



## #iRail >>>> Teacher Led Pack

### The Sessions >>>>

The teacher led iRail sessions enable students to develop skills vital for the world of work by focusing on career examples and supported by a range of companies across the rail industry. Containing aspects from the geography, technology, and business curriculum these sessions can be run as a block, such as a drop-down day or fit into class lessons.

The teacher led iRail sessions are split into 2 sections –

- The enterprise project, comprising 5 x 1-hour long lessons that lead students through a series of activities to develop a station design and present it to the class.
- The deeper learning lessons, comprising of 5 stand alone lessons that can be adapted in length from 1 hour to 2-hours long. Each focuses on a different topic including sustainability, manufacturing and inclusive travel.

The PowerPoints, session plans and other resources for each of the lessons are available from the teachers' area of the Rail Forum website. Each lesson also links to youtube hosted career videos from people in rail.

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# Rail Forum



## The Deeper Learning Lessons

The deeper learning lessons offer a deep dive into different aspects on the rail industry. They are standalone lessons that can be used alongside the enterprise project, as a series of 5 lessons or as individual lessons. All 5 lessons encourage the learners to utilise their skills and consider various careers in rail. The sessions can be run in a 1-hour lesson, there are extension activities to take each session up to a 2-hour lesson.

Underlined resources are only required for a 2-hour session.

### Solving Complex Problems

This session helps learners to develop their lateral thinking and problem-solving skills. Working as a whole class to answer some traditional lateral thinking problems before understanding some of the complex problems in the rail industry and completing some timetabling challenges. In the extended session students are challenged to think outside of the box with a "desert island" style challenge.

#### Teacher assets:

- PowerPoint (*DL1. Solving complex problems ppt*)
- Session plan (*DL1. Solving complex problems session plan*)

#### Resources required:

- Timetable challenge worksheet (*DL1. timetables*) one set per team of 4
- Island adventure worksheets (*DL1. Island adventure worksheet*) one per team
- Island scenarios (*DL1. Island scenario cards*) one set per class
- Island Scenario worksheet (*DL1. Island scenario worksheet*) one per team

### The Manufacturing Process

This session guides learners through the manufacturing process and different methods within it, focusing on examples from the rail industry. Learners are challenged to consider the methods of production they would use in a case study activity.

The extended session includes a practical challenge to manufacture a structure that can withstand the force of a fan.

#### Teacher assets:

- PowerPoint (*DL2. The manufacturing process ppt*)
- Session plan (*DL2. Solving complex problems session plan*)

#### Resources required:

- Methods of production sheet (*DL2. Methods of Production*) one set per team of 4
- Mrs. Sweeting Case study (*DL2. Mrs. Sweeting worksheet*) one per team
- Challenge tokens (*DL2. Challenge tokens*) one sheet per class

#### Equipment required:

- 1 x fan
- Scissors x16 (2 per team)
- Items to build towers: cardboard, lolly sticks (large and small), plastic cups (large and small), string, straws, pipe cleaners, tin foil, pegs, A4 paper, masking tape

### Designing for Inclusive Travel

The session develops the idea of Inclusion and the need for all individuals to be valued. The idea of Inclusion is advanced with an understanding of disability. Disability is linked to transport highlighting the problems with inclusive rail travel and learners are tasked with designing an innovative solution to a problem faced by those with a disability.

#### Teacher assets:

- PowerPoint (*DL3. Designing for Inclusive Travel ppt*)
- Session plan (*DL3. Designing for Inclusive Travel session plan*)

#### Resources required:

- Disability mix and match cards (*DL3. Disability mix and match*) one set per team of 4
- Disability fact sheets (*DL3. Design Disability Fact sheets*) one set per two teams
- Rail section sheets (*DL3. Design Rail section sheets*) one set per class
- Design task sheet (*DL3. Design task worksheet*)

### Sustainability

This session explains the concept of sustainability before allowing learners to take a deep dive into an area of sustainable innovation. In teams they must design a poster that explains their area before knowledge is shared in a poster conference style activity. The learning about sustainability is then linked to the rail industry. In a 2-hour session there is an extra activity to focus on the students' own experiences of travel and how their journeys could be made more sustainable.

#### Teacher assets:

- PowerPoint (*DL. sustainability ppt*)
- Session plan (*DL3. sustainability session plan*)

#### Resources required:

- Fact sheets (*DL4. Fact sheet 1 (climate change) DL4. Fact sheet 2 (Minimising waste production), DL4. Fact sheet 3 (Renewable sources of energy)*) one fact sheet per team of 4
- Journey mind map (*DL4. Journey mindmap*) one per student

#### Equipment required:

- An A4 book





**Right First Time**

In this session students consider engineering tolerances and the impact they have on the rail network.

If you have access to Cambridge brain box circuit sets for the class to use, then there is an activity involving creating electrical circuits and rail electrification.

If your school does not have these circuit sets then there is a competitive activity where, working in teams' students must then build a track out of paper making sure to stick to the tolerances provided!

**Teacher assets:**

- PowerPoint (*DL5. Right first time – circuit challenge ppt* **OR** *DL5. Right first time – Paper track challenge ppt*)
- Session plan (*DL5. Right first time – circuit challenge session plan* **OR** *DL5. Right first time – Paper track challenge session plan*)

**Resources required:**

The circuit session requires no printed resources

For the paper track session:

- Track challenge teacher guide (*DL5. Track challenge teacher guide*) 1 per class
- Track challenge worksheet (*DL5. Track challenge work sheet*) 1 per team of 4

**Equipment required:**

For the circuit session:

- Cambridge Brainbox circuit sets, 1 per team of 4

For the paper track session:

- A4 paper
- Masking tape
- Scissors
- Rulers



## The Enterprise Project

This series of 5 lessons takes students, in working groups of 5, through the process of designing a new station, from team formation, considering the location of the station, thinking about the customers and their needs, designing an innovative new solution to a future problem and finally planning and presenting their station to the class. This project will help learners to develop a variety of skills ranging from teamwork and creativity to communication skills and problem solving.

