



# The IET Faraday Challenge Day



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## 4 minutes

- Welcome to the Institution of Engineering and Technology's Faraday Challenge Day. My name is **xxxx** and I will be your Challenge Leader today.
- This DIY Faraday Challenge Day is set in partnership with Network Rail.
- All of you competing today will receive a certificate to say you have worked as an engineer for the Network Rail team
- The team which scores the most points today will receive .....

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# Project Flow

- Project brief
- Planning
- Team roles selection
- Apprenticeship
- Development
- Presentation to client

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NetworkRail

### 3 minutes

- Today you will be working as real-life engineers.
- You will be following an engineering project flow as shown.
- We will explain each of these stages when we get to them so you will need to listen carefully to make sure your team completes each section of the project.

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# What is engineering?

“The application of knowledge and creativity to the needs of humanity”

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**7 minutes**

- We want you to think about being an engineer in the future. Anyone thinking of being an engineer?
- What do you think engineering is? Try to get response from each group. **Stress idea that engineering is difficult to define.**
- We at the IET use this phrase **[click on definition]. Use your own example of engineering to illustrate this idea. This could be anything from a kitchen appliance to a metal knee joint but try to use something which motivates or relates to you.**
- There are many different areas of engineering. All require creativity and innovative problem-solving. Engineers use their knowledge and ideas to come up with new products or adapt existing products. They challenge themselves. We want you to do the same.


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## 1 minute

The first step in our project flow is the brief from our client, in this case the Network Rail team.

Watch the video carefully to see what Network Rail want you to do today.

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# Briefing video

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STD DAY STD DAY RETURN

**NetworkRail**

**6 minutes**

You will need to switch to the video clip here.



# The brief

- **Design and engineer ONE** prototype which will help manage one aspect of increased passenger use on their stations.  
You **MUST** Include at least one electronic component.
- **Complete** the planning and events log
- **Present** your prototype to the Network Rail judge.



## 10 minutes

- **On click: Show overview of brief.**  
Think carefully about what challenges Network Rail may face with increased passenger numbers. Think about such things as waste management, safety, accessibility. Be creative. You will think of many ideas which we have not even imagined!
- Remember you are not trying to design a whole train station, just a very small part of this which will help. Often simple ideas can be the best.
- Your design will be a prototype. Does anyone know what I mean when I say prototype? (Seek responses from students and emphasize that their design may not be the finished product but should do something of what was intended).
- **On click:** Engineering is not just about the end result. The journey to this is just as important. You will need to complete the event log at key points during your development. We will explain this further later.
- **On click:** Finally you will need to present your product to the Network Rail judge. Engineers need to be able to tell people about these so that they can be used in the real world – we don't want these ideas to be a secret! We will brief you about what should be in your presentation later so don't start writing this until then.

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# Considerations

- Energy
- Sustainability
- Capacity for growth

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### 3 minutes

- **On click:** You will need to think about the energy source for your product. Cost of powering a product is an important consideration.
- **On click:** Network Rail want to have as little impact on the environment as possible so think about how you could achieve this when designing your product.
- **On click:** Network Rail want to be able to continue to increase the numbers of passengers who can pass through their stations so think about how your product will support this.
- The brief can be found on page 5 of your student booklet so don't forget to refer to this during your planning and development.



## Assessment criteria


- Planning
- Development
- Budget
- Product engineering
- Presentation
- Teamwork




### 4 minutes

- You will be scored on all of your work today. It isn't just about your finished product, engineering is a journey and we want to know how you have arrived at your final prototype.
- The marking criteria can be found on the back pages of your Student Booklet (direct students to look at pages 12 and 13) so it is a good idea to have a look at this to see how you can score marks. You will need to do well in all the areas in order to score highly.
- You do not get marks for having money left at the end of the challenge but we are looking at how you have spent your budget.






