

D&T

The Design and Technology publication for professionals

News – Pull-out posters – Communicating with design sheets – Digital workflow

PRACTICE

Issue 2 – April 2020

www.data.org.uk

BLUEPRINT
1000

**Now incorporating
D&T Primary!**

D&T the design
and technology
association

BERNINA⁺

made to create

Teaching the World to Sew

- Basic Computer Machines
- Advanced Computer Machines
- Embroidery Machines
- Embroidery Design Software
- Teacher Training
- Textile CAD Software

AUTHORISED EDUCATION STOCKISTS

MIDLANDS

BIRMINGHAM – F. L. NUTT 0121 4443978
DERBY – ELEGANCE 01332 382292
LINCOLN – COULING SEWING M/C'S 01522 521841
NORTHAMPTON – SEW NORTHAMPTON 01604 637200
NOTTINGHAM – SEWING & KNITTING CNTR 0115 9223904
SUTTON COLDFIELD – L. M. NUTT 0121 3735497
SHREWSBURY – SEW & KNIT M/C CENTRE 01743 343902
WALSALL – D. C. NUTT 01922 497603

NORTH

CHESTER – JAYCOTTS SEWING M/C'S 0845 0712228
SHEFFIELD – WOODSEATS 0114 2552822
SUNDERLAND – TULLY'S SEWING M/C'S 0191 5657995

SOUTH/SOUTH WEST

CHELtenham – WEST END SEWING CTR 01242 244025
EXETER – EXETER SEWING M/C'S 01392 275660
REDRUTH – DIRECT SEWING M/C'S 01209 216942
TAUNTON – BREDONS SEWING M/C'S 01823 272450
TAVISTOCK – QUILT DIRECT 01822 810877
TROWBRIDGE – WEST WILTS SEWING I/M/C'S 01225 753792
WINCHESTER – READS 01962 850950

SOUTH EAST

EWELL – SEW WORKS 020 8393 8488
GUILDFORD – SEWMASTER SEWING M/C'S 01483 567609
HIGH WYCOMBE – HOME COUNTIES SEWING M/C'S 01494 440647
HOUNSLOW – TYSONS 020 8570 6790
LONDON NW5 – TONY'S SEW CNTR 0207 4851653
LONDON SE8 – LEWISHAM & DEPTFORD S/M/C'S 020 8692 0228
LONDON SW11 – THE SEWING CENTRE 020 7228 3022
MAIDSTONE – MAIDSTONE SEWING M/C'S 01622 670254
READING – SEWMASTER SEWING M/C'S 0118 9571845
ROCHESTER – C.C.B. SEWING M/C'S 01634 841597
SOUTHALL – TYSON SEWING M/C'S 020 8574 1750
WALTHAM CROSS – RONA SEWING MACHINES 01992 640250
WORTHING – ECLECTIC MAKER 0845 8625552

SCOTLAND/WALES/N. IRELAND/CHANNEL ISLANDS

EDINBURGH – DAVID DRUMMOND 0131 5397766
JERSEY – JERSEY SEWING MACHINES 01534 280044
NEWPORT – NEWPORT SEWING CENTRE 01633 284646
SWANSEA – CLIFFORDS 01792 655928

Generations of school children have learnt textile design and sewing on BERNINA machines.

No other make comes close to being as long-lasting, reliable and easy to use as a BERNINA. If you need to add to, or update, your sewing department, then contact your local authorised BERNINA Education stockist for specialist service and support.

For details of the current range, and our latest catalogue, contact:
Bogod & Company Ltd Tel: 020 7549 7849
Email: info@bernina.co.uk www.bernina.co.uk



Visit us at
data.org.uk
for more resources, news
and information



Editor

Willy Adam

Editorial team

Ryan Ball

Tony Ryan

Debbie Woodbridge

ISSN 1745-5448

© The Design and Technology
Association 2020

Published by The Design and Technology
Association, 11 Manor Park, Banbury, OX16 3TB

Copy deadlines 2020

Members and subscribers wishing to contribute to D&T Practice should provide completed articles and accompanying materials by the following dates. Due to the range of topics covered and quantity of materials received we cannot guarantee publication and articles may be delayed for an appropriate issue.

Issue copy deadline

3. 2020	24th June 2020
1. 2021	21st October 2020
2. 2021	5th February 2021

Contents

- | | |
|---|---|
| 2 Editorial
"There is no education like adversity" | 20 Engineers on a mission
Tomorrow's Engineers week |
| 4 Blueprint 1000
Connecting Education with Industry | 22 Teaching Design and Technology: the modular approach
Paul Woodward |
| 5 Beecroft Primary School
Something a little special | 26 Supergrid
Interactive wind turbine business game |
| 6 Designer in residence
Sehanna Dev, Langley Academy | 28 Think like a designer
Chris Wilson, product designer maker |
| 8 Primary food
Healthy eating to combat obesity | 32 Digital workflow
A design approach for now |
| 11 Resources
Build To The Line and Ceramic knives | 38 The James Dyson Foundation
Transforming the way we teach D&T |
| 12 Primary engineers
TRAINing teachers and enGAUGEing pupils | 40 Ten tips for making your department shine
Building the profile of D&T |
| 14 Working with primary feeder schools
Ceri Stokes, Kimbolton School | 42 I'm a D&T teacher, what's your superpower? Part 2
Ketan Lad, Langley Academy |
| 16 SEND in D&T
Hayleigh Eglinton, Brook Green Centre for Learning | |
| 18 News updates
Talking D&T
Teaching food and nutrition | |

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

Articles which are attributed to an author do not necessarily represent the D&T Association's views nor do advertisements indicate the D&T Association's endorsement of the products featured. Articles in D&T Practice are published

in good faith and whilst every care is taken in compiling this publication the publisher cannot accept responsibility for inaccuracies or changes after publication, or for consequential loss arising from information in articles.

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.

“There is no education like adversity”

– Benjamin Disraeli

I sincerely hope that this edition finds you and your family well and that you are bearing up under the demands of the COVID-19 pandemic. It does not need saying that this is a crisis the like that most of us have never experienced before.



I write this in our second week of remote working at the Association and with school closures now almost two weeks ago. We are all settling into new patterns, new routines and new ways of thinking.

The speed that this pandemic has fallen on us has caught the majority by surprise and the measures taken to manage the impact of the virus have not been seen by this country in times of peace. I am, as ever, in awe of the way that our profession has responded to the demands placed upon us: school leaders and teachers have gone the extra mile to minimise learning disruption and to ensure that each of their students is safe, cared for and adequately fed. At times such as these, it is more evident than it ever was to me that teaching is not just a career, it is a vocation, we all do what we do driven by a desire to make a positive difference.

The draw on the Association staff and resources over the last month has also been notable. We moved quickly to expedite the move, already underway before the crisis, to make the vast majority of our electronic resources ‘free for members’. I have now been in post a little over two years and from day one this was an objective for me. Once you join the Association, we want to work with you to make the delivery of our subject easier, better informed and fantastically resourced. This has obviously been well-received as resource downloads over the last three months have been at record levels.

We are working hard to update existing resources and create new ones where there are obvious gaps in curriculum coverage. Please do feel free to contact us at info@data.org.uk if you have noticed a gap in our coverage and want to make us aware.

For obvious reasons, professional development courses planned for venues across the country have had to be rescheduled for the autumn term. We have regretfully had to make the decision to cancel the design lectures scheduled for London earlier this month (Zoe Laughlin) <http://zoelaughlin.com/> and later this summer in Manchester (Michael Omotosho) <https://www.michaelomotosho.co.uk/>. We will be rescheduling these lectures which are supported by our friends at the Edge Foundation so look out for them in the autumn term.

We have also decided to reschedule our Summer School planned initially for Friday 3rd July at De Montford University, Leicester. We had to cancel this last year as teachers could not sanction or finance two days out of school in times of continued austerity; it appeared that the move to a one-day event packed with keynote speakers and hands-on workshops had excited the D&T community, and we will re-organise for later in the year and come back stronger; watch this space!

We are currently working to finish the paper ‘The state of D&T’ started over eighteen months ago with partners the Royal Academy of Engineering. Our plans to launch in May are now on hold due to the pandemic, but we believe that we have a paper worthy of note and will be launching this later in the year, with calls for action for government, business/industry and school leaders.

We are also working hard to produce online CPD for teachers that can be taken at low cost from May onwards. We have consulted widely on this

and teachers tell us that face-to-face remains their delivery method of choice; that said, we think that we can supplement face-to-face with online subject-specific learning and will be releasing modules for primary and secondary teachers in the coming months. Keep an eye on our website www.data.org.uk for details.

I would like to end this piece by commending D&T teachers nationally who have opened their workshops and used the specialist machinery, tools and their considerable level of expertise to produce protective shields and other items of safety equipment for the NHS, doctors’ surgeries and even supermarkets local to them. It is in times of crisis that society is forced to step back and look at what it needs to protect and value. We will get through this; life will go on and we will return to a version of normality. I hope that those in positions of power look carefully at what, and who played the most active roles in providing solutions to some of the biggest challenges in the country’s hour of need.

Stay safe!

Tony Ryan
Chief Executive Officer

D&T IsoTech 2020 Challenge

The 'D&T IsoTech2020' challenge is a free long-term D&T challenge for secondary schools to help focus D&T work during the Coronavirus outbreak.



You must choose one contextual challenge theme to explore and respond to.

Theme 1: Isolation

Theme 2: Mental & Physical Health

Theme 3: Adapting



Deadline date June 12th 2020

Visit: www.data.org.uk/news/dt-isotech2020-challenge/



New ACM
Education
Band Saws



QUALITY
BANDSAW
BLADES

TCT Circular Saw Blades
Planer Blades

A.L.T. Saws & Spares Ltd
Tel: 01634 850833

www.altsawsandspares.co.uk
(Startrite Machine Specialist)

Shaping better value

BGL350



**Laser
Cutters**

boxford

Our latest range of low-cost engraving, marking and cutting lasers.

Model	Cut area (mm)	Power (W)	Type	Prices from
BGL350	500 x 300	50	Co2	£2,945
BGL460	600 x 400	80	Co2	£3,945
BGL690	900 x 600	80	Co2	£5,195
BGL1390	1300 x 900	100	Co2	£6,195
BML1390	1300 x 900	150	Mixed Metal/non metal	£11,995
BFL1390	1300 x 900	500	Fibre Metal cutting	

To shape better value
call **+44 (0)1422 324810**
or visit **boxford.co.uk**

Blueprint 1000

Connecting Education with Industry to Meet Tomorrow's Challenges

Now, more than ever, it is important that teachers receive high quality CPD to ensure that Design and Technology and Engineering education is delivered in an innovative and meaningful manner. **Blueprint 1000** connects education with industry across the country who are keen to support technical and creative education. Engaging with business provides students with a context for learning and helps equip them with the knowledge, skills and character sets required to excel in the workplace.

We understand how difficult it is for teachers, specialists and non-specialists, to attend training. Blueprint 1000 events address this problem and provide curriculum aligned training in a business setting.

Free for D&T teachers, supply cover paid up to a maximum value of £150, so no cost to the school!

When an employer becomes a D&T Association Blueprint 1000 member they are signing up to connect with schools in a sustainable and meaningful manner. Industry input ensures students' classroom learning has a real context, inspiring students to fully engage and succeed. It is also designed to enable them to nurture an engaged, inspired and innovative workforce of the future. This initiative addresses Ofsted requirement to prepare learners for future success in their next steps and the Gatsby Benchmarks, a framework of eight guidelines that supports the successful delivery of the best careers provision in secondary schools.

Blueprint 1000 really is a Win Win Win initiative!

Teachers benefit

- Free D&T subject specific CPD, organised in an industrial setting
- Supply cover up to £150 paid so there is minimal disruption and no cost to the school
- Helps put the D&T curriculum perfectly into context
- Develops teachers' understanding of industry requirements for students entering the workplace
- 3-5-day teacher work placements may be available in a local company
- Students are highly motivated
- Links gained with industry
- Addresses delivery of the Gatsby Benchmarks, looked for by Ofsted
- Links to additional classroom guidance and support from industry
- Meeting with an engaged company and agree how they can help support D&T teaching such as by providing projects, materials or company visits.

Students benefit

- Industry/pupil engagement successfully puts learning into context
- Students learn what is expected of them upon entering the workplace
- Classroom learning gains life and context, inspiring students to fully engage and succeed
- Students learn how briefs and projects are undertaken in the real world of work

Industry benefits

- Becoming visible and better known in the community by teachers, pupils and parents
- Being recognised as a strong supporter of education locally, in practical, meaningful ways
- Addresses corporate social responsibility, helping industry to give back to the community
- Helps them become a well-known employer of choice in the area



- Input into school curriculum, helping to inspire and engage students and providing a possible talent pipeline for future employment and growth
- Learn more of the challenges facing education and understand how best to engage with schools.

Industry leader James Dyson, about the Blueprint 1000 initiative:

"This is a wonderful initiative giving design and technology teachers the opportunity to see how engineers work in businesses such as Dyson. It is encouraging to know that teachers will be equipped with industry-relevant knowledge and skills to teach young people about the exciting, creative and challenging world of engineering."

We are committed to joining up the worlds of education and industry because where technology and creativity meet... that's where the magic happens!

For more information visit **www.blueprint1000.org.uk**

Register your interest in a Blueprint 1000 initiative in your region.

Email **blueprint1000@data.org.uk**

Beecroft Primary School

Ryan Ball



Beecroft primary school is something a little special. In the centre of Leeds, West Yorkshire, with over 300 pupils and proudly judged as an outstanding school by Ofsted since 2007. I was lucky enough to visit the school to see what made it such a special place.

I was invited by Brian Russell from ICSAT who provide a range of support, advice and training for D&T teachers and are based in West Yorkshire. They have been working with teachers at Beecroft for three years to help with their design and technology implementation and delivery. The results are evident for all visitors of the school.

During the morning of my visit, Year 6 were half-way into the manufacture of their board games. The work featured a wide range of skills and opportunities for the pupils and they could all articulate what they were doing, why, and probably more importantly, all with great enthusiasm. The games were themed around New York, to fit an existing year topic, and were designed to be played on the plane during a long flight to America. Alongside analysis and evaluation of existing games, CAD skills for the board and packaging using



Corel Draw, the electronic dice, which all pupils assembled and soldered, has been further developed this year.



ICSAT are still very hands-on in Beecroft, but it was evident from a few minutes in a reception class that teachers are embracing D&T across the school. As I observed a young boy using a purpose-built table vice and junior hacksaw to cut parts for his vehicle, I struggled to get a photo of him as his friend spoke passionately about all the sawing, sanding and gluing they do in reception! They have key-words based around D&T, construction zones with Lego, wheels and various components, books on making things and creativity,

with children flocking to these areas to explore and play.

In the rest of the school it was obvious that it wasn't a one-off show for the visitor from the D&T Association. Even on the website, the first subject mentioned by headteacher June Turner is design and technology which she feels is really important to her and her pupils. Standards and expectations are high across the school, and subjects appear to have equal weighting and importance. There are displays everywhere, including a celebration of work in the school hall to show pupils' work in a variety of subjects, with D&T prominent.

There has been clear financial investment in D&T also, with a D&T room shared with Art that many secondary schools would be envious of, including 3D printing, laser cutting, die cutting, sewing machines, vacuum forming, electronics, control and much more. June and the teachers, although rightly proud of the progress made with their D&T provision, still see it as an ongoing journey and are constantly evolving, adapting and implementing new aspects to the curriculum as pupils develop their skills, knowledge and understanding of D&T.

Designer in Residence

Sehanna Dev, Langley Academy



I'm currently on my third-year of an undergraduate course from Bournemouth University. I could not find a placement for my sandwich course, so asked my previous school if they would assist me gaining experience within the Design and Technology faculty. I was really pleased that the Academy agreed to assist me with my placement as I really enjoyed studying here for GCSE and A Level and this is the reason I chose to study Industrial Design at university. I have been given the title of 'Designer in Residence' and have been given a clear pathway by the Head of Faculty on what he expects from me this academic year.

I have many sub-roles within my job title, but they all revolve around the field of design. For example I get two-days a week to construct a journal and projects which have been set for me. Not only is this a great learning experience, but it allows me to develop projects for the faculty. So far, I have design and manufactured a 'tooth-brush holder' for open evening, developed an injection moulding project that involves use of the laser-cutter and a hot-glue gun, and worked with Year 11 students in creating living hinge templates.

My free time involves me in working on areas of development, for example I have been improving my technical drawing skills by working with the Visual Communications teacher. I have been working on my single-point, two-point perspective and orthographic drawing skills, by using traditional technical drawing equipment. Not only has this refreshed my skills-set but will also help me communicate ideas in my final year of degree.

For three-days of the week, I support design and technology classes from KS3 - KS5. I have enjoyed them all, but

KS4 and KS5 I have found the most challenging, not because of it being a qualification, but because you can have creative and realistic conversation about design. It's amazing what direction you can guide students to get a positive outcome. In addition to this, I've also been able to show them the benefits of CAD/CAM and how they can implement it into their work. Being a university student and having gone through the GCSE and A-level process not too long ago, I can understand and relate to them more about the pressures of making a deadline. I am then able to help them understand exactly what they need to do for their NEA and how to go about it.

Speaking to students across all the year groups I've seen that they like different aspects of design and technology and I have been able to express to them what they can do in the future by studying the subject. I've shown students some of my design portfolio and they have been surprised by the range of different products I have worked on, from a torch to car interiors. This helps broaden their concept into design and technology and has inspired some of them to continue it further.



We share your passion

What our customers say...

"Being able to use Axminster as a one stop shop has saved us hours of searching and procuring from many varied alternative suppliers."

Sherborne School

For more testimonials and to find out how Axminster can benefit you visit...

axminster.co.uk/business-knowledge

New!

Education catalogue now available. To request a copy visit axminster.co.uk/education



Providing top quality, bespoke solutions to the education sector to help maximise your success.

We have a large range of specialist and unique products, all of which are compliant with Health & Safety legislation, and offer the services of expert advisors and a full installation programme if required.



For your students... enabling them to purchase tools and machinery at an advantageous rate! To apply for a Student Discount Card simply direct your students to axminster.co.uk/student and fill out the online form.

To find out more visit axminster.co.uk/education, email education@axminster.co.uk or call 0800 371822

AXMINSTER
Tools & Machinery

**Business
Services**

Axminster • Basingstoke • Cardiff • High Wycombe • North Shields • Nuneaton • Sittingbourne • Warrington



Rated 'Excellent' on Trustpilot

How Primary D&T can help with childhood obesity

Suzanne Gomersall, Nottingham Trent University

Childhood obesity has increased at an alarming rate and has been described as “one of the most serious public health challenges of the 21st century” by the World Health Organisation¹. Current figures show that the number of children who are obese doubles from 10 to 20% during the time they are at primary school².

What can primary D&T do to help tackle this project?

Although much of the research shows that there are many factors as to why we have this obesity crisis, one key factor is the lack of understanding of adults of what healthy eating is, and how to cook healthy dishes. In September 2018 I started a six-year longitudinal study to see if teaching children cooking and nutrition in a practical way every term, from Year 1 to Year 6, would change their attitudes and behaviours towards healthy eating and ultimately reduce the number of children who become overweight or obese.



So what did I do?

I drew on the experience of the Adopt a School programme which was founded in 1990 by the Royal Academy of Culinary Arts. It is a membership organisation of leading chefs and hospitality professionals who volunteer their time to share their knowledge and expertise with the next generation. Helena Houghton, the Programme Director explains: “Our vision is that every child learns at an early age about food in a holistic sense and has the confidence to eat well, be healthy and happy. Our programme encourages them to develop healthy eating habits, an enthusiasm and interest in food, cooking, food provenance and sustainability, as well as giving an

insight into the hospitality industry.” Together with chef Idris Caldora, and Naomi Atamaniuk, KS1 leader from Milford Academy, the ‘Healthy Lifestyles’ Project was born.

