banks using solar cells. In the second part of the project they each design a product that is powered by the charged power bank. I don't think I teach the class very much over this unit of work, I just encourage the students to find things that I know will be helpful. I ask that students record findings and then put the knowledge to good use over a period of around a half-term (12 lessons).

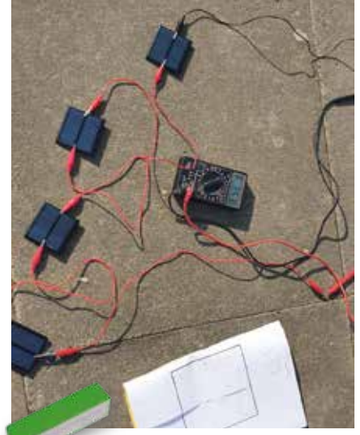
TASK 1 – CHARGE A POWER BANK USING THE SUN

The unit of work starts off by giving students an uncharged USB power bank (we bought these from a local pound shop), some solar cells and crocodile clips. I give a quick demo on how to connect the solar cells together (in series) and measure the voltage using a multimeter. Students then experiment outside with the solar cells, wires and multimeters. They create a table or produce quick sketches to show how the voltage changes as more solar cells are joined together.

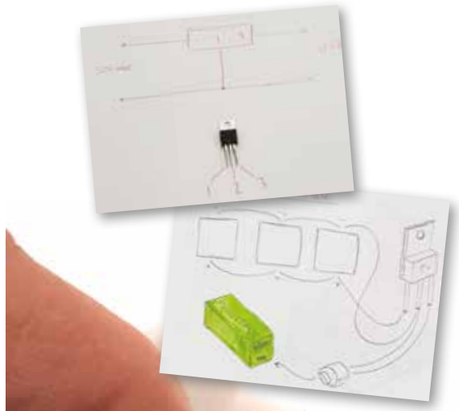




After 15 minutes or so, I call the class back and suggest that whilst high voltage may sound useful, the current is perhaps a little low to be of use. I don't show the students how to wire the solar cells in a parallel formation, but ask them to find out how to do this themselves (a quick Google is all they need). The task is repeated, record findings and produce some simple sketches of the solar arrangement.



Moving swiftly on from here, the students are then introduced to using a 5v voltage regulator. Voltage regulators are integrated circuits used to generate a stable and consistent voltage within a circuit. They take an input voltage and convert this into a fixed output voltage. Even if the input voltage changes, the regulator will continue to provide the same output. From this point onwards, students can charge a power bank using a parallel solar arrangement with a voltage regulator.



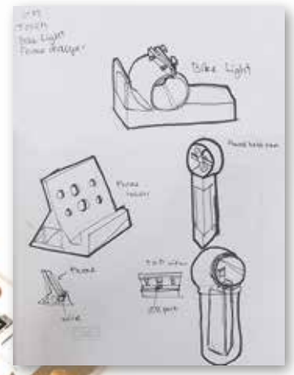
TASK 2 – WHAT TO DO WITH THE POWER BANK

The students now have a power bank that is capable of being charged by the sun; the next task is to put the power bank to use so that a simple product is made. This unit of work ends with students designing on Fusion 360 and having their product 3D printed and tested. They sketch first, then produce card/Styrofoam models before they get to work on Fusion 360.

Working models allow them to fully develop a way of holding any components used. Too often I have seen models of products such as fans, yet a way of holding the motor or fan blades has not been fully thought through. Typical examples of products my students are designing are a:

- phone charger to fit on a bike
- design fans/desk lamps
- phone holder/chargers for use on a beach or away from home
- camping tent light.

Many students have opted for using USB LED cards. These are super bright and can plug straight into the power bank or USB extension cable, without the need to solder. By using LED cards, they can make a working model of a lamp or camp light in a single lesson. Soldering LEDs or strip light is fine for final prototyping, but I find that fast paced working models really help keep students focused on the task as there is some form of instant success.



TASK 3 – TEST THE MODEL AND DRAW ON FUSION 360

Once the sketches have been developed further, working models are made until a feasible idea has been produced and tested. Students start to develop their work on Fusion so that a 3D print can eventually be made and tested. Some students design a functioning product that also charges the power bank; examples are desk lights that can be placed on a windowsill, then used at night. Others have opted for a card model to charge the power bank, and then produce a 3D printed final prototype. It all depends on how ambitious the product is and how much time students have available.

SO, WHAT'S THE GAIN FROM DELIVERING THIS UNIT?

Quite simply, at the start of the unit students didn't know how to charge a power bank using solar cells; they now have a working, functional prototypes that have been 3D printed and tested. I enjoy the fact that the unit of work has some similarities as a NEA outcome, but with the support I can offer along the way. The unit poses lots of questions that need to be addressed as the lessons progress: *How many solar cells do I need? Series or parallel? What's the voltage regulator for? How do I stop the power bank falling out of the 3D print?* I hope you get the idea, there are dozens of things that the students need to find out. All I know is the answers are easily obtained by simply guiding the students to finding them out for themselves.

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The demonstration: a matter of perspective.

Previously I had written about the use of video in design and technology and the involvement of the 'silent demo' responding to the challenges of the COVID-19 pandemic. Whilst 'normality' has somewhat returned to the education setting, some adopted pedagogical enhancement tools have remained.

Dominic Huey – teacher of Food Design and Technology

The visualiser

The introduction of the visualiser has increased in popularity in classrooms over recent years embedding itself with pedagogical practices used to display texts and objects on screen. However, this is nothing new to education, if we consider the development of the overhead projector in classrooms. The role of educational technology (EdTech) has developed over the last few decades, changing the face of teaching and learning. Research has demonstrated there are advantages and disadvantages associated with EdTech in the classroom, recognising multimedia as a pedagogical tool for enhanced teaching and learning including the retention of knowledge, but highlighting the cost and experiencing of those using the equipment. Regardless of debates on the pros and cons, one thing is certain, new technology in the classroom will never cease, with each new development fostering new enhancements and challenges to our pedagogy.

So, what does this mean for design and technology?

