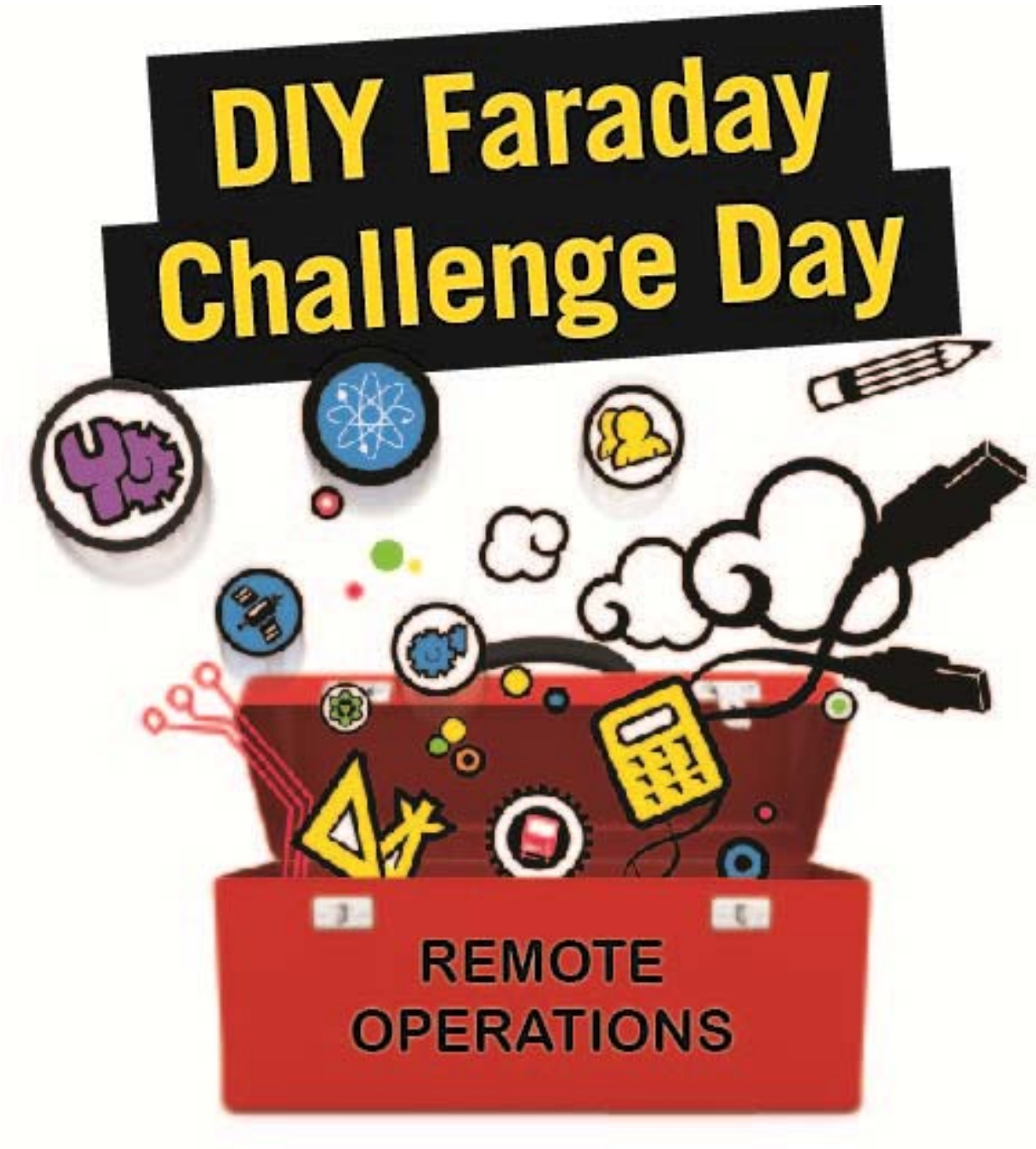


Introductory Presentation Slides and Notes

Remote Operations Introductory Presentation

This document serves as a printable copy of the introductory PowerPoint presentation for the Remote operations Faraday Challenge. It includes the slides within the presentation and accompanying notes. You can use this presentation as a guide for both you and your students during the day. The introductory PowerPoint presentation, this document and the set of video clips listed below make up the full set resources for introductory presentation for the day:

1. Remote Operations Introductory Presentation (PPT)
   Includes references to the video clips listed below (items 2-7) – you will need a video player installed on your computer which plays both MP4 and AVI formats in order to view the video clips listed below (digital media players are readily available to download for free online)