### 1. Project briefing

The structure of the project is explained. Teams are formed and then students take part in an interactive challenge to immerse them into thinking about careers in rail

#### Teacher assets:

- PowerPoint (*E1 -project briefing ppt*)
- Session plan (*E1 – project briefing session plan*)

#### Resources required:

- Workbooks – 1 per student – these will be used throughout the 5 sessions (*iRail enterprise project workbook*)
- Career hunt resources – print one for the class, place around the room.
- A4 paper (at least 30 sheets)

### 2. Location, Location, Location

In this lesson students begin to think about the new station they will be designing. A team challenge of planning a route to the new station alongside thinking about the people they will need to consider in their station design will allow learners to develop their team time management skills.

#### Teacher assets:

- PowerPoint (*E2 -location, location, location ppt*)
- Session plan (*E2 – location, location, location session plan*)

#### Resources required:

- Workbooks from previous session

### 3. Future thinking

In the future thinking session students will learn about the history of rail and current innovations, they will then use their creative skills to develop their own innovative idea that could be implemented in their station. Finally, they will create a mood board of their station

#### Teacher assets:

- PowerPoint (*E3 -future thinking ppt*)
- Session plan (*E3 – future thinking session plan*)

#### Resources required:

- Workbooks from previous session
- Access to computers with the internet or resources to create a mood board from (magazines etc.)



#### 4. Designing your station

In this session teams are reminded of the project brief and are set the challenge to create the floorplan of their station with a budget of £5,000,000 and a price list of various assets they may wish to include in their station.

##### Teacher assets:

- PowerPoint (*E4 - designing your station ppt*)
- Session plan (*E4 - designing your station session plan*)

##### Resources required:

- Workbooks from previous session
- Station floor plans (*E4 - station floor plan*) printed on a3 paper x3 for each team – you may wish to print some spares in case teams would like to start over!

#### 5. Project presentations

In this session groups look at what makes a good presentation before having some time to plan their own presentations. Groups then present their projects with the other team's peer assessing them – points are to be awarded on each of the elements from the previous sessions!

##### Teacher assets:

- PowerPoint (*E5 - project presentations ppt*)
- Session plan (*E5 - project presentations session plan*)

##### Resources required:

- Workbooks from previous session
- Rail careers articulate (*E5 - rail careers articulate*) one set per team





# Rail Forum

## Deeper Learning: Solving Complex Problems

### Session Plan



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**Deeper Learning: 1-2 Hour Lesson**  
**Solving Complex Problems**



<p>Theme</p>	<p>This session helps learners to develop their lateral thinking and problem-solving skills. Working as a whole class to answer some traditional lateral thinking problems before understanding some of the complex problems in the rail industry and completing some timetabling challenges. In the extended session students are challenged to think outside of the box with a “desert island” style challenge.</p>
<p>Learning Objectives</p>	<ul style="list-style-type: none"> <li>• Understand what a problem is.</li> <li>• Be able to understand that a problem needs to have a solution.</li> <li>• Understand the importance of lateral thinking and how to use it for solving problems.</li> <li>• Use critical thinking, problem solving skills, good teamwork and communication skills to complete a task as a group.</li> </ul>
<p>Curriculum and Key Skill Links</p>	<ul style="list-style-type: none"> <li>• <b>Communication Skills:</b> within teams.</li> <li>• <b>Creativity Skills:</b> producing innovative ideas to problems.</li> <li>• <b>Problem Solving Skills:</b> lateral thinking.</li> <li>• <b>Teamwork:</b> lateral thinking challenge as a whole class, solving complex problems as a small team.</li> <li>• <b>Emotional intelligence:</b> considering the impact solutions would have on other people.</li> </ul>
<p>Resources Required</p>	<p>Computer; Projector; PowerPoint Presentation (DL1. Solving Complex Problems), DL1. Timetables x8 (1 per team of 4), DL1. Island adventure worksheet x8 (1 per team of 4), Island scenario cards x1, DL1. Island scenario worksheet x8 (1 per team of 4), one dice.</p> <p><b>Resources listed allow for one session of 30 students, you will need to adjust accordingly.</b></p>
<p>Ability/ Special Educational Needs</p>	<p>This session has the students working in their teams to read information from a timetable. Working in their teams should allow for collaborative conversation and communication. Any struggles with reading comprehension or writing should be mitigated by working within the groups although some adjustments may need to be made depending on student’s needs.</p>





SLIDE / TASK (CHALLENGE)	1 HOUR SESSION
1. Title / Introduction	0.5 minutes
2. Session aims	2 minutes
3-4. What is a problem?	4 minutes
5-8. Lateral thinking challenge	10 <b>20</b> minutes
9. What makes a problem complex?	5 <b>10</b> minutes
10. What problems are in rail?	5 <b>10</b> minutes
11. Problem solving in rail	2 minutes
12. Rail problems	2 minutes
13. Timetable challenge	20 minutes
<b>14. The future</b>	<b>2 minutes</b>
<b>15-17. Your challenge</b>	<b>30 minutes</b>
18. Careers in rail	2 minutes
19. Careers in rail (external link to further videos)	5 <b>10</b> minutes
20. Working in rail	2.5 minutes
<b>Total:</b>	<b>60 (120) minutes</b>

**■** = include these slides/tasks for a 2-hour session

## SESSION GUIDE

SLIDE / TASK (CHALLENGE)	STUDENT ACTIVITIES	MATERIALS AND RESOURCES	Notes
<b>Slide 3-4</b> <b>What is a problem?</b>	Offer answers to the question "what is a problem?"		<i>Let the students give some responses and encourage them in a positive manner allowing, for their own comments to be valued.</i>



