



HS2

ARE YOU
EPIC?



Name

Teacher

Group

Team Number

STUDENT BOOKLET



INTRODUCTION

During this workshop, we are going to be learning about **Science, Technology, Engineering and Maths (STEM) topics** and **STEM skills** connected to **railway and transport infrastructure careers**.

You will learn to:

- Describe the STEM careers available in transport infrastructure.
- Describe the skills useful in a STEM working environment.
- Understand how railway infrastructure is developed to satisfy present and future needs.

By taking part in today's workshop, you are joining the EPIC (Extra Ordinary People Initiating Change). You will be designing stations, building tunnels, managing rail networks, exploring careers with augmented reality, and strengthening your STEM skills in games and challenges.

Students will self-examine and reflect on their essential skills and understand how these can be used in a STEM Career.

Starter: STEM careers

How many STEM careers can you list? If you can, write a short description of each one in the table provided below.

STEM Career	Description



1. Welcome to the team

In this first session, think about your Skills Builder essential skills. These are the **skills** that we will use across today's workshop. Throughout the day, we will be giving you stamps / reward marks when you show these skills. These skills will help you to succeed in education and in the workplace, and are vital to any role.

a) Think about and evaluate your own essential skills on the grid below. Then, answer the questions below.

Essential Skills	Low						High
Listening							
Speaking							
Problem Solving							
Creativity							
Staying Positive							
Aiming High							
Leadership							
Teamwork							

b) Which essential skill do you feel most confident in?

c) Which of your essential skills would you most like to improve today? How will you improve them?

2. Stations of the Future

Imagine that you live in the year 2050. What will life be like? Taking on the role of a **Civil Engineer**, **Environmental Advisor**, **Building Information Modelling (BIM) Technician** or **Customer Experience (CX) Designer**, create a design proposal for a railway station of the future for your town or city on the site map provided.





You must include:

- An annotated map of a futuristic station.
- A front elevation drawing, showing the outside of the station building.

You will present your proposal to the rest of the class and you will be marked on your *STEMPowers* evidenced throughout the activity.

1. Challenge 1: Joining the team

a) In your team, you decide who is most suited to each of the job roles below. Put a tick next to your job role.

	<p>Civil Engineer</p> <p>I oversee the groundwork, design and construction of huge infrastructure projects such as tunnels, bridges, airports, stations and motorways</p>
	<p>Environmental Advisor</p> <p>I investigate and minimize the impact of engineering projects on our planet, from ensuring wildlife is respected to decreasing the carbon footprint.</p>
	<p>Building Information Modelling Technician</p> <p>I am responsible for communicating and testing all details of the construction project as drawings and models.</p>
	<p>Customer Experience (CX) Designer</p> <p>I ensure that all our designs and services are on trend and meet the needs of our customers.</p>

b) What essential skills and other qualities do you have that make you suitable for this job?

c) Using the HS2 EPIC App, add two extra sentences to your job description that help to explain your role in the team.

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Challenge 2: Creating your proposal

a) Using the materials provided, get started on your futuristic station design.

- You should think about:
- How new technologies such as robotics and digitalisation will change the way that people live and travel in the year 2050 and beyond
 - The shops, restaurants and leisure facilities that will exist in the future
 - And how your station will meet the needs of all customers
 - The impacts of your station on the natural and historical environment of your town or city



Figure 1 Design Vision for Interchange Station, Solihull

Challenge 3: Evaluate

How did it go? Answer the following questions to evaluate your proposal.

a) How did you influence the design of your station?

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b) Which essential skill did you use the most during the activity?

