THE JAMES DYSON FOUNDATION

DISASTER!

Design and Technology scheme of work

Key stage: 3

Duration: 6 weeks (approximately 12 hours)

Project overview: Design a 'disaster box' containing all the essential supplies that might be needed for people to survive a natural disaster.

The James Dyson Foundation is a charity supported by Dyson Ltd.

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OVERVIEW

ABOUT THE SCHEMES OF WORK

This scheme of work has been designed to support you in delivering project-based, engaging and relevant Design and Technology (D&T) lessons that are mapped to the Key Stage 3 (KS3) national curriculum progression framework. KS3 is a key point in students' D&T learning, as it's at this stage that they need to make a choice about whether to continue studying D&T at Key Stage 4 (KS4). Offering students high-profile, projects at these times can inspire them to want to continue learning about technology and engineering.

Through this resource, students will learn how to take risks, be resourceful, be innovative and be enterprising. They will also learn about design engineering and begin to develop the skills needed to become an engineer.

LEARNING OBJECTIVES

Objectives
Understand how to use real design techniques to solve real problems.
Analyse and apply iterative design processes.
Identify and master the technical skills needed to produce design solutions.
Produce a functioning prototype that could solve a relevant problem.

ABOUT THE SCHOOLS PROJECT

The UK faces an annual shortfall of 59,000 graduate engineers and technicians

Engineering UK, 2018

Students' closest experience of engineering in secondary education is through D&T. Too often the subject is taught through limited and irrelevant project work. This approach neither promotes student engagement in the subject, nor reflects the exciting reality of an engineering career.

The James Dyson Foundation believes that a D&T curriculum based on iterative design, problem-led and project-based learning is more relevant and engaging to students. As a result, students enjoy D&T more, their perception of engineering improves and more students choose to study D&T and pursue engineering as a career.

Between 2012 and 2018, we worked with five schools in Bath to test this hypothesis. We helped these schools to develop their D&T labs and worked closely with them to develop schemes of work that reflect our beliefs.

Thank you to the teachers and students at Writhlington School, Ralph Allen School, Wellsway School, Hayesfield School and Chew Valley School, who helped to develop the content for this scheme of work.

As a result of our intervention:

32% of students chose to study D&T at GCSE in 2017, against a national figure of 18%.

Over the course of the project, student uptake of D&T at GCSE increased by 37%, whilst the national uptake has decreased by more than a half.

7% of students across all the schools opted to study D&T at A Level in 2017, against a national figure of 1.7%.

Over the course of the project, there was a 156% increase in the number of students who would like to pursue a career in engineering.

Between 2012 and 2018, there was a 300% increase in the number of girls who would like to be an engineer.

TEACHER RESOURCES

TEACHER'S NOTES

Context

The project comprises a design engineering task to solve major problems affecting life in the immediate aftermath of a natural disaster (such as an earthquake or a tsunami).

Although this context deals with large events which may take place thousands of miles away, and which are generally outside of students' first-hand experience, the increase in extreme climate and weather events means there is a high degree of awareness of such events among students. There is also a very high level of sympathy for the people affected.

The large-scale nature of the context will help to show students ways that engineering can help alleviate the effects of extreme and catastrophic events, providing a positive example of engineering in today's world. The focus on a disaster box poses a design challenge which is manageable and helps to show how even large-scale events can be approached by small solutions.

Autonomy

Please note that this project is designed to have open-ended outcomes. It does not set out to define products or systems which might make good designs. Rather, it puts emphasis on the students identifying and developing good designs.

The variety of possible solutions enables students to retain a degree of autonomy over their design and decision-making. This may mean that some students create prototypes that do not achieve great functionality. It is important to recognise this as a normal and useful function of the design process.

Scenarios

Design projects usually succeed best if students readily identify problems to solve and negotiate approaches with their teachers. Sometimes, though, students can feel inhibited about coming up with problems and need some encouragement to engage with creative thinking.

This project focuses attention on creating a box of essential supplies for survivors of a disaster. To keep prototyping and evaluation manageable, we have suggested constraining ideas for the disaster box to some of the issues that arise most often in disaster situations, such as the basic need for shelter, safety, food and drink, communications, search and rescue, waste disposal, disease prevention, transport and energy supply. Aspects of the box such as size, materials used in construction and the ways it is to be delivered have also been emphasised.