'When' and 'how' to demonstrate need to be considered and planned into lessons and curriculum. Generally, there are three styles of demonstration: frontloaded, just-in-time and after-failure, and McLain (2020) describes these, discussing associated benefits and limitations (Table 1). Modelling is a pivotal part of the demonstration in D&T (Petrina, 2007;

Types	Description	Benefits	Limitations
Frontloaded	A demonstration given in advance of a guided practice task, where a complete process is modelled and explained.	Provides an overview of a complete procedure and enables pupils to work with autonomy.	Relies on pupils' capacity to observe and engage their long-term memory.
Just-in-time	A demonstration where stages of a larger procedure are modelled and explained separately, with pupils completing each part in 'lock step' with the teacher.	Reduces cognitive load for pupils' working memory and the need to engage long-term memory.	Limits pupils autonomy, increasing dependence on the teacher with all pupils waiting for the next stage.
After-failure	A demonstration is given after pupils have engaged with a task and errors or misconceptions have been observed – either as part of guided practice or a discovery learning[2] approach.	Provides opportunity for diagnostic in-lesson assessment and correction of technique or misconceptions.	Relies on the teacher effectively monitoring and identifying issues, particularly with discovery learning activities.

Table 1

Figure 1. Restrictive expansive continuum (McLain, 2021)

McLain, 2018), commonly used in the teaching of motor skills through observation of techniques. The combination of the visualiser and demonstration may have the potential to enhance teaching and learning in D&T. McLain, Pratt & Bell (2014) have discussed visual communication in demonstrations and the use of visualisers to enhance the modelling of fine motor skills in the ability to pre- or live-recording and playback, suggesting increased independence of learning. Considering independence of learning, McLain (2021) discusses the concept of the expansive-restrictive continuum for D&T (Figure 1). The restrictive end of the continuum may be associated with a just-in-time demonstration, where learners follow steps and stages for a similar outcome (teacher-centred approach). Conversely, the expansive end could be accompanied to the after-failure demonstration, where students approach the task first (learner centred approach). If we incorporate a visualiser with demonstrations on this continuum it provides the potential to enhance the demonstration. Using the visualiser as a hybrid has the potential to showcase practical skills on a large screen for just-in-time, limiting the disruptions of bringing learners to the front, and the ability to pre-record and playback to enhance after failure, looping a video on the screen for expansive purposes.

Can students see what you see?

Considering visual communications, what can the learners see whilst demonstrating and does that influence their understanding? Bringing students over to view practical steps asks students to replicate the skills from a third-person perspective, whereas the use of a visualiser can be positioned to show learners exactly what we see through the eyes of a demonstrator.

Point-of-view video modelling involves the video being filmed from the first-person perspective and therefore presenting the view of what it would look like from the demonstrator's viewpoint. There are a small number of research studies suggesting that the use of first-person perspective can create a stronger memory for the observed actions. Fiorella et al. (2017) found students who viewed first person perspective performed significantly better on post-tests than students who viewed third-person view (Figure 2). It is suggested this view is suited to how-to videos including construction and cooking, but further research is needed to confirm these findings. Additionally, it has been proposed that the angle of view that a demonstration is given may improve learning due to learner involvement in cognitive processes; this research was however in the modelling of entire body motion skills (Hamideh, Hamidreza & Alireza, 2016).

Where to next?

D&T appears undervalued compared to its counterparts in science, technology, engineering, and mathematics (STEM) and in the English Baccalaureate (EBacc). Additionally, it is argued a workforce that is armed with STEM skills will be

Figure 2. Photos of third- and first-person perspective. What the learners see with a traditional horseshoe demonstration vs what they see by using the visualiser demonstration

imperative to the nation's competitiveness assuring economic prosperity. Such views and educational policies should value D&T, however in contradiction, it finds itself at the bottom of a hierarchical academic status. Perhaps this explains the limited research in the field of D&T education, or undervalued owing to the small body of research in an era of evidence-informed education. Could a greater body of research in the field bring about a greater informed need for recognition of the subject and its value?

As a Doctor of Education student at Liverpool John Moores University I have proposed a research study contributing to the field of D&T and improved teaching and learning, involving the visualiser for demonstrations which I will base a thesis around. I hope to deliver a randomised control trial using the visualiser as an EdTech enhancement tool and would love to network with fellow D&T teachers of all disciplines and regions to discuss ideas and inform future research projects. If this is of interest, please contact me on k.j.richardson@2020.ljmu.ac.uk and it will be greatly appreciated in our drive to get our subject the recognition it deserves.

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BUILDING A NEW CRAFT AND DESIGN T LEVEL

The new Craft and Design T Level is coming in September 2023. Zac Aldridge, Director of Qualifications and Assessment at NCFE calls for sector experts to contribute to its design.

In October 2021, the Institute for Apprenticeships and Technical education announced six new T Level contracts, which means by September 2023 there will be a total of 20 available to study, across 11 different sectors.

These two-year courses follow on from GCSEs and are equivalent to three A Levels. Employers offer support with the design of the content, ensuring students are equipped with the knowledge and skills required by their industries to later enter the workplace. In studying for a T Level, students will access both classroom and work-based learning, gaining a mixture of technical knowledge and skills, relevant maths, English and digital skills, as well as taking part in an industry placement.

Rising interest

Interest and anticipation around these T Levels has steadily increased over the past year, with a growing number of young people considering the opportunities that studying a T Level would offer to them. Notably, they have also become an increased focus for Government and other key stakeholders, who are recognising how T Levels can help shape and support critical industries, whilst offering learners a dynamic and fulfilling alternative to A Levels.

Nadhim Zahawi, when Secretary of State for Education, made it his priority to be a champion of T Levels, recently saying that if he did his job properly then "T Levels will be as famous as A Levels." He has advised that the qualification is making "a real difference to the skills agenda in our country," while asking LBC listeners to "tell their kids, their grandkids, to look at the opportunity of a T Level and not just an A Level."

Educational charity and leader in vocational and technical education NCFE has been selected to develop a number of these T Levels, including the Craft and Design course which will be rolled out in September 2023.