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Self-assess your essential skills. How did you improve?							
Creativity							
Teamwork							
Listening							
Speaking							

3. Engineering Challenge: Tunnel Structures

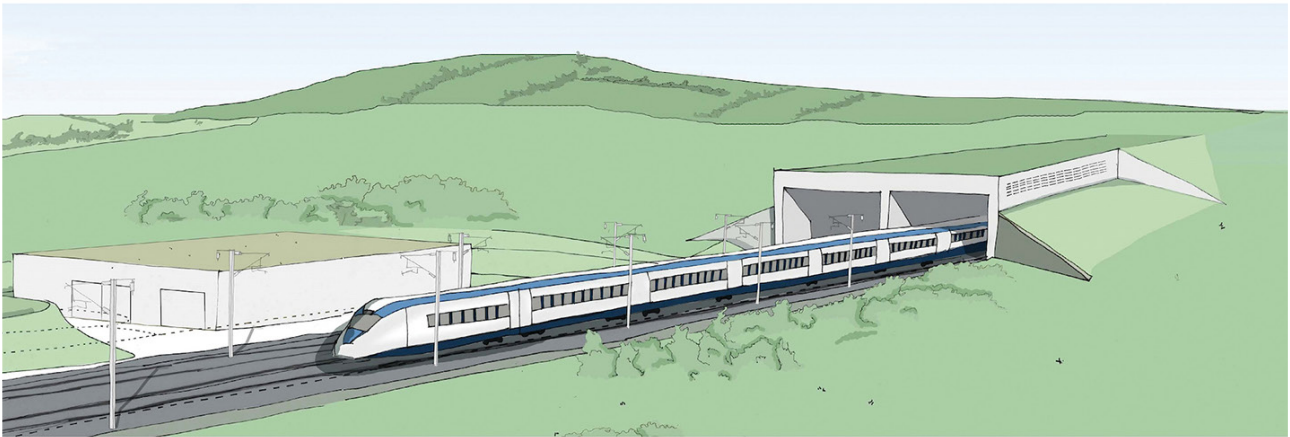
Building railways would be impossible without tunnels. Tunnels allow trains to travel through hills rather than over them, reducing disturbance to houses and woodlands by going under them.

There are three ways of building tunnels. They are either **excavated** using tunnel boring machines, **mined** by diggers, or built using a technique called '**cut and cover**'.

Cut and cover tunnels

When building cut and cover tunnels, the land above the tunnel route is removed, the tunnel is constructed and the land is replaced over the top. The tunnel structure is built of reinforced concrete, to help resist the forces acting upon the tunnel and to prevent collapse.

Today, you will build a tunnel structure for a cut and cover tunnel.



Challenge 1: Designing a tunnel structure

Together with your team, you must design a prototype tunnel structure to span 400mm through a testing jig. Your tunnel structure should be strong and lightweight, using as few materials as possible to resist the earth pressure acting upon it.

Sketch your design below. We have included an isometric grid to help you.



Challenge 2: Testing & evaluation

For each group's tunnel structure, let's record its weight and whether you think it will collapse under or withstand the forces acting upon it.

Group	Mass (g)	Prediction (✓ or x)	Result of test (✓ or x)
1			
2			
3			
4			
5			
6			
7			
8			
9			
10			
11			
12			
13			
14			
15			

Next, evaluate your own tunnel structure using the questions below.

a) What would you improve about your tunnel structure?

b) What were the challenges you faced when designing and building your tunnel structure?

c) How did you use your essential skills during this session?

d) Self-assess your use of essential skills during this session.

Essential skill	Low						High
Teamwork							
Staying Positive							
Problem Solving							

4. Rail Rush!

Rail Rush! is a turn based rail-building game. To play the game, each player competes to build the best rail network.

How will you build the most sustainable service for people and the environment?

How to set up:

Cut out the game cards and pieces. Separate the card deck into: community, service, environment and construction decks. The rule cards should be distributed and hidden in each of these decks. Place each deck face down on its marked on the board. Each player chooses one coloured set of counters. The youngest player goes first.

Playing the game:

- Each player starts the game by placing their two starting stations anywhere on the board, along with two lengths of track. Starting stations may be built anywhere there is a station circle. These stations are the start of your lines. Tracks and additional stations must join to one of these starting stations.
- For each turn, players choose to take the number of cards from the decks equalling their number of stations (e.g. a player with two stations may take two cards per turn). Players can take any combination of cards from the community, service, environment or construction decks.
- Each player must read their cards out to the team, state and record any points that they have earned, or build track or stations if their cards instruct them to.