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## Project tools

- Engineering shop
  - Cutting station
  - Hire centre trade card
- ‘How to’ sheets
- Network Rail Student Booklet
- Engineering consultant



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### 8 minutes

- **Engineering Shop** – This will open later. You have 120 Faradays on your credit card to spend in the shop but supplies are limited. If you buy something you don't need/want you can sell some of these back to the shop for half price as long as they are unused but we will be looking at how often you do this as it tells us how good your team is at planning. The shop does not negotiate and does not do deals so don't even try! We also don't give overdrafts or loans so don't go over your spend limit.
- Details of what is available to buy are in your Student Handbook. You **MUST** read this as it tells you important information and will prevent you buying things you cannot use.
- Point out the **Cutting Station** and **Hire centre** and explain rules for trade card.
- **How To sheets** – you can take two at a time to your table but please return them to the centre table when you have finished with them. These sheets will help you with some of the aspects of your designs and some of them **MUST** be read before you try to connect some of the equipment.
- **Student booklet.** This **MUST** be read if you want to have any chance of winning. You can write in this booklet if you want as it is yours to keep.
- **Engineering consultant** – You can ask for help but only if your team has worked together to try to solve the problem first.



# Project Flow

- Project brief
- Planning
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- Development
- Presentation to client



- You have now completed the Project Brief.



# Project Flow

- Project brief
- Planning
- Team roles selection
- Apprenticeship
- Development
- Presentation to client



Time to move on to Planning.

The graphic features a blue header with the IET logo (The Institution of Engineering and Technology) on the left, 'Faraday Challenge Days' in the center, and 'Education' on the right. Below the header, the text 'Be creative!' is written in green, slanted font. To its right is a glowing yellow lightbulb with the word 'idea' written inside. In the center, the word 'Planning' is written in large, bold black letters. Below it, the words 'THINK THINK THINK' are written in a grey, spaced-out font. On the left, a red quote reads 'Failing to plan is planning to fail'. Below the quote is a yellow sticky note with a paperclip and the text 'TIME TO THINK BIG!'. At the bottom, there is a dark blue footer containing social media links (theiet.org/faraday, @IETeducation), icons for a mobile phone, train tickets, a person sitting at a desk, a train, and the Network Rail logo.

## 1 minute

- Planning is essential to a successful project. We have seen many teams have great ideas and rush into developing them, only to realise that they won't work, they don't have enough Faradays or they simply don't have the time to develop them.
- All projects have a large planning aspect. This is an important stage of your project.

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# Planning

Explain how your idea will help Network Rail  
**(3 marks).**

Draw out your idea with labels. Provide as much detail of the construction as possible  
**(5 marks).**

Draw the electronic circuit(s) you will use **(5 marks).**

**TIME UP**

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## 18 minutes

- You have 15 minutes to plan out your prototype idea. Only draw the thing that you will make and make sure you use annotations to note how you are making it and what materials you are using. Network Rail should be able to copy your prototype from your final design.
- These are the marking criteria from your Student Booklet that we will use to mark you. We do not mark handwriting or spelling so don't worry about this.
- You will not finish the planning in the next 15 minutes but please note that this must be handed in at XXXXXX (time/date – this will be 5 minutes after you have asked them to complete the engineering priorities section – slide 29). We **WILL NOT** remind you of this again so make sure you go back to update it regularly as your design progresses.
- Your brief is in your Student Booklet on page 5, use it to remind you what Network Rail want from you.
- You might want to look at some of the 'How to ....' sheets, but please only take two at a time to your table so that all groups get to look at them.
- **ON CLICK:** The countdown will begin automatically and run through the 15 minutes. **Do not** freeze the powerpoint as this will stop the countdown. Do not give students any longer than 15 minutes for this stage.

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# Project Flow

Project brief	<input checked="" type="checkbox"/>
Planning	<input checked="" type="checkbox"/>
Team roles selection	<input type="checkbox"/>
Apprenticeship	<input type="checkbox"/>
Development	<input type="checkbox"/>
Presentation to client	<input type="checkbox"/>

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## 1 minute

You have now completed the Planning part of the project. Now it is time to move onto our next task which is team roles selection.