Learning management

As this is an open-ended design challenge, the usual caveats apply about progress, pace and standards associated with practical work. The specified evaluation points enable teachers to hold students or teams to account for the progress they have made.

Design iteration

While students should aim to create a high-quality final prototype, our goal is for students to practice the non-linear and iterative design process. They should understand that they need to master technical skills in order to create their design solutions.

The scheme of work requires that students produce a number of prototypes from the second week onwards. Making early rapid prototypes with card and glue, or through CAD and 3D printing, is part of the learning and evaluating process. It ensures that students make improved versions of their designs within the project's time allocation.

Carrying out this design/make/evaluate cycle allows students to demonstrate skills in analysis, judgement and synthesis, while simultaneously developing their technical skills. The outcomes of students' work may be products or systems, but they will be prototypes and not finished products.

TEACHER'S NOTES
CONTINUED

Mapping

This project has been mapped to the KS3 D&T Progression Framework and to the D&T Programme of Study for KS3 (PoS 2014). Please note that this mapping is indicative only and acts as a guideline for teachers. You and your students will use a range of techniques and materials according to the needs of their design ideas, and some content may be covered in more depth than others. You can use your professional judgement as to what masterclasses and other teaching is needed to ensure students can demonstrate their design and technical skills.

JDF project backbone

This scheme of work has been created in line with the format that is applied to all James Dyson Foundation project work. This format is outlined below.

Phase one: Conception
Introduction to the contextual area and identification of problems, issues and user needs
Phase two: Development
Research into evidence and sources Analysis of risks, scale, impact and affected people Compilation of the design brief, project plan and evaluation criteria Compilation of individual sketches and drawings
Phase three: Realisation
Early prototyping of possible solutions Evaluation and iteration Taught masterclasses to achieve technical skills Completion of iterated and developed prototypes
Phase four: Explanation
Presented explanation of the prototype and design process Portfolio

TOP TIPS FROM TEACHERS

Our resources have been created with the help of our champion teachers in our five Bath schools. Below are some of their hints and tips for running a James Dyson Foundation project.

Shift the focus to the design process, as opposed to assessment and producing a finished product.

If possible, arrange for students to present their work to an external visitor. This allows the students to take ownership over their project.

Teach technical knowledge through practical activities – this way students are more likely to retain this knowledge.

Remember these key words when planning lessons: Risk, failure, autonomy, iteration and prototyping

Teach failure as a technical term, not a criticism or opinion.

Create a habit of constantly documenting students' work.

Test, test, test – fail, fail, fail.

Avoid linear processes.
Avoid fixation.

Be brave!

SCHEME OF WORK

OVERVIEW

Project overview

This project is intended to be a high-profile activity for year 7 students. It can be used as an introduction to student-led problem solving. Because of the external engagement with the project, it can help students to learn purposefully under time and resource pressures.

The project explores the contextual theme of responding to the unexpected. It is based on the scenario of a large-scale disaster, where the means to carry out everyday life have suddenly and dramatically been removed. The challenge is to create a rescue design that supports people or communities who find themselves in this situation.

The project is intended primarily to inspire students to think of design and engineering solutions to real human problems. **This has two key functions:**

- To promote a positive attitude to technology and engineering, where students experience the positive effects they could bring to human existence.
- To help students realise some of the stark differences between highly-developed societies and those where life is an everyday struggle.

The project works best if the disaster scenario is real. Floods, hurricanes, earthquakes, volcanic activity and droughts are all good stimulus events. The project was first used in the shadow of the Nepalese earthquake of 2015. The key is that the event should resonate with the students on a human scale. It is best if the event is reasonably current, and can be highlighted with good reportage and information. There will also be opportunities to explore cultural and other needs.

Given the age, experience and maturity of the students, it is suggested that a range of potential human needs are examined to identify the problems that victims might face, from shelter, safety, security, food and drink and communication, to pollution, waste and disease. However, in guiding practical and manageable solutions within the scope of the project, these can be condensed into essentials for a 'disaster box' for initial disaster relief. What it contains, how it is made and how it is delivered or reused are decisions that should be made by the students.

