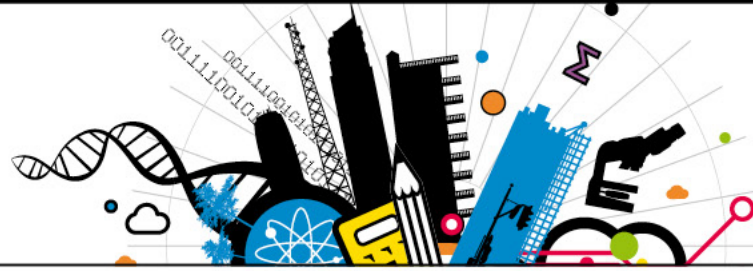


Introductory Presentation Slides and Notes

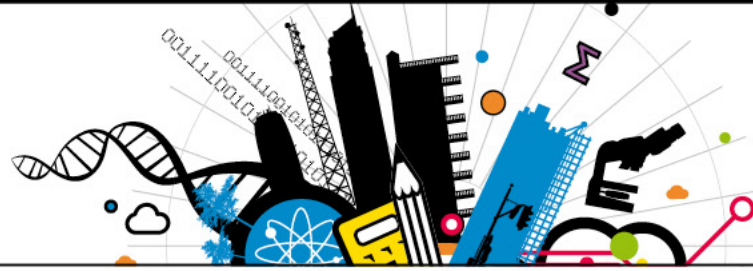


Flood Defence Introductory Presentation

This booklet is a PDF copy of the introductory PowerPoint presentation for the Flood Defence Faraday Challenge. You can use this presentation as a guide for both you and your students during the day. The PowerPoint presentation includes the use of some related film clips which can be found at the bottom of the resource page.

This booklet presents all of the presentation slides and accompanying notes, which included the use of the following files:

- 1. Flood Defence Introductory Presentation (PPT)**
Includes references to the video clips listed below (items 3-8) – you will need a video player installed on your computer which plays MP4 formats in order to view these video clips (digital media players are readily available to download for free online).
- 2. Flood Defence Introductory Presentation Slides and Notes (PDF)**
- 3. Video clip: Flood and river engineers (MP4)**
The first introductory video showing water management engineering.
- 4. Video clip: Possible solutions 1 – Drive belt (MP4)**
Video of a possible solution to the challenge using a drive belt.
- 5. Video clip: Possible solutions 2 – Simple pump (MP4)**
Video of a possible solution to the challenge using a simple pump.
- 6. Video clip: Possible solutions 3 – Water wheel (MP4)**
Video of a possible solution to the challenge using a water wheel.
- 7. Video clip: Example learning log (MP4)**
Video of a previous learning log
- 8. Video clip: Animation of a simple pump mechanism (MP4)**



Slide 1

Faraday Challenge Day

Flood Defence

Urban dwellers adapt to global
warming



Notes

Introduce yourselves.

“Welcome to this Faraday STEM Challenge Day. We’re passionate about science, maths, design and technology and bringing the skills from those subjects together to make the best engineers in the world.”

The UK has produced some of the greatest engineers ever to have lived, e.g. Isambard Kingdom Brunel, George Stevenson, Michael Faraday, Thomas Telford, James Watt and Frank Whittle.”



Slides 2 & 3

Context

- Over the past few years the UK has seen unprecedented flood levels across a range of urban areas
- The Environment Agency says;
 - Flooding happens naturally and can't be completely avoided
 - Around five million people, in two million properties, live in flood risk areas in England and Wales
 - Changes in climate, such as more severe storms and wetter winters, will increase that risk



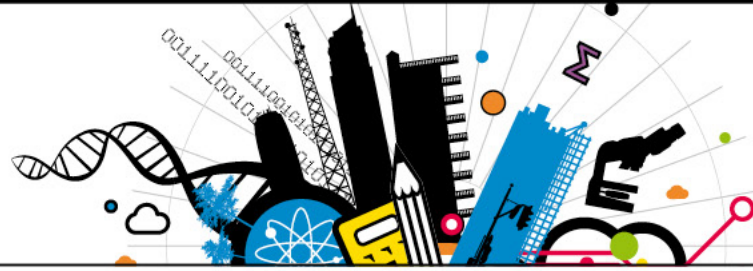
Notes

“Let’s get on to what we’re doing today.”