## SESSION GUIDE

SLIDE / TASK (CHALLENGE)	STUDENT ACTIVITIES	MATERIALS AND RESOURCES	NOTES
<p><b>Slide 5-8</b></p> <p><b>Lateral Thinking Challenge</b></p>	<p>Work as a class to answer the lateral thinking problems.</p> <p>As a class students may ask up to 20 yes/no questions to help them to come to the answer.</p>		<p>The difficulty of each question gets harder.</p> <p>The Coal, Carrot and Scarf. THE ANSWER: They were used by children who made a snowman. The snow has now melted.</p> <p><b>There may only be time for the first problem in a 1-hour session</b></p> <p>The man in the elevator. THE ANSWER: The man is a person of short stature. – he is too short to reach the number 10 button! If they are not getting close, you can include the clue that on rainy days he goes up in the elevator to the tenth floor (he uses his umbrella to push the button!)</p> <p>Push the car. THE ANSWER: The man is playing monopoly!</p>
<p><b>Slide 9-12</b></p> <p><b>Problems in Rail</b></p>	<p>Offer answers to the question "what is a complex problem?"</p> <p>Offer answers to the question "what are problems in rail?"</p>		



## SESSION GUIDE

SLIDE / TASK	STUDENT ACTIVITIES	MATERIALS AND RESOURCES	NOTES
<p><b>Slide 13</b> <b>Timetable Challenge</b></p>	<p>Complete the timetable challenge in groups of 4.</p>	<p>DL1. Timetable Worksheet</p>	<p>In a 1-hour session students would be expected to complete page 1 - page 2 as an extension.</p> <p>In a 2-hour session students would be expected to complete both pages.</p> <p>The second page is a more complicated timetable that you would find online. Some students might need some explanation initially – especially when services are split across columns</p> <p>Answers:</p> <p>DRBY = Derby BRGHTN = Brighton NTNG = Nottingham IVRNESS = Inverness MNCRPIC = Manchester Piccadilly</p> <ol style="list-style-type: none"> <li>1. platform 9</li> <li>2. 30 seconds</li> <li>3. 1054</li> </ol> <ol style="list-style-type: none"> <li>1. 1000</li> <li>2. 9 minutes</li> <li>3. 1 hr 20 minutes (80 minutes)</li> <li>4. 0952</li> <li>5. 1 hr 5 minutes (65 minutes)</li> </ol>
<p><b>Slide 14</b> <b>The Future</b></p>	<p>Understand that rail is a good option for future transport.</p>		<p>As the world’s population becomes increasingly urbanised, it is estimated that the number of journeys measured in passenger-kilometres will triple by 2050. Roads simply can’t absorb this increase.</p> <p>Railways, with their greater capacity for carrying more people, quickly and with greater energy efficiency, are the best bet to become our mobility backbone.</p> <p>Of course, engineers’ imaginations have created many alternatives to the original steel-on-steel approach to the railway.</p> <p>Maglev and the much-publicised but so far theoretical Hyperloop are often regarded as the ones to watch – but you are the people who will make the future of rail travel possible.</p>



## SESSION GUIDE

SLIDE / TASK	STUDENT ACTIVITIES	MATERIALS AND RESOURCES	NOTES
<p><b>Slide 15</b></p> <p><b>Your Challenge</b></p>	<p>Understand the key skills needed to solve complex problems and the background to the challenge.</p>		<p>Set the scene: the year is 2050, You have been chosen to undergo the first test of the new hovering bullet train that is believed to be the solution to all the world's transport needs.</p> <p>You were chosen due to your abilities in solving complex problems.</p>
<p><b>Slide 16</b></p> <p><b>Lightening Storm!</b></p>	<p>Consider the 4 items they would take from the train.</p> <p>Explain why they would take those items to the class.</p>	<p>DL1. Island Adventure Worksheet</p>	<p>Allow students time to discuss and decide on 4 items then ask them all to share those items with the class – if time each team can present the reasoning behind their choices.</p>
<p><b>Slide 17</b></p> <p><b>Scenarios</b></p>	<p>Using the 4 items they have chosen, work out a way to survive on the island. Each team will have a different scenario.</p>	<p>DL1. Island Scenario Worksheet</p> <p>DL2. Island Scenario Cards</p> <p>Dice</p>	<p>Hand out the scenario cards at random.</p> <p>Using the 4 items they chose students must devise a plan to survive on the island.</p> <p>Allow 15-20 minutes for planning time. Each group then presents their ideas to the class.</p> <p>Score each groups chances of survival on a scale of 1-3 (1 being a plan with lots of missing areas and things that could go wrong, 3 being a plan that is well thought through and considers all aspects of the scenario).</p> <p>After presenting each group must roll a dice. They need a score of 4 to barely survive on the island. A score of 9 would mean that everything goes as planned and they thrive!</p> <p>Improvise a short ending to each group's scenario based on their score.</p>

## SESSION GUIDE

SLIDE / TASK (CHALLENGE)	STUDENT ACTIVITIES	MATERIALS AND RESOURCES	NOTES
<p><b>Slide 18-20</b> <b>Careers in Rail</b></p>	<p>Discover different careers in the rail industry.</p>		<p>Talk through benefits of a career in rail before discussing the different job roles on slide 19.</p> <p>If time allows follow link to look at videos from people in the rail industry.</p>



# Rail Forum

## Deeper Learning: The Manufacturing Process Session Plan



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**Deeper Learning: 1-2 Hour Lesson**  
**The Manufacturing Process**



<p>Theme</p>	<p>This session guides learners through the manufacturing process and different methods within it, focusing on examples from the rail industry. Learners are challenged to consider the methods of production they would use in a case study activity.</p> <p>The extended session includes a practical challenge to manufacture a structure that can withstand the force of a fan.</p>
<p>Learning Objectives</p>	<ul style="list-style-type: none"> <li>• Understand what the manufacturing process is.</li> <li>• Be able to understand and choose which type of production and manufacturing process is suitable for particular business activities.</li> <li>• Use good teamwork, technical skills, analytical skills and communication skills to complete a task as a group.</li> </ul>
<p>Curriculum and Key Skill Links</p>	<ul style="list-style-type: none"> <li>• <b>Communication Skills:</b> within teams.</li> <li>• <b>Creativity Skills:</b> Producing and drawing ideas.</li> <li>• <b>Problem Solving Skills:</b> establishing the best way to manufacture baked goods.</li> <li>• <b>Working with Others:</b> discussing and refining ideas.</li> <li>• <b>Design technology:</b> the manufacturing process.</li> </ul>
<p>Resources Required</p>	<p>Computer; Projector; PowerPoint Presentation (deeper learning – Manufacturing), 8x Methods of production activity sheet (1 per group of 4), 8x Mrs Sweeting activity sheet (1 per group of 4).</p> <p>For tower manufacture challenge (included in longer session): 1 x fan, scissors x 16 (2 per group of 4), challenge tokens (1 sheet per team) items to build tower: cardboard, lolly sticks (large and small), paper cups (large and small) string, straws, pipe cleaners, tin foil, pegs, a4 paper, masking tape.</p> <p><b>Resources listed allow for one session of 30 students, you will need to adjust accordingly.</b></p>
<p>Ability/ Special Educational Needs</p>	<p>This session has the students working in their teams to produce ideas, refine them and develop them. Working in their teams should allow for collaborative conversation and communication.</p> <p>For the extension activity students will be building a structure out of recyclable materials, this will involve moving around the classroom as well as the dexterity required to build the tallest structure. Any issues with this should be mitigated by working within the groups although some adjustments may need to be made depending on students needs.</p>