This project can be enhanced through the involvement of real relief agencies. In the UK, the DEC (Disaster Emergency Committee) works with 14 key agencies who may be willing to participate. ShelterBox have also been successful partners. If practical to organise, the project climax is a presentation event, which provides an ideal opportunity for students to demonstrate and discuss their ideas with these relief professionals.

Curriculum mapping

This project is mapped to KS3 Design and Technology national curriculum/Programme of Study (PoS) 2014.

The Programme of Study identifies seven key areas:

Design – understand contexts
Design – generate, develop, model and communicate ideas
Make – planning
Make – practical skills and techniques
Evaluate – own ideas
Evaluate – existing products
Technical knowledge – making things work

OVERVIEW CONTINUED

Success criteria

All	Most	Some
Engage with a range of information about catastrophic events which impact on humans.	Demonstrate basic understanding of the practical and emotional impact of sudden disaster situations.	Make connections and analysis from observations of given examples of disasters. Demonstrate understanding of a range of critical factors affecting human survival.
Research and record information about disaster events from given sources.	Research independently and from given sources, and record key and common features of disasters.	Use individual research, from a range of appropriate sources, to comment on a range of disaster situations.
Act as part of a team.	Make an effective contribution to a team and understand the needs of other team members.	Understand roles and strengths in working as a team. Make a key contribution to achieving outcomes in a given time frame, taking into account the needs of all team members.
Develop a series of design ideas that generally reflect the design brief.	Apply some different and relevant design approaches that lead to ideas that offer scope for challenge.	Apply different and relevant design approaches that lead to non-stereotypical ideas and fully reflect requirements.
Develop design ideas through experimental prototyping.	Understand how ideas can improve through iteration.	Use consistent design iteration to combine, synthesise and extend ideas into new concepts.
Evaluate a series of design ideas using a set of evaluation questions.	Evaluate a series of design ideas using a range of evaluative tests, and reach conclusions for further development.	Use a range of appropriate evaluative techniques to provide evidence and priorities for further development.
Identify, justify and understand the technical skills required to carry out their project.	Identify and apply the technical skills required to complete the project.	Identify, apply and explain how technical skills have been used to enhance functions and outcomes.
Produce a final prototype that is generally functional or demonstrates the main intended functions.	Produce a final prototype that is made with enough structural precision to demonstrate key functional aspects and comprises generally appropriate materials.	Produce a final prototype that is made with accuracy and precision. Functions are appropriately demonstrated and show the use of a range of appropriate techniques and materials.
Make a contribution to a presentation.	Make a relevant contribution to a presentation which effectively explains the project process and outcomes.	Make a relevant contribution to a presentation which effectively explains the project process and outcomes.

WEEK 1: CONCEPTION

Overview

Students are introduced to the concept of disasters, where the fundamental basics of living have suddenly been removed. They are encouraged to understand how a hierarchy of needs exists, and this hierarchy has to be met in order for other needs to be addressed.

Resources

Relief agency volunteers/materials

Current news sources

Useful references

CNN coverage of the 2008 Sichuan earthquake:
www.youtube.com/watch

Coverage of the 2011 Tōhoku tsunami:
www.youtube.com/watch

Government website – Humanitarian emergencies:
www.gov.uk/humanitarian-emergencies

Planning

Learning objectives	Teaching and learning activities
List and categorise types and magnitude of recent natural disasters. Identify and understand obvious and unexpected risks and needs facing humans in survival situations.	**Pre-prep (optional)** Teacher-led introduction to the project theme. Students research the types and magnitude of natural disasters which have occurred during a calendar year. Teachers may guide students as to the range of events researched. Teacher shares film/media clips of one natural disaster. The most relevant material shows the aftermath as well as the event, including personal experiences and responses. Consider recent disaster events, such as floods/earthquakes/hurricanes/volcanic eruptions.
Discuss and express responses to disaster situations. Compare everyday life before and after disasters occur.	A seminar session is held to identify and discuss the major risks and challenges to survival and recovery created by disaster situations. Survival factors may include shelter, safety, food and drink, communications, search and rescue, waste disposal, disease prevention, transport and energy supply. If practical, this session should be led by relief agency representatives visiting the school. If not practical, the session is teacher-led. **Note:** At this stage the objective is to understand a range of problems. Leaders should not provide what they see as the solutions. **Table continues overleaf.**

WEEK 1: CONCEPTION CONTINUED

	In discussion with expert contributors, students reflect on the practical, and possibly emotional, realities of survival situations. Students note/record their responses.