2. Remote Operations Introductory Presentation slides and notes (PDF)
   A PDF version of this booklet

3. Video clip: Robotic surgery
   The first of two introductory videos showing engineering used in the health industry

4. Video clip: Remote medicine
   The second of two introductory videos showing engineering used in the health industry

5. Video clip: Example gripper 1
   Video clip of gripper prototype 1

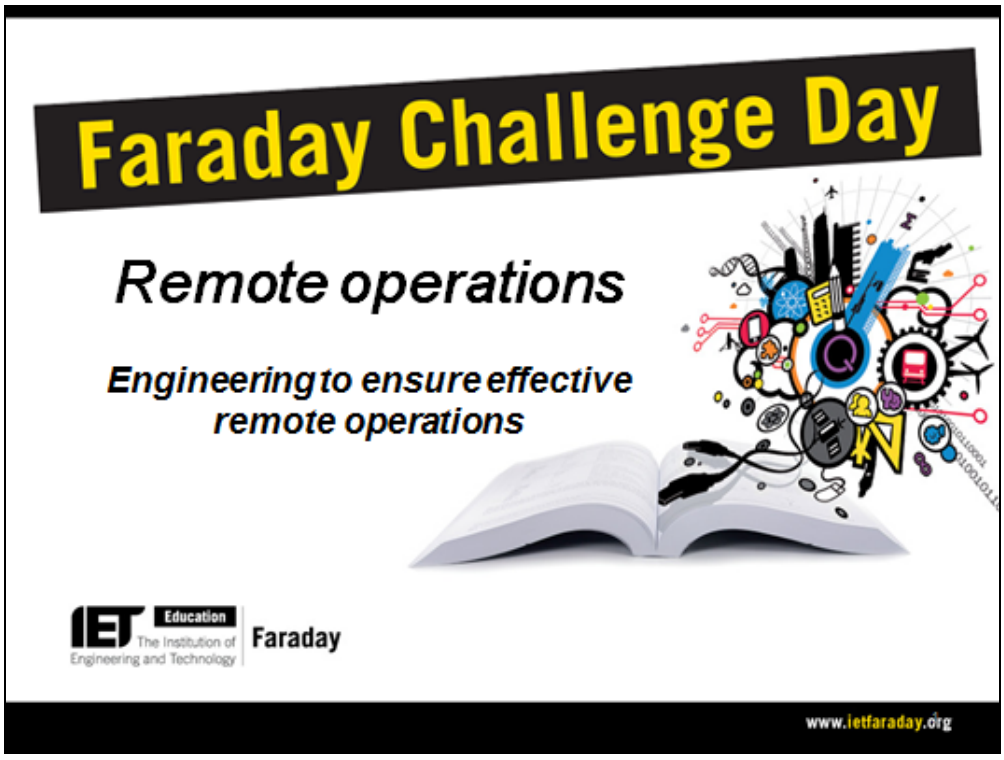
6. Video clip: Example gripper 2
   Video clip of gripper prototype 2

7. Video clip: Example sliding mechanism
   Video clip of a prototype using a *sliding* mechanism

8. Video clip: Example lever mechanism
   Video clip of a prototype using a *lever* mechanism

This booklet presents all the presentation slides and accompanying notes.

Slide 1



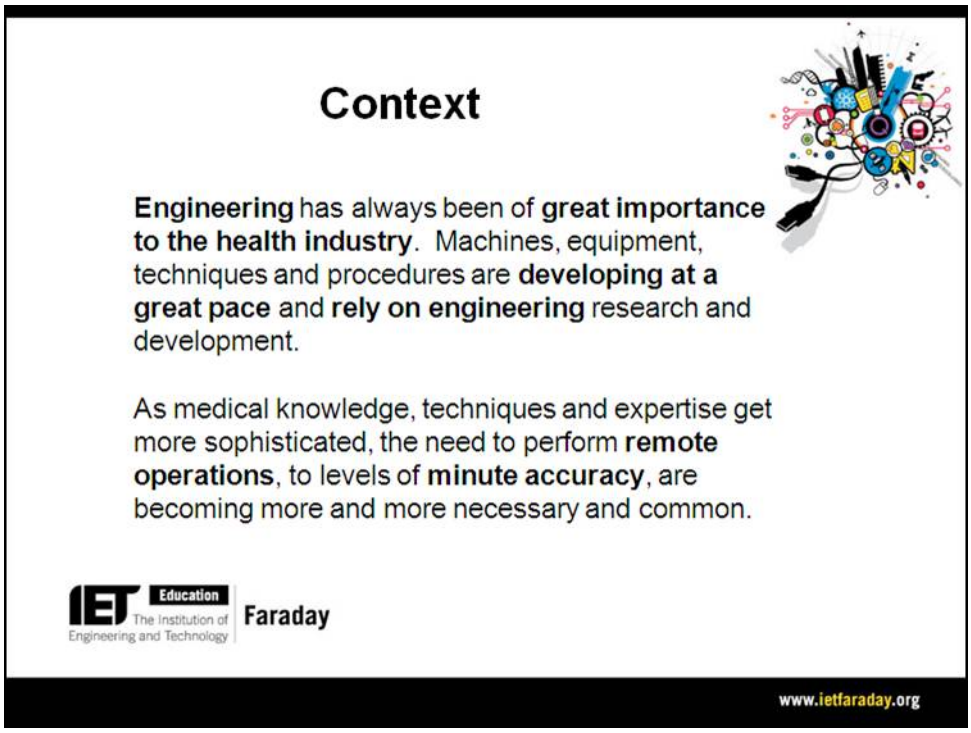
Notes

Introduce yourselves.

"Welcome to this Faraday STEM Challenge Day. We're passionate about science, maths, design & 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