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# Project Flow

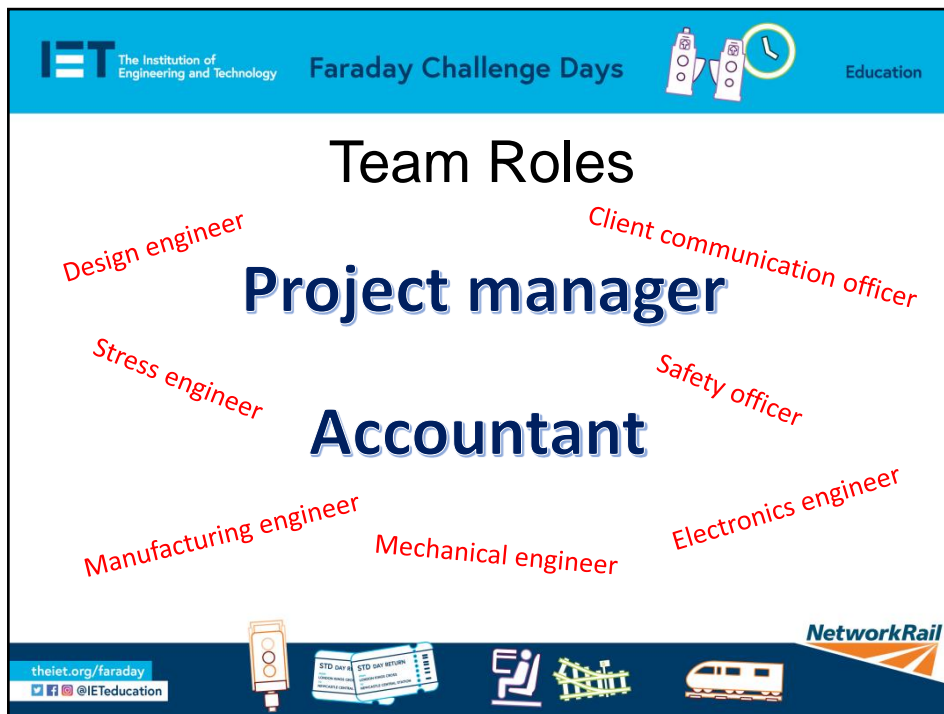
Project brief	<input checked="" type="checkbox"/>
Planning	<input checked="" type="checkbox"/>
Team roles selection	<input type="checkbox"/>
Apprenticeship	<input type="checkbox"/>
Development	<input type="checkbox"/>
Presentation to client	<input type="checkbox"/>

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## 5 minutes

- In real life, engineers work in teams and their ability to work well as a team is key to their success. Today, you are going to take on real-life engineering roles to experience what it is like to be part of a problem solving team.



## 5 minutes

You have 5 minutes to choose a Project Manager and an Accountant for your team. Remember that these people will also be part of the engineering team so they can't just put their feet up and shout orders!

The **Project Manager [Red sticker if using]** will manage the project, checking out the marking criteria, keeping the team together and making sure the team meets all the deadlines.

**The Accountant [Yellow sticker if using]** will manage the budget. They are the only one who can go to the shop but they may take one other person. They will also need to keep a record of their spending on the accounts sheet.

You may decide you want to allocate other roles in your team, it is your team so do you what you feel will work well. But **remember** everyone is an engineer.

### Notes:

- Give 1 minute warning.





# Project Flow

Project brief



Planning



Team roles selection



Apprenticeship



Development



Presentation to client



- Now onto our last task before you can work as part of the Network Rail engineering team.

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# Project Flow

Project brief	<input checked="" type="checkbox"/>
Planning	<input checked="" type="checkbox"/>
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Apprenticeship	<input type="checkbox"/>
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- Find the Engineering Apprenticeship brief on page 7 of your Student Booklet.



# Engineering Apprenticeship

All teams **MUST** complete the Apprenticeship and everyone in your team **MUST** be involved.

Use the components in the box to connect the circuit shown in your student booklet on page 7.

- What happens when you shine a light onto the Light Dependent Resistor?
- What happens when you cover it up?