Curriculum mapping

Design skills	Technical skills
DA1 Develop detailed design specifications to guide their thinking. **DA2** Use research, including the study of different cultures, to identify user needs. **DA4** Develop design specifications that include a wider range of requirements such as environmental, aesthetic, cost, maintenance, quality and safety. **DA11** Analyse where human values and compromise has to be achieved. **EA3** Select appropriate methods to evaluate their products in use and modify them to improve performance.	

WEEK 2: CONCEPTION

Overview

Students start to think like engineers, considering ways in which they might start developing designs that could rapidly bring relief to communities in danger. They have to logically prioritise and justify engineering decisions they make.

Resources

Exemplar materials (e.g. wood, metals, polymers etc.) to support student understanding of the characteristics and properties of a range of materials which could make the disaster boxes fit for their design purpose.

Planning

Learning objectives	Teaching and learning activities
Understand and use logical techniques to reach decisions. Agree actions based on evidence gained through testing and evaluation.	Students share responses to the seminar held in the previous lesson. In pairs, they prioritise the problems that have been identified in a draft hierarchy of needs, from critical to optional. At this stage, the problems associated with disasters have been identified and categorised. Students are briefed that they will work to create a real prototype to solve one or more of the prioritised problems. Their task will be to produce a disaster box which contains what they judge to be vital aids to survival. They will need to: – Justify the size and shape of the box – Justify its materials and structure – Justify how it is to be delivered to a disaster area The completed boxes will be presented to representatives from a relief agency or to school leaders in the final session.
Participate in and understand effective teamwork, communication, roles and responsibilities.	The project is best tackled as a group exercise. Teams can either be set in random groups from 3–5 members to work on general solutions or, if time allows, teams can be set up to consider one of the survival factors from the project brief: shelter, safety, food and drink, communications, search and rescue, waste disposal and disease prevention, transport and energy supply.

WEEK 2: CONCEPTION CONTINUED

Apply criteria to assess user needs.	Students may have a special interest in a particular factor. It will help if students are given an opportunity to negotiate team membership. Each team produces a basic design brief, with the support of teaching staff. Teams will consider: – A range of users – Their practical and cultural needs – Listed needs in priority order.

Curriculum mapping

Design skills	Technical skills
DA3 Identify and solve their own design problems. **DA5** Research the health and well-being, cultural, religious and socio-economic contexts of their intended users. **EB2** The positive and negative impact that products can have in the wider world.	**TK1** How to classify materials by structure

WEEK 3: DEVELOPMENT

Overview

Student teams consider a range of trial and error ideas to establish whether the ideas have design merit. They share their ideas and test out their first thoughts about what is really essential to fit into a very limited space.

Resources

Card, paper, glue, tape

Hand tools, cutting and joining equipment

Variety of textiles

Planning

Learning objectives	Teaching and learning activities
Develop ideas through making, discussion and review. Take design risks and trial novel methods to produce innovative solutions.	The design brief should initiate a discussion in each team. Teams should produce a list of ideas for the following points: – The contents of their disaster box – the essential items and the purpose/function of each item. – The structure/size and construction of their box. At this stage, students should be as radical and unrestrained as they like. There are no right or wrong answers. Students produce initial prototypes demonstrating their ideas, using readily available materials. At this stage, it is important that students do not fixate on only one potential solution.
Recognise relevant feedback and use it to make appropriate conclusions. Make judgements according to evidence. Experiment with a range of design ideas and integrate them into a coherent design plan.	Student groups share their initial ideas and prototypes. The purpose of the evaluation is to help groups to make decisions about which of their ideas to take forward to functional products/prototypes for presentation. At this stage, you may guide groups into more specific areas of work to ensure success. Specific areas for students to concentrate on might include: – Delivery methods – airdrop, vehicle, by hand – Alternative uses for box – Communications devices – Location devices – Costs/accessibility The above will affect the design durability, weight and materials of the prototypes.

