



**TABLE TENNIS
SERVER**

**Tomorrow's
Engineers**

www.ietfaraday.org

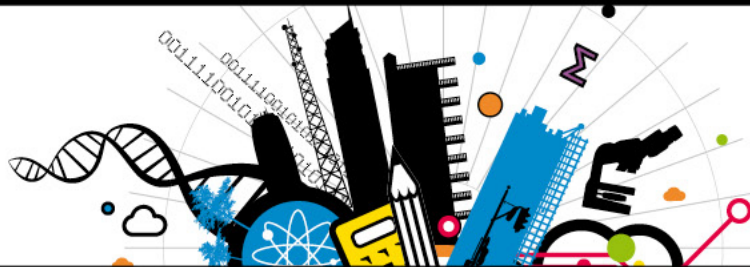


Table Tennis Server Introductory Presentation

This booklet is a PDF copy of the introductory PowerPoint presentation for the Table Tennis Server 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.

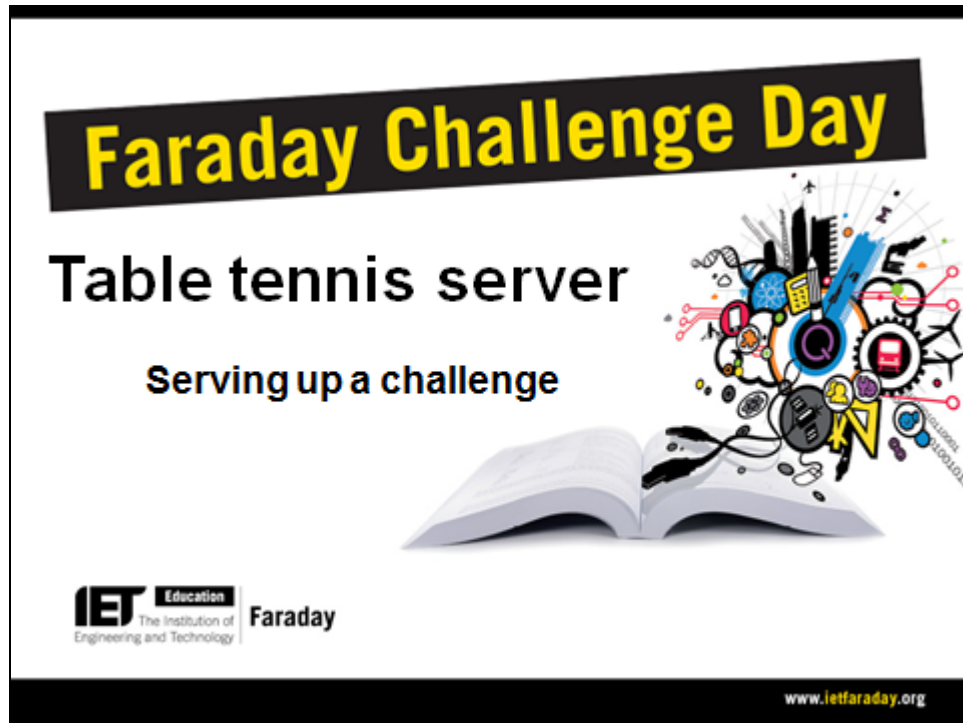
This booklet presents all of the presentation slides and accompanying notes, which includes the use of the following files:

- 1. Table Tennis Server 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. Table Tennis Server Introductory Presentation Slides and Notes (PDF)**
- 3. Video clip: Example server 1 (MP4)**
The first of three video clips showing student examples of a solution to this challenge.
- 4. Video clip: Example server 2 (MP4)**
The second of three video clips showing student examples of a solution to this challenge.
- 5. Video clip: Example server 3 (MP4)**
The third student example of a possible solution to this challenge.
- 6. Video clip: Practice makes perfect (MP4)**
A fun video from You Tube showing a different way of serving a table tennis ball.
- 7. Video clip: Learning log example (MP4)**

This booklet presents all the presentation slides and accompanying notes.