Each term, the children have one session delivered by Idris. These lessons are designed to teach children the basics of food and cookery without the need for cooking facilities which most primary schools lack: all that is required is a classroom. These practical sessions fit within a sequence of sessions, following the D&T approach of Investigative and Evaluative Activities (IEAs), Focused Tasks (FTs) and Design, Make and Evaluate Assignments (DMEAs).



1. WHO p1, 2018
2. NCMP, 2019

Laserscript

HPC Laser
Precision, Accuracy and Repeatability

The UK's leading supplier of laser cutting and engraving machines and CNC routers into education

- » CE certified and compliant with UK safety standards
- » Established 2005, over 5,000 machines supplied
- » Delivered, installed and serviced by our own engineers
- » Lifetime access to UK technical support desk
- » 12 month ONSITE warranty on our PRO range, extendable to 3 years
- » Supplied complete with software, water cooling and fume extraction
- » Finance and lease options available
- » Onsite training provided



FREE 3D Printer
with our package deals

HPC Laser Ltd.

Castle Mills, Saddleworth
Road, Halifax, HX5 0RY

T: 01422 310800

E: sales@hpcclaser.co.uk

W: www.hpcclaser.co.uk

TIMBERITE



Cut to size sheet materials for education

Looking for ways to maximise your D & T budget and storage space? Enquire today for a copy of our brochure

- Cut to size sheet materials to fit your laser cutter machine
- Dowels and Prepared Softwood & Hardwood
- Nationwide delivery service

Phone: 01227 765011

Email: sales@timberite.co.uk

Website: www.timberite.co.uk



FREE OF CHARGE MDF & LASER PLYWOOD SAMPLES - quote DTPA20
To receive this please email us your name & postal address

Stockist of Medite Premier MDF, Laser Plywood - (Birch & Poplar Plywood), Birch Plywood, Veneers/Veneered MDF, Flexible Plywood, Tools, Adhesives and many more

- In Year 1, the children's first session followed the IEA approach of investigating textures and flavours, whilst learning about the five senses, the five tastes and the five food groups.
- The second session focused around the DMEA 'to design and make a healthy sandwich for a teddy bear's picnic'. The children really enjoyed the IEA where they tasted and evaluated breads. The FT involved learning to hold a knife correctly to spread toppings onto the bread and layering up their sandwiches.
- The final session was to learn the bridge and claw technique (FT) to cut vegetables into batons to go with a dip, and fruit to make a fruit salad. Prior to the session, the children had spent time exploring (IEA) a wide range of fruit and vegetables, by drawing detailed sketches of them.

to take part in the project, they have agreed to complete yearly food diaries, parent surveys and encourage their children to carry on with the healthy eating habit at home. As a result, their awareness of the risk of their children becoming overweight / obese has increased from 49% to 62%, and nearly half (47%) are now using the Eatwell guide to help them with food choices, compared to only 26% before.

After the children have taken part in the practical food session a termly 'Top Tips' leaflet has been sent home to support the parents. With this is a follow-up activity encouraging the children to reproduce their dish at home, or to enjoy the food they have made with their parents, which is what happened with the fruit salads and veggie dips. As one parent said, "I would never have believed my son would eat a pepper, if I hadn't seen it myself."

Meet the parents

A key to the success of this first year has been engaging with the parents. After giving consent for their children



Primary food – healthy eating



The results

I believe it takes years to change hearts and minds, which is why this is a six-year project. However, the results from food diaries, surveys and taking measurements show that the project is having a real impact already. Having looked closely at the food diaries, questionnaires and interviews, we were able to draw out the following conclusions:

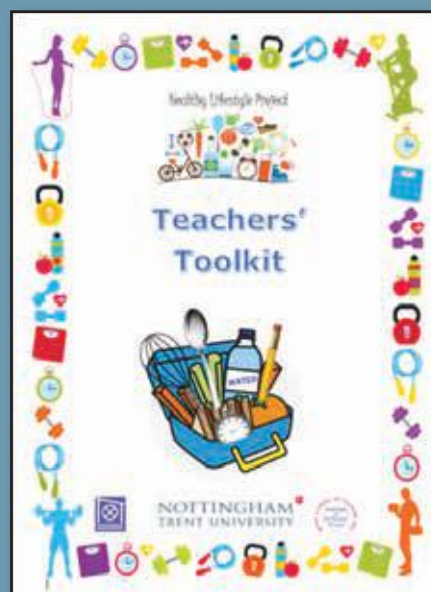
- There has been a real increase in the number of children wanting to cook – with 62% asking to help prepare food at least once every week – up from 45% at the start of the project.
- Children have **developed confidence** in their own cookery skills and have improved on all Core Competencies (set out by the British Nutrition

Foundation), especially peeling, mixing and weighing ingredients, many of which the children feel they can do independently.

- Children have a **better understanding** of foods that are healthy / unhealthy for us.
- Children were **more willing to try** different foods.
- Parents and children are taking **more notice of the traffic light information** on the front of food packaging, with both groups asking for / purchasing 'red' foods less often.
- Parents reported children **talking more about the foods** they are eating with regard to it being healthy or not.
- Children are drinking squash, milk and water every day, **no fizzy pop**.
- All children are **having breakfast** nearly every day. Some parents have helped children move away from chocolatey cereals.
- Children are **eating more fruit** at home.
- Children are **eating fewer snacks**. When children are having snacks, there is a more variety, and fruit / raw vegetables are becoming more common.
- The meals that children are eating are becoming **more varied**.
- Children are doing **lots of different activities** throughout the week, which is a key part of a healthy lifestyle.

What's next?

The children have moved into Year 2 and had a bread-making session before Christmas and are making potato salad in the summer. We are looking at them growing some of their own food this year – potatoes being one of them – and have consulted a gardener as to which produce can be grown and harvested during the academic year. Staff training is also planned so that all staff have got the basic cooking skills and knowledge of the key elements of D&T to help make sure that all future food sessions are high quality. The work is being captured in a 'Teacher's Toolkit' which I hope to publish in the future to support other schools and build on what I hope will be a successful approach to tackling childhood obesity.



You can get in touch with Suzanne at: suzanne.gomersall@ntu.ac.uk

Build to the Line

The Design and Construction Challenge for age 8-11

Build To The Line is a new Science, Technology, Engineering, Arts and Maths (STEAM) education programme from the Learning Partnership that aims to engage and educate young people aged 8-11 years in new ways of design and engineering thinking.

We live in an engineered world and new engineering ideas and solutions will be needed for future challenges and opportunities in areas such as energy, food, transport and housing. We need to apply approaches to design and engineering that embody the key principles of sustainability and low environmental impact.



Future engineers will need to rethink the materials they choose and their sources. Efficiency will also be a key consideration in the design process to maximise scarce or valuable resources.

The D&T Association is able to offer a 10% discount on the entry fee for members to get a class pack of materials and entry into the programme.

Beginning with cardboard as material, the programme offers a wide range of design challenges and virtual competitions for students and classes to engage with.



Team and class organisation

A class pack can support five teams of around 5-6 students with each team having a limited number of parts they can use for tackling a challenge. The registration fee covers all teaching materials to support the competition and a school STEM collaboration area.



www.buildtotheline.com

Slice[®] Ceramic Knife

A safer blade in a familiar handle

The Slice[®] 10490 Utility Knife has the feel of a traditional utility knife, with a thick, heavy texture metal handle for a comfortable grip. Its manual-retract slider offers three fixed cutting positions for different tasks, as well as a fully retracted position for safe storage.

The ceramic blades feature a patent-pending finger-friendly[®] edge that cuts effectively and is safe to the touch. Spare blades can be kept handy with the onboard blade garage, which is designed to hold one spare blade.

They also offer superior wear resistance: Slice blades last up to 11 times longer than steel blades. The blades are chemically inert, which means they never rust.

Slice knives are offered at a discount to D&T Association members singly and in packs of five.

Visit the Association's resource shop for details and discounted prices.



TRAINing teachers and enGAUGEing pupils

In the 2018/19 academic year, Primary Engineer launched their new Primary Engineer Rail Project with Hitachi Rail (Japanese bullet train and high speed trains in the UK) providing teachers with a **fully funded**, one-day practical CPD course which enabled them to use engineering with a rail focus for whole-class, cross-curricular teaching. Teachers were given components and tools to run the projects for Key Stage 1 and Key Stage 2 as well as further resources to support the experience in the classroom along with the opportunity for Hitachi Rail engineering professionals to work with teachers and pupils. Now in its second year, with Hitachi Rail supporting again and Doncaster Council providing further opportunities for schools in their area, the programme is about to get bigger and better with Hitachi Rail committing to a third year and Network Rail joining to bring the programme to even more schools around the country.



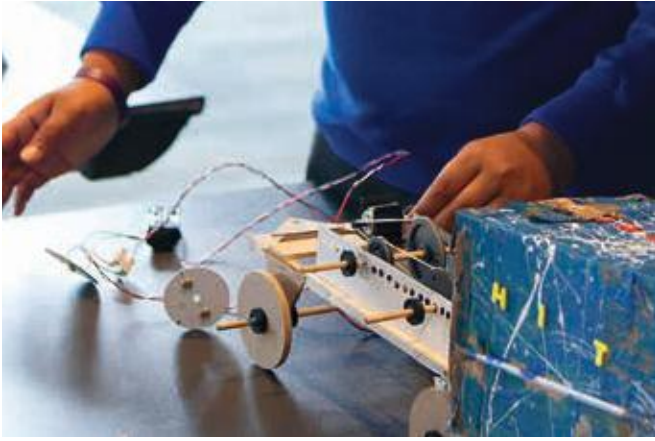
"It's essentially about developing skills with pupils" says UK Director of Primary Engineer, Chris Rochester. "We want pupils to have opportunities to develop both practical, design, build and make skills along with the engineering mindset skills, such as problem finding and creative problem solving, improving and adapting skills and communication and teamwork."

We offer teachers training and support to deliver this in the classroom, knowing they are fulfilling parts of their D&T, maths and science curriculum teaching along with literacy and, with the rail project, history and geography. Just about everywhere in the country has local history links with rail and railways."

"The children really engaged well, especially some of the girls who I expected to take a 'back seat' in the activities"

Heidi Thompson from Phoenix Community Primary School





Teachers around the UK have been singing the praises of the programme both in terms of impact on them and on their pupils. "The [training] day was engaging and well-structured from start to finish" said Kate Bratt from Tranmoor Primary School in Doncaster. "The practical was fantastic and taught me new skills as an adult and primary school teacher to take back and share with the children. It most definitely inspired me."

"The children really engaged well, especially some of the girls who I expected to take a 'back seat' in the activities," said Heidi Thompson from Phoenix Community Primary School in Ashford, "The project enabled children to try new experiences such as cutting and stripping wires as part of building their circuit. Doing this also highlighted to us gaps in children's knowledge with regards to basic D&T skills."

Gaining engagement

"Engagement of girls is crucial" adds Chris Rochester. "And not just girls, we need more diversity in engineering and the early engagement of girls and other under-represented groups is vital not only to the future success of UK engineering but more importantly, it's about letting all young people know that they can all be engineering professionals if they would like to. Teachers like Heidi tell us all the time about how girls are just as engaged as boys with the project and we know from research, that early engagement is essential to allow pupils to have meaningful experiences before they form definitive ideas about themselves and engineering by the time they finish primary."

The Primary Engineer Rail project currently runs with Hitachi Rail at six locations around the UK; London,

Ashford (Kent), Bristol, Doncaster, Newton Aycliffe and Edinburgh and with Doncaster Council for schools in Doncaster, which culminate in celebration events where teams of pupils from the participating schools have the opportunity to meet engineering professionals, test their trains, compete and be championed for their achievements. With Hitachi Rail supporting six locations again and another seven locations being announced shortly through a partnership with Network Rail, teachers are encouraged to register with Primary Engineer to ensure their place on the teacher training day and involvement with the programme.

"We're encouraging schools to register with us now to avoid disappointment" says Chris Rochester, "and to ensure they have time to include this in their forward planning. Providing teachers with the opportunity to enhance their own skills and to plan cross-curricular teaching to enable fun learning experiences is powerful for all involved. Fun is not enough, but fun should definitely be part of what makes meaningful educational experiences for pupils especially when it's about investigating and developing scientific or mathematic ideas and opinions. STEM or STEAM should be about how schools can enhance their curriculum and the E in STEM, engineering, offers a fantastic opportunity to do exactly that."

Pete Fletcher, the Programme Manager for Hitachi Rail adds, "This programme is essential to Hitachi Rail, not just from a community



engagement perspective, but also for building a talent pipeline for the future. It's important that teachers and young people and their parents and carers have an understanding of the roles and routes into engineering and to see that there could be a future for them in engineering. We know that not everyone will become an engineering professional and of course engineering companies like Hitachi Rail have many other non-engineering opportunities but as our colleagues at Primary Engineer say, 'You don't know what you don't know' and we would like primary pupils to have the opportunity to investigate engineering through the Primary Engineer Rail Project, be inspired and possibly become an engineering professional of the future."

For more information and to register for the fully funded Primary Engineer Rail Project, please contact Emma Hargreaves at Primary Engineer: emma.hargreaves@primaryengineer.com

Working with primary feeders

Ceri Stokes, Kimbolton School

For the last few years, the Kimbolton School's Design, Technology and Engineering (DTE) department has invited several local primary and prep schools to enter their Year 5 DTE competition. Teams of four pupils are given a brief, a problem that they have to solve, and a range of basic materials. For last year's make-believe scenario the pupils had to protect Batman, who happened to be an egg, while he flew across a ravine full of laser cut crocodiles in a vehicle designed and made by the pupils.

Whilst this is a competition, it is probably the first time many of them would have set foot into a workshop environment. It also offers chance to help develop pupils' skills and confidence in the workshop, so we teach them about safety, using machinery and tools correctly. It is great to see them work as a team, build on skills learnt in their lesson, but also work in a senior school workshop, helping aid any transitions.

Teachers are also invited to come along, giving them a chance to connect with other teachers, chat through any issues, and as an added bonus we give them a mini project including the 'scheme of work' that they can then make at their own school. We hope this would mean that the teachers come back the following year and gain something new, which they can take back with them. This usually includes a memory stick with all information and files needed for the lesson, and an example that they have made.

Creative competitors

As a department we love running these competitions and often spend months planning the task. It is a chance to get creative and such has been the success of these events that we have developed our own version of the 'F1 in Schools' competition to complement the success that we have achieved with our senior school students. Due to their success we have invested in our own test track;

initially bought to complement the work done by our senior students, but we now run our own in-house Year 9 'F1 in schools' competition. The students use the term to design and make their cars, which also includes the production of a 'display pit'. The actual racing competition takes place on a Saturday morning with parents invited to attend and experience the same excitement the students have shown over the previous few months.

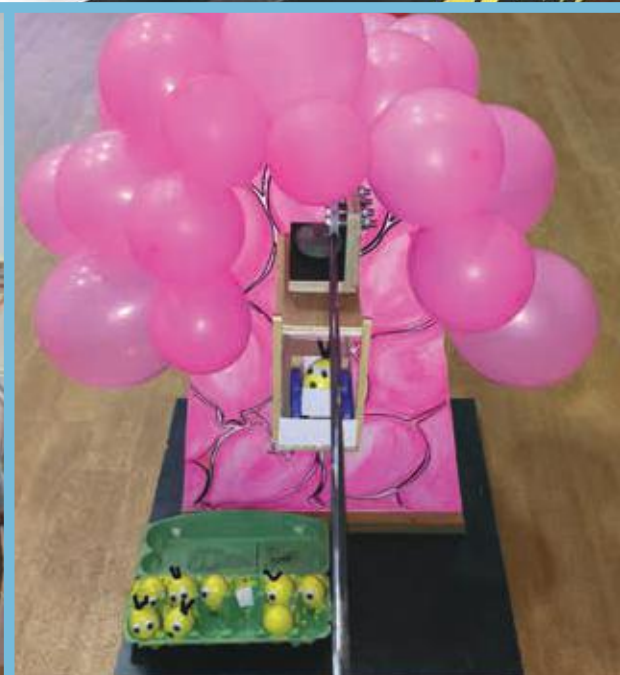
With the experience that we have gained organising our own competition we are proposing to bring this know-how to next year's Prep School event, replacing Batman with a scaled 80mph vehicle race down the F1 track. We have yet to determine our full set of rules and the expectations that we hope the pupils achieve but we are convinced that they will be highly motivated and excited by the challenge once they are introduced to it.

Year 5 masterclass

As we are very keen to inspire the next generation of pupils who may come through our department doors, we also have an established Masterclass course for Design, Technology and Engineering that we offer to local Year 5 pupils on a Saturday morning. Twice a year over a block of four two-hour slots, up to 15 pupils are introduced to the workshop environment, together with a little bit of CAD, laser cutting, creative design and practical skills. The aim is to design and make their own battery powered 'Wall.e' tracked vehicle.

The whole scheme has been a positive success over the last few years and has contributed towards establishing the department as an exciting progressive environment with our future students and parents.







SEND in D&T



Hayleigh Eglinton, Brook Green Centre for Learning, Plymouth

With the introduction of the new style GCSE course and the drive to improve standards I feel it is time to celebrate more of the work and efforts undertaken by students with additional needs, both in a purpose built SEND provision such as ours or within mainstream settings, as many of these young people are not able to access Level 2 courses such as GCSE.

Like other special schools we aim to supply our students with a wide range of experiences in the school and specifically in the Design and Technology department, giving them the opportunity to work with different materials and processes using the design process to solve problems, develop skills and make products. Due to the importance of developing life skills and independence Food Technology and Cookery are taught as a separate subject within our school.

At Key Stage 3 all of our students work through a range of projects, building up the experiences, subject knowledge, resilience and skills, just as they would in a mainstream setting, but the differentiation, pace of progress and level of expectation are naturally different.

Learning In the Natural Environment

This year Learning In the Natural Environment (LINE) has been introduced to our Key Stage 3 curriculum and the development of cross curricular skills and students' confidence in their application of practical skills is already noticeable, for example we have started our own apiary. Within Year 11 we have included a unit on bee keeping, where students use their team-working skills to construct the hives and broad boards, learn how to inspect the hives and what to look for to keep the colonies healthy. All students in Year 10 also work towards their Duke of Edinburgh Bronze award and a few are using the bees as one of skill areas.

Like students in mainstream settings our students take options at Key Stage 4

selecting either food or materials. At present those selecting food work towards a BTEC level one, with some achieving a Level 2 in cookery. This year those continuing with materials will complete a Crest Award either at Discovery or Bronze level and a range of Unit Award Scheme Units from AQA. We are constantly looking for suitable courses for Key Stage 4, each year adapting the offer to meet the complex changing needs of our students. Previously we have had students achieve GCSE Product Design, BTECs in Engineering and Technical awards in materials.

Developing confidence and pride

The complexity of students' needs continues to increase with many having multiple diagnoses, for example visual impairment, global delay, ADHD and ASD. Students also come to us from all types of home situations. Over 16% of our cohort are LAC students, with a significant proportion having a history of neglect, abuse or trauma. The success of making, completing and being able to take a product home can be invaluable in developing confidence and pride. Some who join us later in the school have often never been in a technology learning environment or have very little experience of the unique working





environment of a workshop, with the amount of free movement, smells and noises. Building their confidence to try tasks can take time as you build trust. To aid this our technology rooms are split in to defined areas and as much as possible are tidy and organised, difficult at times as work needs to be left out to dry etc.

The D&T syllabi assume that students have adequate literacy and numeracy skills and an understanding of basic science. Students with SEND frequently do not have this. This presents its own challenges for teaching as well as learning. For example, a student may not be able to read the instructions to a task. Once it is read to them they may be able to produce design sketches, but cannot annotate them to show reflection and evaluation, but can still produce adequate solutions.