WEEK 3: DEVELOPMENT CONTINUED

Curriculum mapping

Design skills	Technical skills
DB5 Use specifications to inform the design of innovative, functional, appealing products that respond to needs in a variety of situations. **DB8** Decide which design criteria clash and determine which should take priority. **EA3** Select appropriate methods to evaluate their products in use and modify them to improve performance.	**MA6** Match and select suitable materials considering their fitness for purpose. **MB1** Make use of specialist equipment to mark out materials.

WEEK 4: DEVELOPMENT AND REALISATION

Overview

At this stage, teams have established the key design features of the boxes and contents they want to develop. They are now expected to recognise some of the challenges they face in making their prototypes, and to think about the technical skills they need to create good functioning models. They also identify the tools needed to make their prototypes.

Resources, as required:

- GRP cloths and resins
- Sheet ply, metals as appropriate
- Jointing equipment – riveting, drilling/screwing
- Measuring equipment
- Hooks/catches etc.
- Hand and machine tools – drills, sanders, saws

Planning

Learning objectives	Teaching and learning activities
Identify and discuss skills and techniques required to produce functional models and prototypes. Select and use appropriate tools, techniques, processes and equipment, including computer-aided manufacture (if relevant). Select, justify and use a range of structural methods, appropriate materials and components.	Students will need to make their prototype disaster boxes and contents to functional standards. Construction methods will depend on the specific types of box and methods of delivery they have chosen. **Masterclasses** Materials used and joining techniques will be major factors in the success of prototypes. At this stage, will need both to anticipate and to negotiate the skills students will require for their boxes and the contents. These may range from metal fastening and gluing, through to basic GRP moulding. Masterclasses should be used to equip groups with the knowledge and skills to complete their design solutions. Much of the work will improve and develop through a series of trial and error, so a wide range of materials and techniques should be offered for students to try.
Understand and use the properties of materials and the performance of structural elements to achieve their intended functional solutions. Understand how mechanical systems used in their products enable or resist changes in movement and force.	Students commence making functional products or prototypes that accurately demonstrate their ideas. They will need to make a disaster box of the size, weight and strength appropriate for its intended purpose. They will also need to make prototypes or models of the contents that they consider essential for survival.

WEEK 4: DEVELOPMENT AND REALISATION CONTINUED

Curriculum mapping

Design skills	Technical skills
DA6 Understand how to reformulate design problems given to them. **DA9** Take creative risks when making design decisions. **D86** Combine ideas from a variety of sources.	**MA8** Select appropriately from a wider, more complex range of materials, components and ingredients, taking into account properties such as water resistance and stiffness. **MB6** Recognise when it is necessary to develop a new skill or technique. **TK2** About the physical properties of materials. **TK5** About textile fibre sources. **TK7** How materials can be cast in moulds.

WEEK 5: REALISATION

Overview

Teams are busy meeting deadlines for completing their prototypes. They consider some of the more complex making, structural and joining engineering tasks in light of the mode of transport needed to get their box to the disaster zone. They also concentrate on achieving functionality in their models.

Resources

Testing equipment to establish structural integrity and resilience of prototypes

Design engineering and iteration (page 24)

Planning

Learning objectives	Teaching and learning activities
Agree and implement successful team functions, taking into account both team and individual needs.	Student teams choose roles and appoint tasks for each member. Roles may cover making the box and its contents, but will also need to cover ways for the box to be delivered in the disaster area (e.g. by plane, drone or helicopter, or by hand) and ways to ensure it is not damaged when it is deployed. Students will require at least one, and maybe many more, opportunities to check, test and assess prototypes for functionality and against their team's design brief.
Understand how to record assessments so as to inform improved versions of design solutions.	Teams should make notes of their tests, whether these are assessments of suitability for users, drop tests, or other evaluations. It helps if teams take photos of each iteration of their prototypes to help tell their design story. Groups continue to refine their prototypes and check them for functionality, ready for presentation. Refer students to **Design engineering and iteration** (page 24) to help them understand the importance of iteration to improve their designs.

Curriculum mapping

Design skills	Technical skills
DB9 Develop and communicate design ideas using annotated sketches. **DB10** Produce 3D models to develop and communicate ideas. **EA5** Test, evaluate and refine their ideas and products against a specification, taking into account the views of intended users and other interest groups.	**MAB5** Adapt their methods of manufacture to changing circumstances. **MB9** Use a broad range of manufacturing techniques, including handcraft skills and machinery to manufacture products precisely.