Slide 1



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.”



Slide 2

Context/brief

- Table tennis is a growing sport in the UK
- Practice, as with most things, is the key to improving at the sport. The problem is, it is hard to practice on your own.
- Being able to return service is often what provides the edge in terms of winning and losing.



Engineering brief

- Design and make a prototype table tennis server
- The server must be operated remotely

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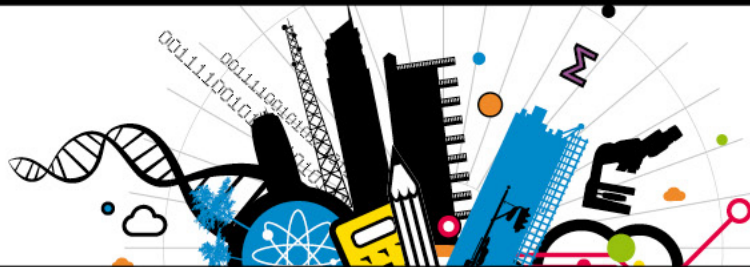
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Notes

Read out the context and brief.

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.

Explain what the three specifications mean (see next slide for visual reference to 'remotely operated').



Slide 3

 **Watch the film:**
Practice makes perfect

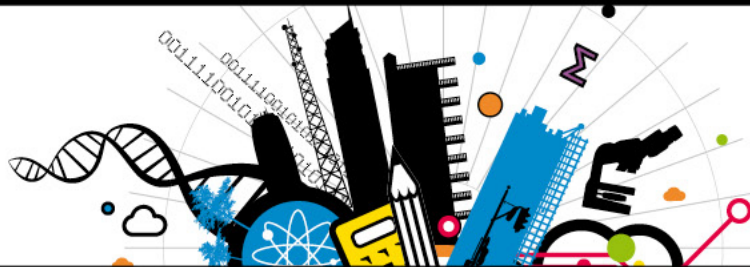


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Notes

Notes for teachers: Show the video 'Practice makes perfect'. It will make the students laugh and get them thinking about alternative solutions and ideas – hopefully!



Slide 4



Watch the film: Commercial table tennis server







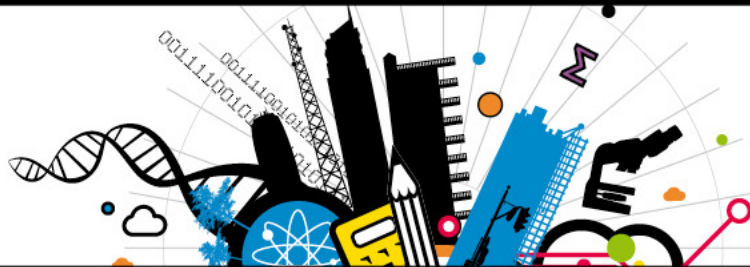
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Notes

Note for teachers: Show this video of a school that has a commercial table tennis server.

Make the point that this brief has commercial opportunities.



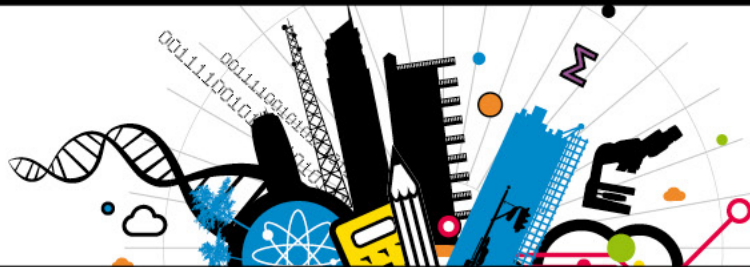
Slide 5



Notes

Note for teachers: This slide can be used to reinforce the remote operated element of the brief (this is the specification point the students find the hardest understanding).

"As you can see, the student has the device set up and then pulls the release pin, which fires the ball".