Note for teachers: Show the video – Flood and river engineers (MP4) which gives a good introduction to how engineers work to minimise flooding in the UK. (You will need a video player compatible with the MP4 format of the video).

Read out the context.

You might want to emphasise the importance of using their knowledge of science, maths and D&T in order to arrive at a successful solution.



Slide 4

Engineering brief

Your team has been commissioned to design and make a prototype of a simple device, that will allow homeowners to remove water from their homes, during periods of flooding.



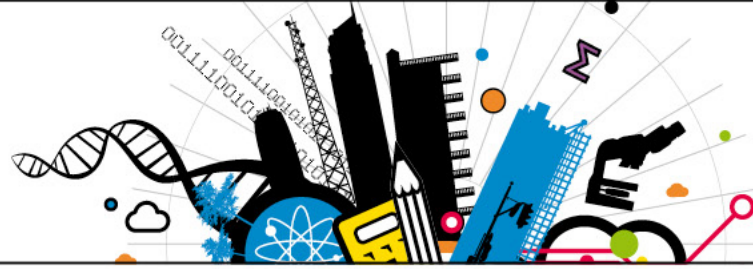
Notes

“The video has given us an insight into how engineers try to reduce the risk of flooding.”

Read out the engineering brief.

“Just take a moment to think about how you might remove water from a house. What objects can you think of that already exist that can move water from one place to another?”

Notes for teachers: Before you move onto the next slide, you might want to get some responses to the questions above, e.g. a bucket.



Slide 5

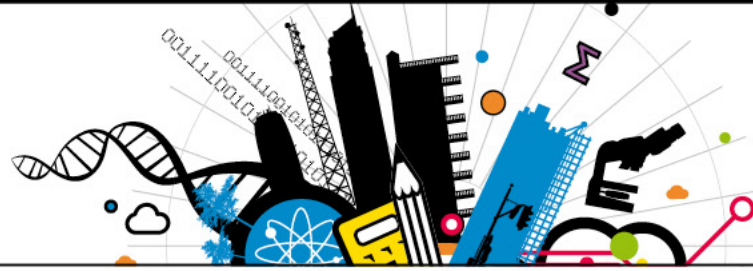


Notes

“Here are some ‘products’ that move water. BUT they do it in a variety of ways. Look at these and they might help you arrive at some ideas of your own.”

*“This is your first piece of assessed work. For the **initial ideas section**, I want you to work in pairs, and sketch down a variety of ideas that might solve the engineering brief.”*

Note for teachers: This is the ‘initial ideas’ section. Give the teams five minutes on this piece of work.



Slide 6



Notes

“Stop drawing now. Please write ‘initial ideas’ and your team number at the top of each page. Now put them into the middle of the table, as I don’t want you to draw on these particular sheets again.

What you’ve just been doing is the process of problem solving. Problem solving is a really useful process, and it is great to combine maths, science and D&T to overcome problems, particularly for ‘ENGINEERING’ type problems.

There is often lots of confusion about engineering and engineers, largely because there are so many different types; electrical, computer, civil, mechanical, nuclear, etc. But the one core thing they all have in common is ‘problem solving.’ This is always at the core of what they do, together with working in teams; sharing and collaborating; working to a budget and working to tight deadlines, all of which you will be doing today. We’re giving you a mini engineering experience.”

Note for teachers: This slide highlights the different types of engineering and the different contexts in which science, design and technology, engineering and maths are used in the real world.



Slide 7



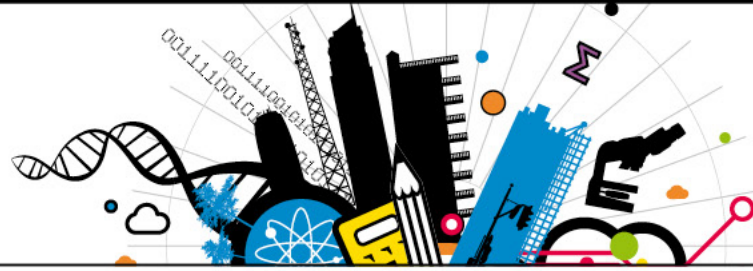
Watch the film:



Notes

“Now you have generated some initial ideas, before you go onto developing these ideas. I now want to show you some potential solutions.”

“Here is one potential solution which uses a drive belt mechanism with cups attached to the belt, which simply scoops up the water and deposits it at a higher point.”



