Ambassador Guide

Activity Title: Clockwork Challenge

This Ambassador Guide is designed specifically for the **Clockwork Challenge** activity. It includes general information about the activity, and tips on how the included activity could be best implemented. Please use this guide with the Ambassador Presentation to effectively conduct the session.

Resources needed:
Screen and Projector for Ambassador Presentation
Classroom with tables/desks for students to work as groups

Suggested Student Group Size:
3-5

Materials needed Per Group:
Pens/Pencils
Paper
LEGO kit

****Optional materials****
A box of chocolates/ sweets suggested as prizes

Related subjects:
Applied Maths, problem solving

Documents included:
Ambassador activity guide
PowerPoint Presentation
Student Worksheet
Evaluation Form

Total Estimated Time: 1 hour 30 minutes

Activity	Time (min)	Slides
1. Introduce Crossrail and Engineering	10	1-8
2. STEM Background	5	9-10
3. Team Formation	5	11
3. Project Explanation	5	11-14
5. Planning work	35	14
6. “Incidents”	5	14
7. Presenting	5	15-16
8. Discussion and Activity Evaluation	20	17-18
Total:	**90**	**18**

Before the Session Checklist ☑

- ☐ Get in contact with the Young Crossrail team (youngcrossrail@crossrail.co.uk) to ensure that you have the kits/ materials needed to present the lesson
- ☐ Review and customise the PowerPoint to your liking

Activity Instructions:

1. Divide students into groups of 3-5, 4 being an optimal number
2. Give each group their designated materials
3. Thoroughly explain the requirements of the activity
4. Let the students create their plans
5. Administer 'incidents and delays' (see below)
6. Collect materials at the end of a discussion and team presentation period
7. Hand out evaluation forms

Requirements and Restrictions:

Keep in mind when assisting students:

- Electricians can only work a maximum of 10 days with a minimum 5 day rest period between each 10 day block
- Flooring and Glass work cannot be completed simultaneously
- Heating and Air Conditioning must be complete before Flooring can be started
- Only 3 tasks can be worked on at one time
- "Double up" work is not allowed
    - The same task cannot be placed in more than one row/column concurrently.

Organisation:

Keep track of time during the activity. An estimated running time is as follows:

Phase	Time (mins.)
Team Formation	5
Explanation	5
Activity/Incidents	45

There is no testing phase for this activity, but each team will be asked to tell how many days they could complete construction in.

Incidents:

To add another layer of complexity to the challenge, "plot twists" can be added to the activity. After the 35 minutes are up, ask the students to stop working on the schedule, you could use the following "plot twists" or think of your own:

- *"There has been an accident on site 45 days into construction causing work to cease for 5 days while the incident is investigated"*

- *"There is a plumber's union strike 30 days into construction, meaning that no plumbing work can be done for 10 days"*

Following these announcements, allow students to make adjustments to the total number of days to completion.

- **Students may not rearrange their schedules prior to the day the incident happened (just like you can't turn back time in real life), but may rearrange their schedules after the start of the incident**
- Limit the number of 'incidents' to 2-3. Be creative, but realistic. If you choose to make your own "incidents", keep the delays in 5 day increments (i.e. 5, 10, or 15 day delays)
- Do not make the delay too long as the students will only have room for 150 days on their schedules. Also, try not to exceed 15-20 days' worth of "incidents" as the minimum number of days to completion is 110 days, leaving 15 days of freedom before going over goal

After the Lesson:

Ensure that all the materials have been returned by completing the check list in each kit

Activity Tips:

Q: **What if students are struggling to understand the task or relevant information?**
A: Ask the students to summarise the key points, including the number of days to complete each task, what colour each task is, and any restrictions on specific tasks that may exist. If they're still struggling after summarising key points, ask them to begin placing LEGOs on a board to visualise a schedule. They should be able to work from this point

Q: **What if students are frustrated because they can't get their schedules under goal before incidents are implemented?**
A: Check to see if all of the tasks are blocked together. In order to get under the goal, they will need to divide some tasks up and not leave empty spaces on the board. As long as the tasks don't overlap once divided (take up the same block of time in more than one task row/column), they are following the rules

Q: **What if students are struggling to understand the "incident assessment" or the restrictions about schedule rearrangement during the "incidents"?**
A: Explain to the student that in real life, you can't go back in time. Once you start implementing "incidents", it is as if construction has started on the project according to their plans, and the schedule can only be rearranged after the day something happens

Q: **What if students are frustrated because they can't meet the goal after "incidents" happen?**
A: Explain that in real life, things happen and force you to be delayed beyond your ability to meet a deadline

Presentation and Discussion Tips:

Q: How do I deal with disruptive behaviour in the classroom?
A: One effective way of preventing this is to set ground rules for students when the presentation begins, such as no talking when the ambassador is talking, no talking over others, showing respect to everyone etc. Making sure that the class as a whole agrees to follow such rules allows you to enforce the rules when they are broken.

Remember that you are not the only responsible adult in the classroom. Teachers are responsible for managing behaviour.

Q: There are students who dominate the discussion or activity work, while others are too shy to speak out and hardly participate. How do I promote equal participation?
A: Repeatedly emphasise that the most important element of engineering is planning and teamwork. Encourage students to work as a team and make decisions after discussion amongst themselves. Allow students to produce responses to questions as a small group, so that students who are too shy to speak out in class are still able to contribute within the team. If a single student is repeatedly answering questions, you can always engage others by saying something like, "I don't think we have heard from this side of the class yet?"

Q: **There are students who show disinterest in the presentation and the subject material. How should I handle these kinds of students?**
A: The first step is to get them involved. You could use praise or award prizes for correct answers. This will initially make students focus more on what is being presented, but eventually allow them to find an element that interests them.

Secondly, address how the subject matter and the engineering challenge is relevant to daily life. Connect real-world examples and applications to the engineering principles instead of presenting them as just another subject.

Finally, when providing your professional background, remember to include exciting experiences relating to your work, and how Maths and Science are tools you use in your job, rather than just a subject you learnt.

Q: **How do I make sure that students will have a positive, educative experience with the activity?**
A: When the activity progresses, ask students to justify their actions and decisions. Utilise the reflection prompting questions that are provided with the Ambassador Presentation and Activity Sheets.

After you explain information, ask simple questions that allow students to review what they have learnt. This way, the key concepts are fresh in their minds as they begin the activity. Encourage students to try different activities at home using materials they have seen being used.

Additionally, if a student makes a good point in a classroom discussion, be sure you give them ownership of that contribution, with prize or recognition. Students will gain confidence and actively participate.

Q: **What are some different ways I can structure the discussion?**
A: There are two main ways you could structure the discussion:

One way, called "Snowball". Begin by engaging the students with discussion questions in their respective groups. Then, after a certain amount of time, join two or three groups to

share their discussions. Finally, bring the discussion to the entire class, allowing individual students to speak out about their group's approach to the activity and see how each group had different ideas.

Another way to make sure individual students are participating is called the "Marketplace Format". Allow students to discuss their approach to the challenge provided in the activity in groups. Then, ask the students to form groups consisting of one member from each activity group, and ask them to share what they did to members from different activity groups. This allows individual students to explain the groups design, and promotes each student's participation in discussing and sharing ideas.