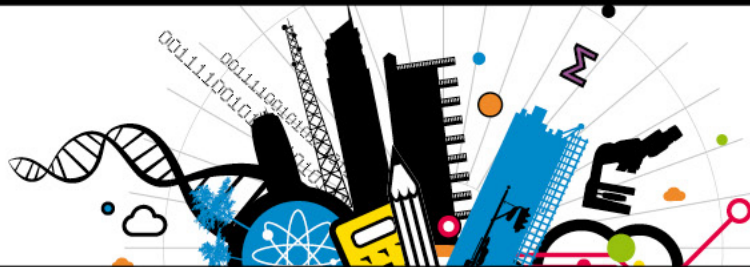
Slide 6



Notes

Note for teachers: Point out, using this slide the accuracy that is needed to win the challenge. You can just about see three small white dots on the table indicating where the table tennis ball first landed.

Remember this challenge is all about precision and accuracy.



Slide 7

First piece of assessment

ALL teams:

- Sketch a variety of ideas for the table tennis server


We are looking for:

- Working in pairs
- A **VARIETY** of ideas
- Sketches and notes
- Not whole team chats

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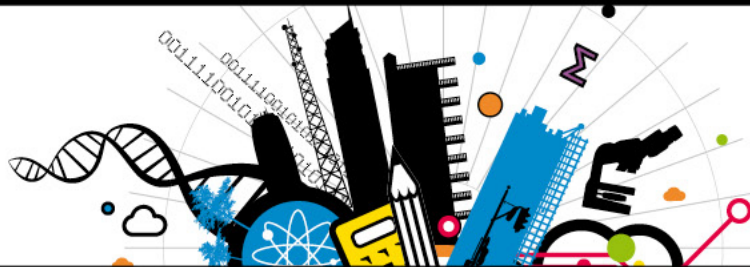
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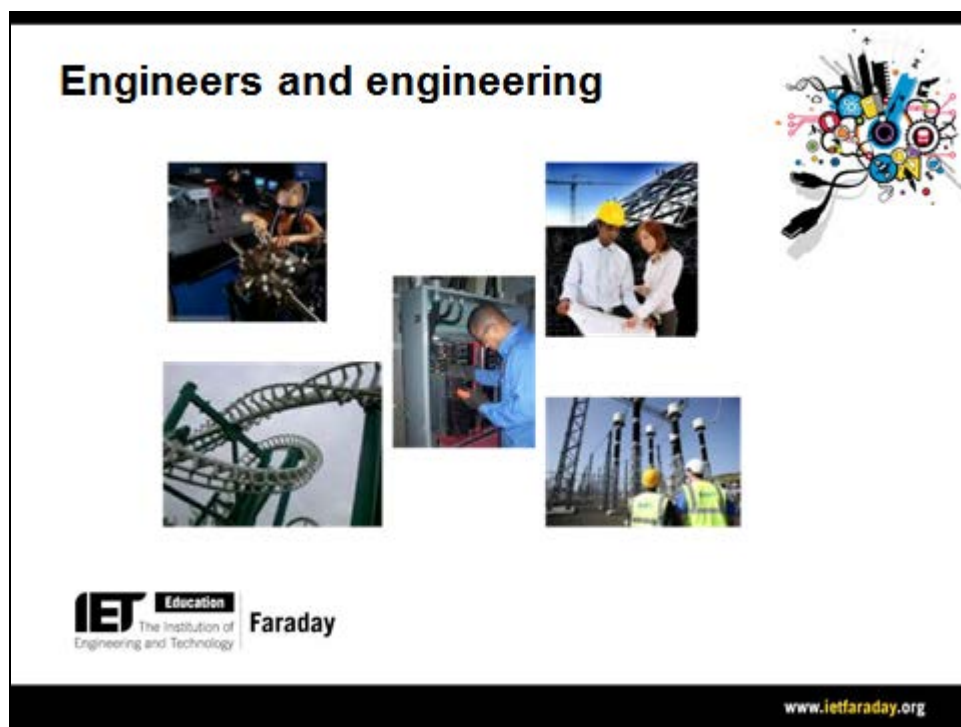
Notes

"You get marked on the variety of ideas so it is important that you work in your pairs to maximise your potential for ideas."