Slide 8



Watch the film:



Notes

“This example is a simple pump mechanism, note that it has a stand for stability and a handle to make it easier to use.”



Slide 9

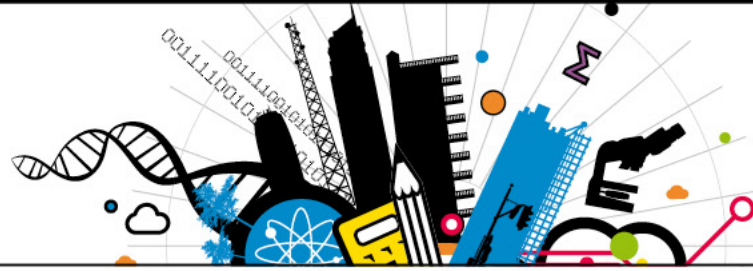


Watch the film:



Notes

"This uses the principle of a water wheel. You can see that the biggest issue is getting the water from the cup into the upper tray. This can be solved - you just need to design it!"



Slide 10

Engineering constraints

- A limited range of materials will be available for you to make your working prototype
- Your device has to move 1000 ml of water from one position to another, which is 300mm higher
- You will be given 1 minute to move the water
- Your device needs to stay in one position during this time



Notes

“OK, we have given you the context – ‘UK flooding’, we have given you the brief – ‘moving water out of a house’, now we are going to give you some constraints.”

Notes for teachers: Read out each of the bullet points on the slide. As you do this, show the test area with the two trays, one 300mm higher than the other. Explain that the task is to move 1 litre of water from the bottom tray to the top tray within one minute. To help illustrate how much 1 litre is, have a 1 litre bottle of water to hand.

“You will be awarded marks for the amount of water you successfully move within one minute and you will have two opportunities to do this – your best attempt will count. You will note that bullet point 2 talks about ‘your device’, this means that you will have to design and make a device to move the water and therefore you can’t just use a cup and move it with your hand.”



Slide 11

Planning your day

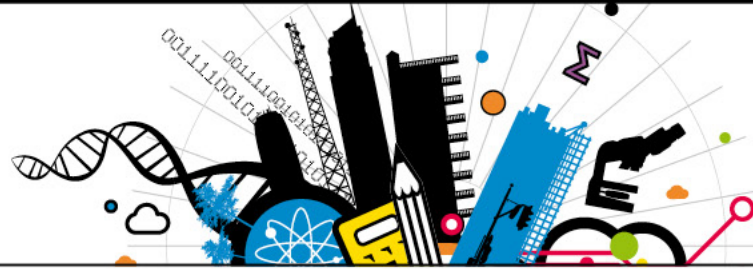
- 09.30 Session one**
 - Presentation
 - Teams to embark on initial ideas stage
 - Teams draw ideas together (development)
- 11.00 Break (shop opens)**
- 11.25 Session two**
 - Teams to develop chosen idea into viable solution
 - Start manufacture
- 12.25 Lunch**
- 13.00 Session three**
 - Produce final engineering solution
 - Put your engineering solution to the test!
- note that the shop closes at 13.30**
- 14:00 Finish manufacture, set up final challenge**



Notes

Notes for teachers: This schedule may need to be changed to fit in with your own times.

Please note that the shop closes at 13.30 to give you time to get the accountant sheet in and marked. The 14.00 cut off is to allow you time to tidy up and carry out the challenge before you add up the scores and announce the winning team – this can take about 45 minutes.



Slide 12

Assessment

Initial ideas	10 marks
Development of ideas	20 marks
Team accounting sheet	10 marks
STEM questions	30 marks
Team 'learning' video	30 marks
Teamwork	10 marks
The Challenge	90 marks

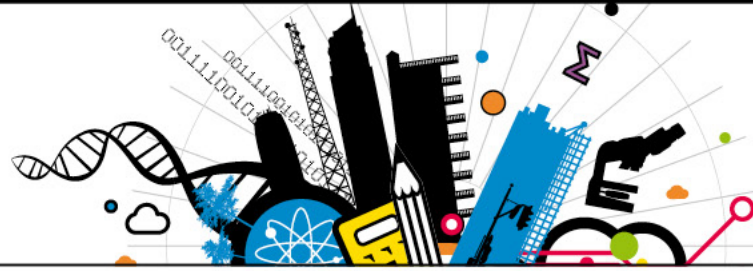


Notes

“OK, you are being marked throughout the day, NOT just on the final outcome. We’ve highlighted teamwork because it is usually the team that worked best together (supporting, collaborating, being on task, etc.) that normally comes out on top.