## 10 minutes

- All engineers need to complete an apprenticeship. You will also need to discuss the questions on the sheet and be ready to respond when the challenge leader asks for ideas.
- You must show me your circuit when you have successfully completed it.
- Once all teams have finished discuss the idea of resistance quickly. Remind them these ideas might be important in their development. Point them towards 'How to sheets' such as making a parallel circuit.

## NOTES:

- Watch for them splitting in to boys groups and girls groups during apprenticeship – you may want to point out that each gender brings strengths and they should work across the team wherever possible.

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## Project Flow

Project brief	<input checked="" type="checkbox"/>
Planning	<input checked="" type="checkbox"/>
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Presentation to client	<input type="checkbox"/>

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### 1 minute

- Collect in apprenticeship packs.
- The room may be noisy now and teams will be keen to get going on their development but call for quiet and advise that they have all now completed the Apprenticeship.
- Celebrate this by encouraging them to give themselves a round of applause.

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## Project Flow

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### 1 minute

- Now you have completed your apprenticeship, the Network Rail team are happy for you to begin work on their project.
- You are now my engineers in my engineering workshop so before I open the shop we need to do a quick health and safety briefing.



## Health and safety briefing

1. Keep your work station tidy (including the floor around it).
2. Take care with craft knives, hacksaw, scissors and staplers.
3. Three people only at the cutting station at any time.
4. No blades to be left open and no tools to be removed from the cutting station.
5. Be careful of short circuits.
6. Report spillages, accidents or potential hazards to the Challenge Leader or shop keeper immediately.
7. No food or drink near work tables, shop or cutting station.



### 2 minutes

- Remind them that working as a team is important and they need to keep themselves and everyone in the room safe. We will be looking at this when marking their team work.
- Go through the tips for safe working!
- Re-emphasise the rules of the Cutting Station



The slide features a blue header with the IET logo (The Institution of Engineering and Technology) on the left, the text 'Faraday Challenge Days' in the center, and 'Education' on the right. A clock icon is also present in the header. A large blue 'Shop open' sign hangs from the top left. The main title 'Development' is centered in a large, bold, black font. Below the title is a bulleted list of instructions. The footer contains the website 'theiet.org/faraday', social media icons for Twitter, Facebook, and Instagram with the handle '@IETeducation', a USB drive icon, two 'STD DAY' tickets, a person sitting at a desk, a green bridge structure, a train, and the Network Rail logo.

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# Development

Shop open

- Hand in your apprenticeship pack to begin using the shop.
- Begin to develop your product.
- Remember to go back to your Planning sheet to make sure it is completed.

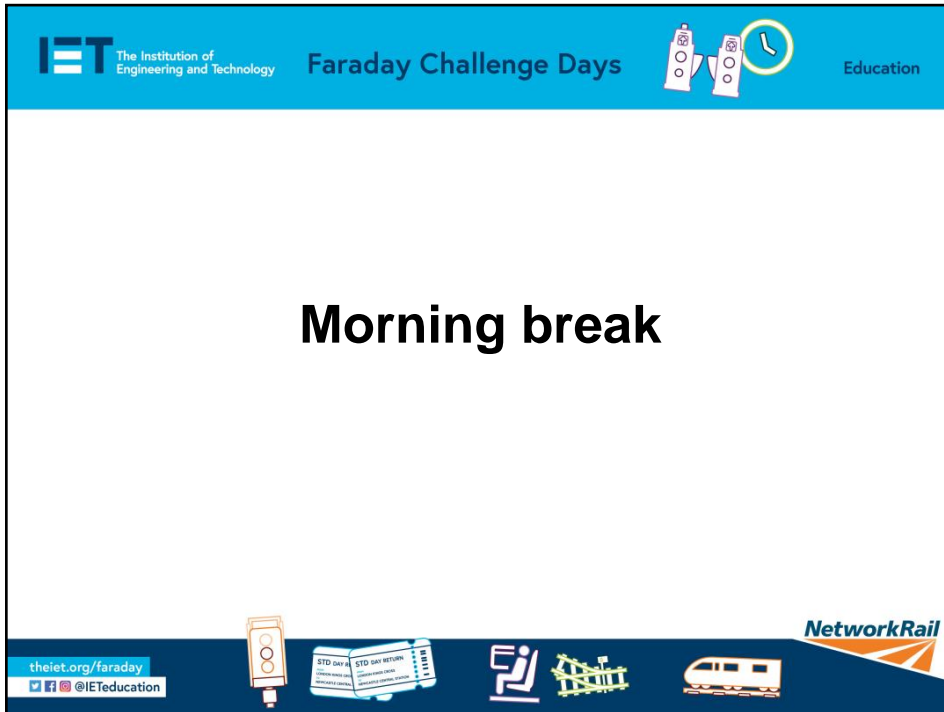
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STD DAY  
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NetworkRail

