SUSTAINABLE TOURISM AT THE RAILWAY

SU-TRAIN-ABILITY

LEVEL

Year 11

Geography Unit 2 Tourism: Issues and Challenges

ACTIVITY DESCRIPTION

One of the seven key strategic aspirations at Puffing Billy Railway is "Commit to Environmental Sustainability" which emphasises the importance of the stunning Dandenong Ranges that the rail Corridor passes through. Puffing Billy is committed to minimising the impact on the environment in which it operates and has been collaborating with the community and key stakeholders in supporting the conservation of native wildlife and healthy ecosystems in the area. Puffing Billy Railway is committed to improving its environmental footprint and actively pursues sustainable outcomes as a matter of priority.

Throughout an excursion to Puffing Billy Railway students explore the interior and exterior sustainable features of the new Lakeside Visitor Centre. Students use this information to inform their development of an ecofriendly, sustainable aspect to the railway. Students build a prototype of their sustainable design and share with their peers via a gallery walk.

THEME

Area of Study 1 – Characteristics of Tourism

Area of Study 2 – Impact or tourism: issues and challenges

MATERIALS REQUIRED

- "Su-train-ability" design sheet
- Access to materials to build prototype e.g., Lego, wooden materials, metal materials (this can be the teacher's choice and could have students undertaking this unit of work across multiple subjects)

INSTRUCTIONS

1. Ask students where is Puffing Billy Railway (PBR)? Discuss the Temperate Rainforest habitat that Puffing Billy Railway passes through.
2. Ask students what is a steam engine? Is it sustainable? Discuss sustainability and the progress in sustainability in transportation. What type of trains do we use now?
3. As Puffing Billy Railway is a heritage steam railway it must commit to a certain amount of historical operation e.g. using coal. As such PBR's impact on the environment has been drastic over the last century. What negative environmental impacts would PBR have had over the last 123 years? Create a list on the whiteboard with the class.
4. PBR architects use STEM/STEAM (Science, Technology, Engineering, Arts and Mathematics) when developing new products and parts. Have students break the STEAM acronym down and share examples of each at PBR.
5. PBR architects use Design Theory when developing new products and parts. Discuss Design Theory with students. Show students the design theory video: https://www.youtube.com/watch?v=LhQWrHQwYTk&t=124s

6. Set students their task *"Using the Design Process, design, develop and construct a prototype of an aspect/product/part that will support Puffing Billy Railway to be more sustainable in the future".*
7. Students can use any notes, survey results or data collected on their visit to the railway to inform their design.
8. Show students the list of materials (teacher's choice) available to create their prototype. Hand out "Su-train-able" design sheet and give students a time frame to work on the design sheet and prototype. This could go over multiple sessions with an opportunity to refine their design before they showcase their final product.

Remember: Students are to showcase their finished prototype in a gallery walk.

SUGGESTIONS FOR ASSESSMENT

This task includes the use of STEM/STEAM and design theory. Using the LVC for inspiration, students will create a protype of their sustainable design. Their "Su-train-able" design sheet will showcase their understanding of the design process in conjunction with their completed prototype.

BACKGROUND INFORMATION

DANDENONG RANGES HABITAT

Dandenong Ranges National Park is part of an Aboriginal cultural landscape in the traditional Country of the Wurundjeri People.

The ranges consist mostly of rolling hills, steep weathered valleys and gullies covered in thick temperate rainforest, predominantly of tall mountain ash trees and dense ferny undergrowth. The Yarra Ranges natural environment is made up of the landforms and ecological services that provide the air we breathe, the water we drink, the soils that grow our food, and the habitats that are home to indigenous wildlife, such as Lyrebirds, and make up our scenic landscapes. The Yarra Ranges contain some of the most environmentally important areas in Victoria. These precious areas include the Mountain Ash forests of the Dandenong Ranges and Central Victorian Highlands. Remnant native vegetation is home to iconic species such as the Powerful Owl, the Helmeted Honeyeater and Leadbeater's Possum. The upper half of the Yarra River and its tributaries support a diverse range of plants and animals including significant populations of platypus, frogs and fish. These waterways and key dams and reservoirs such as O'Shannassy, Upper Yarra, Maroondah and Silvan provide about 70% of Melbourne's drinking water.

STEAM LOCOMOTIVES

Creating a steam engine is spectacular. When water is heated it produces steam and the volume occupied by the steam is enormous compared to the volume occupied by the water. When we boil water in a kettle if we let it continue it will produce enough steam to fill the whole room. Puffing Billy uses the power of steam to create enough energy to move the train.

Firstly, the fireman builds a fire out of wood in the first locomotive, that pulls the train, the wood fire creates hot coals which heat the water boiler. The fireman controls the blower to raise pressure slowly, attaining working pressure/a 'head of steam'. Steam is piped from the boiler into the cylinder and used to power the pistons, driving the locomotives wheels. It usually takes about 3-4 hours to build up a 'head of steam' to get the first engine ready for departure. You need water and heat to create steam power.

The coal-loading and fire-making goes on all day, particularly in the busy summer months, when up to six trains leave Belgrave Station each day.