Notes

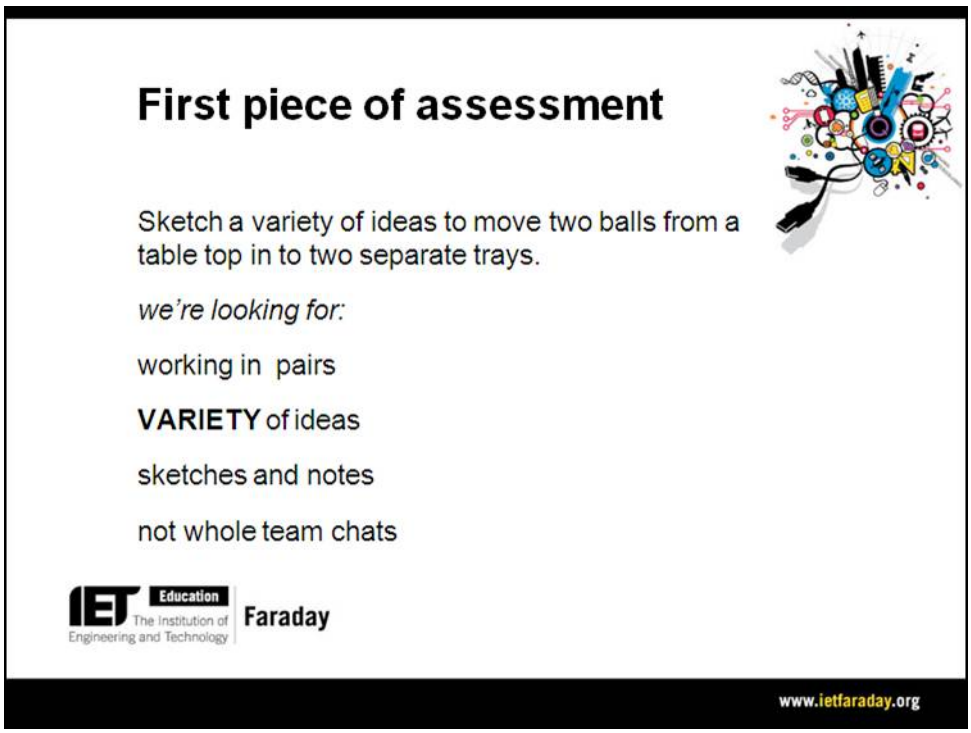
"Let's get on to what we're doing today."

Note for teachers: show the videos Remote medicine and Robotic surgery (on the IET Faraday memory stick provided in the box for this challenge) which give a good introduction to a variety of ways engineering is used in the health industry (You will need a video player compatible with the MP4 format of the video).

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.

Slide 3



Notes

"Before I give you the brief I'm going to ask you to work on some basic ideas to get you thinking about how to move objects from one position to another.

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 moving a 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 4

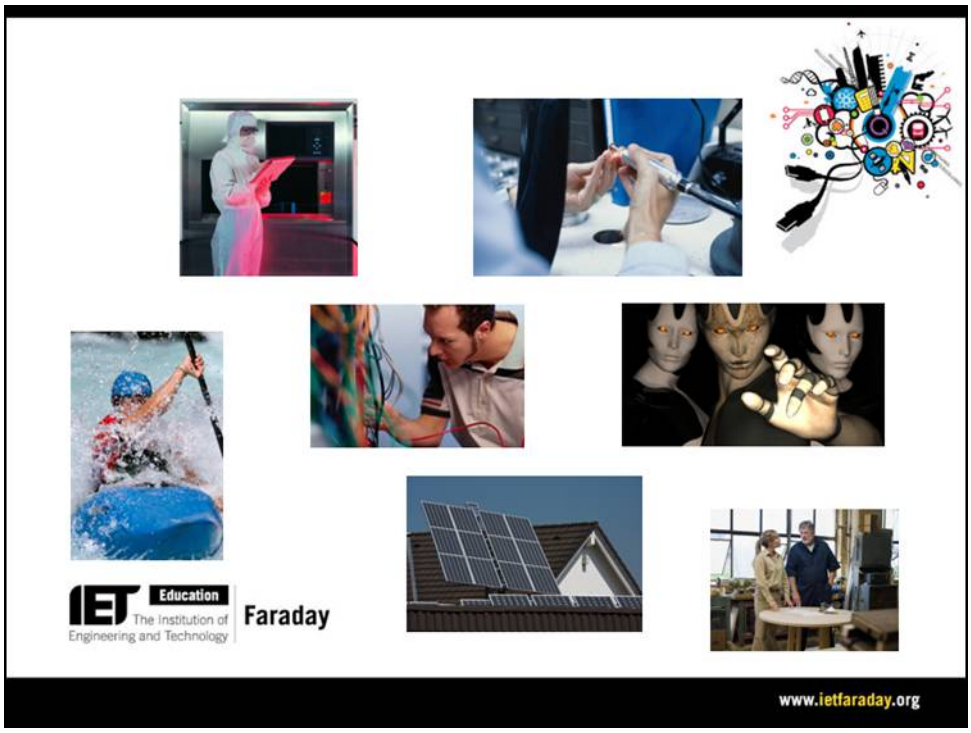
Notes

"Here are some 'products' that pick things up, BUT they do it in a variety of ways. Look at these and they might help you arrive at some ideas of your own."

Note for teachers: this is the 'initial ideas' section of the day.

Image sources and credits:
Black pliers – Ambro / FreeDigitalPhotos.net
Yellow and black handled pliers – dan / FreeDigitalPhotos.net
Vacuum cleaner – John Kasawa / FreeDigitalPhotos.net
Red handled tongs, magnet, green bucket and backhoe – Microsoft Office Images