The year ahead

In Plymouth this year we are celebrating the 400th anniversary of the sailing of the Mayflower to America. This has provided many opportunities for each curriculum area in the school to be included in different projects. We are part of a project with the National Marine Aquarium and Marine Projects to make a boat for two of our students to row in the Kids Afloat Regatta in Plymouth Sound in May. We are also taking part in the First Lego League competition. This is great as it requires different skills and interests in order to complete each of the elements, such as programming or presentation skills, as well as enabling us to be part of an international competition.

Each year as part of National Science week we have a whole school STEM day, where students complete a carousel of activities based on a

theme. This year our whole school STEM theme is seasonality to reflect the introduction of the bees to our school community. Previously we have had themes such as life at the beach through to links with English and literacy with Chitty Chitty Bang Bang vs James Bond (the works of Ian Fleming) and Alice in Wonderland by Lewis Carroll. We have also been able to link STEM with RE when we looked at the life and work of Professor Steven Hawking.

As with all subjects Design and Technology faces its challenges, but for the students at Brook Green Centre for Learning we continue to look for and develop projects that develop the wide range of skills offered within the curriculum plus many more opportunities to build and develop our students ready for when they leave us, not just within their subject ability but as confident young adults that have had a wide range of experiences.



Talking D&T

So far, this year's Talking D&T podcast episodes have been a mix of conversations and discussions. The content has been 'ideas and thinking in progress', an exploration of knowledge in D&T, curriculum design and current D&T research.

The first was a response to Amanda Spielman's speech, where I suggested that curriculum design should start with D&T capability. In February and March, I gave updates about my research; several teachers colleagues from other universities have been involved in this, and the aim is to produce resources for teachers and

researchers to help with curriculum design.

Other episodes have focused on knowledge and curriculum design, stemming from conversations with Eddie Norman, formerly at Loughborough University and now editor for Loughborough Design Press. In #12 I explain why I am interested in knowledge and curriculum, and for #13 David Spendlove and I talked about design thinking and how it differed from design. In #14 conversation with students about 'knowledge' led to considering the idea that not all 'facts' are facts in D&T. This led to Eddie's 'Do designers actually know anything?'



(#15), using the example of iD Cards to show that the answer is 'yes'. Eddie has recorded two more for release in March and April.

If you have ideas for future episodes, contact me via Twitter (@hardy_alison) or my website alisonhardy.work.

Characteristics of good practice in teaching food and nutrition education in secondary schools

A new guide and online course to support trainee, new, non-specialist and more experienced secondary food and nutrition teachers across the UK.

Why was the guide developed?

While the curricula and qualifications around the UK set out what should be taught, there is little in the way of specific guidance on teaching modern food and nutrition in UK secondary schools. The British Nutrition Foundation (BNF) believes that there is a need to provide guidance and direction for non-specialists and highlight key characteristics of good practice, across the UK.

BNF worked with practising food and nutrition teachers from across the UK; representatives from Initial Teacher Training providers; Public Health England; Healthy Schools London, Ofsted, the Council for the Curriculum, Examinations and Assessment (NI) and Louise Davies from the Food Teachers Centre to develop the guide's content. Teachers across the UK were also asked what worked well in their schools.

How can it be used?

It is anticipated that this guide can be used in a variety of ways, such as:

- showcasing practice through defined characteristics
- encouraging consideration of other characteristics of good practice leading to further discussion and implementation
- promoting lifelong personal and professional development, helping individuals to audit their knowledge and skill-set
- developing the management of the subject
- acknowledging the role of the teacher in the whole school approach to health and wellbeing.

Online course

An online course based on the guide has been developed comprising 11 modules, each with a downloadable 'check list' designed to review and reflect on teaching practice, highlighting actions for the future – a useful tool for personal development.

The course usually costs £120. However, Food – a fact of life is making 2,000 complimentary access codes available to trainee and practising secondary food teachers. **For more information, to download the guide and to register, go to: www.foodafactoflife.org.uk**



TECHSOFT

The Educational CAD/CAM Specialists

CAD/CAM Machines

"A wide range of machines, ideal for use in both education and industry"

Milling Routing Turning



Print & Cut



Laser Cutting



DIRECT TS TO CONTROL
DESIGN
Software



Textiles



3D Printing



Workshop Equipment

3D SOLIDWORKS

Alongside TechSoft Design Software, TechSoft also supply SOLIDWORKS 3D CAD for use with 3D printers & millers.



TechSoft
Supporting Design & Technology
since 1987

Alongside CAD/CAM TechSoft also provide:

- **Project Management Services**
New Build Design, Installations & Refurbishments
- **Resources, Training and Support**
Onsite Training, Online Help
- **Electronics**
PCB Manufacture, Software, Programmable Components
- **Textiles & Image Transfer**
Software, Sewing Machines, Sublimation, E-Textiles, Clothing
- **Art, Design & Ceramics**
Precious Metal Clay, 3D Pen, Pottery, Screen Printing
- **Furniture**
Workstations, Desks, Chairs, Workbenches, Cupboards, Shelving

Tel: +44 (0)1745 535007 ~ Fax: +44 (0)1745 535008
Website: www.techsoft.co.uk ~ Email: sales@techsoft.co.uk

Engineers on a mission to make the world a better place

Tomorrow's Engineers Week

Tomorrow's Engineers Week in November aims to inspire a new generation into engineering and tackle an annual shortfall of 59,000 engineers in the UK. Engineers are key to helping the nation keep healthy and well – from helping find cures for cancer and keeping people safe at sea to helping dementia patients.

During **Tomorrow's Engineers Week** 2019 five engineers from across the UK were handpicked to front #EngineerOnAMission to inspire a new generation into the profession. Each 'Engineer on a Mission' is the star of a film that highlights the impact engineers have on people's lives, which was shown to over 52,000 students at the Tomorrow's Engineers Week Big Assembly in November.

The featured engineers include:

Ellen Harper, 22, a Masters student at University of Strathclyde who helps those with restricted mobility to swim. Ellen designs and manufactures Poolpods, which provide dignified, independent access to swimming pools and were used during the Paralympic Games in London, 2012.

"I've always loved doing things that were creative and arty but I'm also quite an analytical person. I didn't really know about product design engineering until a teacher suggested it could provide the perfect balance. I love that I get to design for people. That's what I get a kick from, you get to see the impact you're having on people's lives and when you design with people in mind, it means you want to make the product the best it can be."

Hiba Khan, 29, is a civil engineer helping to keep people's homes safe. Hiba works on international flood defences and her biggest project is in Bangladesh, where rivers up to 8km wide can erode hundreds of metres of bank per year.



"My grandma taught me how important it is to help people. She lived in a rural area in Pakistan and had very little but would do things like rearing chicks to sell as chickens and use the money to help people in the local community. At university, while in my first year studying another subject, I saw the amazing humanitarian work done by Engineers Without Borders and I decided to switch into civil engineering. Ten years later, here I am as a chartered civil engineer getting to witness how the work I'm involved in is completely transforming the trajectory of people's lives."

Rhodri Lewis, 39, is a lifeboat systems engineer at RNLI. Rhodri builds, develops and maintains the rescue equipment to ensure they are in good working order when the volunteers go to sea, often in dangerous situations.

"I was always destined to be an engineer, it's my dream job. At school I enjoyed technology and sport. The teamship that I had in sport is part of my professional life now and I get to work on really interesting equipment."



The sense of satisfaction I get from applying my knowledge to build, develop or repair something that mitigates the risks involved for the volunteers who go to sea, at times in dangerous situations, is second to none."

Rebecca Shipley, 36, a healthcare engineer helping to beat cancer for University College London, develops tools to visualise the structure of cancerous tissues in the body and better predict where drugs will be delivered to within the tumours.

"From when I chose my A-levels, I focused on maths, physical sciences and engineering, as these were the subjects I loved. Once I started my research career, I wanted to be able to have an impact on people's health and quality of life. Fortunately, there is huge opportunity for this, as we need researchers who can develop tools from maths and engineering to develop digital and medical technologies in healthcare."



Clockwise from far left;
Ellen Harper, Rhodri
Lewis, Hiba Khan, Severin
Skillman, Rebecca Shipley,

Severin Skillman, 26, is a software engineer with the UK Dementia Research Institute. He develops software that helps people affected by dementia to live in their own homes by monitoring their health and behaviour. As part of his role, Severin is developing software applications and systems that track patients' behavior and health at home and predict when problems might arise. His work in this area began on the award winning TIHM (Technology Integrated Health Management) for dementia NHS Test Bed. TIHM has pioneered the use of Internet of Things technologies and Artificial Intelligence to continuously and remotely monitor the health of people with dementia living at home.

"I always wanted to go into engineering because I was fascinated by the internet and how it could change

people's lives. The work that we're doing now could transform the care given to people affected by dementia and provide peace of mind for their families. In the future 'treatment' could include the in-home remote care that we're developing right now. Engineering feels very tangible to me. The new things I'm working on today may be common tomorrow."

Dr Hilary Leever, CEO at **EngineeringUK**, the organisers of **Tomorrow's Engineers Week**, commented:

"We want every young person to see that engineering offers a varied, stimulating and rewarding career. The UK needs tens of thousands more engineers and Tomorrow's Engineers Week provides an opportunity for

the engineering community to work together to inspire the next generation of engineers to meet this demand."

Tomorrow's Engineers Week takes place in 2020 from 2nd- 6th November. It provides a unique opportunity for universities, schools, employers, professional institutions and engineers to drive interest in engineering careers, showing young people the ways in which engineers are on a mission to make the world a better place, find innovative solutions and shape the way we live.

www.tomorrowsengineers.org.uk

Teaching D&T: the modular approach

Paul Woodward

Design and Technology is a complex and expansive subject which is regularly broken down into sections for delivering teaching to students. This is particularly so for the theory content which covers a great deal of content, materials and processes. To try and deliver it all in a linear or episodic fashion would be difficult so it is often delivered in sections such as materials, processes etc. With the new syllabi from the various awarding organisations, we now have a great deal to cover within a limited time frame and this includes design and make skills as well as the supporting theoretical knowledge. With so much to cover during the years leading up to GCSE it is important that teachers have the confidence and resources to deliver as much of the designing and making skills as possible in that time.

A modular approach to design

I have always loved LEGO, even before I realised its potential as a tool for creative learning, but I am not someone who collects the sets. Instead I have been inspired by the concept behind the product; that of modularity. In my years of teaching,



A modular approach to architecture

this modular concept has proven to be both inspirational and useful. Students would often have design ideas more ambitious than they could realise in the time available, but I didn't want to restrict their creativity and potential. I would show them examples of modular approaches to design and LEGO would often be used as an inspiration. Students would design items of furniture, products or toys that had many different interchangeable or connecting parts, but they would never have the time to realise them all. I would ask them how many LEGO

pieces do you need to demonstrate the concept? You need just two.

Taking that same principle, students were then free to design numerous elements for their prototypes, but only had to make several of the components to demonstrate how it would work; a proof of concept.

Some excellent outcomes have been produced over the years and they often left the design open to further iterations or 'add-ons' which extend the



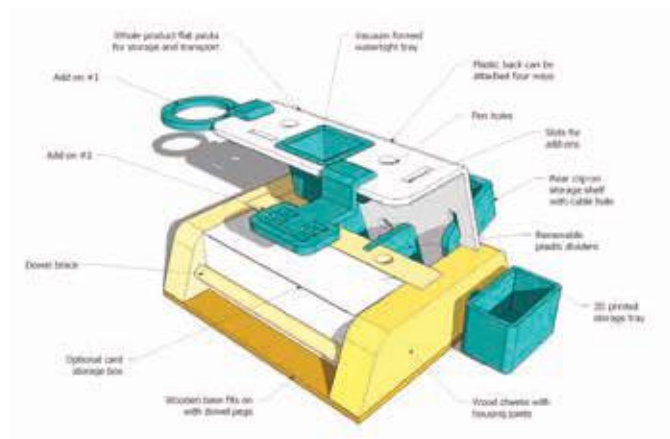
A modular storage/seating system



A modular electric guitar system



A prototype modular toilet training and play system



The modular desk organiser design

design work and allowed for further iterations; an important aspect of the design process and prominent in the new D&T curriculum. Additionally, as

there is essentially more design work than realised outcomes, this same approach is particularly suitable for the new GCSE where there are time limits.

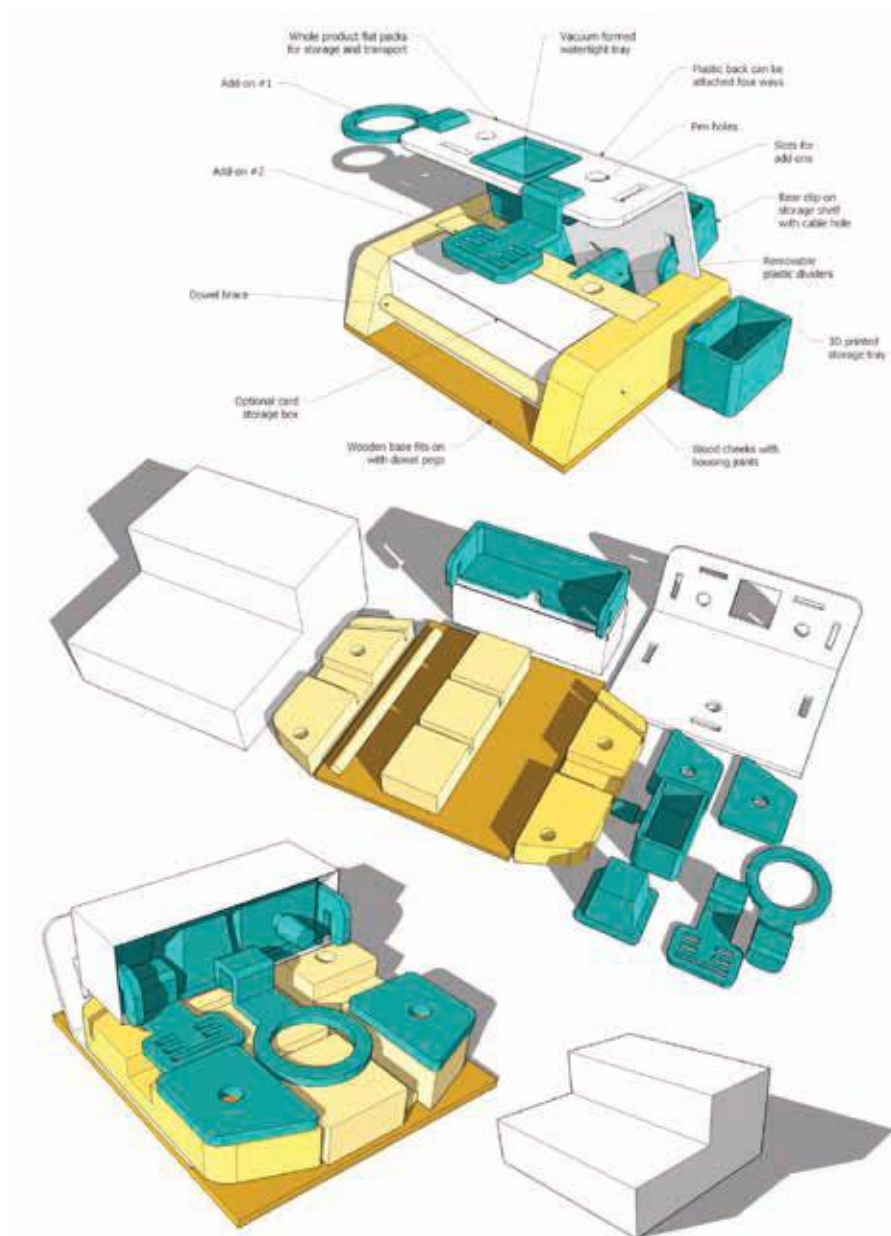
Modular approach to designing teaching materials

To introduce the concept of a modular approach to design in KS3, I created a scalable multi-process project and supporting design material that can be introduced in KS3. I originally chose not to share a resource for KS3 simply because of the wide range of approaches teachers take due their backgrounds, area of specialism, resources and teaching groups etc. It is impossible to produce a single resource that fits such a diverse range of needs, but by taking this modular approach again, I tried to produce something which can be adapted to a range of teaching situations.

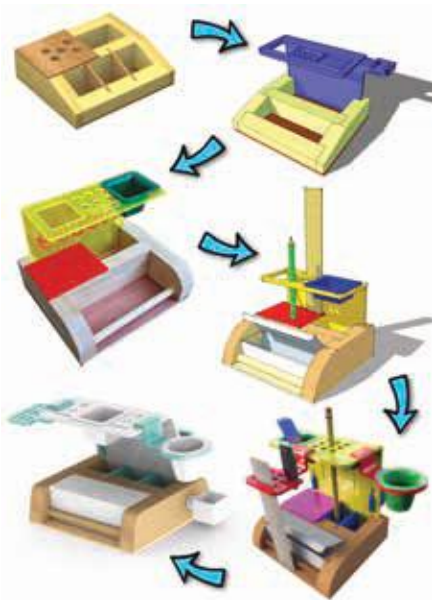
The outcome is constructed from low cost wood in sizes often considered 'off-cuts', and relatively small pieces of acrylic. Vacuum forming and 3D printing is optional as is the packaging for the whole project when it is flat packed. It can be delivered with the use of basic hand tools or make use of CAD/CAM and rapid prototyping technology if it is available.

The project is primarily skills based so that teachers can deliver training in wood and plastic work, but the design element can be adjusted to a range of needs and, as such, can be used with a variety of age groups and abilities.

The context is that of a desk organiser but that is simply a vehicle for delivering a range of skills in wood, plastics and board; many of which centres will have previously delivered through Resistant Materials and Graphics. This 3D outcome is just part of a much bigger project which can be approached from any angle. It is simply a vehicle for delivering training and giving students the opportunity to design and make something useful.

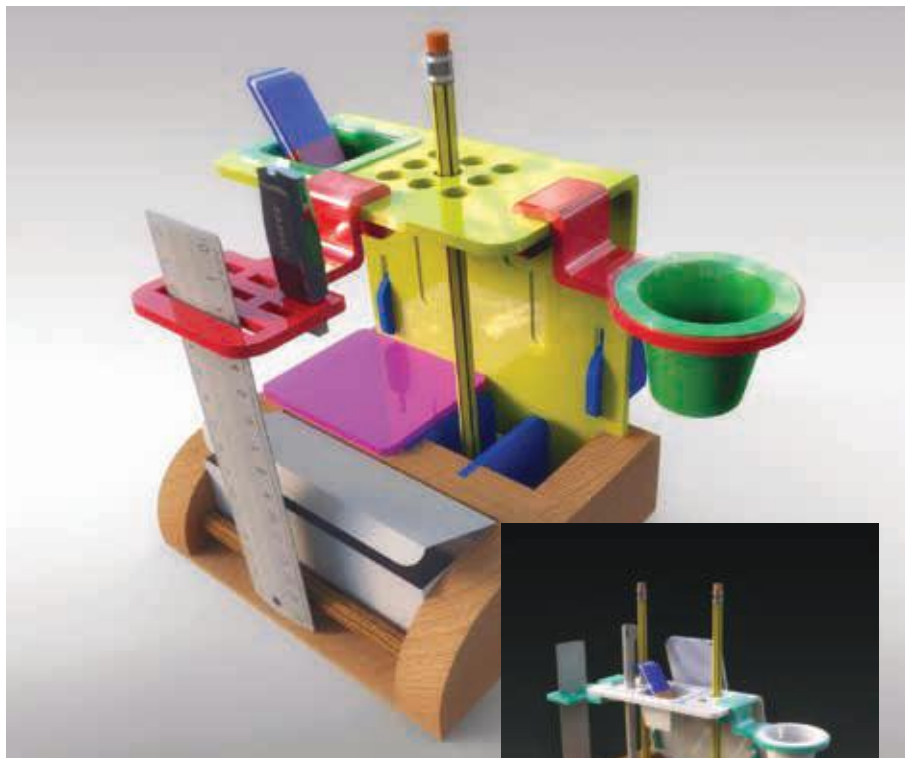


The elements of the modular desk organiser



Iterations of the desk organiser

To give an idea of the scale of the project, it can be used to deliver 2D and 3D drawing and rendering, 2-point perspective, orthographic projection, joinery, digital illustration, packaging design, 2D and 3D CAD, polymer work; line bending, vacuum forming and fabrication, vinyl cutting, jigs and templates, 3D printing. It also covers materials and processes theory, scales of production, flat pack design, iterative design and more. All this plus the mathematics and science required for the subject. Finally, it forms part of a seven-year curriculum plan with a supporting 9-1 tracking system to help towards Progress 8. Again, this reflects the modular aspects of design and planning.