SLIDE / TASK (CHALLENGE)	1 HOUR SESSION
1. Title / Introduction	0.5 minutes
2. Session Aims	1.5 minute
3. What is Manufacturing?	4 minutes
4. Manufacturing Process	2 5 minutes
5. Manufacturing Process Video	2 minutes
6. Methods of Production (Methods of production activity sheet)	10 minutes
7. Job Flow Batch	2 4 minutes
8. Alstom	2 minutes
9-10. Job Production	3 minutes
11-12. Flow Production	3 minutes
13-14. Batch Production	3 minutes
15. Job Flow Batch	2 minutes
16. Production in Action	2 minutes
17-18. Case Study (Mrs. Sweeting activity sheet)	15 20 minutes
19. Why is manufacturing important in the UK?	2 minutes
20. Evolution of Mobility	7 minutes
21. Not Just Trains	1 minute
22-23. Your Challenge	3 minutes
24. Challenge Price List	40 minutes
25. Careers in Rail	2 minutes
26. Careers in Rail (external link to further videos)	2 7 minutes
27. Working in Rail	4 minutes
<b>Total:</b>	<b>60 (120) minutes</b>

  = include these slides/tasks for a 2-hour session

SESSION GUIDE			
SLIDE / TASK (CHALLENGE)	STUDENT ACTIVITIES	MATERIALS AND RESOURCES	NOTES
<b>Slide 3</b> <b>What is Manufacturing?</b>	Offer answers to the question "what is manufacturing?"		<i>Let the students give some responses and encourage them in a positive manner allowing, for their own comments to be valued.</i>

**SESSION GUIDE**

SLIDE / TASK (CHALLENGE)	STUDENT ACTIVITIES	MATERIALS AND RESOURCES	NOTES
<p><b>Slide 4 -5</b></p> <p><b>The Manufacturing Process</b></p>	<p>Understand the manufacturing process.</p> <p>Watch video.</p>	<p>Manufacturing and production process video (slide 5) 4 minutes</p>	<p>The process of converting raw material into finished products is called a production process. In this production process, different types of machines, tools, equipment are used to produce the finished goods. Several types of manufacturing processes are applied in production process based on the nature of work and ultimate resultant finished goods required.</p> <p>The fundamental goal of manufacturing process is to produce a product that has a useful form. The three different types of functions that are involved in manufacturing process are as follows:</p> <p>To change the physical properties of the raw material.</p> <ul style="list-style-type: none"> <li>• Hardening, tempering, annealing, surface hardening,</li> </ul> <p>To change the shape and size of the work piece.</p> <ul style="list-style-type: none"> <li>• Rolling, forging, extrusion</li> </ul> <p>To produce required dimensional accuracy (tolerances) and surface finish.</p> <ul style="list-style-type: none"> <li>• Lapping, honing, superfinishing</li> </ul>



**SESSION GUIDE**

SLIDE/TASK	STUDENT ACTIVITIES	MATERIALS AND RESOURCES	NOTES
<p><b>Slide 6</b> <b>Methods of production</b></p>	<p>Methods of production activity- In groups sketch how the following items are manufactured.</p>	<p>Methods of Production Worksheet</p>	<p>Working in teams of 4</p>
<p><b>Slide 7- 16</b> <b>Job, Batch or Flow?</b></p>	<p>Learn about each of the 3 types of production method and then decide which production method Alstom use to manufacture rolling stock.</p>		<p>Slide 7: Alstom is worldwide company known for sustainable mobility solutions, in the UK over half of all train journeys are made on an Alstom train. There are 8 stages of production when they create new vehicles.</p> <p><b>Each stage has 2, 7 member teams</b></p> <p>Roof – first stage, includes installation of lights, door control units and air con units.</p> <p>Underframe – installation of pipework, flooring, painting and greasing for protection.</p> <p>Bodysides – installation of windows, thermal and acoustic insulation, interior panels.</p> <p>Erection – roof, underframe and body sides are assembled, installation of toilet and drivers' cab.</p> <p>Doors – installation of all doors and gangways. Once complete vehicle is water tested.</p> <p>Traction – installation of remaining pipework and electrical boxes below the vehicle.</p> <p>Fit out – inside the vehicle, installation of remaining interior panels and door gear covers.</p> <p>Completion – installation of seats and tables inside vehicle, installation of yaw dampers and brackets.</p>

**SESSION GUIDE**

SLIDE/TASK	STUDENT ACTIVITIES	MATERIALS AND RESOURCES	NOTES
<p><b>Slide 7- 16</b></p> <p><b>Job, batch or flow?</b></p>	<p>Learn about each of the 3 types of production method and then decide which production method Alstom use to manufacture rolling stock.</p>		<p>Slide 16: <b>Using BMW as an example explain that businesses such as Alstom can use a combination of production methods-</b></p> <p><b>MASS:</b> Most BMW cars</p> <p><b>BATCH:</b> Most expensive top-of-the range</p> <p><b>JOB:</b> Custom made cars full of unusual gadgets (James Bond).</p>
<p><b>Slide 17-18</b></p> <p><b>Case study</b></p>	<p>The students will work in the same teams of 4 and should be giving the, <b>PRODUCTION sheet.</b></p> <p><b>Let the students have a go at the task.</b></p> <p><i>If time allows you can give the students an opportunity to present their ideas to the group.</i></p>	<p>Mrs. Sweetings Case Study Worksheet</p>	<p><b>Working in the same teams of 4</b></p> <p>Slide 17: Mrs Sweeting has decided that after years of working in a supermarket in the bakery department that she would open her own small bakery. She has decided to focus mainly on cakes and sweet foods (e.g., flapjacks, iced buns, biscuits, buns etc.) as well as creating order only cakes for birthdays, weddings and other celebrations. She has decided that she will need to employ another person to help cook all the products.</p> <p><b>Discuss which method of production would be the best for Mrs Sweeting to use to cook her products.</b></p> <p>Slide 18: recap of the production methods, can be put up during the activity to help students remember the different types.</p>