Slide 5



Notes

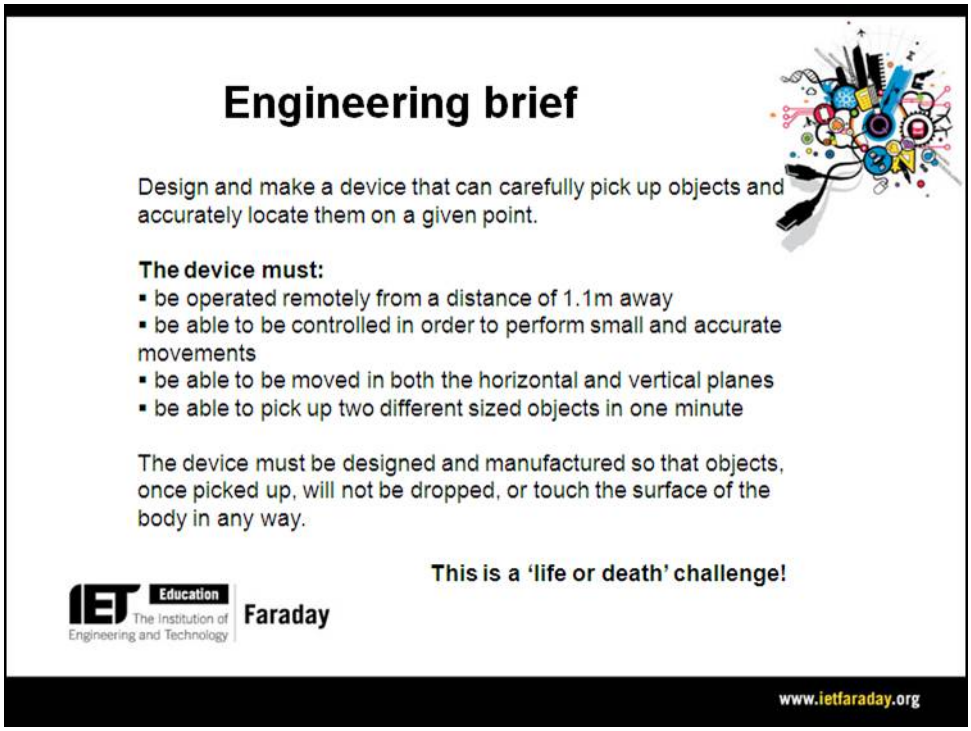
"Stop drawing now. Please write 'initial ideas' and your team number at the top of each page. Now put them into the middle of the table, as I don't want you to draw on these particular sheets again.

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 6



Notes

"OK, back to your challenge today. You've already got an idea of what you'll be doing because you've already been asked to sketch ideas for moving balls.

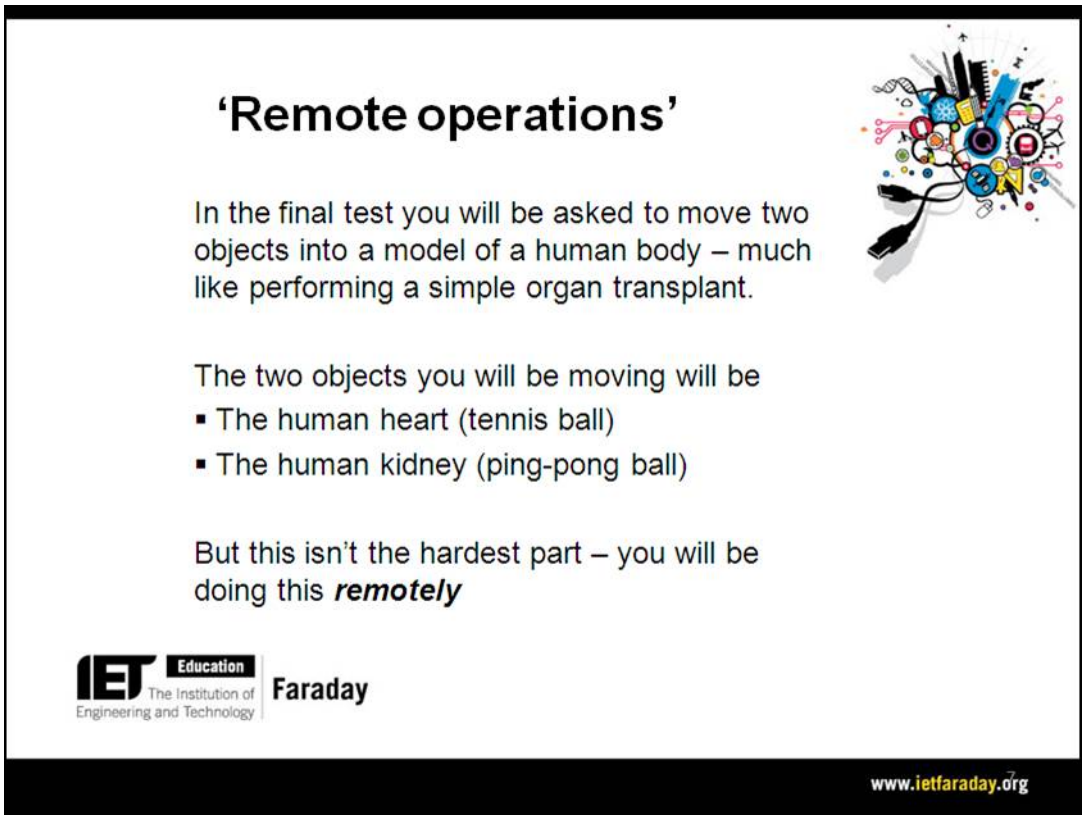
Now I'm giving you the actual engineering brief."

Note for teachers: read through the brief, pointing out on the test area the distance of 1.1m. Mention why vertical AND horizontal movement is required.