A SolidWorks render of one final design

Digital workbooks

Some centres like to use sketchbooks or worksheets but this project is accompanied by a generic design booklet which can be edited in almost every aspect to suit any project work. This particular resource comes with a wide range of supporting worksheets and information pages that can be used with the basic booklet to make a folder of work unique to each centre. The focus can be on design,

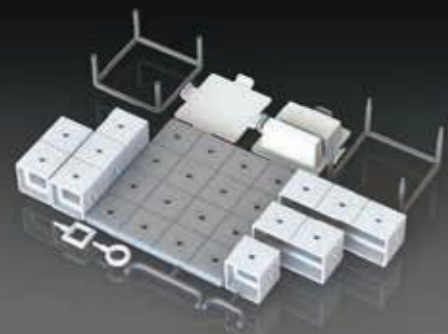
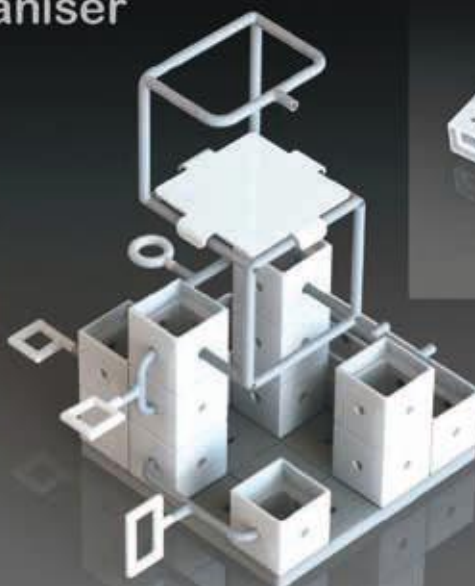


A more advanced design solution

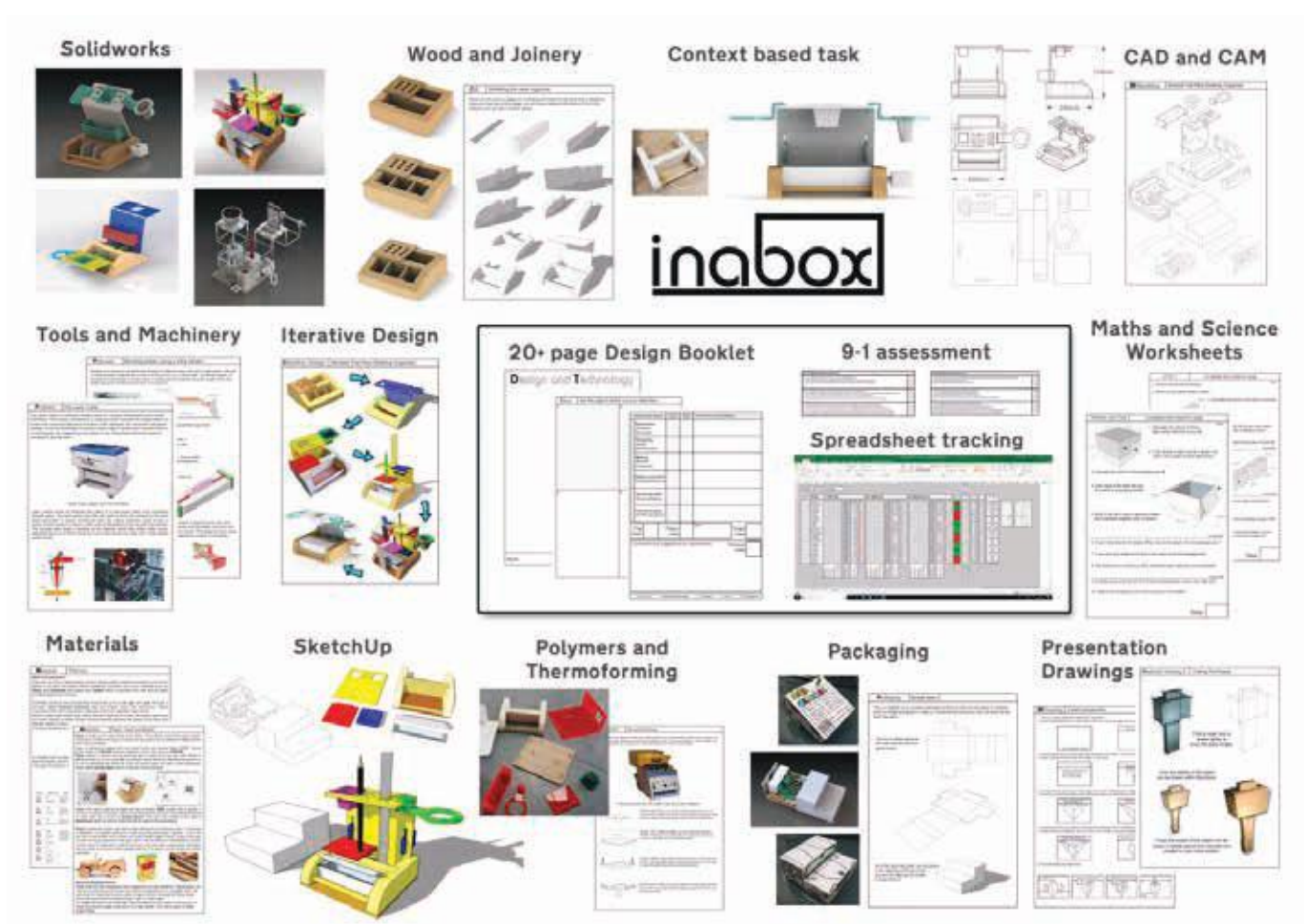
communication, joinery, packaging or much more. Also included are worksheets linked to the project that support the teaching of CAD as well as maths and science, two important aspects of the new GCSE. There is also a 52-page detailed SketchUp tutorial to support the design and construction of the project. As the

Modular Desk Organiser

Alternate version



How the concept can be evolved to more advanced modular solution



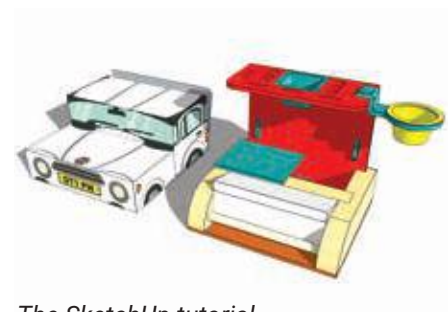
The larger scale of the project

whole project it in a digital format, it could also be delivered through Google Classroom or similar VLE.

The full resource is available for new teachers or those who don't have the time to develop their own, but I would hope that the concept behind this project would be more of an inspiration for teachers to produce their own unique resources. While there is a lot of work in producing a comprehensive resource like this, once created it can be tweaked and edited with relative ease and adapted to different age groups or abilities. Furthermore, a printed set of booklets can be produced before a term starts and you then have all the resources necessary available for your teaching with no photocopying of textbooks

and worksheets through the term. With a limited set of materials for each project, this can also help with budgeting for a department.

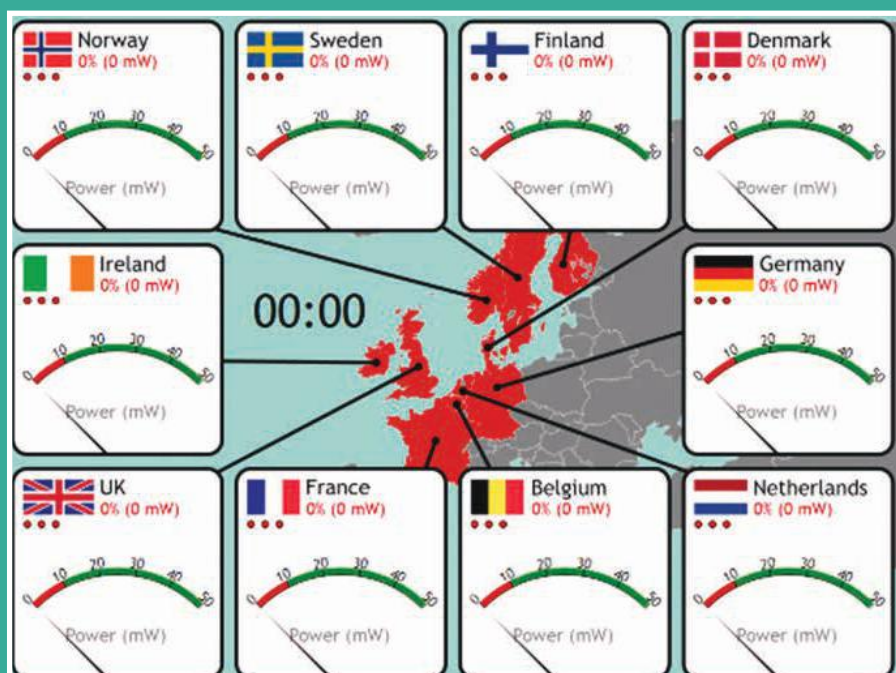
The modular approach is one that can allow students to develop their designs beyond the limitations of the time available to realise them fully in prototype form, but it is also an approach that can benefit teachers in their design and delivery of their teaching material. By taking this approach you can design a system for teaching the skills and knowledge that can be adapted and differentiated for a wide range of ages, abilities and resources which will hopefully prepare students well for the later stages of their design education.



The SketchUp tutorial



A prototype and practical outcome



Live power gauges



Live leader board

Supergrid



Large-scale interactive wind turbine business game

Day-long STEM activities are a big investment for a school so it is important to plan to get as much impact as possible from the event. In this article Mike Cargill focuses on 'Supergrid' and with several years of experience in delivering the activity, shares ideas on how to maximise the learning opportunities and the fun.

Supergrid is the first of a new generation of gamified interactive STEM business games. Based on the scenario of developing and operating a wind turbine installation it combines design, practical work, data logging and business decisions. Key features include:

- Large scale – up to 50 students taking part in 10 teams of five
- Facilitates straightforward study of blade angle vs power output
- Instant feedback to every team
- Cost effective to run – consumables limited to less than one A4 sheet of card per team
- Level of challenge can be varied to allow access by all ability levels
- Variable and randomised wind speed settings enhance element of risk

- Business game considers cost of tower and blades
- Price forecasting by teams with instant profit/loss and scoring feedback
- Variable number and duration of rounds to suit the students
- Advanced features enable study of load/power curves

Supergrid was developed by Mike Cargill (UK STEM Ltd) and Joseph Birks (Redfern Electronics). It was inspired by wind turbine sessions aimed at improving awareness of the growing European offshore wind

industry and the new jobs that were being created. After running many sessions where groups of students build towers, design blades and then measure the voltage achieved by their generator on a multimeter it was clear there was a need for a more engaging system that gave instant feedback and created a communal learning atmosphere.

The specification for the new software and hardware was to:

- Remotely log the generator outputs from all 10 teams
- Process the results simultaneously to show power output (watts)



Typical 3 blade hub



Hub with blade holders



Video clip courtesy of Malet Lambert School

- Display results as 'power meters' on a big map of Europe for all participants to see clearly
- Trace power output against time – for use during competition rounds
- Show which teams are accumulating the highest net energy (joules)
- Show the allowable wind speed for each team and include a randomisation feature

Preparation

It is ideal if preparatory work for Supergrid is carried out beforehand. This could be in maths, science, D&T or engineering or all areas and the activities can form the basis of a design project in, for example, Level 2 engineering. Prep work in science could be on how wind energy is

transferred into electricity and types of wind turbines available. Building a simple wind turbine with card and an axle or an anemometer with cups as vanes are both useful introductions.

In maths, students look at what a profit is and how it is made. They work out the unit price to charge once they have bought materials and have an idea of how much output to expect from their turbine. In D&T or engineering the design of the tower, the hub and the blade mounts all provide opportunities for design activity and where facilities permit, students design and manufacture their own hub/blade holders for use by their team on the competition day.

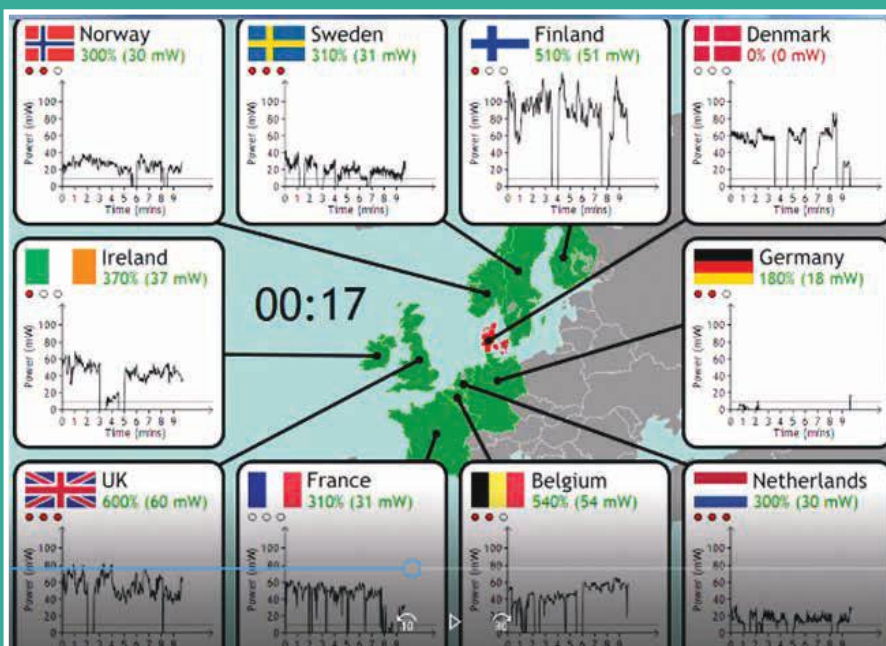
Students start the activity by designing and constructing their turbine towers, generally using

K'nex®, and the towers are attached to a standard 'foundation' to prevent them sliding across the tables. For pricing purposes, each team is given a known weight of K'nex and the pieces they don't use are returned and reweighted to determine the quantity used. Alongside tower build is the blade design and testing. 1.4mm mounting card makes a great blade material as it has limited flexibility and can be sourced as cheap offcuts.

Once their tower and blades are working short practice rounds are run to help judge the total power output over two or three minutes. The wind speed is variable – every 20 seconds a random wind speed is shown on the display against each country. The real challenge then comes when teams are asked to forecast their electricity sale price prior to each of three or more short competition rounds. On completion of the round the Supergrid software automatically calculates profit/loss based on their sale price and cost of turbine installations and points are awarded. Maximum points go to the team that charges least but still makes a profit. The competition increases as teams attempt to undercut each other's prices; this works when their windspeed is consistently good but in the event of a series of calms generation figures plummet and losses prevail.

The Supergrid resource is available from Redfern Electronics with training provided by UK STEM. The resource is ideal for consortia or outreach providers where a number of schools across a region can get involved.

<https://redfernelectronics.co.uk/>
<https://ukstem.uk/>



Live outputs from all turbines

Think like a designer

Chris Wilson, product designer maker

Why do some students find it easy to produce pages of design ideas, when some struggle so much?

Are we doing enough to give our students the best chance of becoming accomplished product designers? Is there a way to make this process accessible to all our students, not just the talented few? I've agonised over this for many hours over the years, searched for resources, given advice to students and still found most struggling to produce work they are pleased with, let alone proud of. The reality is often that many lose faith rather quickly and give up all too readily. Perhaps we then lower our expectations of what they can achieve.

So what's changed? Why do I feel like I've found an answer?

I realised that I was approaching this issue from the wrong direction. I thought I knew what I wanted, what my students should be producing, and how to get them to generate great design pages. As a student of the exam board specification and mark scheme, I knew what a design page should look like – or at least I thought I did.

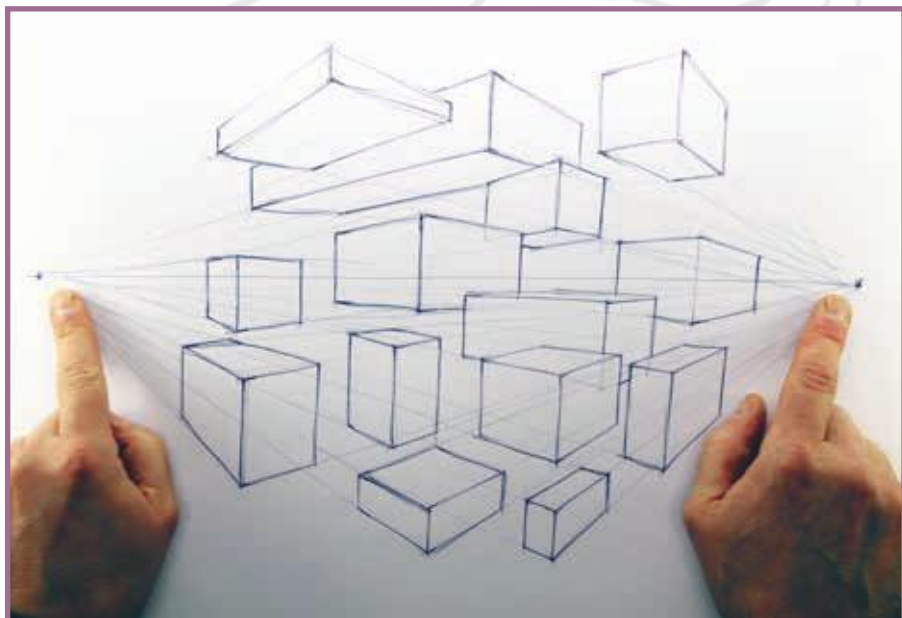


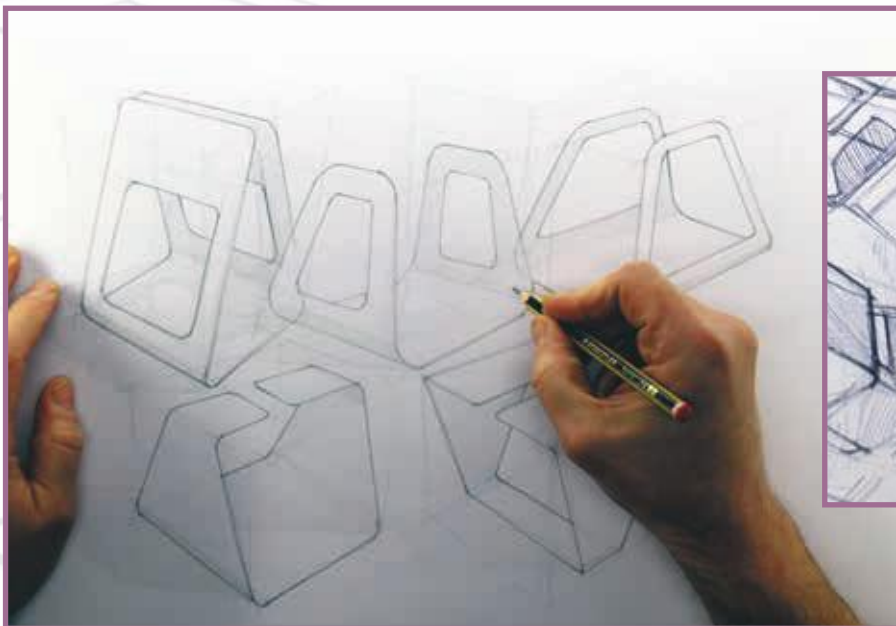
I was demonstrating techniques; I was showing my students the work of successful and celebrated designers and I was presenting them with exemplar design pages. I scanned the internet for images on Instagram and Pinterest and I sent them links to instructional videos on YouTube. In addition to all of that, I was exhausting my department budget to fill the shelves with inspirational books on sketching and rendering. I was surrounding my students with work of the highest quality.