How to win:

- The game ends when the first player has used all their track. At the end of the game, the player with the most points wins the game.
- Your points score is a combination of your community, service and environment points, as well as the points you have earned for building track and any bonus points available.

How to get bonus points:

- Bonus points can be won by following the instructions on the rule cards, which appear at random in the other decks. These will change the rules of the game, and are placed on one of the three rule card positions on the board. The player who picks a fourth rule card must replace one of the rule cards already in play.

Rail Rush! scorecard

Use this grid to keep track of your points score. In addition to service, community and environment points, you win one point for each length of track built. You do not receive points for stations.

Scorecard	
Service	
Community	
Environment	
Number of tracks	
Bonus	
Total:	

EPIC Careers skills

Your application has been a success and you have an interview to become an apprentice Civil Engineer, Environmental Advisor, Customer Experience Designer, Buildings Information Modelling Technician or Construction Plant Operator.

Answer the following interview questions below.

You could role-play this activity with somebody else in your group.

Role Applied For:

1. Describe a situation where you have used your creativity to help solve a problem

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2. What makes you effective at teamwork?

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3. Explain what makes an effective presentation?

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4. Describe a situation where you have set yourself goals and aimed high.

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5. How do you stay positive in challenging or unfamiliar situations?

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6. Describe a situation where you have shown Leadership skills?

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7. What other skills and qualities do you have that would be helpful in this role?

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How to build your essential skills

Use the Skills Builder Framework to help improve your essential skills at www.skillsbuilder.org/framework.
Speak to your teachers about how to build you essential skills in their subjects.

Future You

Britain's high speed rail network is rapidly expanding, and there are many different careers available to you. Take our take our personality quiz to discover how you could help deliver the project.

Challenge 1: Future you quiz

Visit www.hs2.org.uk/future-you-quiz and take our personality quiz to Find your perfect job role, then answer the questions below.

a) What is your perfect job role according to the quiz?

b) What qualities and skills do you have that could be useful in this role?

Challenge 2: Careers profile

After you have completed the Future You Quiz, read the profile about the HS2 employee and fill out the table below.

- Try to summarise their day-to-day activities as part of the job description
- Describe their education pathway to the role
- List the essential skills that they use as part of their work

Name	
Job Description	
Education	
Essential skills	

Future talent

To find out more about how you could become a HS2 Apprentice, go to www.hs2.org.uk/careers/future-talent/

6. Reflection

What have you learned in today's workshop? Do you think your ideas about STEM careers have changed?

Re-evaluate your own Skills Builder Essential Skills on the grid below. Then answer the following questions.

Essential Skill	Low							High
Listening								
Speaking								
Problem Solving								
Creativity								
Staying Positive								
Aiming High								
Leadership								
Teamwork								

a) Which of your essential skills have you improved most today? Explain how.

b) Which of your essential skills would you most like to improve next?

c) Which aspect of STEM careers most appealed to you today? Why?

d) Are you more or less likely to follow a STEM career path than at the beginning of the day?

☐ Not at all ☐ Much less likely ☐ Less likely ☐ Neither more nor less likely
☐ More likely ☐ Much more likely ☐ Certain