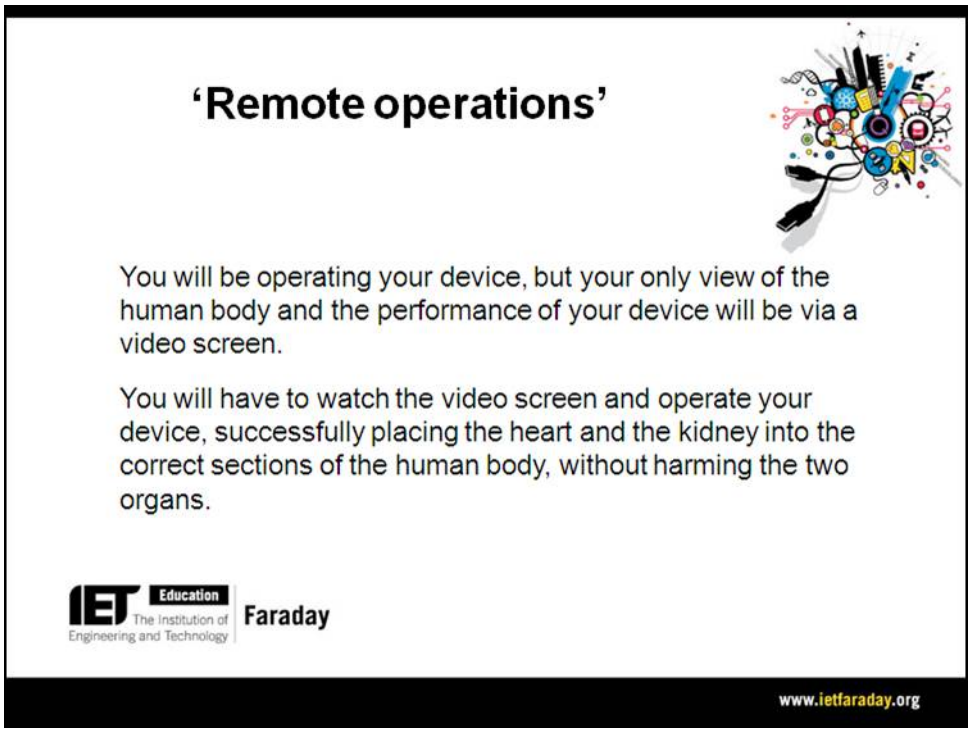
If you can borrow a litter picker from the site manager you can get one of the students to demonstrate picking the balls up and putting them into the trays in the mannequin (precut mdf/cardboard human torso).

This should be pretty easy to do, so you now remind them of the doctor talking about tele-present surgery which is carried out via video. Put the whiteboard/screen in place and set the projector up. They now need to carry out the same operation BUT this time only looking at the video screen. This should be much harder.

Slide 7


'Remote operations'
In the final test you will be asked to move two objects into a model of a human body – much like performing a simple organ transplant.
The two objects you will be moving will be
▪ The human heart (tennis ball)
▪ The human kidney (ping-pong ball)
But this isn't the hardest part – you will be doing this remotely
IET Education The Institution of Engineering and Technology Faraday
www.ietfaraday.org

Slide 8



Slide 9

Notes

First video: Chris Kerrs Human actuated robotic gripper
"We now have some videos to help you formulate your ideas more fully.
This is too sophisticated for you to be able to do today but it is such a good video related to your task today that I wanted to show you."

Second video: Syringe actuated mechanical arm
"This video shows a device doing a similar task to the one you've been asked to do. Note that it has a stand from which we get the vertical and horizontal movement.
Although it uses syringes, which you don't have available, it does use other materials which you do have. Look closely at the gripper detail, it is simply two levers operated by string and an elastic band to open and close it."

Note for teachers: these video clips show different remotely operated arms. At the end of the first video, point out that the boy said it was the coolest thing he'd ever done and that it was engineering!

Slide 10

Notes

"This is a student example. Look again at the fingers. They are operated by the string being pulled. The elastic band closes the fingers when the force applied by the string is released."

Note for teachers: play video Example gripper 1 – this video clip is of a solution presented by students at a Faraday Challenge Day and shows how string and elastic bands can be used to create a gripper mechanism.

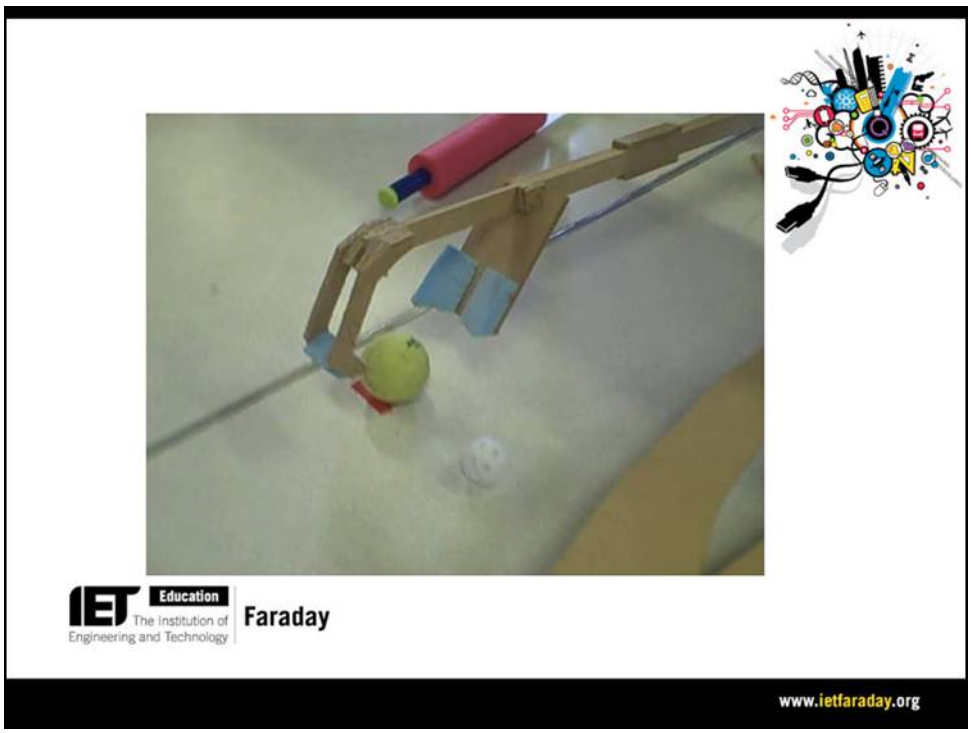
Slide 11

Notes

"This is another student example, this time with two fixed fingers and only one moving finger, again operated by string and an elastic band."