What's the problem with that? Surely it's good to show students work they can aspire to?

I couldn't agree more, but first we must understand why that might not be the best starting point from which to inspire our students. Teenagers are complex beings with complex lives and complex needs, under all sorts of social and academic pressures. There's every chance that the student who sits down at the start of your lesson is feeling stressed or anxious before they even enter your classroom. They might have come from a lesson where they've been challenged on their behaviour, or perhaps there's some complex issue at home that's playing on their mind.

They might reasonably feel under additional pressure upon being presented with crisp, white A3 paper, asked to produce a page of design ideas, and told that the work will count towards their GCSE or A Level mark. We think we're making it easier for them by placing beautiful sketching and rendering books under their noses, but it's possible that we're adding to the pressure. Let's not forget that these books are produced by product designers at the very top of their game! We're giving them all the tools they need to produce incredible





design pages, but our hard work and encouragement could well be having the opposite effect.

We might have an occasional student with a natural flair for producing flowing design ideas on paper, but that won't be the norm. Within a room full of undergraduate product design students, there'll be no more than a handful able to communicate beautifully through design sketching. This will even be true of a large percentage of product and industrial designers earning big money in the world beyond the classroom.

How do we know when our approach isn't working?

With pencils and pens at the ready, most students will spend the next 30 minutes carefully working on design sketches that won't live up to their expectations. They'll be sufficiently disappointed with their efforts that they'll throw them away feeling that they've wasted their time and ours, and they'll have taken an unwelcome hit to their confidence and self-belief. If that's not enough to stop them trying, they'll head straight back to the book to see where they went wrong and the vicious cycle will continue.

What's the answer?

Rather than adding pressure, we need to do everything we can to remove it. Perhaps the most difficult job we have is to convince students that they mustn't care about the look of their design pages. To stand any chance of persuading them that this is

absolutely the right approach, we will need to believe it ourselves. If the last two sentences haven't struck you as absurd, then I'm hopeful I can explain why I believe that to be good advice.

I've already said that many successful product designers wouldn't claim to be able to produce design pages worthy of inclusion in books on sketching and rendering. So how do they keep busy with work every day? How can they charge premium prices? How do they convince their client that they're worthy of the brief?

Aside from being creative (and I don't mean particularly skilled at drawing) and expert in problem solving, the accomplished product designer must be a talented communicator. They must be able to both hear and speak to the client. Not just leaving a meeting with a few insights into the

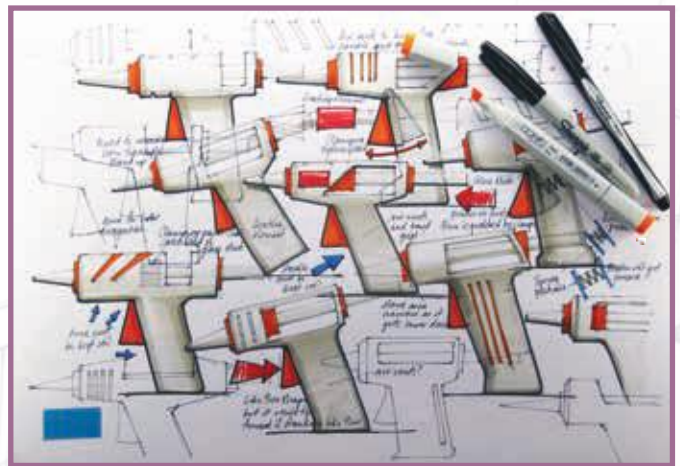
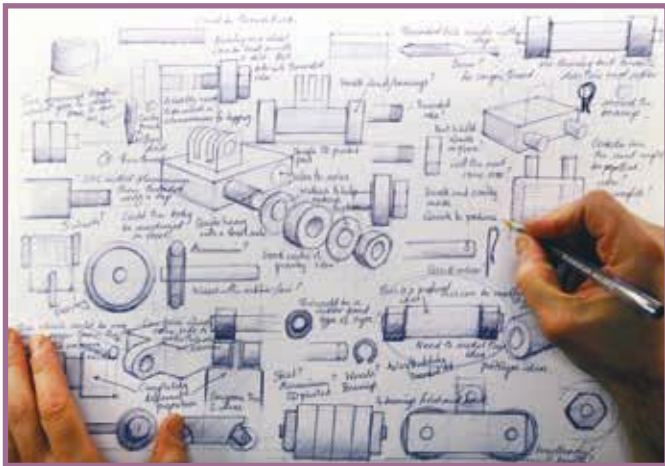
needs of the client, but a relationship built upon trust, and resulting in an honest dialogue lasting throughout the project and beyond. This should be our expectation of our students.

How do we measure the success of the product designer?

The product designer is judged by the success of the product, not the aesthetic value of the design pages. Does the outcome meet the needs of the client, the user and the target market? No-one buys a mediocre product because the design pages looked like artwork. A successful product designer might be measured by their skill to communicate with the client, the ability to get inside one another's minds as a vital step towards designing the successful product.



Secondary Communicating designs



What is the purpose of design pages if not to look good?

We produce design pages for a variety of reasons: recording our thoughts, visualising ideas and perhaps testing our theories. We might be checking sizes and proportions, exploring our imagination or planning our next steps through the design process. We might be listing details of materials and means of manufacture that we're considering.

One important feature of design pages is that they are something physical that forms a common ground between the designer and client upon which to form the basis of a discussion, the starting point for sharing thoughts, ideas, needs and expectations.

What practical measures can we take to help our students?

If we remove the pressure to produce beautiful sketches and encourage students to simply record their

thoughts and ideas, we will see their creativity blossom. They will overcome the limitations of their drawing skills, reduce levels of anxiety and develop their problem solving. We should encourage them to get their ideas down on paper quickly, as this will prevent them overthinking and stalling. For the product designer, time is money. Since the client wants value for money, and not to invest in beautiful artwork, the designer won't spend a moment longer on a sketch than is absolutely necessary.

Our students' design pages need to reflect their thoughts. We should help them understand that it's good to produce pages of rough sketches that help them to work through vague thoughts and ideas. These pages might help them to put greater shape or more form to their ideas. They might help them understand what they don't know, or what requires further research. We need to demonstrate that crisp new A3 paper is a resource that will help them to think, rather

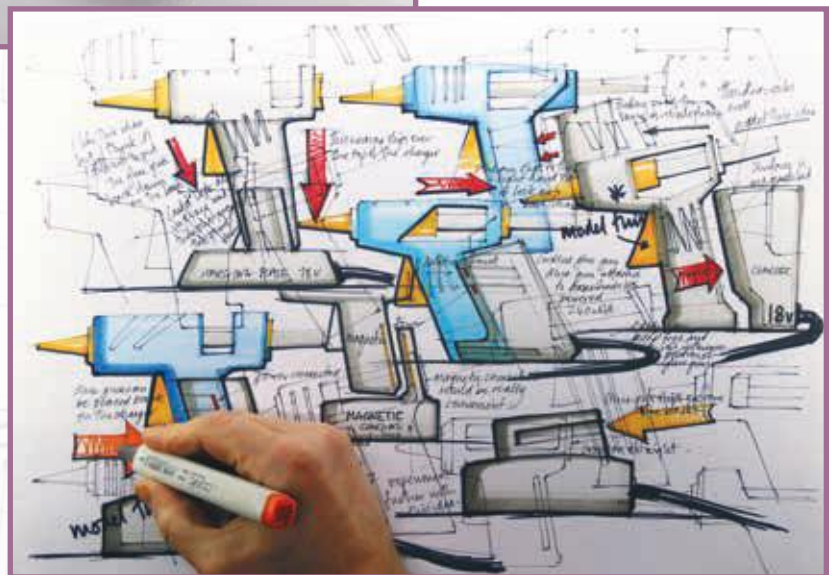
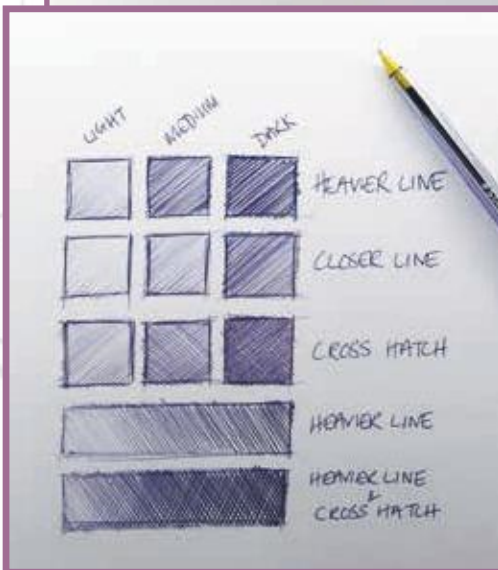
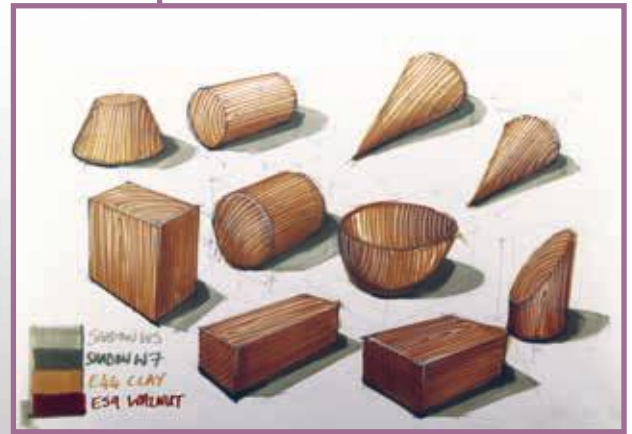
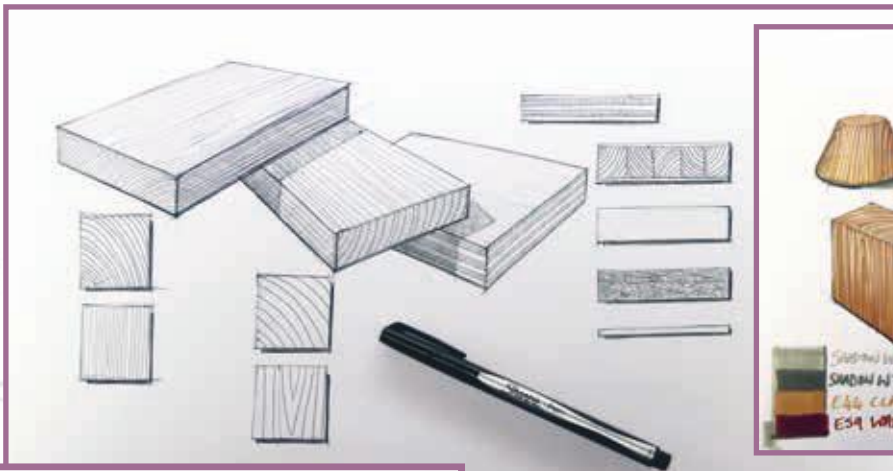
than be something to fear. We need to squarely place the emphasis upon the student being able to communicate, rather than to draw.

The more we can talk to our students as if they were designers, the more they will buy into the process, and the more they will gain from it. One way in which we can encourage them to see themselves as genuine designers is to ensure that they are working with genuine clients.

How do we persuade our students to find a genuine client?

If it wasn't already clear to them, we might list the benefits of working in collaboration with a client. Sharing the responsibility of decision-making, earning client approval at all stages (we only pursue an idea that the client endorses), design ideas grow organically with the client and designer feeding on each other's ideas. The GCSE and A Level examiner wants to see evidence of this collaboration; to see a design page with annotation and input from the client.





We should encourage students to produce some of their design pages alongside the client. Offering the client a different colour pen and giving them the chance to feed their thoughts into the process is a valuable part of this collaboration.

When a design page builds organically like this, with ideas evolving naturally in the form of sketches and annotation, we find that we care less about the look of the page, and more about the content: 'are our ideas good?' not 'does the page look good?' When we approach design work in this way, we are less constrained by a fear of not meeting our own self-expectation, we're more relaxed, more creative and much more productive.

Students will quickly develop a greater confidence in their work, leading to the generation of design work which is more convincing, more creative and more communicative. Encouraging students to care less about the quality of their design work will improve their ability to design.

What about product designer maker on YouTube?

You might be wondering why I'm suggesting you encourage your students to care less about the quality of their sketching when I populate my YouTube channel with videos explaining how to sketch! If you haven't watched and listened carefully to my videos, then I can understand why.

As I touched upon at the start, I used to look online for videos that explained how to sketch like a designer. I found these resources helpful for the small minority of students who could already draw really well, but increasingly I noticed the negative effect on those that couldn't. Whilst my videos can look like they're explaining how to draw like a designer, they are actually explaining how to think like a designer. The difference is subtle, but I'm seeing the results with my students, and I'm overwhelmed by the feedback I'm getting through YouTube, Instagram, Facebook and my website.

If you haven't already, please have a look at my videos. I suggest starting with 'Product Design Sketching with construction lines' or 'Product Design Sketching (annotation, what, how & why)'. These will give an insight into how I try to take pressure away from the designer, whilst empowering them to work with confidence.

I absolutely don't consider myself a graphics specialist, just someone with a few ideas to help those on their way to becoming accomplished product designers.

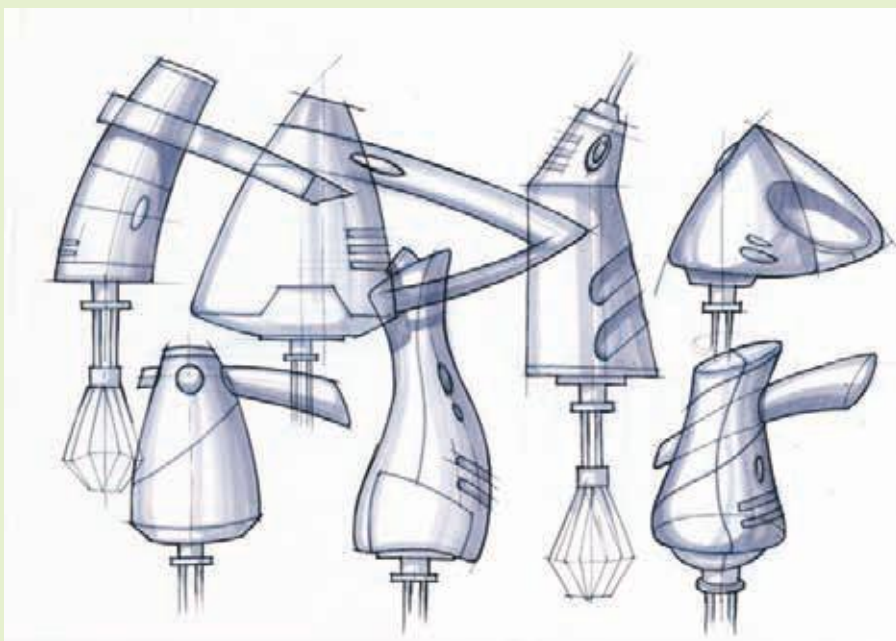
www.productdesignermaker.com/



Digital workflow: a design approach for now

Stuart Douglas and Paul Woodward, Rugby School Thailand

Rugby School Thailand welcomed senior students for the first time in September 2018 following the opening of the Pre-Prep in 2017. The school is based in a rural area outside the bustling city of Pattaya on the developing economic eastern seaboard, where design, manufacture and engineering are highly respected and valued. The school's owners have invested heavily into the start-up of Design and Technology, providing an amazing workspace for students, with a mix of 'traditional' subtractive material machines alongside additive manufacture, as well as investment into digital technologies for the advanced development of a modern digital workflow for design.



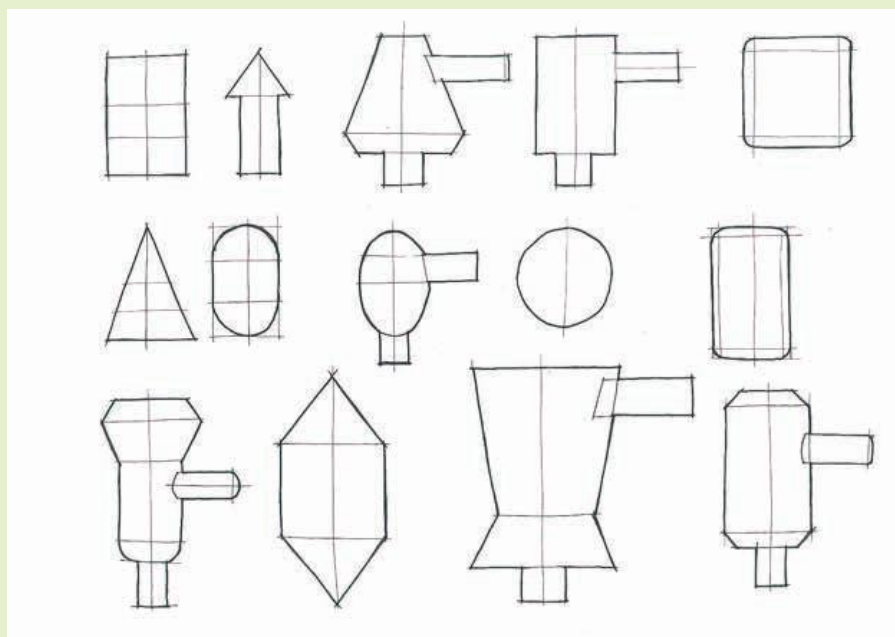
A marker sketch sheet

The importance of the pencil

We believe that every child has a creative mind full of innovative and imaginative ideas but, without the means to communicate their design intent, they could potentially never be fully realised. We endeavour to help

them realise their ideas through a variety of communication methods, using traditional 'analogue' skills and more modern digital techniques. This gives students the freedom to

use those methods that feel more natural and the confidence to develop skills they may be less competent in. This starts at Prep level, constantly reinforced with more advanced techniques in Senior classes, where the focus is on sketching using the simplest of tools: the pencil. From Y6 we encourage students to use a well-engineered mechanical pencil to demonstrate the quality of line that can be produced. Alongside this we recommend sketching in 0.7mm blue pencil lead as this allows them to show 'working out' as well as build layers into their work, with the added bonus that the blue line is very difficult to erase. While we use a variety of digital methods, some quite complex, the pencil is a powerful and cost effective tool for recording, sharing and communicating design intent and it is here where we focus a great deal of the teaching in all year groups.