WEEK 6: PRESENTATION

Overview

Student teams make sure that their final prototypes function as designed prior to the presentation. The presentation itself should be a forum event, where the prototypes for all groups are on display together so that students and others can learn from each other. Students are expected to explain how and why their prototypes would help in a disaster situation.

Resources

Top tips from Dyson engineers: Giving presentations (page 26)

Top tips from Dyson engineers: Providing peer feedback (page 27)

Appropriate setting for presentation and demonstration of student prototypes

Planning

Learning objectives	Teaching and learning activities
Explain, justify and demonstrate design solutions. Demonstrate and validate functions of prototypes. Receive and understand feedback on design solutions and discuss potential improvements.	Student teams present and explain their disaster box prototypes. They should be able to show a prototype which models the functionality of a finished product. They should also have made actual or model contents which explain what they consider to be the most vital items to support people in their chosen disaster situation. A demonstration area where all the teams' artefacts can be displayed together will be an advantage. Refer students to **Top tips from Dyson engineers: Giving presentations** (page 26). The presentation is more effective if it can be made face-to-face to a disaster agency. Feedback to students from real players in the field of disaster relief is highly motivational. If possible, agencies should also be asked to bring along some of their equipment so that students can see current best practice. If this is not possible, the whole class should provide feedback to each team based on their presentations. Students can refer to **Top tips from Dyson engineers: Providing peer feedback** (page 27).

Curriculum mapping

Design skills	Technical skills
DB9 Develop and communicate design ideas using annotated sketches. **EB3** Evaluating products that they are less familiar with using themselves	**TK18** Understand the properties of materials, including smart materials, and how they can be used to advantage.

STUDENT WORKSHEETS

DESIGN ENGINEERING AND ITERATION

Design engineers are problem-solvers. They research and develop ideas for new products, and think about how to improve existing products.

Everything around you has been designed, from the smart phone in your pocket to the pen in your hand. Design engineers work on lots of different products. Their day-to-day job is varied but centres around the design process. Tasks may include brainstorming, sketching, computer-aided design (CAD) or prototyping new ideas.

An important design process is iteration. This is the repetitive method of prototyping, testing, analysing and refining a product.

Consider Dyson's vacuum cleaner tools.

Dyson engineers noticed that the spinning action of the brush bar on Dyson's Carbon Fibre Turbine Head could cause hair or other long fibres to wrap around the bar, slowing it down or stopping it altogether.

Instead of ignoring this problem, Dyson engineers set out to design a solution. The design brief: Create a cleaner head that doesn't tangle hair or fibres.

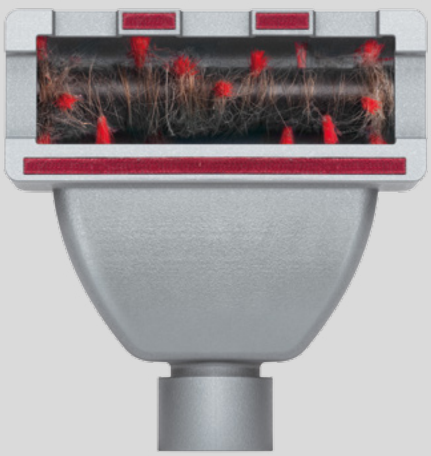
Design engineers thought about the fact that rubbing hair in a circular motion creates a ball – easy to suck up and no tangles. With this theory in mind, they tested dozens of ways to simulate the circular motion. The result was two counter-rotating discs, each with sturdy bristles, enclosed in polycarbonate casing. The spinning discs ball the hair, then it is sucked straight into the vacuum cleaner bin. Hygienic – with no mess.

Iterative design processes result in better solutions and better technology.

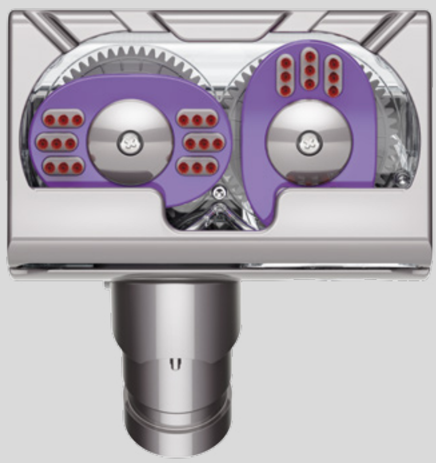
Repeat:

1. Explore
2. Create
3. Evaluate

Regular brush bar.
Tangles.