Note for teachers: this is to break up the presentation and to get them thinking about possible mechanisms for serving the table tennis ball, before we show them examples. Students should begin to work in their subject pairs and contribute as a pair to the team's initial ideas.



Slide 8

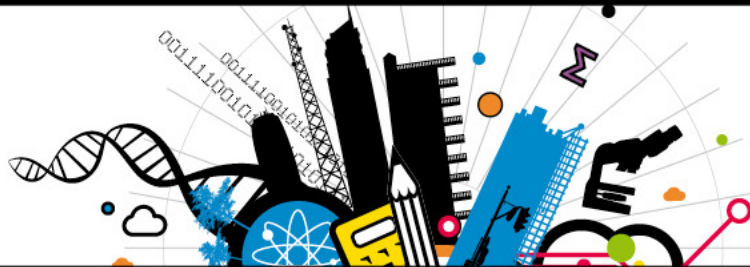


Notes

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 9



Watch the film: Example server 1





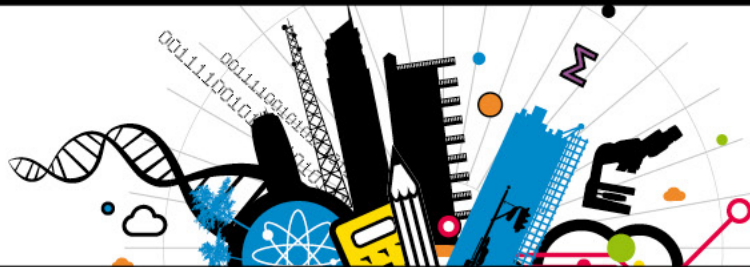
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Notes

"This is a student example, based on the game 'mouse trap'. Although it serves the ball fast and far, it does not have calibration to ensure that the ball lands in the same place every time it is served".

Note for teachers: Play the video 'Example server 1' - this video clip is of a solution presented by students at a Faraday Challenge Day.



Slide 10



**Watch the film:
Example server 2**







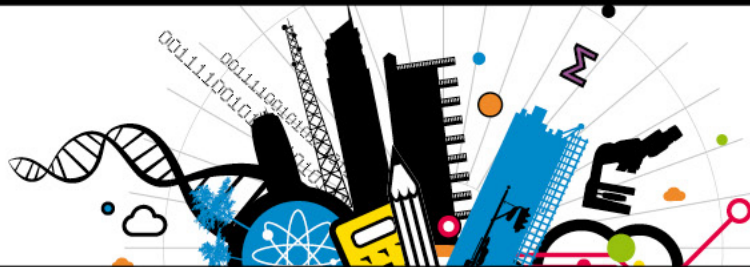
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Notes

"This example uses a traditional trebuchet type mechanism, with a series of holes that allow for calibration."

Note for teachers: Play the video 'Example server 2' – this video clip is of a solution presented by students at a Faraday Challenge Day.



Slide 11

 **Watch the film:
Example server 3**



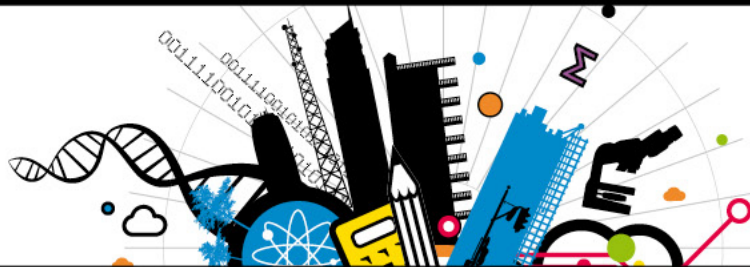
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Notes

“This is a lovely example, it has a turn-table, angle adjustment and power calibration, plus it is operated remotely”.