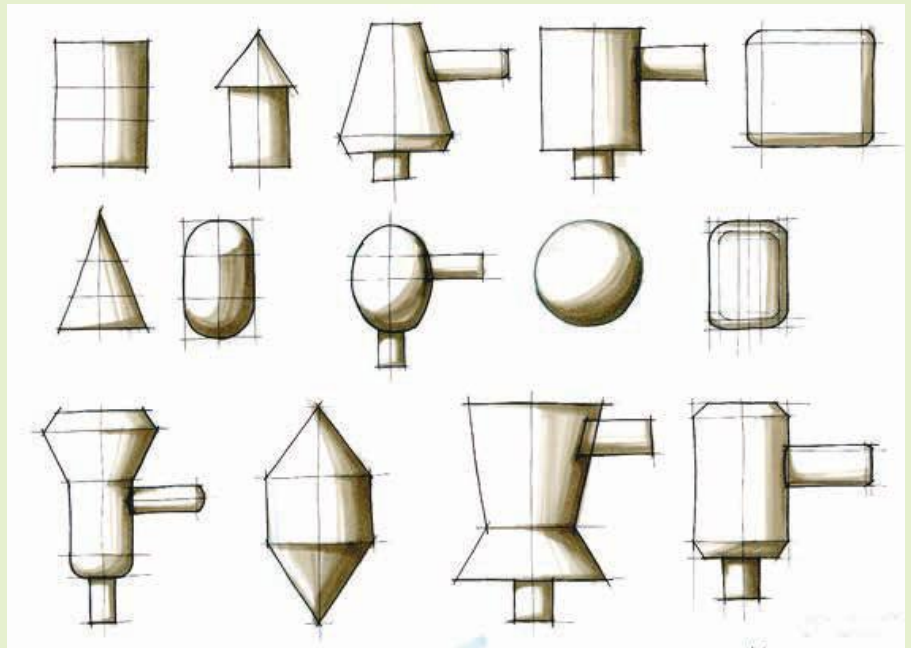
2D sketches of 3D objects

Digital technologies

We feel that the importance of being able to draw cannot be understated but we also embrace digital technologies and understand that they are vital skills to develop for the workforce of the future. We fully support the use of CAD and rapid prototyping technologies to support drawing in the visualisation and realisation of concepts and introduce these concepts from Year 3 onwards.

Technology is now a fundamental part of our everyday lives that will only increase in the future and our students will live in a predominantly technological society, so we cannot avoid using it to its full potential. While we value analogue methods of design and realisation, we are making every effort to incorporate a digital environment into D&T and make the flow from analogue to digital as natural as possible. To give an example: one exercise we introduce pre-GCSE is a simple drawing and modelling exercise. Here we have an A3 sheet consisting of a range of mainly cylindrical shapes with a few primitives (sphere, cube, cone etc.) thrown in, communicated in two dimensions. Students are given a sheet of bleed proof marker paper and a 0.7 mechanical pencil with blue lead and asked to copy these shapes to the sheet after an explanation, demonstration and practice at sketching out shapes, with centre lines. This sheet also becomes a reference sheet for the addition of tone when rendering future shapes.

These are the basic shapes they will draw either as forms or for 'crating' to draw more complex shapes within them. It is essential that they become confident drawing such 2D shapes



Simple marker rendering

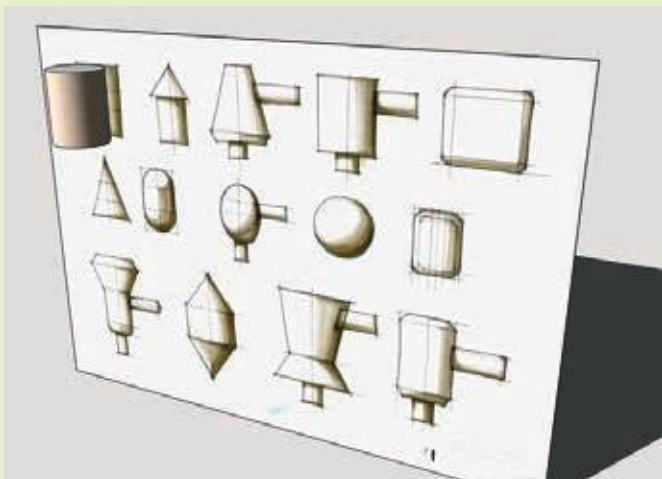
before advancing on to more complex sketches. Once the shapes are drawn confidently in blue pencil, we ask them to use thick and thin fine liner to outline and detail the shapes respectively. By using one light-coloured Copic marker we introduce how to render the shapes to look more three dimensional with additional dark details and shadows created using a soft black pencil. We demonstrate how light and shadow are affected by the 3D shape of the forms and how to use the sketch and render process to represent 3D form, although students don't always understand the physics and lighting that dictates how real objects look.

To address this, students photograph their sheets and add it to Google Classroom, so they can use it later as a template for producing 3D CAD models. Students have access to a range of CAD software in school

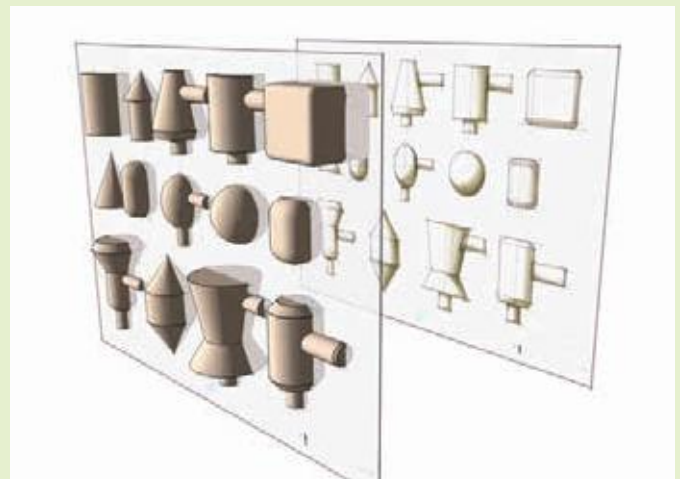
via iMac, iPad or their own devices, which run software such as Fusion 360, Procreate, Illustrator, Photoshop, Shapr3d, SketchUp and TinkerCad.

SketchUp as a sketching and modelling tool

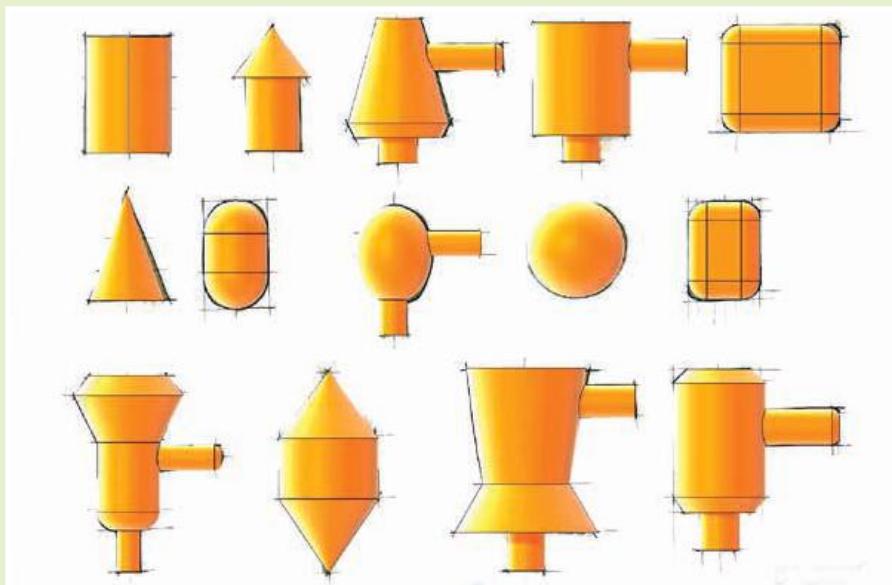
We use SketchUp for its ability to produce quick sketch-like models which complement the students' drawing skills. By applying the students' scanned sheet as a texture painted onto a plane in SketchUp, students use it as a reference image and can make use of the Push/Pull, Scale and Rotate features of the software to produce the different shapes. Various free plug-ins are also available to enable fillets and rounded corners.



Modelling against a reference image in SketchUp



The full set of modelled objects with reference image



Coloured and lit SketchUp 3D models

With the basic shapes drawn, students can then paint the objects to look similar to their marker rendering example. However, in this virtual 3D environment, they are able to move the position of the sun using the shadow option to explore the different effects produced by changing the lighting. By doing this with light and 3D modelled objects, they can see how and why they created the same effect on paper using pencil and markers. This link between analogue and digital reinforces their understanding of how to represent 3D objects more confidently through their drawings.

This relatively simple process provides a means of relating 3D form to 2D drawn imagery and they can save the model to Google Drive for use with the free iPad viewer.

Fusion 360 for parametric CAD

Next the students move on to the use of more advanced 3D software using Fusion 360. The intent here is to show how parametric software gives them more control over their designs as well as the ability to create assemblies, render out models and make use of rapid prototyping to realise their ideas. In Fusion they learn additional tools such as Extrude, Revolve, Fillet and Loft features as well as how to edit and apply materials, render out the results and process one of the objects as a 3D printed component. All their digital work is saved to the cloud allowing them to access them from any computer or iPad later (Fusion has an iPad viewer) and this also allows the teacher to monitor their progress from anywhere at any time.



A Styrofoam model of a 3D object

It is then possible to take the 3D model from Fusion 360 and export it to provide a 3D object that can be printed. These are scaled to a reasonable size and printed so that students can appreciate that 3D printers can give a more accurate outcome using much less of their valuable time, but they can also make their own choice of which process they prefer. Despite the novelty of 3D printing, a surprising number seem to enjoy the traditional modelling process which is also echoed in their love of drawing with paper and pencil.

The students now have a range of digital and analogue assets and a greater appreciation of how 2D marker rendering relates to 3D form. We can now bring the process full circle and use the work created to produce a

Physical modelling of objects

At this point we take the sketching and modelling and learn to realise shape and form through traditional methods utilising a range of hand tools. Using Styrofoam, they choose one of the more complex objects from the sheet and model it using hand tools. For older students we also encourage the use of the lathe to shape symmetrical parts in foam. This is often impractical for larger groups so we give a demonstration of the benefits of using the lathe so they can consider its use in the future and at examination level. Through this process they connect the form they have drawn on paper and modelled on screen with a physical artefact that can be appreciated through touch, feel and sight.



Coloured and lit SketchUp 3D models



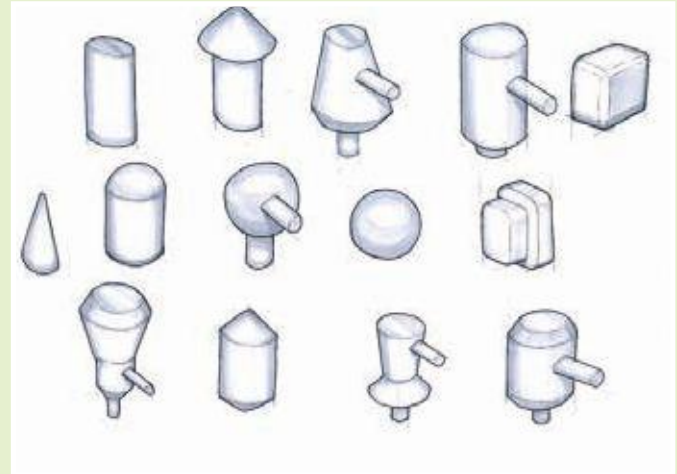
3D models made in Fusion 360



Textured and rendered images in Fusion 360



3D Model and 3D printed outcome



3D marker renderings from the reference images

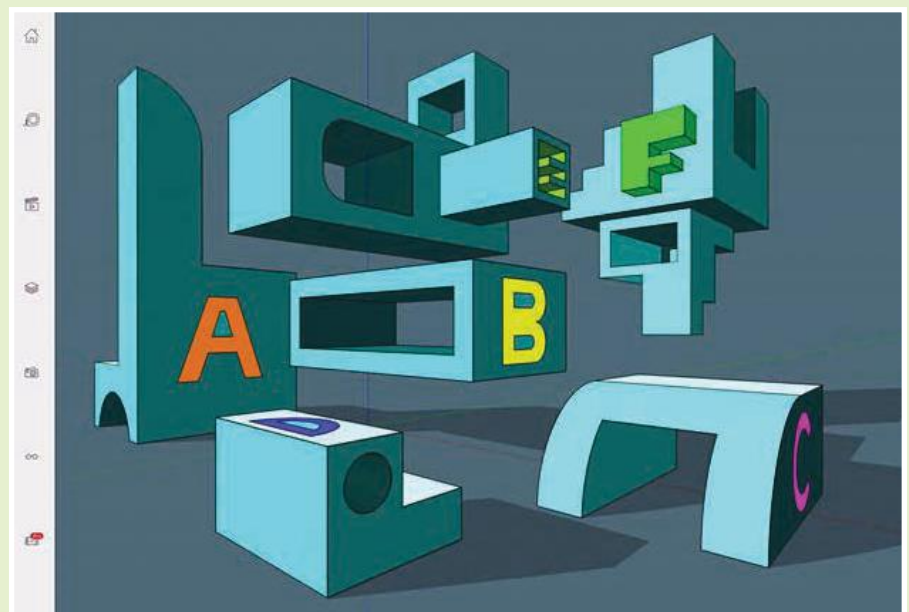
3D marker rendering of those simple 2D objects that started the process. We use the reference images and renders that are generated from the CAD software to draw the objects in 3D. All of this helps students to gain confidence in communicating their ideas while also developing their 3D and spatial awareness. While this may seem a basic exercise, it covers the important skills needed to communicate simple ideas through basic shapes in 2D and 3D.

Digital compositing and enhancement

By this stage, students have experienced a range of techniques and processes associated with communicating and realising a simple idea, but the process is not yet over, and they will use the iPad and Pencil 2 (the department chose the iPad Pro for the additional power, quality and flexibility) to evidence a digital workflow. The same process we use could be done with the latest

generation iPads and Pencil which are often more affordable than a basic laptop. The iPads are equipped with Procreate which is a fantastic real drawing app that has a wealth of features suitable for use by D&T

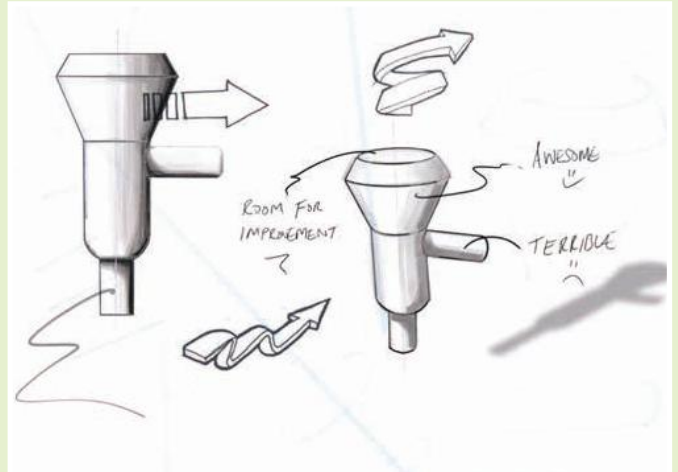
students. We also have Shapr3D, Fusion 360 and SketchUp viewers on the iPads which now allow everything to be processed in a digital environment without needing access to computers.



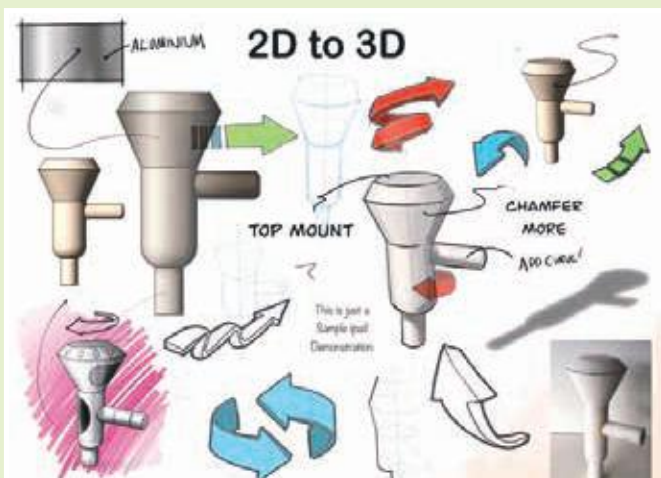
SketchUp 3D Model viewed on the iPad



Fusion 360 3D Model viewed on the iPad



Sketching over 3D models



Bringing digital and physical work together



Student example of integrated design work using Procreate

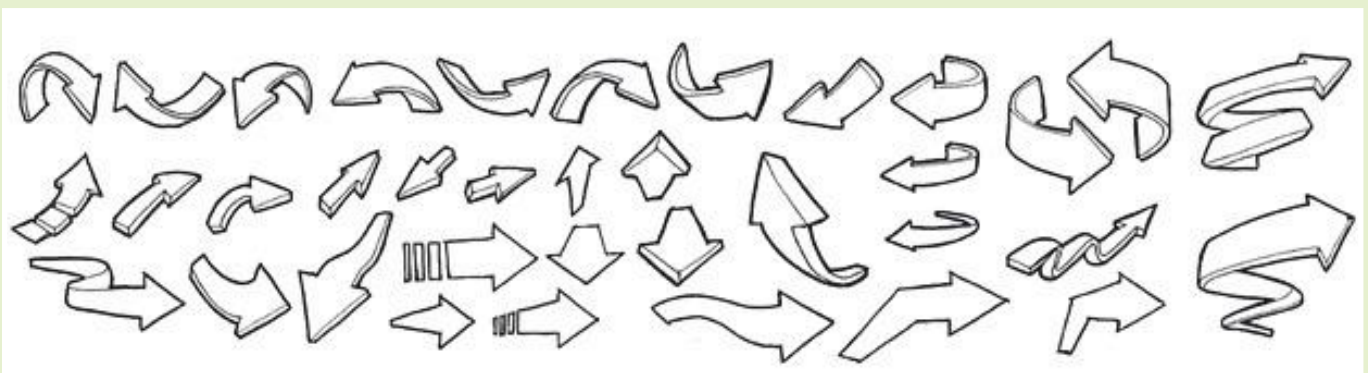
With a model made in Styrofoam, and potentially 3D printed, we then turn to the iPad as a tool for recording, collating and evidencing material to demonstrate an integrated approach that can be edited digitally before being added to a burgeoning digital portfolio of work. Students have photographed or scanned all their sketch and marker sheets, they have rendered images of their CAD models and they now have physical 3D models. All of these are then uploaded to their Google Drive and placed into Google Classroom for

assessment. All of this is done from the iPad with no need to access a desktop computer.

The physical foam model produced can often be inaccurate due to the inexperience of younger students, but here we encourage sketching over photographs (digital) of those models using Procreate where it can be corrected through the digital sketch. Through this process they learn to use the image layers like a layout pad and sketch a new iteration over the existing drawing, CAD model or physical model.

Digital workflow

D&T is highly respected as a subject in many schools in Asia and the department at Rugby School Thailand presented a rationale to invest in iPads and Apple pencils rather than laptops in order to improve the creative and digital workflow. We don't use as much paper or printing and it all flows into a digital folder, using Keynote and Pages. Students as young as Year 3 are becoming accustomed to this process in preparation for a curriculum we hope will be fit for a digital future.