## 25 minutes to Event log 1

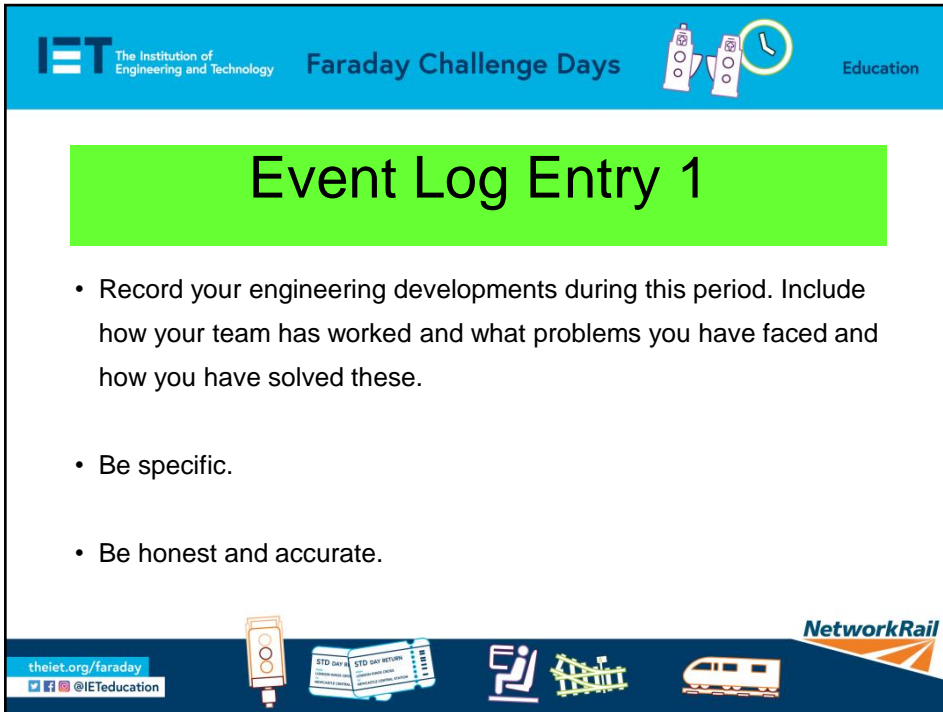
- Shop open for business and you can start building your design.
- I will tell you what you need to do for the Events Log after your break.



**If using – 10 minutes maximum. If no break students can use this 10 minutes for build time.**

- This is a working break so you may continue to work on your prototypes if you wish.
- Keep food and drink away from the electrical components and resources please!





The slide features a blue header with the IET logo (The Institution of Engineering and Technology) on the left, the text 'Faraday Challenge Days' in the center, and 'Education' on the right. To the right of the text are icons of a rocket and a clock. A large green box in the center contains the title 'Event Log Entry 1'. Below the title is a bulleted list of instructions. The footer is dark blue and contains the URL 'theiet.org/faraday', social media icons for Twitter, Facebook, and Instagram with the handle '@IETeducation', icons of a smartphone, 'STD DAY' and 'STD DAY RETURN' tickets, a person sitting at a desk, a railway track, and a train, and the Network Rail logo.