Note for teachers: play video Example gripper 2 – this video clip is of a solution presented by students at a Faraday Challenge Day and shows how string and elastic bands can be used to create a different type of gripper mechanism with only two arms.

Slide 12



Notes

"This example uses a completely different principle, a sliding mechanism. A good idea not operated well!"

Note for teachers: play video Example sliding mechanism – this video clip is of a solution presented by students at a Faraday Challenge Day and shows how a sliding mechanism can be used to operate a device.

Slide 13

Notes

"This example uses levers really effectively, changing the direction of force from the string to make it more efficient."

Note for teachers: play video Example lever mechanism – this video clip is of a solution presented by students at a Faraday Challenge Day and shows how a lever mechanism can be used operate a device. It also highlights how the tennis and ping-pong ball may get away from them, so students should be prepared for the gripping aspect of the challenge to be tricky.

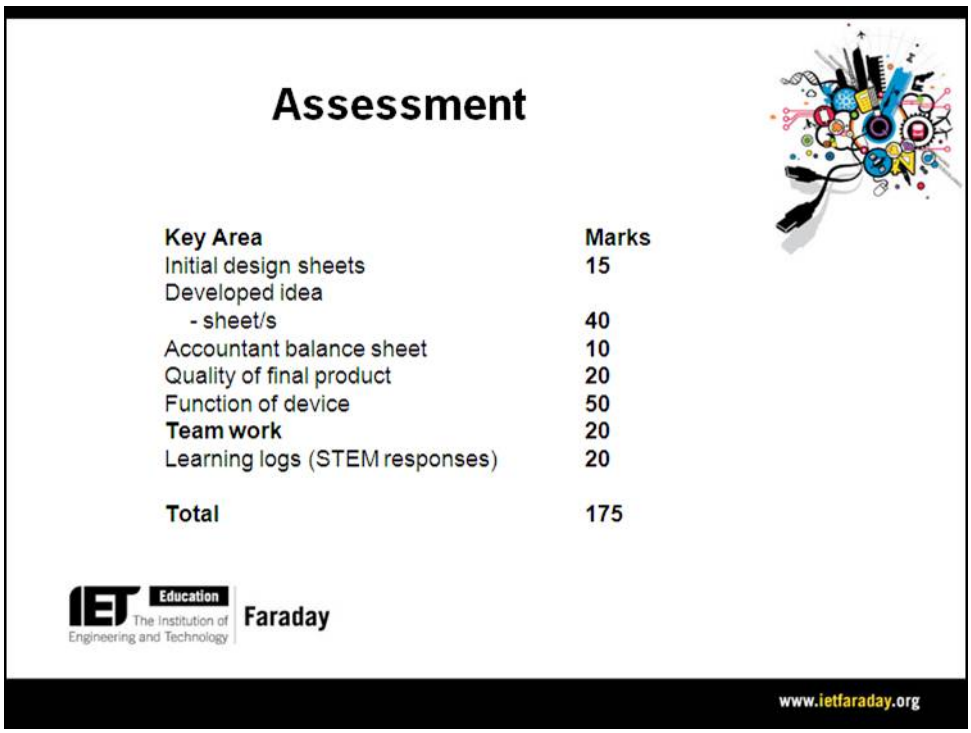
Slide 14

Notes

Note 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 15



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 16

Notes

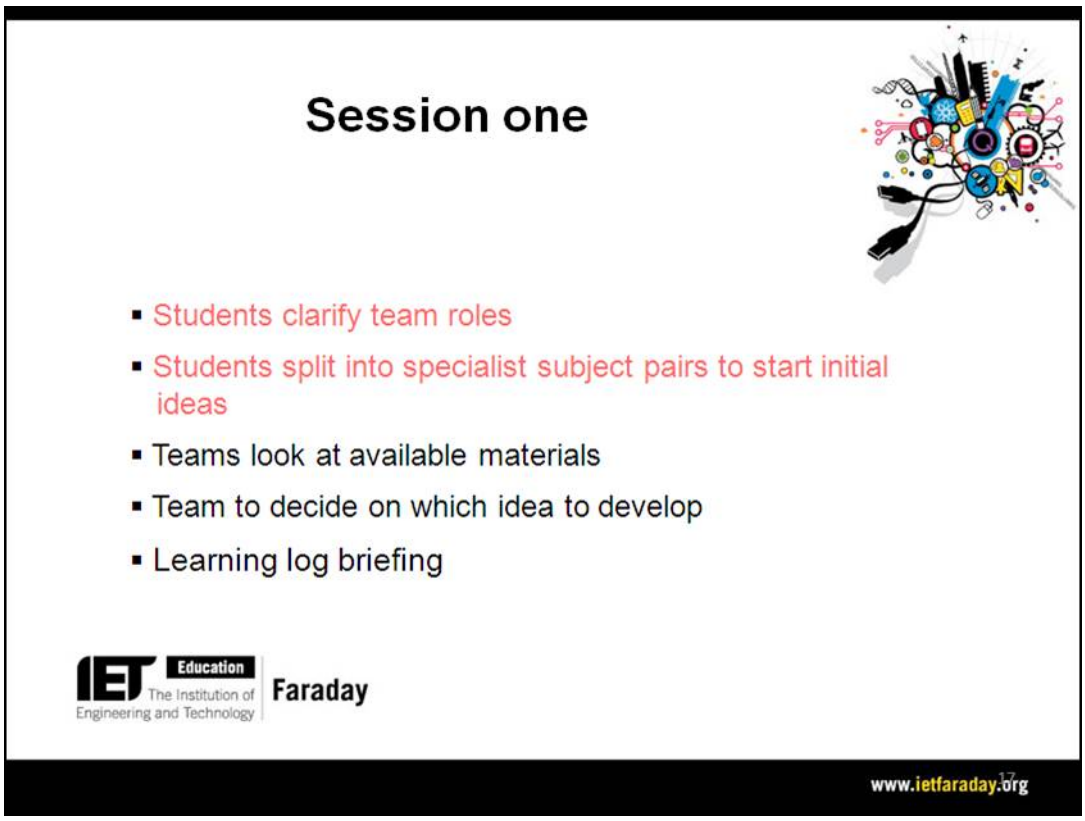
"So, what else do you need to know?
*Each team has a **budget of £150 (the special currency for the day, Faradays)**, there is no credit available; you must buy all your materials from this amount. If there is a draw today, it will be the team that has used the least amount of Faradays that will win.*