**SESSION GUIDE**

SLIDE / TASK	STUDENT ACTIVITIES	MATERIALS AND RESOURCES	NOTES
<p><b>Slide 19</b></p> <p><b>Why is Manufacturing Important in the UK?</b></p>			<p>Ask the question <b>Why is Manufacturing Important in the UK?</b></p> <p>Let the students give some responses and encourage them in a positive manner allowing for their own comments to be valued.</p> <p><b>UK Manufacturing Statistics (Pre-Covid! Statistics are from 2019 figures)</b></p> <p>Manufacturing contributes £6.7 trillion to the global economy.</p> <p>Contrary to widespread perceptions, UK manufacturing is thriving, with the UK currently the world’s eighth largest industrial nation.</p> <p>If current growth trends continue, the UK will break into the top five by 2021.</p> <p>In the UK, manufacturing makes up 11% of GVA (gross value added); GVA is the measure of the value of goods and services.</p> <p>44% of total UK exports and 70% of business R&amp;D directly employs 2.6 million people.</p> <p>The Rail industry is right in the middle of UK manufacturing, both due to its production and the fact that it enables the movement of goods and people.</p>





**SESSION GUIDE**

SLIDE/TASK	STUDENT ACTIVITIES	MATERIALS AND RESOURCES	NOTES
<b>Slide 20</b> <b>Evolution of Mobility</b>	Watch video.	Evolution of Mobility video.	
<b>Slide 21</b> <b>Not Just Trains</b>			<p>Explain that the UK rail network includes more than 2,500 stations and more than 40,000 bridges and tunnels. Every year, there are more than 1.3 billion passenger journeys, including nearly 270 million business trips.</p> <p>All the structures need to be manufactured to cope with normal conditions and extreme ones.</p>
<b>Slide 22 - 24</b> <b>Your Challenge</b>	Take part in the tower manufacture challenge.	1 x fan, scissors x 6 (2 per group of 4) items to build tower: cardboard, lolly sticks (large and small), paper cups (large and small) string, straws, pipe cleaners, tin foil, pegs, a4 paper, masking tape.	<p>Teams are given 20 tokens to purchase materials from the "shop".</p> <p>They will have 20-25 minutes to try to build the tallest tower that will withstand the force of the fan.</p> <p>Spend 5-10 minutes before the end of the activity testing the towers to see if the fan will knock them over".</p>
<b>Slide 25-28</b> <b>Careers in Rail</b>	Discover different careers in the rail industry.		<p>Talk through benefits of a career in rail before discussing the different job roles on slide 26.</p> <p>If time allows follow link to look at videos from people in the rail industry.</p>



# Rail Forum

## Deeper Learning: Designing for Inclusive Travel

### Session Plan



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**Deeper Learning:**      **1-2 Hour Lesson**  
**Designing for Inclusive Travel**



<p>Theme</p>	<p>The session develops the idea of Inclusion and the need for all individuals to be valued. The idea of Inclusion is advanced with an understanding of disability. Disability is linked to transport highlighting the problems with inclusive rail travel. The principals of inclusive design are introduced as a method of removing restrictions to travel (rail). The move from inclusive design to universal design as preference is presented and explored.</p>
<p>Learning Objectives</p>	<ul style="list-style-type: none"> <li>• Understand the effect of different kinds of disability and why the rail industry need to be creative to meet needs of disabled people.</li> <li>• Understand about the <i>inclusive design</i> process and how 'innovation' can improve rail travel for all.</li> <li>• Use good teamwork and communication skills to complete a task as a group</li> <li>• Show solid presentation skills when sharing your idea with the audience at the end of the session.</li> </ul>
<p>Curriculum and Key Skill Links</p>	<ul style="list-style-type: none"> <li>• Communication Skills: within teams and part of the class.</li> <li>• Creativity Skills: Producing and drawing ideas.</li> <li>• Problem Solving Skills: using universal design to solve problems of inclusive design.</li> <li>• Working with Others: teamwork during the design process and presentation.</li> <li>• PSHEE: deals with disability and the need for equality in how structures and services are built and provided.</li> </ul>
<p>Resources Required</p>	<p>Computer; Projector; PowerPoint Presentation (DL3. Designing for inclusive travel), DL3. Disability mix and match cards x8 (1 per team of 4), DL3. Design Task sheet x8 (1 per team of 4), DL3. Design Rail section sheets x1, DL3. Design disability fact sheets x (1 per 2 teams of 4), A3 paper (30).</p> <p>Resources listed allow for one session of 30 students, you will need to adjust accordingly.</p>
<p>Ability/ Special Educational Needs</p>	<p>The main task (<i>Designing for inclusive travel</i>) requires reading of information sheets, however any problems with reading and comprehension should be overcome by the fact that students will be working in groups.</p> <p>Students will need to use pens/pencils and work in team. They will also need to present ideas to the class.</p>