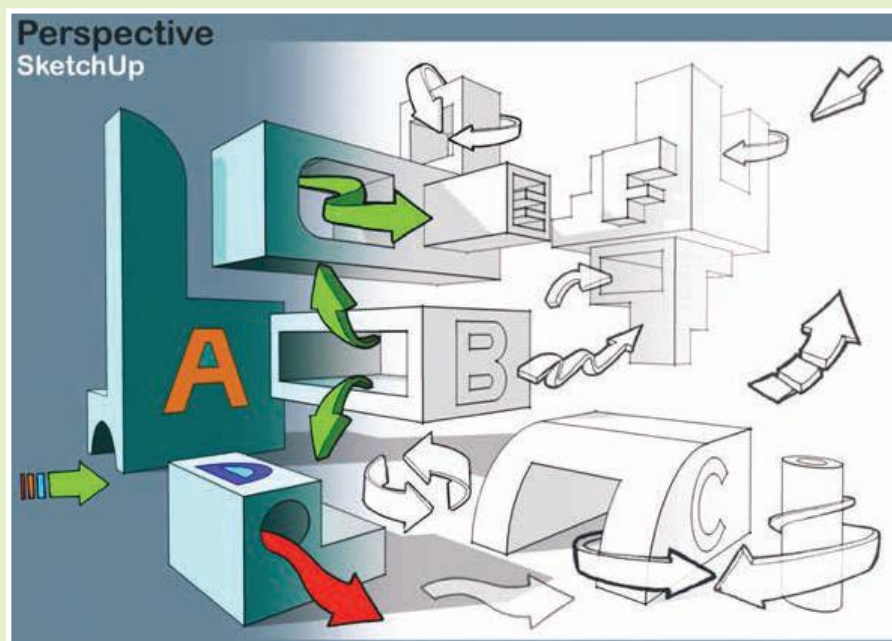


Flow arrows for use in communicating design intent

After the initial exercise explained above we encourage students to communicate their sketching in a digital environment and to advance beyond basic 2D and 3D drawing. They learn the principles of 2-point perspective for 3D sketching and also how to use flow arrows and textures to enhance their design intent. As their confidence grows, they can create personalised digital assets to incorporate in their designs and to give their work a unique look.

Through a series of drawing exercises using a digital medium, students use the skills and techniques learnt to improve their 3D drawing and to enhance their communication. This image is just a sample screen with various elements taken from 3D models, cropped flow arrows and the text tool for annotation. All done in Procreate.

While students undertake contextually focused design tasks we continue to develop these communication skills and use the iPad as their main source of image collation and processing to the point that they will eventually sketch directly into the iPad as part of the ideation process and can also open and manipulate SketchUp, Fusion or Shapr3D models on their device. Coupled with Keynote, PowerPoint, Word and numerous other productivity apps, they can create and develop most of their work within the digital realm. The whole process begins with a sketchbook (all IGCSE students are



A composite of various render stages

expected to purchase one of good quality) and pencil which are still highly valued and prized by D&T staff at RST, but the digital workflow is something we feel is of great benefit to their workflow and to prepare them for a life in a workplace and a world where digital technologies will be prevalent. What is fundamentally most important is that they learn to communicate their design intent and develop their ideas through whichever media is most intuitive and productive for them. By giving them such a wide range of analogue and digital options to do this, we hope to unleash their creativity and remove any restrictions to their innovative ideas being fully realised.



A perspective drawing produced using Procreate



The James Dyson Foundation

Transforming the way we teach Design and Technology

The UK faces a greater breadth of challenges year on year, such as the need to develop clean transport solutions, manage the risk of cyber-attacks, and meet the needs of an ageing population. Engineers are the ones with the skills and knowledge to tackle these challenges. Despite this the UK still faces an annual shortfall of engineering graduates and technicians, which reached 59,000 in 2019. ¹ The James Dyson Foundation believes that tackling this shortfall starts in the education system where we need to support and nurture a generation of problem-solving, academically-minded young people who are ready to pursue engineering careers.

Often students' closest experience of engineering in primary and secondary education is through Design and Technology (D&T). However, nationally the outlook for D&T in schools is not good. In some cases, D&T lessons are failing to inspire students as they focus student learning on making fixed, irrelevant and uninspiring items. What is more, D&T is having to compete with EBacc-status subjects meaning

the proportion of students who are choosing to study D&T at GCSE is falling and the rate of decline is accelerating. Indeed, the number of students choosing to study the subject at GCSE dropped by 23% from 2018 to 2019. ² It is no wonder that this is reflected in the proportion of engineering graduates and technicians entering the workforce.

Inspiring engineers

As a result, the James Dyson Foundation set up a research project in 2012 with five schools in Bath, which ran until July 2018, to improve their provision of D&T. The aim was to inspire young people to become engineers by bringing real-life design engineering into the classroom through problem-focused, open-ended projects supported by access high-tech equipment. The projects were rooted in the iterative design process and real-world engineering challenges. Students identified a specific problem to address and worked to solve it using engineering skills. Solving the problem was the focus, rather than just creating a perfect end solution.

Annual surveys conducted in the schools revealed that more students were engaged in D&T and their perception of the subject transformed over the course of the project. Students went from associating D&T with fixing things, to making and designing. It became a subject in which they gained the skills required to solve problems they encountered in their own lives, but also problems that had a wider, global impact such as environmental degradation. It was a million miles away from being given the brief to make a keyring or pencil case. The effect was made tangible with a 37% increase in students choosing to study D&T at GCSE over the course of the project. This is in contrast to a 54% decrease in students choosing to study D&T on a national scale, in the same time period.

Getting the numbers up

Notably, more than double the number of students showed interest in pursuing a career in engineering. Also, students more readily made the link between D&T and engineering careers

– a link that is often not made. This suggests that by aligning the subject more closely to engineering, it may start to inspire students to pursue engineering as a career. Therefore, it makes sense to argue for the incorporation of the word ‘engineering’ into D&T’s subject name – Design, Technology and Engineering (DTE). This re-brand may drive students, teachers and the government to take the subject more seriously and put in measures to help transform the subject on a national scale.

The project also had a dramatic effect on student perception of the relationship between gender and engineering. With female engineers making up just 12% of engineers in the UK, the lack of women in the field exacerbates the current engineering shortage.³ However, over the course of this James Dyson Foundation project more students stated that engineering was a good job for both males and females. This resulted in 38% of the GCSE cohort being female in 2018 and three times as many female students stating they would like to be an engineer.

What the project has shown is that the government and UK education system should not resign themselves to the idea of D&T’s demise. Rather, the project substantiates the argument that with the right support and approach, Design, Technology and Engineering has the potential to directly address one of the country’s most pressing questions – how are



we going to fare in an increasingly technology-led world faced with pressing global engineering challenges if there is an annual shortage of engineers?

To empower educators across the UK to transform the way they teach the subject in their schools the James Dyson Foundation has made the schemes of work developed in the project available to download, for free, from its website. These resources challenge students to solve real world engineering and design problems in a variety of contexts. Introducing these new projects and teaching methods in classrooms is a step towards

reversing the decline in the uptake of Design and Technology in schools and, in time, can help to address the national shortfall of engineers.

jamesdysonfoundation.co.uk

¹ Engineering UK 2019 Excel Resource: <https://www.engineeringuk.com/research/data/2019-excel-resource/>

² D&T Association, GCSE Examinations Results Review 22nd August 2019, available at: <https://www.data.org.uk/news/gcse-examinations-results-review-22nd-august-2019/>.

³ Engineering UK 2019 Excel Resource: <https://www.engineeringuk.com/research/data/2019-excel-resource/>



Ten tips to make your

We all recognise that D&T is a valuable and creative subject, but this is not an understanding that is universally shared. Better recognition in and out of school means you can attract more funding, students, support and get better results. To ensure that your department and the subject are valued as they should be, consider these tips for building the profile of D&T within your school and encouraging your students and teachers to develop and excel.

Tip 1 – Design

Use your, your colleagues' and your students' design expertise to improve aspects of your school. If you can't think of ideas your students will and you can save the school some money in the process.

- Corporate identity – rebranding the school and department.
- Improving facilities – better equipment and ways of accessing these.
- Accommodation redesign – getting input into classroom layout and appearance.

Vision and positivity

How does D&T fit into the school's vision? Think about:

- What does the subject mean to you?
- What difference does it make to your students?
- What do students think about D&T lessons and the value of the subject?
- What does it mean to parents and the wider community?
- How do others in school feel about your department?

How can you build positive, well organised advocates for D&T?

- Effective team working – ensure everyone buys into the department's and school's vision.
- Set an example with your own outlook to motivate

and improve staff and reward them for their positivity.

- Effective planning – set visible, achievable goals and meet them step-by-step.
- Aspire to greatness through results, engagement, networking and influence.

Communication

- Think about what your department might be and the influence it might wield.
- What steps do you need to take to get there?
- What does your department look like now and how might it appear with a few changes?
- What do people from outside feel about the way your department communicates itself?

Tip 2 – Displays

Celebrate all successes, however small. So much great work never gets displayed in schools and the effort that goes into it is not recognised. Take opportunities to get the message out that D&T is making a difference.

- Front entrance displays are essential for visitors and other school staff.
- In the classroom display objects that show the range and applications of D&T as well as student work.
- Keep displays up to date, and with up-to-date, cutting-edge content.
- Include careers information – the jobs that studying D&T might inspire students towards.

Tip 3 – Teaching

Develop a reputation for innovative practice and celebrate and promote effective teaching including using student mentors.

"We are really good at:

- Teamworking
- Presentation and communication
- Creativity
- Problem-solving..."

Tip 4 – Money

In school, keep close contact with the bursar or business manager, but look elsewhere for sources of funding also. Local firms may donate materials or even staff time to help develop the range of your department. Funding can come from a wide range of sources:

- Charities
- Competitions and awards
- Regional projects
- Sponsorship

department shine!

Tip 5 – Curriculum

- Network with other departments within school.
- Look for links across the Sciences and Arts and time your teaching to be complimentary.
- Drive the STEM agenda with D&T at the core.
- Remind others that D&T is the realisation of what is learned in maths and science and other subjects.
- Look for opportunities for the subject to show what it can do during cross-curricular weeks.
- Engage with and link to vocational options.

Tip 6 – Community

Make use of the community outside of school for support, materials and celebrating engagement through marketing. Community and industrial links are great for:

- Visits to local companies.
- Mentors – parents are a great resource.
- Remote manufacturing.
- Press and publicity – get your school visit or a company's support celebrated in the local press. You may have to write it for them!

Tip 7 – Students

Student role models can be your best ambassadors and generate enthusiasm amongst others. Mentoring and pairing can help younger students develop skills quickly. Older students (with support) can organise and run engineering, CAD/CAM, GreenPower, Young Engineers etc clubs and enter competitions. Use former students as ambassadors and careers models.

Tip 8 – Aim high

- Aspire to be the best – healthy competition with other departments and schools.
- Embed the reputation and image of D&T as a successful department in and out of school.
- Go for competitions, awards, grants, prestige, recognition, and reward and share your success.

Tip 9 – Sustainability

Funding for sustainability is likely to be maintained and can have a huge potential impact upon the whole school environment that can be driven by D&T. Curriculum links are not explicit in the national curriculum but the GCSE and A Level specifications all include sustainable design and manufacture as a central feature. Sustainability awards offer opportunities to show your commitment.*

Tip 10 – Creativity

Creativity should be at the heart of the curriculum and its place fully appreciated in school. Get facts and figures about the creative subjects' contributions to the economy and jobs in areas such as digital design for computer games and film industries, innovative manufacturing, fashion and textiles, and product design.

Let it be known – design and technology is the most valuable subject in school!
With thanks to David Anderson for the original inspiration.

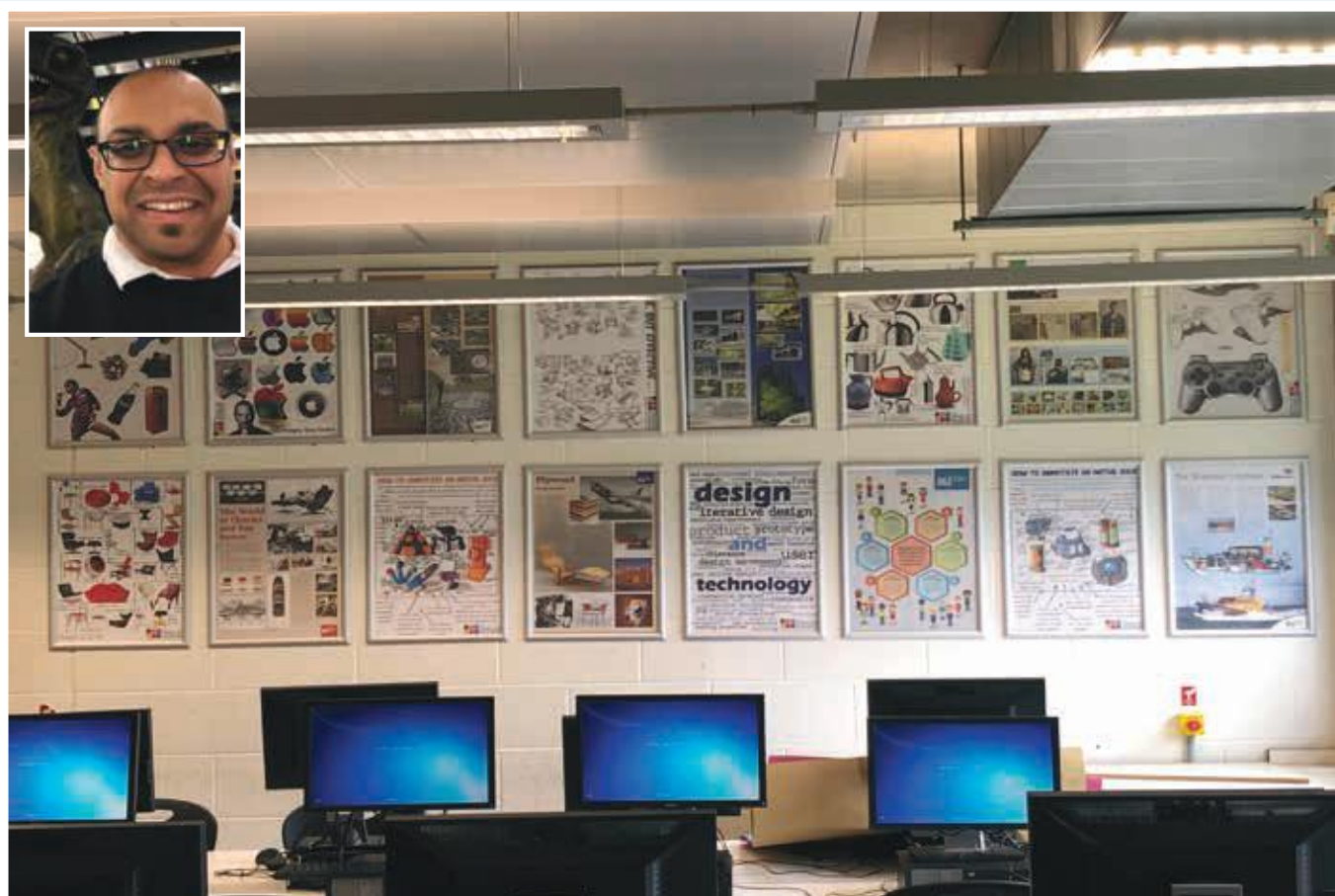
*See the D&T Association website for details of free sustainability challenge courses.

I'm a Design and Technology Teacher

What's your superpower?

Ketan Lad, Langley Academy

Part 2



Back in September last year, I wrote an article in this magazine which I hope has inspired colleagues to promote our subject. As Design and Technology professionals we spend a lot of our time making sure that students achieve their full potential, however are we setting an example ourselves with the surroundings that students are working in and do they link with the content of our new curriculum? If you have read Part 1 of the article you will have seen what I managed to do single-handedly (without a technician) in five weeks! Now six months later, this a further update...

Update

A lot has happened since last September. I have been promoted to the Head of Faculty for Design and Technology and employed three new members of staff. As a faculty we have quadrupled the number of students studying A Level, schemes of work have been completed for all years, projects are more orientated around practical skills than folder work, the faculty is running in an organised manner, new equipment has been purchased. The list goes on....

Sorted

Organisation within the D&T faculty is very important, especially for day-to-day operations. This applies more to the technicians' room than any other, as this is the central focus point for the multi-material area. I organised this technical room so that materials and tools were easily accessible, hazardous materials (like chemicals and portable power tools) could be accounted for and stored in lockable cupboards, and the technician had an area to work in. If you look at the area now and compare this to the same room six months ago, you'll see a mammoth set of differences. Timber is stacked on brackets or within dividers



(in order of thickness) to ascertain stock availability. A safe-storage unit has been purchased and secured to the wall to store the important stuff (machine keys, power keys, etc). The stock cupboard (or Aladdin's cave as I called it) is tidy and arranged so that any member of faculty can get what they want straight away, which sets out a positive environment and mindset for us all to work in.

On the subject of organisation, I found a cupboard full of technical drawing boards and parallel motions that appeared to have just been thrown in and locked away. Technical drawing aids are very expensive (especially in this climate of education budgets), so I made some beams out of 12mm plywood and created a vertical stacking system where the boards could be placed properly and made accessible, and my newly recruited colleagues have begun making some use of them.

Curriculum

Delivering an exciting curriculum is always going to be a challenge as there are so many factors to consider. My predecessor had already laid down some of the foundations for a creative learning environment, however I wanted to make it more robust and challenging and relate it to the new GCSE. In addition, I wanted to reduce the amount of acrylic and HIPS we used, given the challenges the world currently faces with the use of plastic.

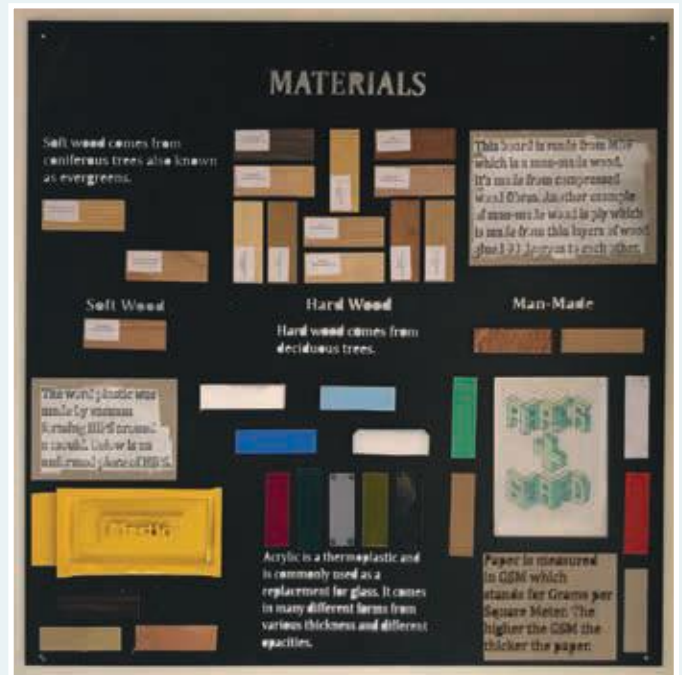
In Year 7, students are introduced to the workshop and manufacture a pencil holder, a sweet-dispenser and an e-textiles product; they also develop their visual communication and design skills and undertake a range of foundation skills in cookery. In Year 8, students design and manufacture a pencil box using various joints, an engineered CAD/CAM ear-phone wrap and a recycled/renewed storage product in textiles. They continue to work on their communication skills and undertake a range of advanced skills in cookery. As we deliver a three-year Key Stage 4, Year 9 is all about gaining skills to put students in good stead for a successful outcome of the NEA in Year 10/11. Students undertake a pizza-cutter challenge, a museum

learning project, a Cadbury's project, skills based-joints (paper and timber), a multi-material mobile phone holder and a reading-book page divider and so on...

Museum learning

I wanted to take advantage of Museum Learning within the department. As you enter the atrium of the Academy there are six display units, which showcase a variety of historic and modern artefacts. In November, I was given the opportunity to choose specific furniture (from the Crafts Council) to display as I wanted to use this for a practice NEA project with Year 9 students. The main objective of this unit is for the faculty to teach focused skills and design; and make activities so students have the tools to work independently in their NEA. Specific lessons have been designed for the students that covers writing a design brief, primary and secondary research, how to communicate ideas and use different media, rapid-prototyping, customer feedback etc. Students have been given a contextual challenge of creating a piece of furniture using the influence of live research. To be successful, students will need to carry out observation drawings of the artefacts and the museum coordinators have arranged a trip to the Design Museum to give students the opportunity to get ideas first-hand. The outcome will be for students to showcase their final design (scaled) to the stakeholders of the Academy.





