

Science and Engineering Careers Challenge: virtual meeting guidance

Introduction

This document is to aid Leaders in delivering the Science and Engineering Careers Challenge online to uniformed organisations. All of the activities can be adapted for online delivery and are explained in this document. Once the participants have the necessary equipment, the majority of the activities can be completed as detailed in the challenge pack. Note that this is only guidance and activities can still be adapted to suit your group needs. Feel free to do whichever activities you think your groups will be comfortable with.

It is recommended to read the challenge pack document before continuing with this guidance. Link to the challenge pack: <https://www.ralspace.stfc.ac.uk/Pages/Science-and-Engineering-Careers-Challenge.aspx>

Section 1: Electronic Engineer



Lemon Batteries

This activity can be completed as explained in the challenge pack with each participant having access to the equipment in advance.

An alternative method is to complete the activity with a leader demonstrating the lemon battery with the participants giving instructions on what they think you should do. After a few goes take the participants through each step in the challenge pack.

Electronic Playdough

This activity can be completed as explained in the challenge pack with each participant having access to the equipment in advance, with the playdough already made.

An alternative method is to complete the activity with a leader demonstrating the design of a circuit. As a group decide on a model to design (see Sun, Sentinel and ISIS neutron target station examples in the pack). Once they have decided, get each individual participant to draw their design and add a diagram of what they think the circuit will look like. Once they have drawn their design, show them the models in the challenge pack and compare. A leader will then need to assemble the design with the participants giving instructions.

Electronic Game

To play the electronic game over Zoom, explain that the idea of the game is to make a simple circuit for a Mars rover altogether. Ask the group 'What components do we need and how do we connect them together?'

Answer: Wires, battery for power, bulbs for eyes, motors for wheels and arm.

Each component is given a physical action or movement:

- Wire - arms stretched out wide
- Battery - arms straight up
- Bulbs - flashing motion with hands
- Motor - winding action

Start by nominating one person to go first (suggest the leader) and say the name of the component you are going to start with (battery for power) and do the correct hand gesture, then you have to say the name of who goes next. The next person will need to make a connection to the next part of the circuit so they will be a wire. Following a wire might be a bulb, then another wire and so on; continue until the circuit is complete and is back to the leader who started.

Section 2: Mechanical Engineer



Edible Rover

The edible rover activity can be completed online in two ways.

The first includes the leader assembling a Mars rover only. Complete steps 1 and 2 as suggested in the challenge pack. At step 3, share the list of materials you have available to assemble the rover and a picture of a real rover. Get the young people to draw a design of their Mars rover. The leader should then make a rover as a demonstration, a bit like Frankenstein combining all design ideas. Continue with step 5. The young people can then use their design and construct a rover at home in their own time.

The second method is to give advance notice with the equipment they need for the activity. Complete steps 1 and 2 as suggested in the challenge pack. Get the young people to make a list of food they have available to build a rover and show them a picture of a real rover. Get the young people to draw a design of their Mars rover. Once they have a design, construction can begin. Continue with step 5.

Building a structure

This activity can be completed as explained in the challenge pack with each participant having access to the equipment in advance.

Crash proofing

This activity can be completed as explained in the challenge pack with each participant having access to the equipment in advance.

Section 3: Data Scientist



Rain gauge

This activity can be completed as explained in the challenge pack with each participant having access to the equipment in advance.

Satellite Jigsaw game

This activity can be completed online with a few adaptations. The satellite pictures have been uploaded onto a jigsaw website, see the links to each picture below. The group can then complete the jigsaws online either altogether with the leader sharing their screen and asking the group for instructions, or individually by sending the URL links to the young people in advance of the meeting. Once a picture has been completed ask the group:

- A. What do the pictures show?
- B. What might the picture tell us?
- C. How can this information be used?

Not all the jigsaws need to be completed, pick at least 3.

Alaska sea ice: <https://jigex.com/fjPY>

Amazon wildfire: <https://jigex.com/BmPp>

Man-made bridge: <https://jigex.com/L49h>

Hurricane: <https://jigex.com/Lu1G>

Desert dust storm: <https://jigex.com/yMv5>

Mount Etna Volcano: <https://jigex.com/yABC>

River Thames: <https://jigex.com/kjWR>

Saudi Arabia farming: <https://jigex.com/Af5y>

Binary bracelets

The binary bracelets activity can be completed online with very little adaptation. Ensure the young people have advance notice of the equipment they need for the activity. If young people don't have beads they can use coloured pens and write a binary message.