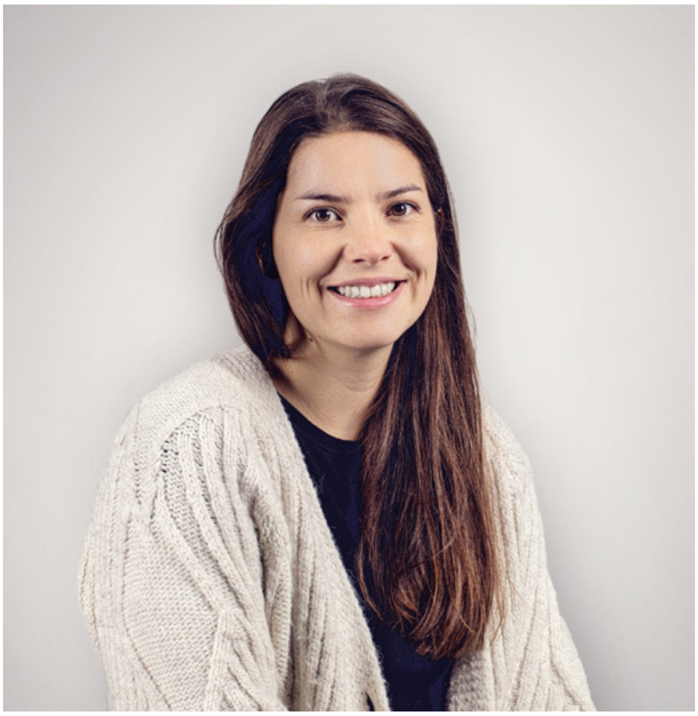
Counter-rotating discs.
No tangles.



MEET THE DYSON ENGINEERS

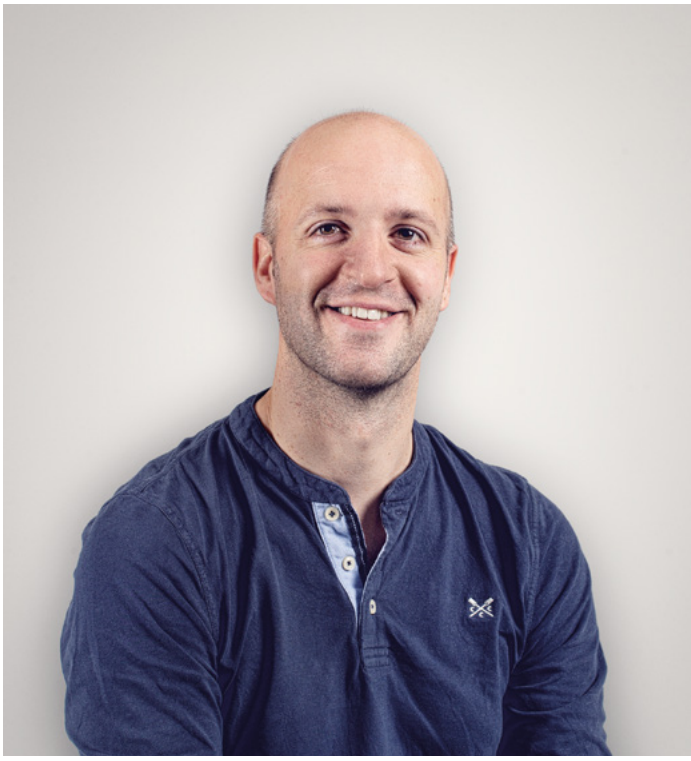
Laura
Design Engineer at Dyson

I found engineering through a combined enjoyment of art and maths. While I loved both, I didn't want to spend my time solely doing one. Engineering is a great combination of the two, with the logic of maths but the creativity of art. I wasn't aware of engineering as a potential career option until I applied to the Arkwright Scholarship as a teenager. At this point, I realised how many different engineering specialities there were to choose from – some of them technical, but some much less so than I had originally thought. The wide range of possibilities available through engineering became clear, and I saw the potential to make a real difference to the world. Dyson gives me the opportunity to be creative, whilst still being backed up by the logic of maths and physics.