Craft and Design

Craft and Design is a really exciting course, which will give students a route into a variety of careers within the craft and design sector, including roles within furniture, dressmaking and jewellery. The T Level will help students develop an understanding of a broad range of issues relevant to the sector. Some of these issues include: the creative economy; cultural context and vocabulary; audience and consumer needs; and legal and regulatory requirements. In addition to the core content, each student will also complete at least one module of occupation-specific content. Students can study a specialism in being a jewellery maker, a ceramics maker, a furniture maker, and a textiles and fashion maker.

Getting involved

As NCFE maps out the initial planning for the Craft and Design T Level, its priority is ensuring that course content lines up with the needs of the sector, specifically addressing any ongoing or upcoming skills gaps that the sector is looking to fill. NCFE is calling for sector leaders, practitioners, and experts from across the craft and design industries to get in touch and share their thoughts on what is needed for this qualification.

By getting involved in designing course content, experts will have an opportunity to shape the upcoming workforce and help to determine the direction their sector is moving in, building a bright future with a wide scope of opportunities and creative and intelligent minds helping to move it forwards. There is no limit on who can contribute, and colleagues don't need to be education experts – they are simply looking for practitioners who can help ensure that the qualifications and assessments being developed reflect occupational reality.

Work is already underway with a number of experts across the field. One contributor, chief expert in cabinet making Christian Notley, describes how the new T Level will create a choice of pathways into the industry, and said it will help bridge the gap between the student and the employer, creating the right fit for both companies and individuals. He has joined NCFE to urge others working in the industry to do what they can to offer their support.

Similarly, furniture designer and artist David Tragen has described how being part of this process has impacted him directly by being able to reflect on the details required to produce learning material, which gave him a new perspective on his own work.

NCFE is encouraging anyone who is interested to get in touch via their website ncfe.org.uk or by emailing jodiewade@ncfe.org.uk. Your input can be provided remotely and flexibly to suit you. Be part of a once in a lifetime revolution in education which will impact and improve your industry.

Encouraging behaviour change

Amanda Campbell, Associate, Sustainability West Midlands

"Let's take the children out of the classroom and put them by a tree…" **is the opening line to a poem by Jonny Fluffypunk for Forest Schools Birmingham as part of an Arts Council commission for COP26. Connecting young people to the nature around them is a critical part of them feeling a relatedness with the natural world and in turn prompting not just a desire but an understanding as to how they can help protect it.**

Credit: Amanda Campbell

But of course, sustainability is about more than just taking care of the environment. As the UN's 17 Sustainable Development Goals illustrate, it's about taking care of each other and working towards a fairer world for everyone now and in the future. The subject therefore is vast and whilst there is a growing awareness and desire for it to be different, the challenge of where to start and how to effect change can seem overwhelming.

Making a change

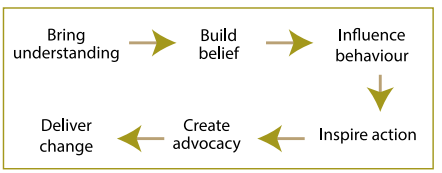
At a recent conference run by Sustainability West Midlands (SWM), this ability and desire to change was a theme that I heard throughout the day. From Jonny Fluffypunk's poem to the keynote, panel discussions and networking, questions like: *'How do we get individuals and organisations to change?'* or *'These impacts can feel a very long way off, how can we change behaviour here and now?'* kept coming up. So too did the importance of innovation and the design of new or adapted products, technologies and processes to deliver urgently required change.

My impression was of a collective urge to change our trajectory and an individual commitment to do so. Hardly surprising given the nature of the event. But this response is not reserved for business conferences.

Gaining acceptance

As a communications and corporate affairs director, a large part of my career has been spent encouraging behaviour change. I say 'encouraging' because to effect tangible, long-lasting change requires a recognition on the part of the person requiring change that their role is to build belief through being honest, consistent and inspirational. Whether asking employees to change how they travel to work, retailers to sort their packaging waste, consumers to switch to a greener product or suppliers to change their practices you need to make it real, make it relevant and make it personal.

As the model below shows, it begins with understanding. This is two way – both understanding where they are



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Credit Highly Sprung Performance

Amanda Campbell is a corporate affairs specialist and executive coach who believes in people-first transformational change and influencing a more sustainable approach to business. She is an Associate for Sustainability West Midlands, a not for profit organisation helping make the West Midlands more sustainable, fairer and greener for all, and Trustee at Highly Sprung, the UK's leading physical theatre company creating work with and for young people.

Links

Sustainable Development Goals

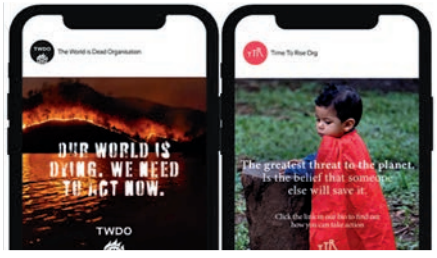
Jonny Fluffypunk poem

Highly Sprung

Sustainability West Midlands

starting from and what is important to them and then helping improve their understanding of the subject.

Understanding what is important to them means you can make the explanation of the topic personal, which is more effective in delivering behaviour change, as is concentrating on less macro issues by being specific to their life, context and environment. Bringing the focus closer makes the subject – and the potential solutions – more realistic and relatable. Building on this, research suggests that catastrophic messaging can be less than helpful. Rather than encouraging action, we can either 'tune it out' or find the enormity generates a feeling of helplessness leading to inaction. Only once you've helped improve understanding and built belief in both the problem and their agency to effect change, can you begin to have a conversation that helps them to take concrete action. The aim though is for them to move beyond that towards advocacy as that is where you can start to effect real change.



Credit Radley Yeldar

Changing climates

I am not an educator, but as a Trustee of Highly Sprung, a youth theatre charity, I see how children and young people are engaging with the subject. As part of our schools engagement work, we run a festival called Changing Climates. Working with children and young people from schools across the Midlands, we help them explore the subject and their response to it. This year there was an increased frustration, anger and sense of helplessness – sometimes referred to as climate anxiety. Sarah Worth, executive director, explains:

"When we asked young people how they felt about their role in the growing climate crisis, their answer was unanimous. They felt they had no power to make the change necessary to stop this disaster. We can't deny that our collective actions, making small changes in our everyday life… are making some difference, but we also have to admit… it's not enough. Together they realised that what was needed now was their collective voice. A coming together of their thoughts and opinions, into one collective call for action, to the people and powers that can make real change, lasting change, and begin to undo the damage that has been done."