SLIDE / TASK (CHALLENGE)	1 HOUR SESSION
1. Title / Introduction	0.5 minutes
2. Session aims	1.5 minute
3. What is inclusion?	2 <b>5</b> minutes
4. Inclusion	4 minutes
5. What is a disability?	4 minutes
6. Disability mix and match	10 <b>15</b> minutes
<b>7. Disability: the facts</b>	<b>4 minutes</b>
8. Disability and rail	2 minutes
<b>9. Jacks Journey (video)</b>	<b>5 minutes</b>
10. Inclusive design	4 <b>10</b> minutes
11. Inclusive design (video)	2 minutes
12. Universal design	2 minutes
<b>13. Meet the Normals (video)</b>	<b>7 minutes</b>
14. Design Challenge	15 <b>35</b> minutes
15. Universal design is good design (present ideas)	5 <b>15</b> minutes
16. Careers in rail	2 minutes
17. Careers in rail (external link to further videos)	2 <b>10</b> minutes
18. Working in rail	4 minutes
<b>Total:</b>	<b>60 (120) minutes</b>

**■** = include these slides/tasks for a 2-hour session

SESSION GUIDE			
SLIDE / TASK (CHALLENGE)	STUDENT ACTIVITIES	MATERIALS AND RESOURCES	NOTES
<b>Slide 3</b> <b>What is Inclusion?</b>	Offer answers to the question "what is inclusion?"		<i>Let the students give some responses and encourage them in a positive manner allowing, for their own comments to be valued.</i>





**SESSION GUIDE**

SLIDE / TASK (CHALLENGE)	STUDENT ACTIVITIES	NOTES
<p><b>Slide 4</b> <b>Inclusion</b></p>	<p>Understand the meaning of the word inclusion.</p>	<p><b>Inclusion at its simplest is 'being included' but it is a bit more complicated than that... It is used by disability rights activists to promote the idea that all people should be freely and openly accommodated without restrictions or limitations of any kind.</b></p> <p>It is about <b>valuing all individuals</b>, giving <b>equal access and opportunity</b> to all and <b>removing discrimination and other barriers</b> to involvement.</p> <p>From an ethical point of view, <b>human rights are fundamental to overcoming disabling barriers and promoting inclusion.</b></p> <p>A human rights approach should ensure positive processes and outcomes for disabled people including treating people with dignity and respect and ensure that society no longer disables its members.</p> <p>Respecting human rights in the delivery of services is not an optional extra but a set of core values and fundamental to public sector and travel reform. Human rights extend to economic, social, cultural, civil and political rights.</p> <p>Work towards inclusion must be active, involve imagining better and understand that we all have something to contribute. It encompasses people having control over their own support and making their own decisions (personalisation), participation and presence in their own communities.</p>
<p><b>Slide 5</b> <b>Methods of Production</b></p>	<p>Understand the meaning of the word disability.</p>	<p><b>Disability</b> is an impairment that may be:</p> <p><i>Cognitive (mental / reasoning / perception). Encompassing various intellectual or cognitive deficits, including intellectual disability, deficits too mild to properly qualify as intellectual disability, various specific conditions (such as specific learning disability), and problems acquired later in life through acquired brain injuries or neurodegenerative diseases like dementia.</i></p>


**SESSION GUIDE**

SLIDE / TASK	STUDENT ACTIVITIES	NOTES
<p><b>Slide 5</b> <b>Methods of Production</b></p>	<p>Understand the meaning of the word disability</p>	<p>Developmental (<i>Child-development / Progressive</i>). <i>Developmental disabilities cause individuals living with them many difficulties in certain areas of life, especially in "language, mobility, learning, self-help, and independent living".</i></p> <p>Intellectual (<i>Academic / Intelligent / Logical</i>). <i>General learning disability, and mental retardation (MR), also includes neurodevelopmental disorder characterized by significantly impaired intellectual and adaptive functioning. An IQ under 70 in addition to deficits in two or more behaviours that affect everyday, general living.</i></p> <p>Mental (<i>Intellectual / Perceptual / Psychological</i>). <i>A mental illness or psychiatric disorder, has a behavioural or mental pattern that causes distress or impairment of personal functioning. It can be relapsing and remitting or happen once.</i></p> <p>Physical. <i>A weakness in a person's physical functioning, mobility, dexterity or stamina. Physical disabilities also include limit to daily living, such as respiratory disorders, blindness, epilepsy and sleep disorders.</i></p> <p>Sensory. <i>A disability that affects one or more senses; (sight, hearing, smell, touch, taste or spatial awareness). Sight and hearing loss are common sensory disabilities. Often sensory disabilities are referred to as sensory impairments or sensory sensitivity. A person does not have to have full loss of a sense to be sensory impaired.</i></p> <p>Or some combination of these. It substantially affects a person's life activities and may be present from birth or occur during a person's lifetime.</p> <p>Let's now look more at what would count as normal day-to-day activities:</p> <p>Mobility – ability to walk up steps or being a wheelchair user.</p> <p>Manual dexterity - ability to hold a pen and write with it.</p> <p>Physical co-ordination – a person with Alzheimer's disease or a stroke patient may have difficulty feeding themselves.</p> <p>Continence – not having the ability to control bladder movements.</p> <p>Ability to lift, carry or move everyday objects.</p> <p>Speech, hearing or eyesight.</p> <p>Memory or ability to concentrate, learn or understand</p> <p>Understanding the risk of physical danger.</p>

SESSION GUIDE			
SLIDE / TASK	STUDENT ACTIVITIES	MATERIALS AND RESOURCES	NOTES
<p><b>Slide 6</b></p> <p><b>Disability Mix and Match</b></p>	<p>Match the disabilities to the description.</p>	<p>DL3. Disability mix and match.</p>	<p><i>Give each team a set of disability mix and match cards (DL3. Disability mix and match). Students must match the disability with the description.</i></p>
<p><b>Slide 7</b></p> <p><b>Disability: the Facts</b></p>	<p>Try to guess the answers to the questions.</p>		<p><b>Ask.</b></p> <p><b>Q1. How many disabled people are there in the UK?</b></p> <p>There are 13.9 million disabled people in the UK. 8 per cent of children are disabled 19 per cent of working age adults are disabled. 45 per cent of pension age adults are disabled.</p> <p><b>Q2. How many disabled people are in work?</b></p> <p>Over 3.4 million disabled people are in employment.</p> <p><b>Q3. Have attitudes to disabled people changed?</b></p> <p>Despite the positive effect the London Paralympic Games had on public perceptions of disability, 43% of the British public don't know anyone who is disabled, and the majority (67%) feel awkward around disability.</p> <p><b>Q4. What are the most common disabilities?</b></p> <p>The most commonly reported impairments by disabled people are Mobility (52%) Stamina, breathing, fatigue (38%) Dexterity (27%).</p> <p>Now you know some things about disability, <b>what does disability mean to transport and train travel?</b></p>