Section 4: Software Engineer



Exact instructions for making a sandwich

This activity can be completed online via a few ways. Firstly, ask the entire group: do they know how to make a peanut butter and jam sandwich? Can they teach you how? Then you can either:

- split the group into different breakout rooms to write their instructions in smaller groups
- or get the young people to write the instructions individually.

Once they have finished writing their instructions get the young people to take turns giving the instructions. The leader then completes the command by doing EXACTLY what is said. Continue until clear and concise instructions are given.

Coding obstacle course

To complete this activity online get the participants to set up their own obstacle course in the room they are using in advance. Ask them the questions in step 2 in the challenge pack. On a piece of paper get the participants to write the following instructions:

- Move forward one space
- Move backwards one space
- If
- Else
- While
- For
- Drop
- Grab
- Squat
- Body rotate

Explain that their task is to complete the obstacle course by only using the commands on the paper. The conditions for the commands are as follows (x is equivalent to a person);

- 'If' : Makes the group either complete an action or not complete an action e.g. If x has one bean bag, move forward one space
- 'Else': When the 'If' statement was not completed, do something else e.g. If a ball is next to me, move forwards one space, else move backwards one space.
- 'For': For repetitive actions e.g. for x at the ball station drop the ball 10 times.
- 'While': Continue an activity until a threshold or event has been reached e.g. While x is standing still, jump 5 times.
- 'Drop' : Drop an object
- 'Grab' : Grab an object
- 'Squat' : X can squat
- 'Body rotate': X can rotate their body by a specified number of degrees and direction (left/right)

Complete the obstacle course using only the commands on the slips of paper.

Coding game

This activity can be completed online with little adaptation. Ensure the young people have enough space to move around in the room whilst still in view of their webcam. The leader allocates a Programmer and watches whilst the activity takes place so they can name any of the Computers who get a command wrong to sit down.

Section 5: Physicist



Solar system: Scale of the Solar System

This activity can be completed as explained in the challenge pack with each participant having access to the equipment in advance.

Solar system: Weight in the Solar System

This activity can be completed as explained in the challenge pack with each participant having access to the equipment in advance.

Astrophysics: Beyond the Solar System – Doppler Spin

This activity can be completed as explained in the challenge pack individually with each participant having access to the equipment in advance. Ensure an adult is present to check the object is properly attached to the string and will not come loose. Alternatively, a leader will need to demonstrate.

Astrophysics: Beyond the Solar System – Exoplanets & Aliens

This activity can be completed as explained in the challenge pack with each participant having access to the equipment in advance.

Particle physics - Particle detection game

This activity can be completed as explained in the challenge pack with each participant having access to the equipment in advance.

Section 6: Science Communication



Drawing a scientist or engineer

Ensure all young people have paper, pens (particularly coloured pens if possible) before the activity starts. Once their drawings are complete, the young people could hold theirs up to the screen. Perhaps split the group into breakout rooms to discuss similarities and differences in their drawings, and allocate one person to bring ideas back to the main room. Case studies can be shown by the leader via screen share. The young people can then go back into breakout rooms to discuss the questions laid out in the challenge document, and once again allocate one person to share the group's ideas with everyone in the main room.

Matching job descriptions

The leader can split the young people into breakout rooms to discuss each of the questions, and ask them to allocate a spokesperson to bring their ideas back to the main room.

Not all young people may have access to a printer at home so the leader may want to add the descriptions to a PowerPoint to share. As an alternative, the leader could use a website such as [mentimeter.com](https://www.mentimeter.com) to create an interactive online poll, where the description appears and the young people have to select which of the six job roles they think fits the description. See example below.



Solves complex problems in the storage and handling of data for long term preservation, turning raw data into meaningful information.

Electronic Engineer

Mechanical Engineer

Data Scientist

Software Engineer

Science Communicator

Physicist

You have already voted on this question.

Creating and presenting a poster

The young people could make their posters on PowerPoint and therefore be able to share their poster by screen share in an online meeting. This would allow for collaboration between young people in groups if they worked on the same document. Alternatively, the young people could draw their posters by hand and send a photo of it to the leader via email etc. The leader could share photos of the posters one by one via screen share and each young person takes it in turns to present theirs. However, this would likely rule out the opportunity for teamwork.

Useful links

[RAL Space YouTube](#) - Career profiles

[STFC YouTube](#)