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## Event Log Entry 1

- Record your engineering developments during this period. Include how your team has worked and what problems you have faced and how you have solved these.
- Be specific.
- Be honest and accurate.

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NetworkRail

### 3 minutes to explain then 25 minutes to Event log 2

#### Notes:

- Remind them to complete the event log for the time period up to this point.
- Explain that the journey to their final product is really important. Get them to focus on the engineering progress and to think about how their team is working.
- Remind them to look at the assessment criteria for the events logs.
- Tell them you will not interrupt them for Event log 2 and 3 they will just hear the drum roll when it is time to do them.



## Event Log Entry 2

- Record your engineering developments during this period. Include how your team has worked and what problems you have faced and how you have solved these.
- Be specific.
- Be honest and accurate.



### 20 minutes to Event log 3

- Do not interrupt them for this unless the sound is poor and they cannot easily hear the drum roll.



## Event Log Entry 3

- Record your engineering developments during this period. Include how your team has worked and what problems you have faced and how you have solved these.
- Be specific.
- Be honest and accurate.



### 20 minutes to presentation brief

- Do not interrupt them for this unless the sound is poor and they cannot easily hear the drum roll.

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## Presentation briefing

- 5 minutes, maximum, to present.
- Look at the assessment criteria and write notes.
- Demonstrate and explain how your prototype works.
- Make it interesting.

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YorkRail

### 5 minutes

- Remind them that all the team should present.
- Emphasise the need to look at the assessment criteria. If there are 4 marks for something then one sentence is not going to be enough to score highly.
- Be specific and detailed. For example, if you have used a parallel circuit you might want to explain why. Remember our discussion about resistance in the Engineering Apprenticeship.
- Encourage them to make notes for their presentation. They can use these notes in their presentation.
- Tell them it is their presentation and they may present in any way they like – make it interesting!



# Engineering Priorities



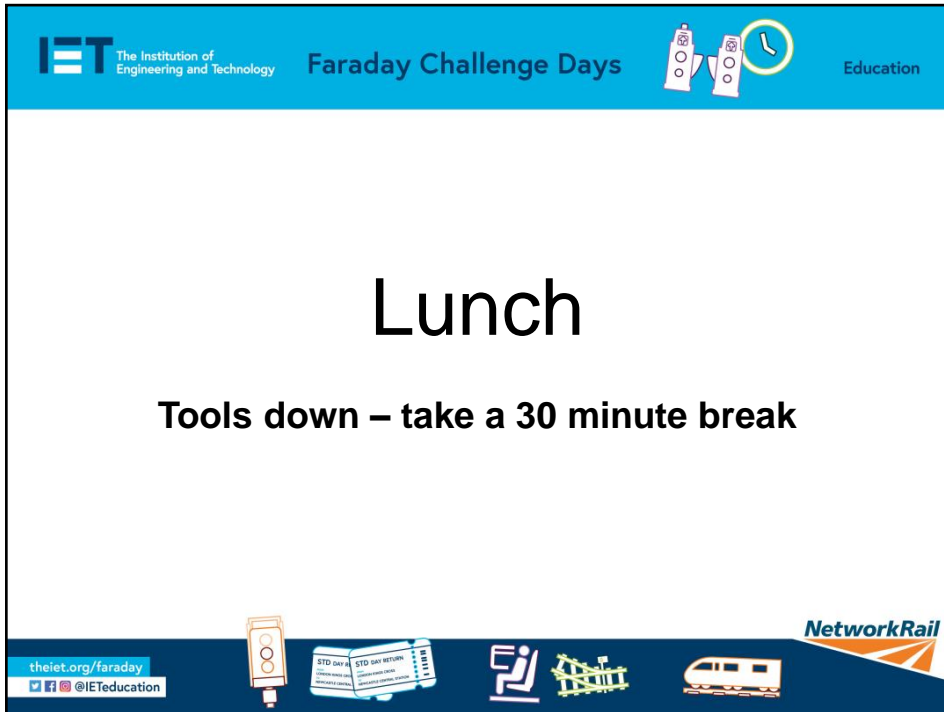
List your engineering priorities for the last half hour of development.