Wall space

New school interiors are predominately one of two materials: plaster board or breeze blocks and Langley Academy is constructed with the latter. Breeze blocks can bring a very cold, industrial feel to the whole room and this was definitely the case for the CAD/CAM room within the faculty. I purchased and assembled various brushed-aluminium clip frames around the room to display posters and students' work. These were a great investment as you can chop and change visuals instantly and it makes the room feel modern and vibrant. In addition to this, to make the faculty link with the Multi-Academy Trust, some of my Sixth Form Students constructed the school logo and ethos using recycled multi-materials. This was completed with the help of our 'Designer in Residence' - former student, Sehanna Dev (see page 6).

Sehanna is a former student at the Academy and has been employed as a 'Designer in Residence' for two reasons, firstly to support the faculty and secondly to complete her sandwich year as part of her undergraduate qualification. She has been an excellent addition to the faculty; not only has she supported a range of specialism classes but she has also undertaken several projects that have assisted with student's learning and that would have taken me additional time to complete. For example, she has constructed a material board showcasing different timbers, polymers and metals.

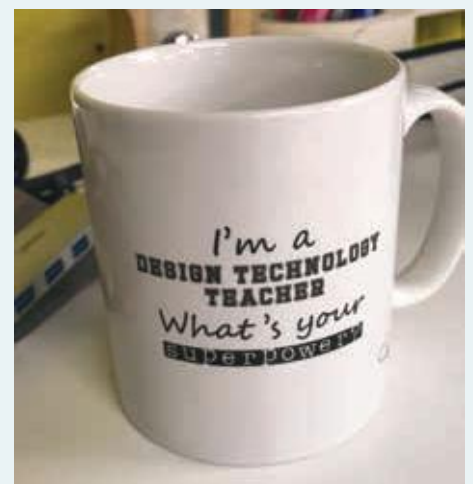
Sustainability

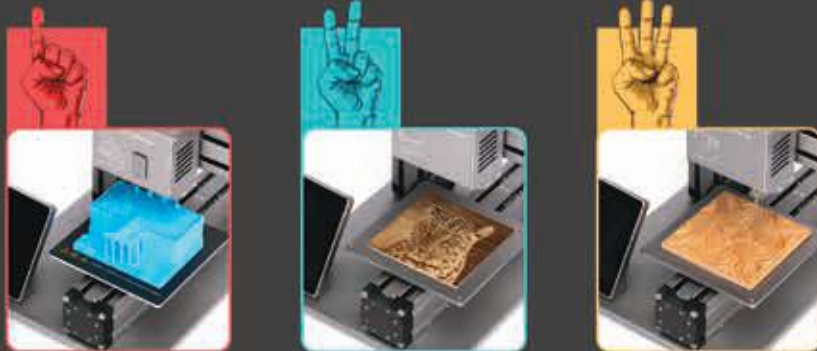
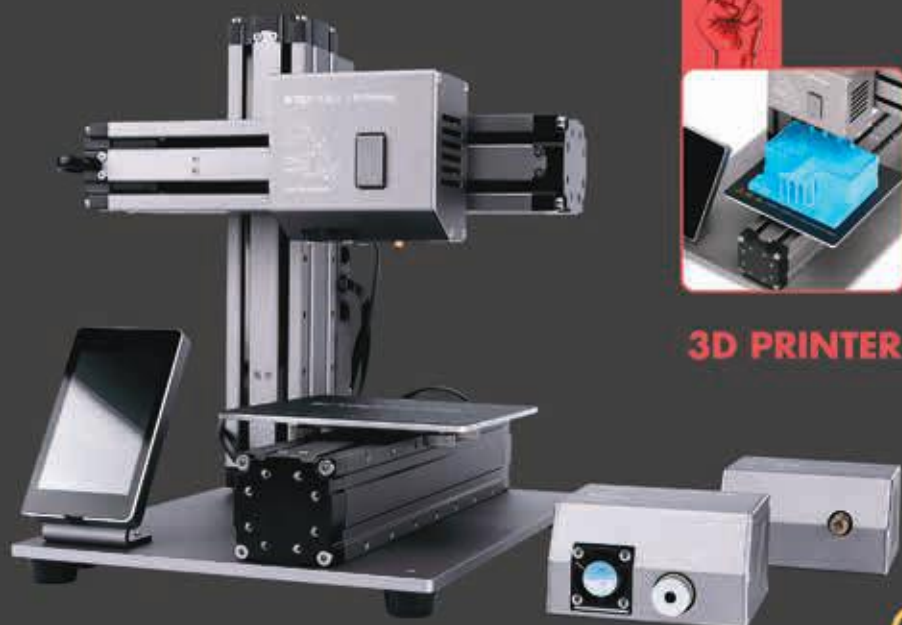
Design and Technology faculties are notoriously known for having off-cut material and we are no different. The Academy's Art department donated their display boards, which were in great condition, and we decided to use them for the Year 11 students undertaking their GCSE NEA. I also found lots of off-cut acrylic material in one corner of workshop, which now gets used for the earphone wrap project in Year 8 and part of a project in Year 10. In addition to this, a lot of the Year 11 development models have been manufactured from corrugated card and cereal boxes, which has really helped bring the cost of materials down. Corrugated card has been regularly collected from the reprographics room and when deliveries come into the Academy.



Future

So, what's next? Well I have not yet tackled the Faculty Food and Textiles specialisms. We have one dedicated room for Textiles with sewing and over-locking machines. The subject is delivered by an experienced teacher, who is very passionate about the subject and has recently introduced electronics in to her specialism. The food rooms both need renovating; one is a general food room while the other serves the teaching of Catering. Some technological investments need to be made within the multi-material workshops, for example smart boards, a 3D printer, a mug press and T-shirt press. With these final resources and some very well-planned lessons using the new schemes of work, I strongly believe this can become an extremely successful faculty.





3D PRINTER LASER ENGRAVER CNC CARVER

3-IN-1 Snapmaker

If you're looking for affordability and versatility look no further. The **Snapmaker** is a 3-in-1 unit with a robust but small build aimed at workshops with limited precious space. The Snapmaker accomplishes multiple functions in one machine via modular, changeable toolheads.

flamefast
HELPING YOUNG MINDS BURN BRIGHTER

01925 281 230
www.flamefast.co.uk

MOULD YOUR IDEAS

THE FORMBOX DESKTOP VACUUM FORMER WILL
BRING YOUR CLASSROOM TO LIFE!



Formbox

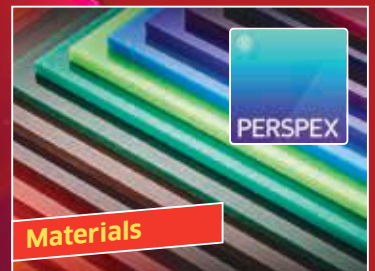
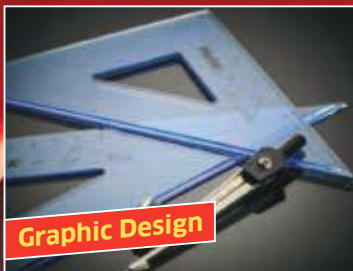
The Mayku Formbox is a powerful desktop Vacuum Former ideal for Schools looking for cost effective solutions. Powered by any vacuum cleaner, it works with a variety of materials.

FormBox also works in combination with 3D Printers, CNC Milling or Laser Cutters and Engravers, allowing even more diversity and creativity across Food Technology, Art and Design Technology departments.

MAYKU

GET D&T SUPPLIES FOR LESS!

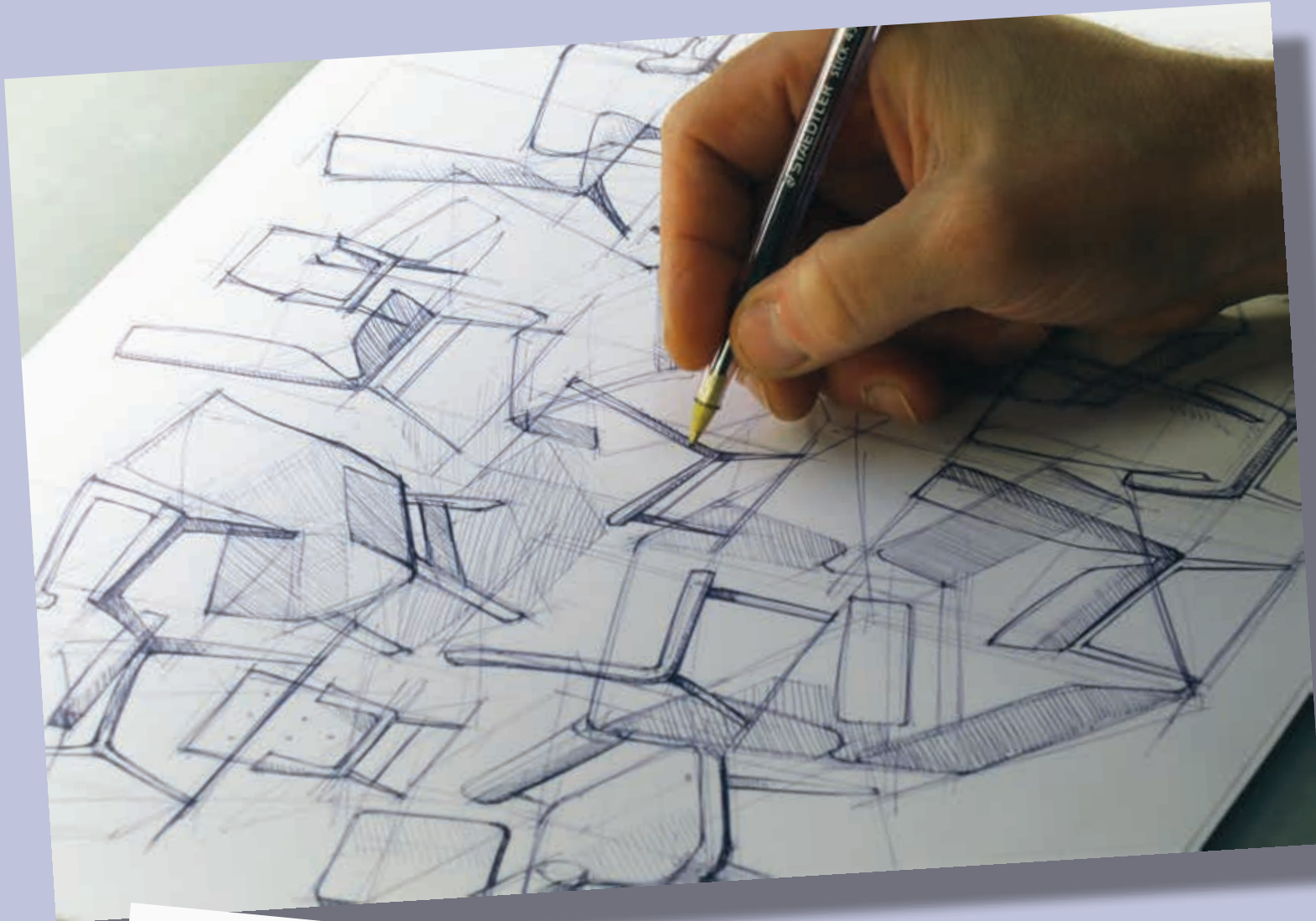
HEART EDUCATIONAL



ORDER ONLINE NOW
www.heart-educational.co.uk
ORDER YOUR FREE CATALOGUE
Call 0116 2744 744



Communicating design ideas



Get ideas down quickly – your design sheet should be the visual equivalent of thinking out loud

Think about how you are communicating with the client, model maker or machinist involved in manufacture

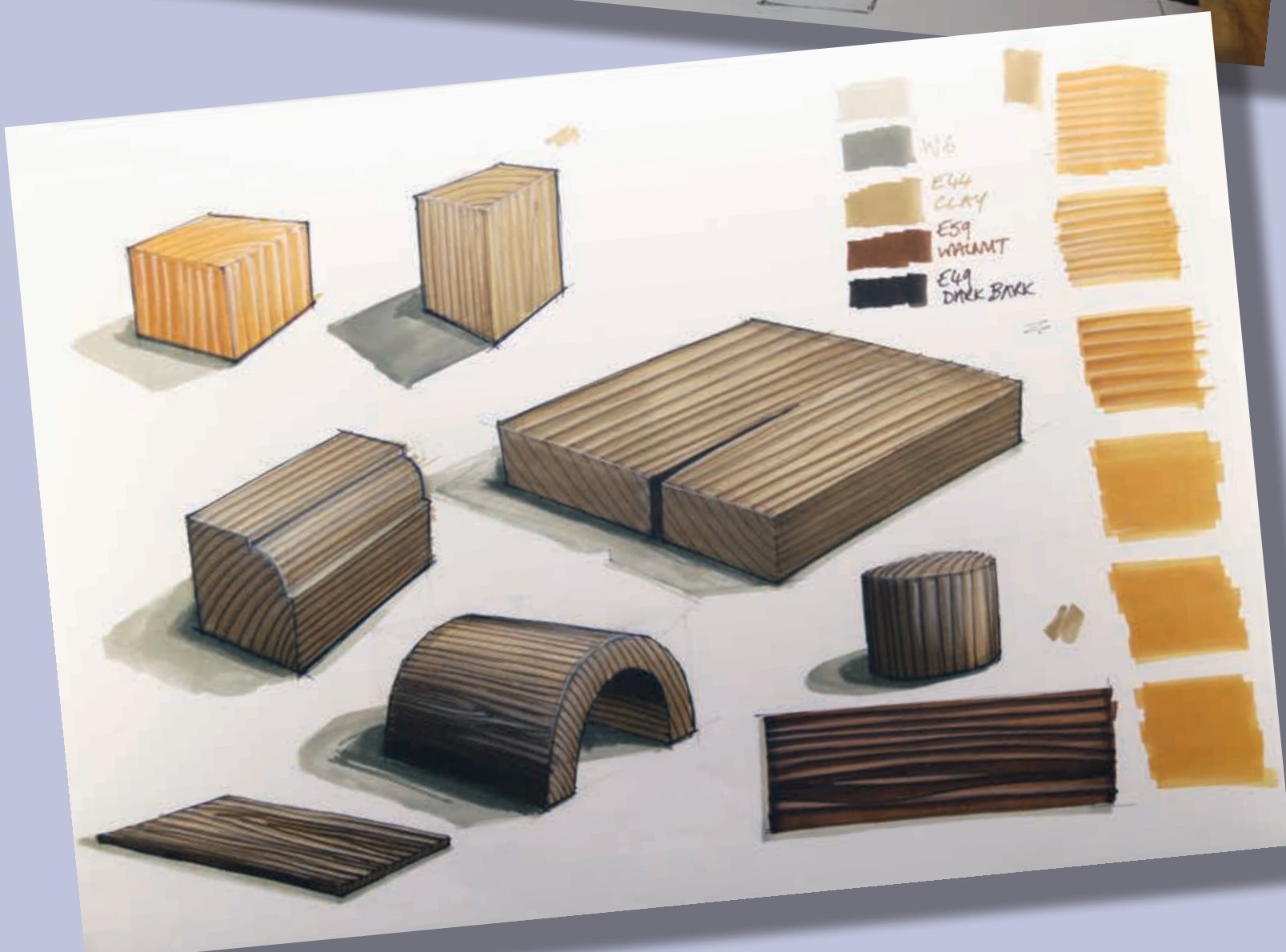
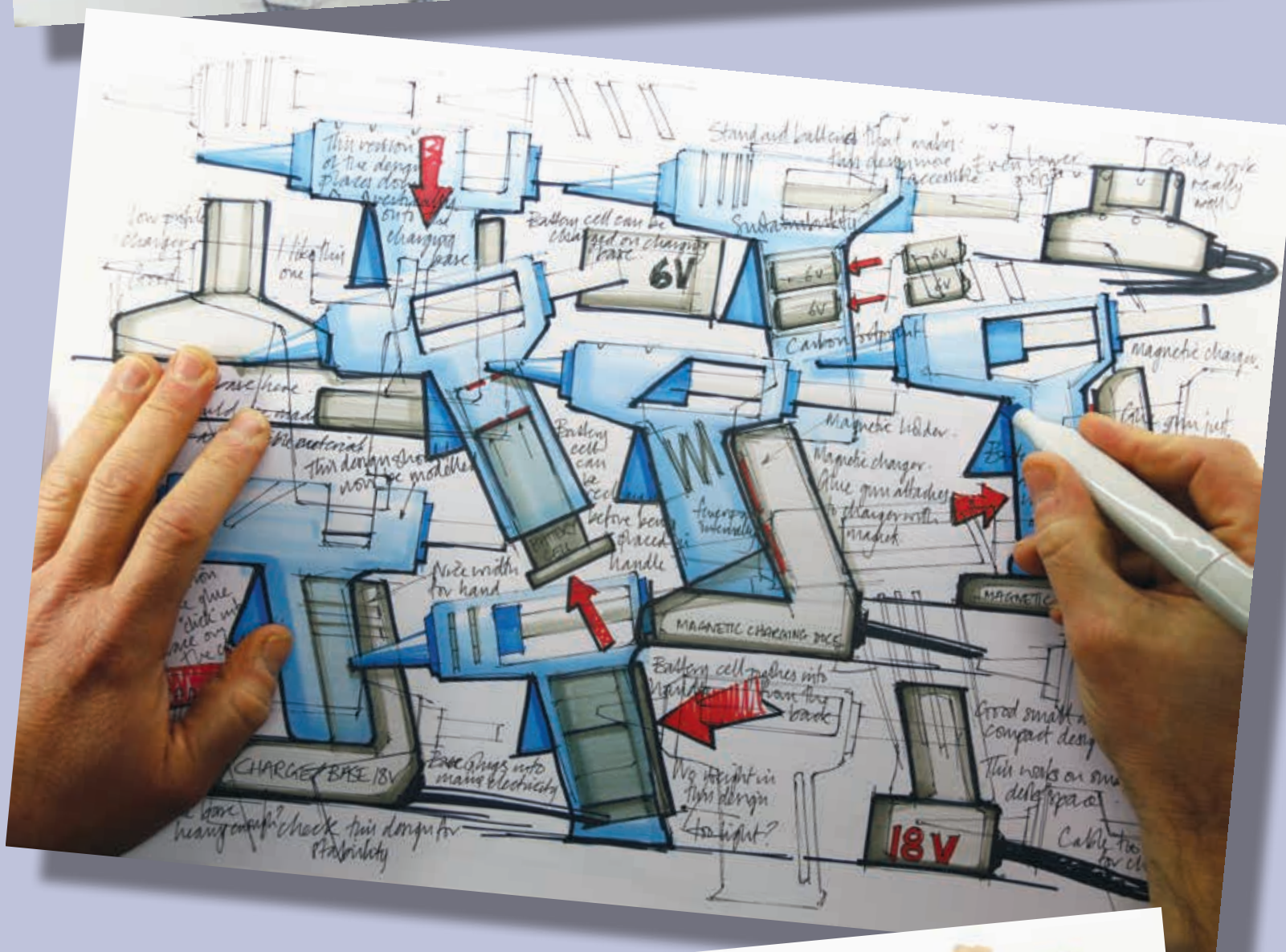
Don't worry about producing a finished piece of artwork – it is all about exploring ideas and being creative

Annotate your work with notes – include your thoughts about materials you might use, problems you may face, possible sizes, tools and equipment, cost and timescales

Fill your page - cover every square cm with your thoughts and ideas

A successful design sheet should **communicate your ideas** and be a record of the design process

Again, remember, **you're designing** and not producing artwork!



This is D&T



Take away the people and almost everything else in this photo has been designed and made: the clothes, bedding, cushions, cupboard and shelves, glassware, pot, tiles, pictures and picture frames, guitar, bed... even the pizza.

Look around your house and you'll soon see that most of what you have has been designed and made.