We use a similar model to engage young people to help them design their own practical responses. Making a public commitment with clear measurable outcomes was as essential with as it has been when working in a business environment.

Next generation

Organisations are increasingly looking to the next generation to help solve sustainability challenges. One example is Unilever. Similar to other organisations they have created a youth sustainability council. It surveyed 160,000 people developing ideas that were as good as those of its leaders and were included in the development of its sustainability strategy. And SWM has a long history of recruiting Young Directors as part of its main Board.

Organisations are also looking for innovation in product design, materials and packaging. Improvements in circular economy models, energy consumption and transport. They need solutions across the whole value chain and regularly work with organisations like SWM to run innovation competitions and forums.

The importance of our next generation of designers and innovators cannot be understated. And neither can the need for them to embrace the challenges and opportunities facing our planet to engineer a more sustainable future for all of us.

All together now

Les Ball, Stiperstones CE Primary School

In 2019, Stiperstones CE Primary School found itself in a very challenging position and looked almost certain to close forever. For decades it had survived the falling rolls affecting all schools in very rural South Shropshire, preserved only by the passion of its community, but this time it looked set to be lost. Design and Technology was right at the heart of its salvation and it is now part of a thriving federation of three small schools (along with Norbury Primary and Chirbury CE Primary) who all value the subject extremely highly. Shropshire Hills Federation values the subject not only for the development of children's D&T skills, but also for applied maths, literacy, PSHE and parts of the science curriculum; most of all for the development of children's confidence, resilience, problem solving skills and because it's great fun!

Shropshire Hills Federation

A D&T specialism

Governors needed to think differently about how small schools could work together and so after many months of convincing all those that needed convincing, we set out on our unique plan: to use Stiperstones CE Primary School as a specialist primary design and technology site and teach all other subjects on our other two sites. When Covid hit just three months onto our plan, we used the time that children were working away at home to completely refurbish the entire building and put in place design and technology facilities that small rural primary schools could previously only dream of. Gone were the days of an afternoon of covering the classroom tables and all sharing two vices and four junior hacksaws; our children returned to a gleaming new facility with a fully kitted out workshop, with all the equipment that we needed to produce high quality projects; a clean room where they could develop their skills in electronics; a professionally designed and built teaching kitchen; and a new classroom where they had space to produce high quality design work. Best of all, this space was purely for D&T and could be shared by every single child in our federation from the Early Years to Year 6. We just needed restrictions to ease so that we were able to get going.

Upskilling

Not ones to hang around and wait, we used this tedious time productively. Staff development days were dedicated to training as many colleagues felt that the training that they had during their ITT or since was insufficient to enable them deliver our ambitious aims. We all worked collaboratively to develop a new policy and curriculum, and then called in consultants Leanne Mee and Mark Harrison to provide expert guidance and training so that everyone could embark upon this exciting venture with complete confidence. PD days were the most exciting we've ever had and staff were full of enthusiasm and laughter. At the end of them, we all agreed that after many stressful months of dealing with home schooling and screens, they were the best therapy we could have had. All of our teachers went home with the skills and confidence that they needed teach their children… and some products that they had made themselves.

Back to school

Covid restrictions over, children were eager to get started. To make this work at the level that we wanted, serious curriculum time was needed. One whole day each week for each class dedicated to design and technology might seem a bit of a risk; what would Ofsted say? Well we don't know yet, but when they do visit, I will be only too pleased for them to see how well teachers have planned their lessons so that cross curricular work is totally embedded.

I have spent many sessions this year being completely amazed at just how keen children are to make sure they read the instructions carefully so that they can make things that they value; at how accurately they measure pieces of wood before they cut, so that their car drives in a straight line; and at how carefully they weigh out their ingredients so that their pasta bake tastes just the way they want it to, and they can take it home to share for their dinner. After many months of sitting alone at home, children were buzzing with excitement together in the kitchen, trying new foods, learning to prepare and cook a wide range of healthy meals and snacks and then taking the recipes home to have a go with mum and dad. So many parents commented positively about this and shared pictures of children cooking with them at home. Home school links and healthy eating – what better way to achieve these?

In the workshop, our focus this year was joining materials. This was to make sure that I never had to see another product just about held together with glue guns and sticky tape! Years 1-6 all had different projects, with many other features, but knowing how to join materials together securely and properly is pretty much a prerequisite to producing a valued

product. Previously, some of our D&T wasn't really sure what it was: was it D&T or perhaps art or maybe craft? With all good intentions, we had tried to incorporate design and technology into our topic work. Great for the topic, fun for the children, but not very successful in developing skills sequentially. We really didn't want to lose the enthusiasm that topic work generated in the children, but decided that where D&T didn't really fit, we would no longer force it. Where it did work, we just needed to be careful of the focus.

Learning across all age groups

Our youngest children started with junk modelling masks to fit in with their topic of animals; older KS1 children creating similar 3D masks out of sheet card; and later bird boxes from wood. In lower KS2 we had one group build a model Anglo Saxon village and another a Roman town, but again, not a craft lesson but constructing frames accurately from wood learning all the skills along the way. In upper KS2, design and technology just didn't fit into the topic. The skills of building a wooden chassis, a hinged and removeable body shell and designing and wiring a circuit for a reversable car and soldering their wiring securely needed to be taught outside of their topics. And Year 6 building and racing two Greenpower Goblin cars fitted into no topic at all, but boy was it an exciting project! What a great experience too: working with retired engineers – STEM ambassadors, and then going off to a real race track to race cars that they had built. In all these different projects we have now sequentially learned to join many materials with different glues and techniques, hiding joints for aesthetics, cutting joints carefully, soldering, using nuts, bolts, spring washers, pins, nails, screws and spade connectors. And out on the race track we learned what happens if you forget the threadlock on a grub screw attaching the drive to the rear axle of your car, but we also learned how to fix it under pressure and carry on.