Further information

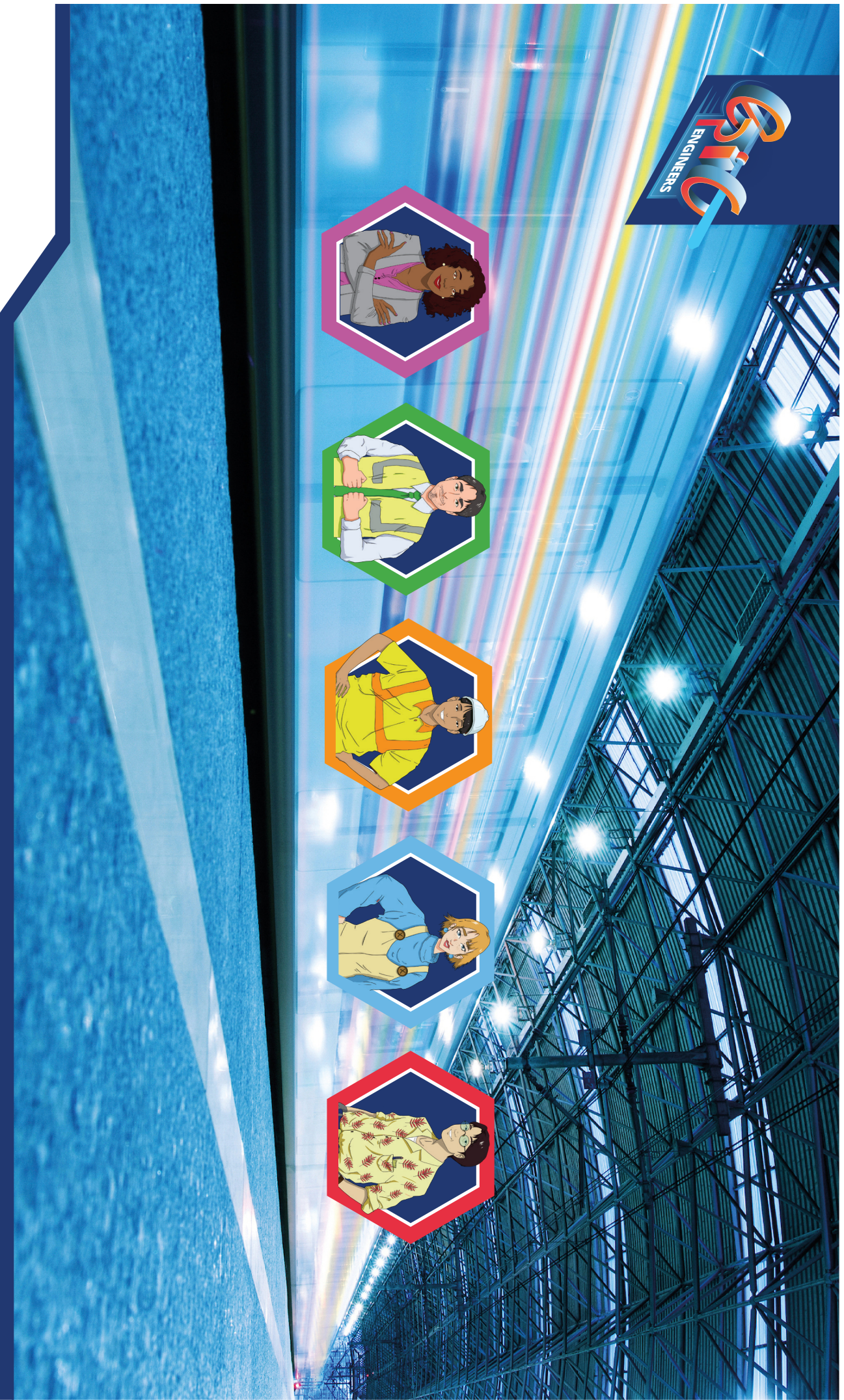
Further information about STEM careers and the HS2 Project can be found:

www.hs2.org.uk/education
www.tomorrowengineers.org.uk
www.ice.org.uk
www.goconstruct.org
www.nchsr.ac.uk
www.young-engineers.co.uk

www.wherestemcantakeyou.co.uk
www.wisecampaign.org.uk/apprenticeship-toolkit
www.britishscienceassociation.org

www.skillsbuilder.org





HSR2

AUGMENTED REALITY TARGET IMAGE

POINT YOUR DEVICE'S CAMERA AT THIS IMAGE TO TRIGGER THE AUGMENTED REALITY FEATURES