OTHER TYPES OF LOCOMOTIVES:

- Diesel Locomotive

https://science.howstuffworks.com/transport/engines-equipment/diesel-locomotive.htm

- Maglev/magnetic train- https://www.energy.gov/articles/how-maglev-works#:~:text=The%20front%20corners%20have%20magnets,design%20creates%20a%20smooth%20trip.
- Electric Locomotive - https://www.metrotrains.com.au/energy-efficiency/

STEAM (SCIENCE, TECHNOLOGY, ENGINEERING, ART AND DESIGN AND MATHEMATICS)

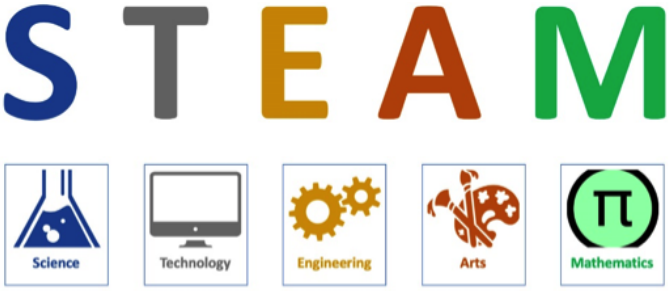

Image 1. Hong Kong Baptist University Affiliated School – STEAM subject

STEAM is a curriculum based on the idea of educating students in five specific disciplines, integrating concepts that are usually taught as separate subjects - Science, Technology, Engineering, Art and design, and Mathematics - in an interdisciplinary and applied approach. Rather than teach the four disciplines as separate and discrete subjects, STEAM integrates them into a cohesive learning paradigm based on real-world applications and emphasises the application of knowledge to real-life situations. What separates STEAM from the traditional science and math education is the blended learning environment and showing students how the scientific method can be applied to everyday life. It teaches students computational thinking and focuses on the real-world applications of problem solving. A lesson or unit in a STEAM class is typically based around finding a solution to a real-world problem and tends to emphasise project-based learning. A good STEAM lesson ensures that students understand the connection to the real world.

DESIGN THEORY

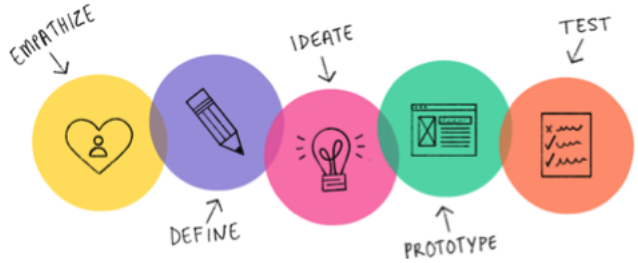

Image 2. LinkedIn: Technology Enabling Radical Innovation

Design Thinking is a mindset and approach to learning, collaboration, and problem solving. In practice, the design process is a structured framework for identifying challenges, gathering information, generating potential solutions, refining ideas, and testing solutions. Design Thinking can be flexibly implemented; serving equally well as a framework for a course design or a roadmap for an activity or group project.

PUFFING BILLY RAILWAY SUSTAINABILITY

In 2021 Puffing Billy Railway opened its new state of the art $20 million Lakeside Visitors Centre (LVC) at Emerald Lake Park in Emerald. As well as enhancing the experience with a café, function spaces, retail, food and beverage options and interpretation spaces, this building was designed with sustainability in mind. Rather than focus on the building as a new attraction the strategy of the architects and builders was to focus on the existing railway line and platform creating a visitor experience anchored within the authentic sights, smells and sounds of the railway and rainforest. These immersive experiences are becoming the norm in sustainable architecture design.

Sustainable architecture design is becoming important to business futures and is present in mission and vision statements for most organisations. Puffing Billy Railway has committed to environmental sustainability and has made attempts within all new designs and buildings to incorporate sustainable aspects. The new Lakeside Visitor Centre has many sustainable aspects including:

- Effective Daylight Design and shading strategies
- Energy efficient lighting systems – dimmers and sensors
- Indigenous plant landscaping utilising more than 16,000 new native plants
- Energy and water efficient systems, appliances, fixtures, and fittings - low flow taps
- Bin signage to limit landfill waste – Speaking to shire about recycling options
- The building has been designed with exposed, insulated slab floors, limited carpeting and limited suspended ceilings to maximise night purging
- Rainwater capture and reuse for toilets or irrigation- Test water from the fire sprinkler/hydrant system is also discharged into the storage tank to minimise water wastage
- Timber is certified by the Forest Stewardship Council (FSC) and Programme for the Endorsement of Forest Certification (PEFC) This helps ensure the wood is sourced from well-managed forests
- Wellbeing – outdoor spaces, natural light, acoustic treatment, low chemical content materials and accessibility.
- Creation of sustainability sub committee looking to the future.

CURRICULUM LINKS

Geography Skills

Source and Data assessment

- Reflect on the validity and reliability of data information and their sources

Social surveys and interviews

- Design and construct survey questionnaires or interview questions for a given purpose
- Undertake surveys and/or interviews with potential for open responses and qualitative recording

DESIGN THINKING

You've got a problem to solve – make a record to show how you use design thinking to find a solution.

Problem: *Puffing Billy Railway needs to be more sustainable in the future.*

Task: *Using the Design Process, design, develop and construct a prototype of an aspect/product/part that will support Puffing Billy Railway to be more sustainable in the future*

EMPATHISE

Who will this product/part/aspect help? What do they need?

DEFINE

Will you be designing a product? A part? An experience? A train?

Redefine the below to include your idea:

"Using the Design Process, design, develop and construct a prototype of an aspect/product/part that will support Puffing Billy Railway to be more sustainable in the future"

WORKSHEET – SU-TRAIN-ABILITY DESIGN SHEET

IDEATE

How many ideas can you come up with?

How will you choose your idea?

Which idea did you choose and why?

Use the next page to show your ideas.

PROTOTYPE

Which idea did you choose?

What materials will you need for your idea?

Draw any designs you might need.

TEST

What is working well?

What feedback did you receive?

What improvements could you make?

IDEATE