Where next?

With one very successful academic year completed, it's time to review and refine our planning; complete plans for the second year of our rolling programme (mixed age classes present their own challenges); to invest in more equipment: a pillar drill takes accuracy to the next level and CAD with plotters and cutters will advance pattern making and sheet work. And then we would like to share. Our children now have the most amazing opportunities and where we have a few gaps in our schedules, we don't want to see tools left idle, so hopefully next year some of our friends at other local small primary schools will decide that design and technology is a great subject to enthuse their children too.

OFSTED 'DEEP DIVE' #APHSDT

Amanda Moffat, Alderman Peel High School

What a stroke of luck!

As the teacher responsible for designing and developing the Design and Technology curriculum in our school, I am always on the lookout for new ideas and ways to improve what we do. When I saw that the D&T Association was offering a new E-Learning course, *'Units not projects - A learning-first approach to D&T'*, written by Tom Corker, I jumped at the chance to book this great learning opportunity and put a request in to complete the CPD over the Easter holiday.

Needless to say, the course was excellent and I would highly recommend it if you are considering reviewing your curriculum… especially if you want to be prepared to justify your curriculum to Ofsted! And the timing couldn't have been more perfect, because, on the first day back after Easter, we got the call that three HMIs were coming the next day to commence a full two-day Ofsted inspection and that D&T was going to be 'Deep Dived'!

Although this came as a shock, it wasn't completely unexpected as we had been anticipating a visit for some time. I was apprehensive but thankful that I felt prepared, as our school had previously had two Ofsted pilot inspections in Summer 2019 and Spring 2021. As part of this process, I had put together a folder of evidence with all the relevant sections (curriculum intent, implementation and impact) and had written my answers to a range of questions Ofsted were likely to ask. I was also reassured that I would not be alone during the subject lead meetings thanks to my wonderful and supportive SLT.

What a day!

Despite being prepared, no inspectors visited my classroom on the first day (which was both a relief and a frustration when you've spent hours getting things ready!) so I knew it was all going to hinge on the second day. And as I was the only D&T teacher, there was nowhere else for them to go, so it was all down to me – no pressure!

Ofsted

Here's what that day looked like from my perspective (from what I can remember!):]

Time	Focus
6.00-7.30	Writing, reading, rewriting and rehearsing my responses to anticipated questions.
7.30-8.00	Arrived at school and met with Assistant Principal to get reassurance that I hadn't forgotten anything!
8.00-8.40	Checking and double-checking I had all my lesson resources ready for the day.
8.40-9.00	Fast-paced first meeting with HMI and Assistant Principal to discuss the D&T curriculum. HMI kept copies of my curriculum maps (one pre & one post COVID with scribbled changes).
Period 1 **9.00 – 9.55**	HMI & Assistant Principal Joint Lesson Observation 1 Year Group: 8 (low ability) Lesson Focus: *Mechanisms – identifying the four types of motion* HMI and Assistant Principal accompanied me from the meeting room to my classroom and remained for most of the lesson. While the HMI was observing and madly typing at the back of the room, I was making sure he had all the relevant paperwork and circulated around the desks to make sure all the students understood what they were meant to be doing! At 9.45am, the HMI identified four students with SEN and asked to speak to them outside with their folders.
Period 2 **9.55-10.50**	HMI & Assistant Principal Joint Lesson Observation 2 Year Group: 10 (mixed ability) Lesson Focus: *Peer mark & self-review of assessment* The HMI and Assistant Principal returned to my classroom during the lesson starter to see me using Plickers to quiz the students, addressing misconceptions on the assessment they were about to peer mark. While the Y10 students were working independently to peer mark and RAG rate their assessments, the HMI identified two students with SEN and requested to meet them later. He then asked if I could get cover for the remainder of the lesson so we could continue our earlier discussion. So once the cover supervisor arrived to oversee my lesson at 10.30am, myself, the HMI and the Assistant Principal rapidly reconvened in the meeting room.
Break **(20 mins)**	I was desperate to include everything on my crib sheet but there wasn't enough time and the meeting over ran into break. Then at 11.00am the HMI requested that the Assistant Principal left so he could quiz me about our school's policies and procedures.
Period 3 **11.10-12.05**	HMI & Assistant Principal Joint Lesson Observation 3 Year Group: 9 (mixed ability) Lesson Focus: *Identifying textile types and testing properties* Having dashed directly from the meeting room back to my classroom to swiftly start my Period 3 lesson, the HMI and Assistant Principal closely followed suit. So once I had hastily delivered the lesson introduction, resources and relevant paperwork to the HMI, I repeated my frantic laps of the classroom to check on students to make sure they understood the tasks. At 11.45am the HMI identified four students with SEN and asked them to bring their folders to the meeting room where he was meeting the other two Y10 boys.
Lunch **(50 mins)**	As I had gone through our school's excellent Teacher CPD Programme, my next stop was another meeting with another of the HMIs to share my experiences. Thankfully lunch was provided and I was able to visit the loo on the way!
Tutor Reading **12.55-13.10**	Back to my classroom for quiet reading with my tutor group and a chance to relax as I knew I wasn't likely to be observed again as the HMIs would be meeting to collate their inspection findings.
Period 4-5 **13.10-15.00**	I was so grateful that I had my Y11s for the rest of the afternoon as the focus was on independent revision going though workbooks that I had created with exam practice questions on each topic.
15.00-16.00	First Tech Challenge Club
16.00-17.00	While HMIs were meeting with SLT and Governors and feeding back judgements, I took myself off to the pub to enjoy a well-earned drink while I nervously waited for news!
17.00-20.00	Received some very positive feedback and then promptly fell asleep on the sofa.

What they asked!

We were advised to make sure we shared our good practice with Ofsted if the HMIs visited our lessons as they were not likely to ask questions. This was certainly true, but they did take great interest in the contents of the personal folders I had prepared for each lesson (with copies of my lesson plan, class charts seating plan indicating which children were SEN, PP, FSM etc, a copy of the SEN register with teacher action steps required to support those students in each class, and a copy of any lesson resources). These were essential as there was a strong focus on our provision for SEN, PP and other potentially vulnerable students and these were targeted during lesson observations and follow up interviews.