***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 17



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."

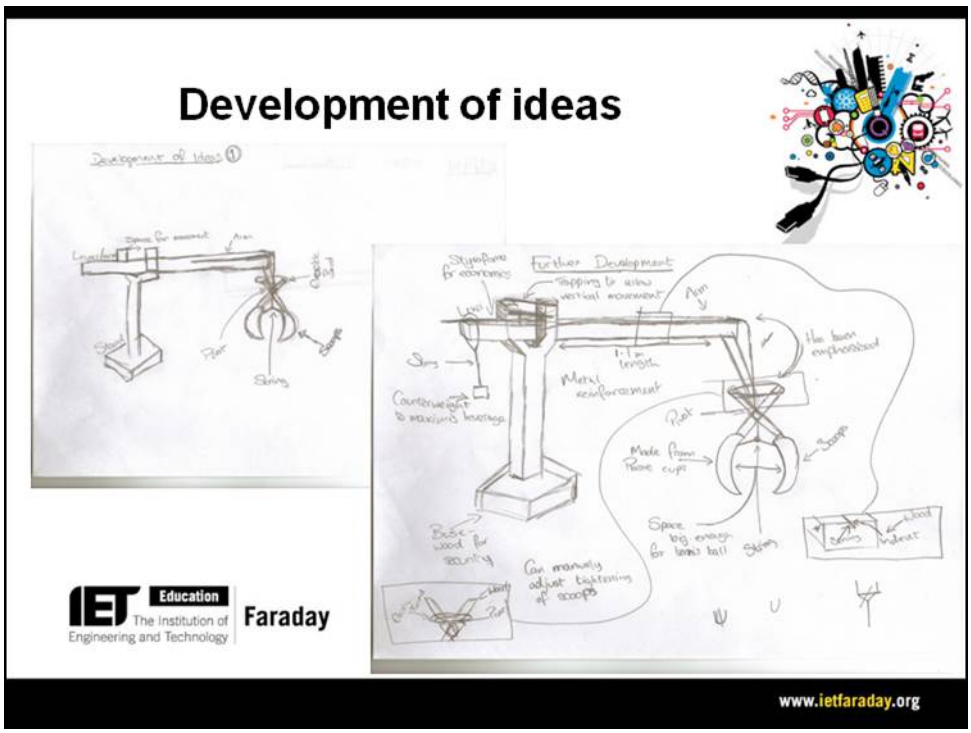
Slide 18

Notes

Note 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."

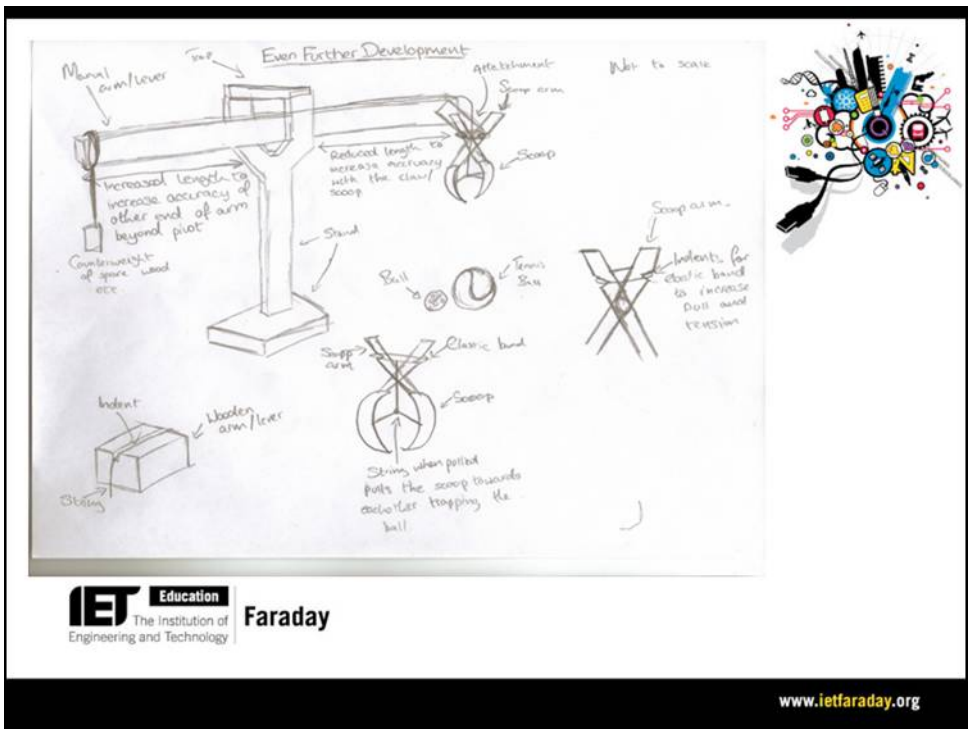
Slide 19



Notes

Note for teachers: these are examples from previous Faraday Challenge Days and show a progression in their ideas, with more detail added to aid their thinking.

