Rail Academy

STEM INIST

Activity book

Jacobs

MAJOR TRANSPORT INFRASTRUCTURE AUTHORITY

VICTORIA State Government

Activity 1: Design your own station

This activity is designed with the idea to promote critical thinking, basics of design, engineering, building resilient infrastructure, promoting sustainable construction and innovation.

This will in turn encourage teamwork and leadership from all those involved. A hands-on and fun activity to do, providing an introduction and insights into rail design and construction.

Learners will be able to:

- Critically analyse design options within budget constraints
- Investigate ideas or concepts of renewable and non-renewable resources
- Compare how sustainable environmentally friendly a build is based on the materials selected
- Explore ways to reduce total cost of build based on materials procured and cost of additional optional features
- Learn how engineers can help create good sustainability outcomes.

Things you'll need:

- Station precinct plan
- Station components
- Budget sheet
- Paper and Pen
- Calculator

Activity 1: Design your own station

Your task

The Victorian government will invest in the station upgrade of **Sapphire*** train station in Melbourne, Australia. The redevelopment will transform the station into a modern transport hub.

You are a group of engineering experts working on a business case, which will allow the government to consider options to upgrade the existing station and achieve sustainable outcomes for the environment and local community. The government has set a budget for the redevelopment which cannot be exceeded, and now needs your team to develop a design to present to the local community and Council.

Design requirements

In your team, you will need to design a new station. You have been provided the station layout and the materials needed.

The success of your project will be based on the following;

- Contribution towards sustainable outcomes (how sustainable environmentally friendly your design is depending on the materials selected)
- Ability to stay within the maximum budget (based on materials procured and cost of additional optional features)
- How well you work as a team.

*'Sapphire' is a fictional train station for the purpose of the activity.

Core components

The station must contain all core components. You have a choice for each core component which has a cost and sustainability impact.

You can pick a 'cheap' solution which is the least sustainable, for example a bathroom with poor water efficiency, or use higher proportions of your budget to purchase a bathroom with good or great water efficiency.

Optional features

Your team can select which (if any) optional features you want to include in your station, so long as you stay within the budget limitation.

Presentation

Your team is required to present your station design to the client, the team presentation should cover three areas of focus:

- Which core component options were chosen to be incorporate into the core design. Why did you select these alternatives?
- Which additional features were chosen to be incorporated into the design. How did your limit budget and your previous choices within the core design impact your decisions?
- What did you think was most important to consider in your design? Low cost? Low carbon emissions? Accessibility? Something else?

Did you know?

Infrastructure is one of Australia's largest employers and is responsible or half of the country's greenhouse gas emissions.

Task 1: Research the problem

What do you think of when you hear the words infrastructure sustainability?

(Visit 'Infrastructure Sustainability Council of Australia' to learn more about 'Infrastructure sustainability': **isca.org.au/Who-We-Are/Infrastructure-Sustainability**)

Why do you think it is important to estimate the cost and how much material will be needed for a construction project?

Task 2: Brainstorm the business case

What specific goal are you trying to achieve, and how will you know if you've been successful?

How much is the overall total budget?

$

What aspects of the design, other than money, are important to consider?

Task 3: Design phase

What is the installation cost of the basic station components your team has selected?

$_____

What is the sustainability outcome of the basic station components your team has selected?

What is one optional feature your team selected for the design, and why?

Station Optional Feature	Cost	Why
Example: Rainwater tank	*$ 30,000*	*To supply water for garden areas*

Task 3: Design phase (continued)

What are the relevant Sustainable Development Goals?

What is the installation cost of the optional station components your team has selected?

$_____

If you changed some of your initial choices and selections, what did you choose to prioritise and why?

Task 4: Build

How much will the total station upgrade project cost?

Does your design meet the criteria for success?
(is the project within budget/what are the sustainability outcomes?)

Task 5: Share your solution

In your teams, present your business case to the client.

What do you think is the best feature of your design? Why?

How sustainable/environmentally friendly is your build? Why?

How underspent or overspent was your teams' total budget?

What would you do differently if you had more time?

Sustainable Development Goals

To be successful in this activity at least one of your optional features must align with a Sustainable Development Goal.

The United Nations set 17 Sustainable Development Goals (SDGs) to form a roadmap for building a stable and prosperous world to 2030 and beyond. Before any major road and rail project commences an environment and sustainability plan must be developed.

Find out how Australia's organisations are changing the landscape through Sustainable Development Goals: **sdgdata.gov.au**

Notes

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