Note for teachers: Play the video ‘Example server 3’ – this video clip is of a solution presented by students at a Faraday Challenge Day.



Slide 12


Planning your day

- 09.30 Intro with film, directions for the day
- 10.10 Development of ideas/start learning video
- 11.15 Break (shop opens)**
- 11.30 Start manufacture/continue learning video
- 12.30 Lunch**
- 13.00 Complete manufacture/start testing
- 13.30 Shop closes
- 14.00 Finish manufacture, put your engineering solutions to the challenge

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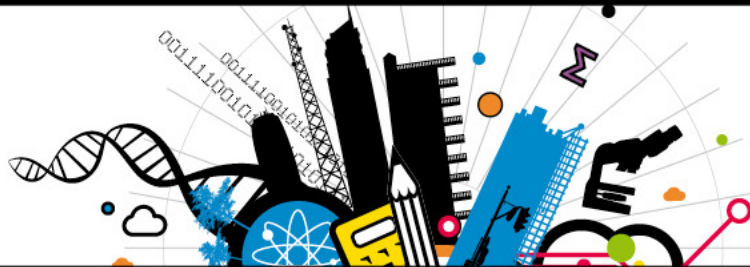
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Notes

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 13

Assessment	
Initial design sheets (3)	15 marks
Developed ideas	40 marks
Accountant balance sheet	10 marks
Quality of final product	20 marks
Function of device	50 marks
Teamwork	20 marks
Video (STEM responses)	20 marks
TOTAL	175 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.”

Note 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 14

What else?

- Faradays
- Buying materials (one person)
- Teamwork – what's your role
- Time management
- Learning video (STEM)

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Notes

“So, what else do you need to know?”

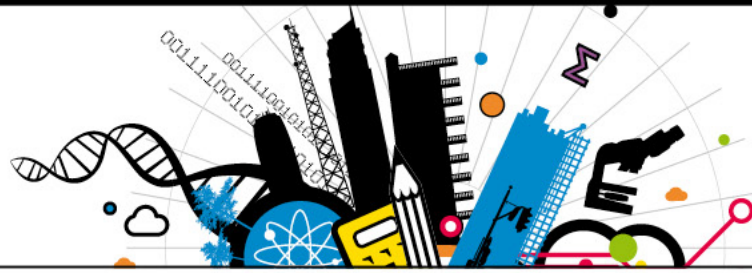
*Each team has a **budget of F120 (the special currency for the day, Faradays)**, there is no credit available; you must buy all your materials from this amount. If there is a draw today, it will be the team that has used the least amount of Faradays that will win.*

***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 15

Session one

- Teams to look at available materials
- Teams to discuss initial ideas
- Teams to develop your chosen idea

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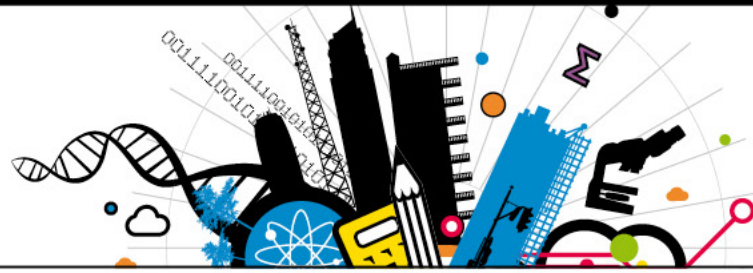
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Notes

“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 16

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

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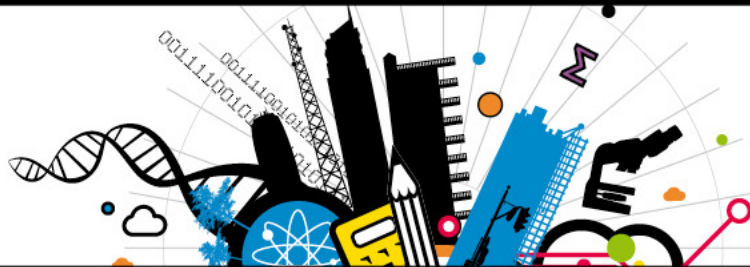
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Notes