Slide 20

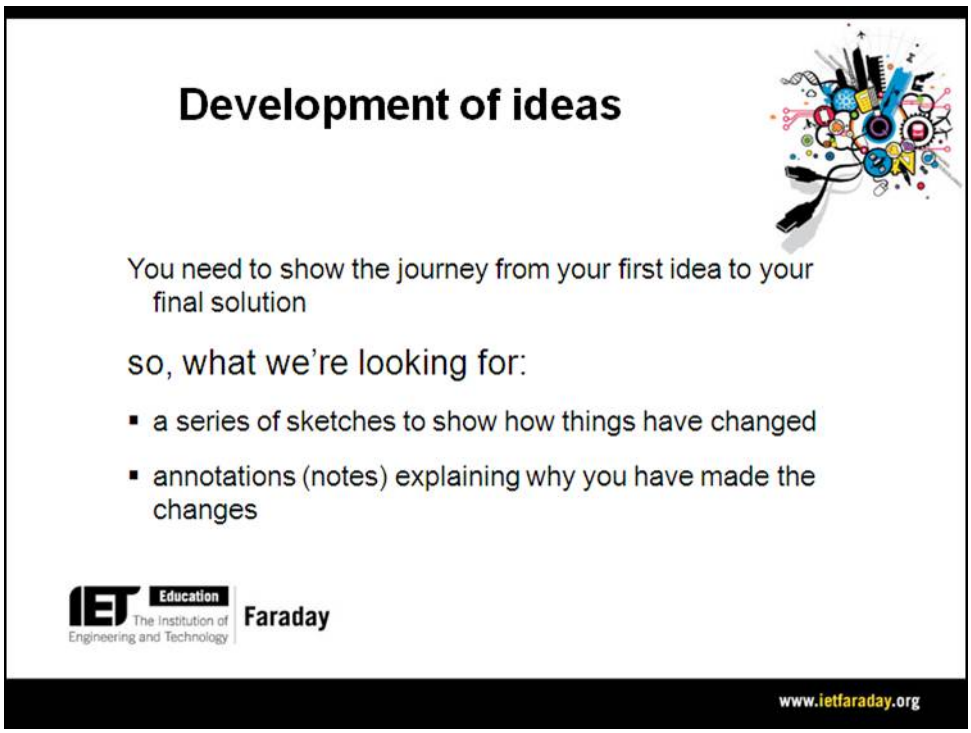


Notes

"This shows further thinking with reasons why they've made decisions."

Note for teachers: these are examples from previous Faraday Challenge Days with more detail added to explain the decision making process.

Slide 21



Notes

Note for teachers: leave this slide up during the rest of session one.

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 22

Notes

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

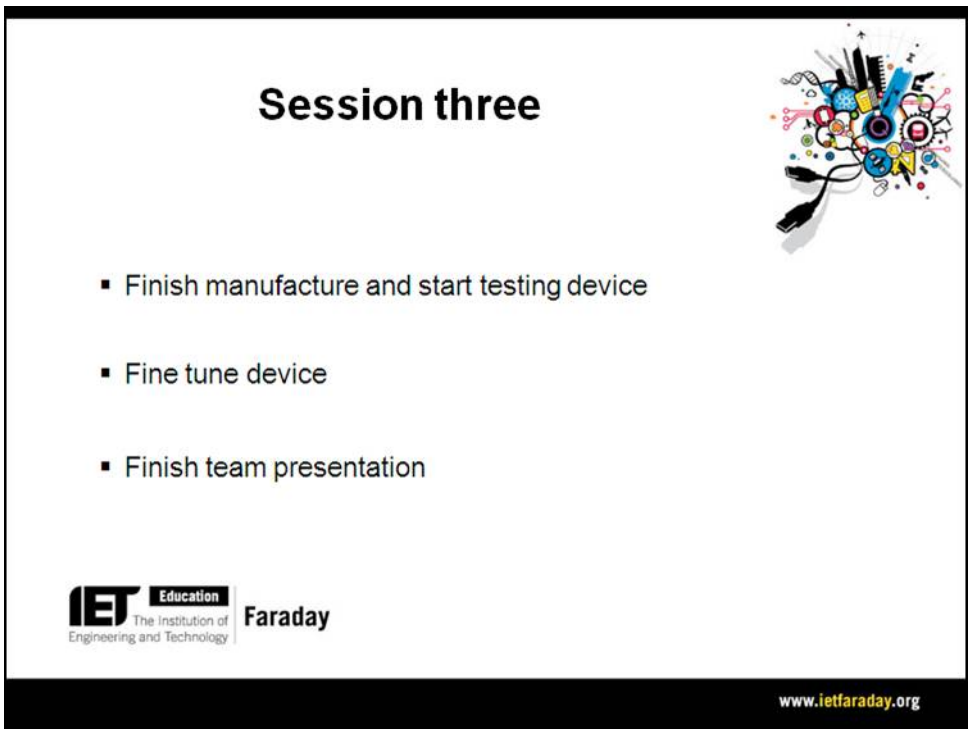
At this point each team should be ready to develop their chosen idea into a viable solution (application of scientific research into creative engineering solution) and start to manufacture their device.

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.

Slide 23



Notes

Note 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 only **1 minute** to pick up both the tennis ball and ping pong ball (one after the other) and place them accurately into the appropriate spots on the MDF/cardboard model of the human torso. This allows 5 minutes per team to present their learning logs and complete the final challenge.