**SESSION GUIDE**

SLIDE / TASK	STUDENT ACTIVITIES	MATERIALS AND RESOURCES	NOTES
<p><b>Slide 8</b> <b>Disability and Rail</b></p>	<p>Understand the impact of rail design on people with disabilities.</p>		<p><i>Info: (Correct figures, based on UK government department of transport on the Mon 27 Nov 2017 15.43 GMT).</i></p> <p>Nearly 80% of stations across the UK are not accessible to deaf, disabled and older people.</p> <p>Despite being one of the wealthiest countries in the world, the UK still has a long way to go on rail access.</p> <p>At the current rate it would be over 200 years before our rail network is fully accessible.</p> <p>The government's own figures show that investment in rail accessibility will pay back nearly three times over in economic benefits.</p>
<p><b>Slide 9</b> <b>Jacks Journey</b></p>	<p>Watch video.</p>	<p>Jacks journey video.</p>	
<p><b>Slide 10</b> <b>Inclusive Design</b></p>	<p>Offer ideas of things within their school that are not useable for people with disabilities and how they could be designed to be inclusive.</p>		
<p><b>Slide 11</b> <b>Inclusive Design Video</b></p>	<p>Watch video.</p>	<p>Inclusive design video.</p>	





**SESSION GUIDE**

<b>SLIDE / TASK</b>	<b>STUDENT ACTIVITIES</b>	<b>MATERIALS AND RESOURCES</b>	<b>NOTES</b>
<p><b>Slide 12</b> <b>Universal Design</b></p>	<p>Understand the difference between inclusive design and universal design.</p>		<p>Inclusive design is good but having a design that works for everyone and looks good is better.</p> <p>Universal Design is the design and composition of an environment so that it can be accessed, understood and used to the greatest extent possible by all people regardless of their age, size, ability or disability.</p> <p>An environment (or any building, product, or service in that environment) should be designed to meet the needs of all people who wish to use it. This is not a special requirement for the benefit of only a minority of the population.</p> <p>It is a fundamental condition of good design. If an environment is accessible, usable, convenient and a pleasure to use, everyone benefits. By considering the diverse needs and abilities of all throughout the design process, universal design creates products, services and environments that meet peoples' needs.</p> <p>Simply put, universal design is good design.</p>
<p><b>Slide 13</b> <b>Meet the Normals Video</b></p>	<p>Watch video.</p>	<p>Meet the Normals video.</p>	<p>The film you are going to watch is made to be accessible. See if you can spot what they did to make it usable for all.</p> <p>Play film.</p>



**SESSION GUIDE**

SLIDE / TASK	STUDENT ACTIVITIES	MATERIALS AND RESOURCES	NOTES
<p><b>Slide 14</b> <b>Design Challenge</b></p>	<p>Each team will produce a universal design for a different rail section.</p> <p>As a team they must draw their idea and complete the task sheet with prompts about their design.</p>	<p>DL3. Design task sheet</p> <p>DL3. Rail section sheets</p> <p>DL3. Disability fact sheets</p> <p>A3 paper</p>	<p>Remind the students that they are going to be working in groups of 4.</p> <p>Hand out each team:</p> <ul style="list-style-type: none"> <li>• A task information sheet (covers the different disabilities)</li> <li>• One rail section</li> <li>• One worksheet</li> <li>• 2-3 sheet A3 paper.</li> </ul> <p>Encourage the students to divide out the roles and be ready to present their ideas at the end of the session.</p> <p>Give them a time deadline.</p>
<p><b>Slide 15</b> <b>Universal Design is Good Design</b></p>	<p>Explain their ideas.</p>		<p>Depending on time either take some ideas from class or every team can have 2 minutes to present their ideas.</p>
<p><b>Slide 25-28</b> <b>Careers in Rail</b></p>	<p>Discover different careers in the rail industry.</p>		<p>Talk through benefits of a career in rail before discussing the different job roles on slide 26.</p> <p>If time allows follow link to look at videos from people in the rail industry.</p>



# Rail Forum

## Deeper Learning: Sustainability

### Session Plan



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**Deeper Learning: 1-2 Hour Lesson**  
**Sustainability**



<p>Theme</p>	<p>This session explains the concept of sustainability before allowing learners to take a deep dive into an area of sustainable innovation. In teams they must design a poster that explains their area before knowledge is shared in a poster conference style activity. The learning about sustainability is then linked to the rail industry. In a 2-hour session there is an extra activity to focus on the students' own experiences of travel and how their journeys could be made more sustainable.</p>
<p>Learning Objectives</p>	<ul style="list-style-type: none"> <li>• Understand what a problem is.</li> <li>• Be able to understand that a problem needs to have a solution.</li> <li>• Understand the importance of lateral thinking and how to use it for solving problems.</li> <li>• Use critical thinking, problem solving skills, good teamwork and communication skills to complete a task as a group.</li> </ul>
<p>Curriculum and Key Skill Links</p>	<ul style="list-style-type: none"> <li>• <b>Communication Skills:</b> within the class, in smaller teams, one student from each team will present ideas to others in a poster "marketplace".</li> <li>• <b>Creativity Skills:</b> designing an effective poster.</li> <li>• <b>Teamwork:</b> working together as a group to extract information and design a poster.</li> </ul>
<p>Resources Required</p>	<p>Computer; Projector; PowerPoint Presentation (DL4. Sustainability); an a4 book, fact sheets x 8 (1 per team) (DL4. Fact sheet 1 (climate change), DL4. Fact sheet 2 (minimising waste production) DL4. Fact sheet 3 (renewable sources of energy)), A3 paper, DL4. Journey mind map x 30 (1 per student).</p> <p><b>Resources listed allow for one session of 30 students, you will need to adjust accordingly.</b></p>
<p>Ability/ Special Educational Needs</p>	<p>This session has the students working in their teams to read information from fact sheets. Working in their teams should allow for collaborative conversation and communication. Any struggles with reading comprehension or writing should be mitigated by working within the groups although some adjustments may need to be made depending on student's needs.</p>