Example questions they asked our students:

- "What are you learning about and why?"
- "What help do you get?"
- "What have you learnt before that helps you now?"

The other main emphasis was curriculum planning and sequencing. This was the core focus of my direct meetings with the HMI who quizzed me about the intent, implementation and impact:

- "How have you structured your KS3 curriculum?"
- "Talk me through how you've sequenced your KS4 curriculum?"
- "What extra curricula clubs do you offer?"
- "What have GCSE students gone on to study post 16?"

He was also interested about what training and experience I had that prepared me for teaching the subject. Interestingly, there was no reference to the old buzz words 'Teaching and Learning' and no questions regarding Food Technology once he learned that this subject was taught separately by another member of staff.

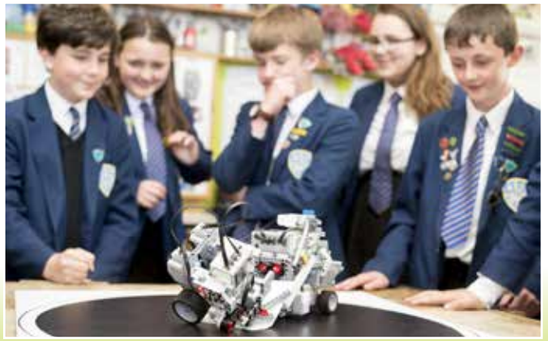
During our one-to-one meeting, the HMI asked me about our school's reporting methods for safeguarding, bullying, behaviour and what I do if I have any concerns (regarding both staff and students). He also asked about staff wellbeing, workload and what support I receive from my faculty lead and SLT.

What they said!

The HMI was pleased to see that the "iterative design process (design, make, evaluate) was integral to our curriculum" which was "a well sequenced progression model". He said that the "curriculum was ambitious" and was pleased to see that "GCSE content was implemented at KS3" so there was "a clear learning journey from Y7 through to Y11". He liked my "ever-evolving curriculum map" (complete with scribbled notes!) and how I had adapted it in response to COVID. He acknowledged that I "have a passion for the subject" and "delivered well planned lessons with outstanding subject knowledge" and that "students were actively engaged". He was also impressed with the "broad range of extra-curricular D&T clubs", including CAD/CAM, drone coding, sewing & STEM, and the "connections with external businesses" I'd made to provide workshops and trips highlighting careers in the local area.

I was obviously very pleased and proud to receive such glowing feedback and to have contributed to our school receiving a good rating overall with outstanding personal development acknowledging the wide ranging and inclusive extra curricula activities we provide for our students. Overall, the experience was a very positive one and although being 'deep dived' was challenging, my advice would be to showcase all the great things you are currently doing (in the time that you have) and be honest about what areas of the curriculum you are working to improve in true iterative fashion.

And definitely check out *'Units not projects - A learning-first approach to D&T'*, written by Tom Corker.



The curriculum in Wales has been overhauled:

is this good news for D&T?

Nerys Tudor Jones, Design and Technology Consultant

History

In 2014, the Welsh Government asked Professor Graham Donaldson to review the curriculum and assessment arrangements in schools in Wales. The blueprint for the new curriculum was first published in 2015 and is a significant change to Welsh education. All learning and teaching aims to support learners to develop towards the four purposes of the curriculum – the starting point and aspiration for every child and young person in Wales.

> *The school's curriculum is everything a learner experiences in pursuit of the four purposes. It is not simply what we teach, but how we teach and crucially, why we teach it.*

The four purposes are:

- to become ambitious, capable learners
- enterprising and creative contributors to society
- ethical, informed citizens
- healthy and confident individuals

Areas of Learning and Experience

Curriculum for Wales in based on six areas of learning and experience (AoLEs) rather than subject areas, with Literacy, Numeracy and Digital skills woven into all lessons. The Government views this as a holistic curriculum.

- Expressive Arts
- Health and Well-Being
- Humanities
- Languages, Literacy and Communication
- Mathematics and Numeracy
- Science and Technology

There are 27 **Statements of what matters (SWM)** in all six AoLEs.

Descriptions of Learning

Progression is supported by descriptions of learning (DoLs) which *'provide guidance on how learners should progress within each statement of what matters as they journey through the continuum of learning'*. These are arranged in five steps which provide reference points for the pace of progression and are expressed from the learner's perspective in terms of 'I can… or I have… statements. The progression steps broadly correspond to expectations at ages 5, 8, 11, 14 and 16. Some children excel in different areas of the curriculum, so it gives these children an opportunity to shine.

Schools' curricula

Whilst the CfW sets a framework, individual schools are encouraged to build and develop their own curriculum tailored to suit the needs of their pupils and communities. For some this is exciting, allows teacher creativity, and is viewed as fresh and inspiring; for others it can be daunting. Are the statements open to interpretation that will result in inconsistencies across Wales? Will there be too much variation in standards? Some want clearer direction and structure, so they are clear on expectations. Pupils are encouraged to influence learning, developing the skills that teachers know they need to develop, gearing it towards pupils' interests and their environment.

All Welsh Primary schools and about half of secondary schools will begin introducing the new curriculum from September. The Welsh Education Minister allowed Secondary schools the option of introducing it as originally planned or delaying until September 2023 due to the impact of the pandemic. No delay was granted for primary schools. Surely, conversations about progression, standards and coverage should be discussed between all primary and secondary schools if the continuum journey is to be smooth and progressive. Estyn have reported a mixed picture in Welsh schools. Some have made exceptional progress towards the new curriculum, whilst others needed support to catch up. The pandemic has put a huge strain on schools and progress is varied.

So where does D&T fit into CfW?

Design and Technology sits within the **Science and Technology** AoLE. I see this as a positive move as D&T can often be the application of Science and can link closely Science, Computer Science and Computation.