- What does the team need to do?
- Who will do what?
- In what order?



## 5 minutes

- Ask teams to spend time before lunch identifying their priorities for the last 30 minutes of workshop time.
- Remind them to be specific about what they will do, be realistic about what they can achieve in the time remaining, to look at the marking criteria for the product and to focus on the engineering rather than on aesthetics.
- Don't include writing the presentation in these priorities, stick to engineering priorities only.
- Give them 5 minutes to complete this section then collect in the Planning and Events log for each team. Do not give them back to the students. Make sure team number is on the sheet. These must be sent to the Challenge Leader for marking.



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**If using. If not this time CANNOT be used for the Challenge.**

- Ask students to sit away from their tables if they are remaining in the room for lunch.
- Ensure all tools are at the cutting station before the students leave the room



## Final preparations

- Can you complete your prototype in the time left?
- Have you started preparing your presentation?
- Have you filled in your accounts sheet?
- Do you need to buy anything else from the shop?
- How can you best use the time remaining?



### 30 minutes

Important here to focus the students on reflecting on what is achievable. Some teams try to start something completely new but get them to reflect back on their engineering priorities.

- The shop will close in 30 minutes so make sure you have bought or sold back any items. You must be ready to submit your accounts sheets to the shop when it closes.
- You must be ready to present your pitch in 45 minutes (or when scheduled with your Challenge Leader) so spend time rehearsing it.



# Preparing to present

## The shop is now closed

- Submit your accounts sheets to the shopkeeper.
- Return any items you are not using.
- Practise your presentation – remember to check the assessment criteria!



## 5 minutes

- Accountants to submit accounts sheets to shop. Ask shopkeeper to note any discrepancies between what they say they have remaining and what they hand back and then to return accountancy sheets to you. These must be sent to the Challenge Leader for marking.
- Remind teams of importance of doing an interesting, rehearsed presentation and that this is part of the marking criteria.





# Project Flow

Project brief



Planning



Team roles selection



Apprenticeship



Development



Presentation to client



You have now completed your development section.

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This is the time that the engineers would present their ideas to their client; in this case, the Network Rail team.

**55 minutes for introduction and all teams' presentations.**

***If students are presenting live online to the your Challenge Leader they can lead this section if you choose. If so please make sure students are sitting in semi-circle around the presentation area before coming online and that they have left their prototypes and any presentation notes on their tables. This avoids noise due to fiddling with resources and stops teams adding to their presentation notes.***

- Telling others about your ideas is fun. There may be problems or issues with prototypes but it is important to be relaxed! Remember the judge is marking on a number of different things and the competition is not won or lost on the performance of the prototypes. They are using all of the sections of the marking criteria to award marks
- Run through how the presentations will work e.g. numerical order, once the previous team has finished – round of applause and then the next team can stand up and get ready.
- There may be questions if you have time or if anything needs clarifying. Do not allow questions from students or teachers.
- Emphasise that any questions are intended to get them extra marks and not to trip them up. Keep questions as positive as possible.
- Remind them we will cut them off if they go over time.

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### 10 minutes

- You have now completed the whole project and worked in the way engineers work in real-life. Well done to all of you. You should be very proud of your achievements.
- Give brief feedback to each team about their strengths. Even where teams have struggled with the engineering it is often possible to identify strengths in teamwork, sense of humour, etc. The point about this section is to enable all students to feel they have moved forward and achieved something.
- You can also ask for a show of hands about who would consider engineering as a future career to see if there has been any change during the period of the challenge. This could be followed up by pointing them towards careers resources in your school.
- Make sure you have the following documents with team numbers written on to send to the Challenge leader:
  - Planning and events log
  - Accounts sheet
  - Also email the marks for teamwork.
- **TOP SECRET!** Please do not share any of the resources or any photographs/videos of prototypes on open social media sites or outside your school until this season of Faraday Challenge Days is completed in July. If you want to compose a press release you can use the details sent to you in the Media Toolkit.