SLIDE / TASK (CHALLENGE)	1 HOUR SESSION
1. Title / Introduction	0.5 minutes
2. Session aims	1 minute
3. What is a sustainability?	4 minutes
4. Sustainability	10 minutes
5. Poster challenge	10 <b>20</b> minutes
6. Poster Marketplace	10 <b>20</b> minutes
7. Poster feedback	5 <b>10</b> minutes
8. Delivering a sustainable railway	5 minutes
9. Sustainability in rail	5 minutes
<b>10. How do you travel?</b>	<b>30 minutes</b>
11. Careers in rail	2 minutes
12. Careers in rail (external link to further videos)	5 <b>10</b> minutes
13. Working in rail	2.5 minutes
<b>Total:</b>	<b>60 (120) minutes</b>

**20** = include these slides/tasks for a 2-hour session

## SESSION GUIDE

SLIDE / TASK (CHALLENGE)	STUDENT ACTIVITIES	MATERIALS AND RESOURCES	NOTES
<b>Slide 3</b> <b>What is a Problem?</b>	Offer answers to the question "what is sustainability?"		<i>Let the students give some responses and encourage them in a positive manner allowing, for their own comments to be valued.</i>



## SESSION GUIDE

SLIDE / TASK (CHALLENGE)	STUDENT ACTIVITIES	MATERIALS AND RESOURCES	NOTES
<p><b>Slide 4</b> <b>Sustainability</b></p>	<p>3 Volunteers from class to demonstrate the sustainability stool</p>	<p>A4 Book</p>	<p>*demonstrate the sustainability stool* - 3 members of the class to come up to the front (roughly the same height) – each student will represent a different leg of the stool. They must, using only 1 finger each, balance a book in the air.</p> <p>“consider an infrastructure project, like building a bridge. To be sustainable that project needs to consider all 3 aspects of sustainability to be truly sustainable. If we didn’t care about the environment while building and pulled down trees and used machinery that released lots of emissions into the atmosphere, then the environmental aspect has been ignored”.</p> <p>*ask student representing environmental to step away* the book will fall!</p> <p>“If, as the bridge is built, we ignore the local people and don’t let them know that roads will be closed, or maybe we need to contractors to work on the project and we decide to hire them from the other side of the country instead of investing in the local people, then the social aspect has been ignored.”</p> <p>*ask student representing social to move away* the book will fall.</p> <p>“Before we build the bridge we need to decide if it is going to make economical sense, is it worth building it? Do enough train journeys happen to make it a good investment? As we are building it there will be a budget and a time frame to stick to. If these are not kept, then the project won’t be economically sustainable.”</p> <p>*ask the student representing the economical aspect to move away* the book will fall!</p>

## SESSION GUIDE

SLIDE / TASK	STUDENT ACTIVITIES	MATERIALS AND RESOURCES	NOTES
<p><b>Slide 5</b> <b>Poster Challenge</b></p>	<p>Design a poster.</p> <p><b>10 minutes</b> <b>20 minutes</b></p>	<p>DL4. Fact sheets A3 paper</p>	<p>In your teams create a poster showing information from your fact sheet in a way you will be able to remember and deliver to other members of the group.</p> <p>You can only use <b>20 words</b> on your poster/fact sheet.</p> <p>Use images/diagrams to record the information.</p>
<p><b>Slide 6</b> <b>Poster Marketplace</b></p>	<p>One member of each team stays with the poster and explains it to the "customers".</p> <p>The other members of the team go round as "customers" to each table and learn about the topics.</p> <p>They must find out about all the other topics and will relay the information back to their team.</p> <p><b>10 minutes</b> <b>20 minutes</b></p>		
<p><b>Slide 7</b> <b>Poster Feedback</b></p>	<p>Return to teams and relay the information they have learnt back to their group.</p>		<p>If time allows take information from the class to ensure all learners understand the 3 topics.</p>
<p><b>Slide 8</b> <b>Delivering Sustainable Railway</b></p>	<p>Watch the video.</p>	<p>Video</p>	

## SESSION GUIDE

SLIDE / TASK	STUDENT ACTIVITIES	MATERIALS AND RESOURCES	NOTES
<p><b>Slide 9</b></p> <p><b>Sustainability in Rail</b></p>			<p><i>Story contracting – Another civil engineering company working on many infrastructure project for national rail across the country. They aim to have a net positive impact on local habitats by building bat boxes, nesting boxes and otter ledges into their designs, assessing the impact on local ecology.</i></p> <p><i>Porterbrook – Porterbook provide rolling stock (locomotives and carriages) solutions. The HydroFLEX train can use 3 different sources of power – electric (on areas of the rail network that have undergone electrification), battery, hydrogen. When running on hydrogen power the train is 100% carbon neutral.</i></p>





## SESSION GUIDE

SLIDE / TASK	STUDENT ACTIVITIES	MATERIALS AND RESOURCES	NOTES
<p><b>Slide 10</b></p> <p><b>How do you Travel?</b></p>	<p>Consider 5 different journeys they make on a regular basis and detail the modes of transport they use.</p> <p>Identify one of the journeys that could impact the environment in terms of sustainability and produce an innovative solution.</p>	<p>DL4. Journey Mind Map</p>	<p>If students are struggling to produce journeys:</p> <ul style="list-style-type: none"> <li>• To school</li> <li>• To visit relatives</li> <li>• To go on holiday</li> <li>• To go to the park</li> <li>• To see friends</li> <li>• To go shopping</li> </ul> <p>Allow students to be as creative as possible when producing a n innovative transport solution – if it is a sustainable mode of transport!</p>
<p><b>Slide 11-13</b></p> <p><b>Careers in Rail</b></p>	<p>Discover different careers in the rail industry.</p>		<p>Talk through benefits of a career in rail before discussing the different job roles on slide 12</p> <p>If time allows follow link to look at videos from people in the rail industry.</p>