The six statements of what matters (SWM) in the Science and Technology are:

- **SMW 1** Being curious and searching for answers is essential to understanding and predicting phenomena
- **SWM 2** Design thinking and engineering offer technical and creative ways to meet society's needs and wants
- **SWM 3** The world around us is full of living things which depend on each other for survival
- **SWM 4** Matter and the way it behaves defines our universe and shapes our lives
- **SWM 5** Forces and energy provide a foundation for understanding our universe
- **SWM 6** Computation is the foundation for our digital world

**Note the Government does not number the SWM. This has done by trainers to make it clear to teachers that Design and Technology is #2.*

What does *'Design thinking and engineering offer technical and creative ways to meet society's needs and wants'* mean to a primary school teacher? What does this look like for learners and how clear is this statement, particularly for a new teacher or teacher with little or no training in D&T? Under each statement of what matters is a rationale. For many primary teachers in Wales this causes confusion and a feeling of being overwhelmed by the complexity of the terminology, which is a barrier to understanding and engaging effectively. D&T is an area that needs further support and training after many years of being neglected. Estyn stopped commenting on specific subject areas, so subjects like D&T were pushed further away, while D&T advisors were few and far between. Is it now time for D&T to be revived under the new curriculum?

The rationale for D&T

By applying their experiences, skills and knowledge, learners can design and shape innovative solutions. Being part of a user-centred design process will encourage them to use creativity to develop ideas, manage and mitigate risks, and minimise complexities. When engineering products, services and systems, learners will need to understand and control interactions between materials, structures, components and users. The application of engineering processes allows them to develop accuracy, precision, dexterity and craftsmanship. By designing and engineering outcomes in response to needs and wants, learners can become enterprising problem solvers.

Progression

Levels and attainment have been removed. Standards haven't gone away, but the emphasis is on learner progress. Do learners know where they are, how they are progressing and is their progress appropriate? Sharing these discussions with pupils could be great for the self-esteem. There are question about what teachers need to put in place and how teachers and learners evidence progress over time. Professional dialogues with schools and clusters is underway to help enable staff to develop a shared understanding of progression. Schools must ensure that all practitioners have the opportunity to take part in professional learning dialogues and this understanding is reflected in the development and refinement of both the school curriculum and daily practice.

Assessment and Progression report

In June the Welsh Government released a post regarding a new three-year project to help practitioners grow a meaningful understanding and support for developing progression and assessment, entitled: *'New Project to bring long-lasting support for Assessment and Progression'*. What will this look like for D&T? Many schools in Wales have not felt confident teaching D&T in the current curriculum, so does placing the subject within the Science and Technology AoLE mean it will be more a focus area and finally get recognised for its strengths or is it going to more of the same?

Nerys is an experienced classroom teacher, a DHT and an award-winning teacher. She runs INSET days, courses and twilight training for schools. Get in touch to enquire about bespoke training. Follow Nerys on Twitter and see some of the amazing D&T happening in Wales.

Welsh Government Curriculum website

D&T on a budget

Dave Bausor, lead practitioner at Ely College Academy in Cambridgeshire and the Meridan Trust lead for D&T

D&T departments across the UK have varying capitation budgets and, unfortunately, many are poorly funded. I've been teaching for 25 years and throughout my career I have had a number of differing roles in school that have allowed me to see first-hand the significant challenges that schools are faced with when it comes to funding.

D&T is an expensive subject and the cost of materials and consumables is rising at a significant rate. Often departments are faced with budget caps too so in real terms (just like the school itself) they are in fact losing money each academic year. I'm not a moaner, and never will be but finance has always been the one area that I have least enjoyed linked to my roles.

So what have I done in the past, am doing, and plan to do in the future?

Trying to be creative, looking at alternatives to traditional based materials and focusing on where we can be more eco-friendly all play key roles, as does time spent reflecting on what is currently being delivered or studied.

At our school, faced with increased costs to sheet materials for example, we decided to use a different material whilst still encompassing the key learning focus. We latched on to the HDPE recycling approach after seeing Brothers Make on YouTube and in Designing magazine and have spent almost two terms collecting HDPE bottle tops (we have a significant amount), purchasing some basic equipment and, with some extremely enjoyable experimentation and trial and error, have come up with a viable alternative that we intend to use from September.

But what else can be done to make the budget go further?

Upcycling is great. We are lucky to have our own museum at our school (full of donated exhibits at no cost) and this has been completely kitted out with upcycled, recycled and repaired furniture from other parts of the school.

- Reflect upon your current schemes of learning, projects and activities. What do you use? What can be replaced? What can be minimised? Where can you save materials and therefore save money?
- Are the materials actually needed in the first place (it's not all about making in every single area that is studied). Look at local businesses; they often need to dispose of their waste and can often be a gold mine of freebies.
- Incorporate prototyping and modelling activities that enable you to disassemble and reuse materials and components afterwards, so you don't need to keep restocking (you only need to add a few more to top things up).
- Fix stuff! If it's broken don't ditch it! Try to repair it or put it to another use, get some students to fix it. A great hands-on way of learning but also recycling and upcycling at zero cost.
- Consider your photocopying. Do you need all those worksheets? Can they be printed once, laminated and used again? Do you need one sheet per person? Can the sheets be developed and used digitally? Is there a need for the worksheet in the first place?
- Facebook marketplace is a great port of call and by simply typing in 'free stuff' often leads to useful items that can be reused.
- And not forgetting the good old skips. I'm a frequent visitor to ours and often remove items that can be disassembled and stored for future use. Pallets too soon stack up after deliveries to school. Why not invest in a pallet breaking tool and you will have a free source of timber in no time.

I have recently seen an open-source device that turns recycled HDPE into 3D printer filament. What a fantastic example of invention and problem solving and of course, a great way of reusing waste and turning it into a new material. Many colleagues in D&T departments are experimenting with other materials too (check out the work of Kate Finlay at Heatherset Academy for example).

I'll finish by saying that if you are lucky enough to be working in a department that is well funded then spend it wisely. This is a great opportunity to shine the spotlight on your curriculum and understand what you use, what it costs and how you can reduce these costs as focusing on the potential impact that the materials you do use have on the environment.

“SIR, CAN WE BUILD GO-CARTS?”