Notes for teachers: after about 20 minutes of session one (approximately 9.50 am), 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 17

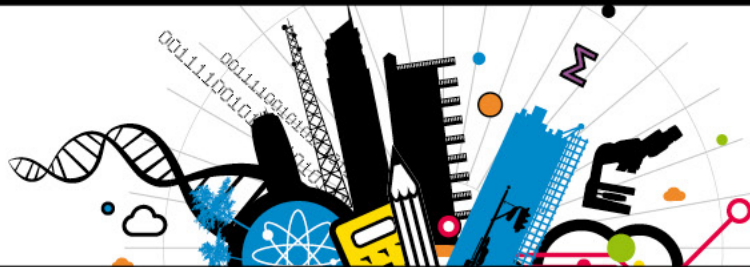


Notes

Notes for teachers: This is an example from previous Faraday Challenge Days and provides the whole team and exemplar of the learning log they are being asked to design and make throughout the day.

Towards the end of session one (approximately 10:30 am) call all team leaders into a group and brief them on what will be expected within their team learning logs. Ask them to return to their groups and brief their teams on what they will need to cover within their learning logs and begin to plan and prepare it. Students should be writing a script for the verbal presentation – scripts should be finished by the beginning of session three (approx. 13:00).

If using portable digital video cameras to produce the learning logs students may need some guidance on how to use the camera.



Slide 18

Session two

- Teams to continue developing and start manufacture
- Teams to continue producing learning video





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Notes

Notes for teachers: Introduce the use of the shop and the technician – money (Faradays), resources, equipment, and help cutting materials.

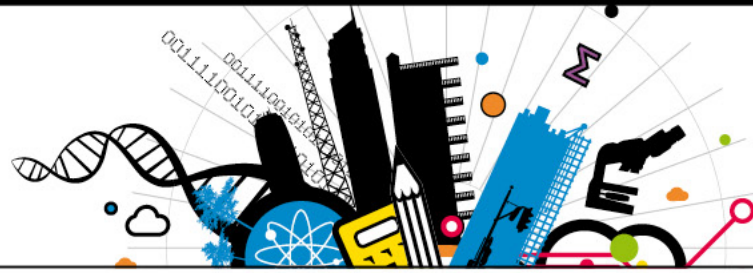
At this point each team should be ready to develop their chosen idea into a viable solution (application of scientific research into creative engineering solution) and start to manufacture their device.

Team interviews are to allow you the opportunity to assess the progression of ideas and the team working taking place. The interviews can be carried out informally by stopping at each team table and asking the team questions.

If any teams are struggling this is a good time to offer advice and guide them to build a solution – it is now that any additional support you may have during the day (other teachers and/or STEM ambassadors from your local area) is invaluable as they can offer support to any struggling teams.

This section of the day should last approximately 80 minutes.

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Slide 19


Session three

- Complete manufacturing
- Start testing
- Put your engineering solution to the challenge!
- Results

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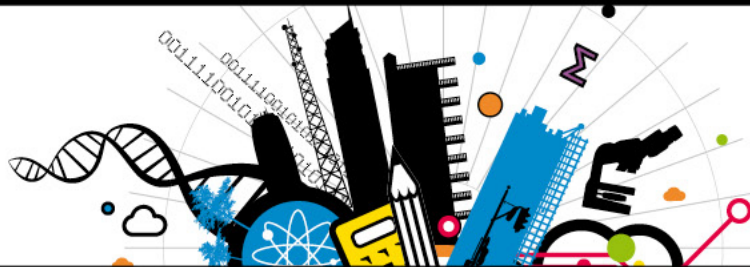
Notes

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. Give each team **4 attempts at server the tennis ball accurately, allowing a return serve**. This allows 5 minutes per team to present their learning logs and complete the final challenge.



The IET Faraday Challenge Day in a Box '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.

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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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