The notes in your student team booklet outline the assessment categories in more detail.”

Notes for teachers: The challenge has been created to ensure that all students create a solution, however basic, and score points for each assessment category.



Slide 13

What else?

- Faradays
- Technician / Buying materials
- Booklets
- Test areas
- Video learning log
- Red and yellow cards
- Expert advice



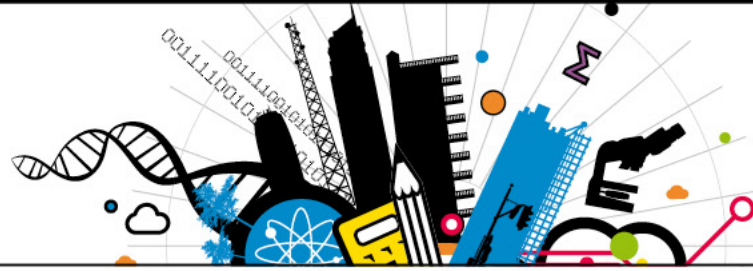
Notes

*“So, what else do you need to know? Each team has a **budget of F120 (the special currency for the day, Faradays)**, there is no credit available; you must buy all of your materials from this amount. If there is a draw today, it will be the team that has used the least amount of Faradays that will win.*

***Buying materials** – (point to the shop area) these are the materials you have available to you today. You have a materials list in your booklet with the cost for each item. Think before you buy, because if you buy something then realise it is wrong, we’ll buy back from you but we’ll only give you half the money you just paid! Also, only one person from each team should go to the shop at a time.*

***Team work** – know your roles but also be prepared to support your team members if they are struggling with their task, this is a team challenge. The day will go past very quickly, so it is a good idea to have someone in the team to keep letting the team know how much **time is left** in each session.*

*We are also asking you to produce a **learning log** during the course of the morning, highlighting, in particular, the input from science, maths and D&T.”*



Slide 14

Session one

- Introduction to Faraday Challenge
- Students split into specialist pairings to generate ideas
- Each pairing present their idea/s to the rest of their team
- Each team now makes a decision as to which idea they will develop into their final solution
- Students have access to materials (but not to buy yet)
- Assign roles for each team member and understand your responsibility throughout the day



Notes

“OK, you’ve already completed the first two sections.

Look at the materials shop to see what is available, then sit down as a team and discuss each of the ideas you have. This is probably the most important decision of the day, so take your time and ask lots of questions before deciding.

You then need to develop your basic concept into a viable working solution and you need to record this development ready for marking.”



Slide 15

Development of ideas

You need to show the journey from your first idea to your final solution

So, what we're looking for:

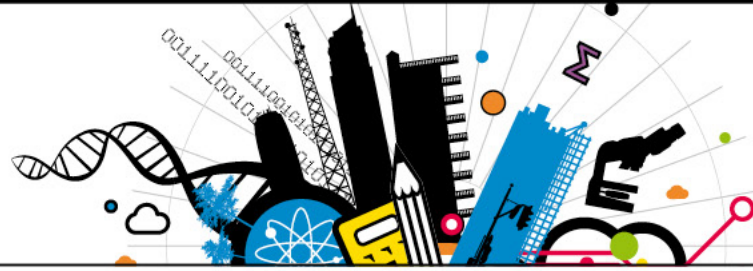
- a series of sketches to show how things have changed
- annotations (notes) explaining why you have made the changes



Notes

Notes for teachers: After about 20 minutes of session one (approximately 09.50am), draw the teams together again and go through this slide.

“The development section is worth a lot of marks, so if you’re serious about winning you must do well in this section.”



Slide 16



Watch the film:
Example learning log



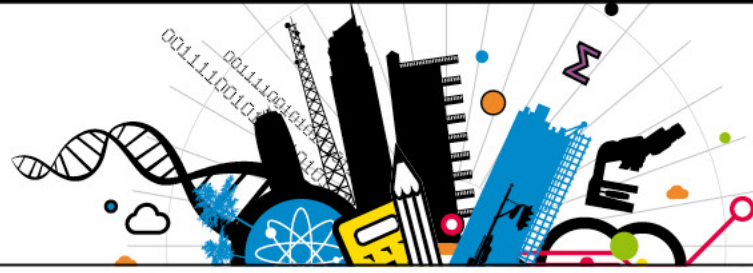
Notes

Notes for teachers: If using portable digital video cameras to produce the learning logs, these should be handed in by the students at the start of this session. This should allow enough time for you or a supporting teacher/technician to put these on a computer ready to present just before they test their finished device to the rest of the group.