George
Senior Design Engineer at Dyson

When I started secondary school, my Grandfather took me to Coventry Transport Museum and I saw Thrust SSC (the current holder of the World Land Speed Record and first to break the sound barrier). I was fascinated by its design and aerodynamics. I started researching engineering feats: The Shinkansen (Bullet) train, Concorde, International Space Station and more. I wanted to find out everything about them – how they work and what technologies they use. I can't think of any other profession that would give me the freedom to design and build multiple prototypes, to learn through failure and success, and to create iterative changes and see their effects first-hand. Engineers are always pushing the limits, finding new materials, technologies and methods to solve problems that are important to society. I wanted to be a part of that community, inspiring through STEM (and design!) and making a difference with my career.



TOP TIPS FROM DYSON ENGINEERS

Giving presentations

Laura Reed, Design Engineer at Dyson

Being able to present your work is an incredibly valuable skill for engineers. It allows engineers to explain how their ideas have developed and how their prototype will function. This then prompts feedback from the stakeholder on the work done so far. This guide will help you to present your work successfully to your stakeholders.

Tip	Actions	Examples
Make your presentation attention-grabbing.	Welcome your stakeholders with a thank you. State how you would like to deal with questions. Maintain eye contact and smile.	'Hello, welcome and thank you for joining us today!' 'We would like you to ask questions at the end of the presentation.'
Clearly state the purpose of your presentation.	Summarise the aims of your presentation in one or two sentences. Your presentation must make sense to anyone who watches it.	'We're going to present our prototype…' 'It solves the problem in this way…'
Be concise.	Follow a simple structure. Organise who is speaking and when.	We chose this **design** because…' 'We used these **techniques** to develop it…' 'Our prototype **functions** in this way…'
Be confident.	Practice beforehand to ensure you are clear on what you want to say and can deliver it with confidence. Speak loudly and clearly. Believe in your design and prototype. If you are using PowerPoint, use pictures rather than words to make sure you are talking to your stakeholders, instead of reading your PowerPoint out loud. Keep on topic! Time yourself, practising your presentation to make sure you don't overrun.	

TOP TIPS FROM DYSON ENGINEERS

Providing peer feedback

George Oram, Senior Design Engineer

Giving and receiving feedback is incredibly valuable for engineers. Constructive criticism offers insight that the designer may not have considered and provides direction for future iterations. This guide will help you prepare your insights and suggestions so that they are well received and highly valuable to your design team.

Tip	How to...	Examples
Ask questions!	Prepare as many questions as possible. Make sure to begin by praising the team for their efforts. If you are struggling, think about how you would do things differently. Ask what their next steps are.	**Don't:** 'We don't think the prototype works very well.' **Do:** 'Please could you explain to us how your prototype functions? Have you thought about another way it could function?'
Put yourself in their shoes.	Think about how and why they may have done things a certain way.	**Don't:** 'You should have done it like…' **Do:** 'Why did you choose to do…?'
Prioritise your feedback.	Focus on the most pressing issues first. Don't look to show up the designers. Instead, ask questions and offer solutions.	**Don't:** 'What colour is the on/off button going to be in the final prototype?' **Do:** 'The user said she can only carry up to twenty pounds at a time, so how can you make your design lighter?'
Feedback should be informative and educational.	Give specific examples and, when possible, context for what you like or dislike about a design and why. Use the word 'because'.	**Don't:** 'I don't like this.' **Do:** 'I don't think this will work because…'
Don't focus on only the positive or the negative.	Be sure your critique of the team's work is balanced and sensitive.	**Don't:** 'This looks ugly' or 'this looks good.' **Do:** 'I like the changes you made to the handlebars, but I think a different material might make the grip more comfortable and look better.'
Provide constructive criticism.	Don't use words like 'always,' 'never,' 'best,' 'worst,' etc.	**Don't:** 'This feature will never work.' **Do:** 'The Wi-Fi-activated alarm wouldn't work well, because it means you need to have access to Wi-Fi at home, which some people don't.'