Richard Lambert, The Axis academy

From the strangest places come the best ideas

In the first half term, one Thursday morning, I asked the students at the end of their lesson about their favourite parts of design and technology. Most of the students at The Axis Academy love the subject, especially the practical side, so this was a slightly loaded question. From the back of the room came a voice that was not always at the forefront, “Sir, can we build go-carts?”. This was at first a shock to my system after planning my year, but then a fantastic buzz of engagement enveloped the room. The students all agreed with this idea and thought it would be amazing.

At The Axis Academy we pride ourselves on fostering enquiring minds, encouraging student led learning and empowering young people to explore new ideas, problem solve and build their own learning piece by piece. We aim to develop self-esteem, self-confidence, perseverance and a love of learning amongst all of our students. We are an SEMH school which is part of the YES Trust, where nothing is impossible and possibilities are endless. This, if you ask me, personifies D&T. The ability to think big, see no restrictions in your planning, learn from mistakes and adjust any design faults without seeing it as a negative and more of a learning experience.

Planning stage

The planning stage was quite a unique experience for me. For once, the students threw themselves into this stage with gusto. Team planning was a novel concept to most of them, with some very interesting discussion about how the car should look, steer and stop. Some of these discussions had to be monitored quite closely and even mediated, due to strong concepts of what was suitable and what just wouldn’t work. This in itself was unchartered territory.

It was wonderful to see D&T so animated and students really believing in their own ideas. The inquiry-based learning that was taking place in the room was incredible, using what the students already know, researching what they didn’t and also questioning the norm. Eventually, the plans were drawn, decisions made and all conflicting ideas ironed out. It felt like something quite amazing was happening in the school with very little input from myself.

If we build them they will race

I put forward the idea of a race or some sort of competition at the end of the project for all seven teams taking place, which seemed to add to the excitement of the build. Small nuggets of information were drip-fed about connecting and fixing, but once again a very independent feeling was occurring in all areas. The different parts of this project allowed a plethora of teaching and learning opportunities in a real-life situation. The students related most of the learning intentions with things they already knew about or had seen somewhere else, allowing a deeper understanding of what we were working on. One of the major problems the students came across was fixing the wheels without them unscrewing every time the vehicle moved. Once again ideas, attempts and research were carried out. There were ideas such as using two nuts together; the students studied locking nuts and other fixings and solved this problem once again. They tested tirelessly through every challenge until they were all resolved. Planning ideas that were too complicated for the time scale were addressed and changed to suit their team’s cart. Steering ideas were quickly adjusted and completed. One of the more interesting parts of the project from a design and technology perspective, were the ideas surrounding how to stop the vehicles. Each team had very different ideas on the way the vehicle would best brake safely; from a stick with a rubber tire on the bottom to a very complex working mechanism with push/pull linkage made from some old chair legs we had salvaged from a skip.

The teaching opportunities were endless; mechanisms, pivots, linkages, recycle, reusing, up cycling were words used as a norm. Students were happy to take risks with their ideas, not worrying about a first-time failure and redesigning on the spot with a different approach. Each lesson was filled with total engagement and excitement, confidence with pre-learned tools was showing with the students’ accuracy and the chance to use new tools such as sockets and ratchets and spanners was relished. I firmly believe the students were getting so much out of this project without direct teacher led input and just exploration of real-life situations.

Seats were utilised and up-cycled from the afore-mentioned salvaged chairs. Students had to work out different ways of fixing the seat in the safest and most secure way. Some of the students decided to decorate their go-cart whilst others used all their valuable time fine tuning, designing flags for the back of their vehicle and enhancing their carts. Time management was always a big concern so everyone worked as a team, distributing jobs and keeping busy.

D&T can be very testing!

Finally, came the opportunity to evaluate these fantastic vehicles. The students were asked to plan and design different ways of testing parts of their cart. Once again out of the box thinking was the aim of this session and the students didn't fail to disappoint. We looked at how real cars are tested and why it is so important to get this stage right. The students made courses to test their steering, race lanes for speed and accuracy of the build, parking bays and braking lanes.

It was at this point I realised how far these students have come in such a short time. Problems that would have bothered them at the start of the project were now just a blip in the planning stage, disagreements became discussions and design fails were now just part of the process. More importantly, I truly believe the skills we are all teaching in D&T are transferable in all areas of real life. This is something I think we must never lose track of and recognise the value of the subject and the unique way in which we deliver it.

My final thought as I close this article is that I am so proud of the students at The Axis Academy and feel so privileged to work with such fantastic designers, planners, builders, inventors and problem-solvers of the future. These guys can achieve anything they want to and are being set up with life skills in abundance and the confidence to change the world.

www.theaxisacademy.org

PRIMARY DESIGN AND TECHNOLOGY

the design and technology association

FLUMPS

Use 'FLUMPS' to analyse products and ideas in D&T!

Function

What does it do? Does it do this well? Does it do more than one thing? Could it do more than one thing?

Looks

Why is it that shape/size/colour? Does it have texture on it / a pattern / is the information easy to read?

User

Who do you think it is designed for? Is it suitable for them? What would have to change if it was designed for someone else?

Materials

What is it made from? Why is it made from that? What properties of the material make it suitable?

Pros/cons

What do you personally like about it? Use the product. What is good and what would you improve?

Sustainability

Can you recycle it? Is it easy to take apart to recycle? Could it use fewer parts?

Try to add as much detail as you can!
All the time, try to answer 'why?'

DESIGN AND TECHNOLOGY

GET INSPIRED!

Looking for fresh ideas can be daunting, but it is worth considering going beyond the usual Google images, Pinterest and other things close to hand. Try getting away from the computer screen, mood boards and existing products, to find personal and different ideas from a range of different sources.

Try:

- Window shopping walks
- Holiday experiences
- Other cultures' perspectives
- Periods in history
- Retro products reworked with modern components
- Nature walks
- Animals' needs
- Micro and macro worlds

Shuffled design cards and word lists can help generate ideas and the Association's design thinking scenario generator generates random words in three categories: User, Location and Theme to help develop design ideas for a product or system that addresses the needs of the user in a context.