Students put the finishing touches to their devices and test them before the final challenge – this should be restricted to approximately 50 minutes, leaving 10 minutes for them to clear their work area and be seated ready for the final challenge. Keep reminding the students of how much time they have left to finish.

The shop should be shut midway through session three at 13.30. This leaves the teams only 30 minutes until they have to be ready to present their solution and complete the challenge.

The learning log for each team should be presented as an introduction to the final testing of each team's device. Allow 5 minutes per team to present their learning logs and complete the final challenge.

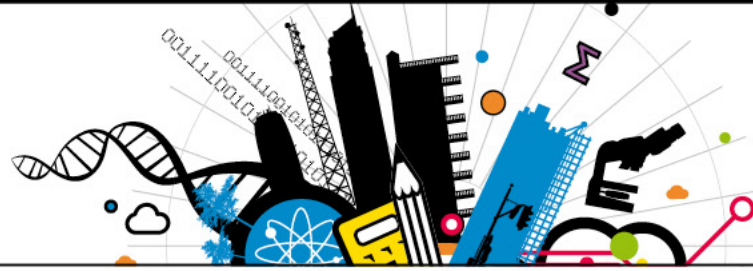


Slide 17

Session two

- Continue video production
- Teams to develop chosen idea into viable solution
- Teamwork to be assessed
- Start manufacture (both prototype and video)

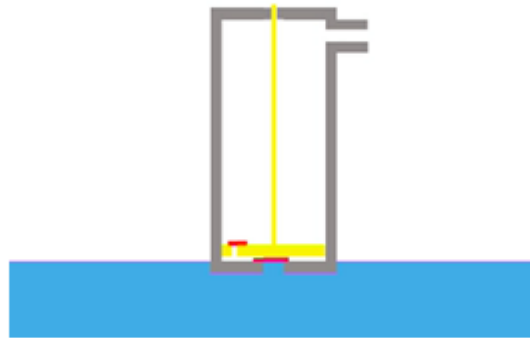




Slide 18



Watch the film:
How a simple pump works



Notes

Notes for teachers: This is a simple representation of how a 'two valve' solution might work. It's a good idea not to show this too early, otherwise teams might just copy it. However, it is useful to use when teams are getting to grips with their manufacture and want clarification as to how the valves work (if they choose a pump solution).



Slide 19

Session three



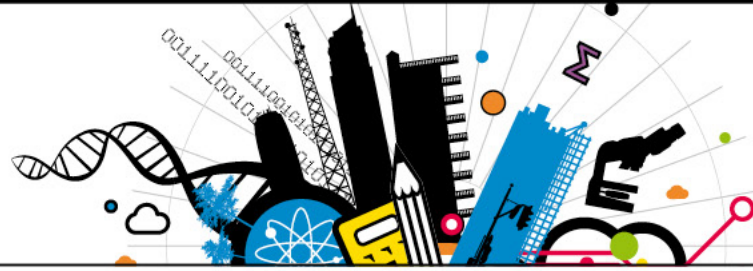
- Students continue with manufacture and complete prototype
- Prototype testing
- Students continue with recording and editing film ready for assessment
- Preparation for the Challenge
- Challenge
- Results

Notes

Notes for teachers: Show this slide to the students after lunch. Emphasise the need to keep on track and the point that they should try to give themselves time to test before the final.

To be handed in:

- Learning log
- Accounting sheet



The IET DIY Faraday Challenge Day 'Flood defence' is based on the Faraday Challenge Day of the same name, a STEM activity day written and delivered by the Attainment Partnership on behalf of the Institution of Engineering and Technology (IET).

The IET Faraday website hosts a wide range of teaching resources for science, design and technology and maths. These include classroom activities with film clips, online games, posters, careers resources and STEM activity days.

www.ietfaraday.org

The Institution of Engineering and Technology

IET Education 5-19
Michael Faraday House
Six Hills Way
Stevenage Herts
SG1 2AY
United Kingdom
T: +44 (0)01438 767653
F: +44 (0)01438 765526

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