INNOVATION STATION

IDEAS AND INNOVATIONS

LEVEL

Level 7 – Level 8

ACTIVITY DESCRIPTION

Using design and technology information gathered from the excursion to Puffing Billy Railway, students create, demonstrate and evaluate a working system, or an innovative train, for the future. Don't forget to take a photo or video and send it to Puffing Billy Railway. We look forward to seeing your ideas and innovations!

THEME

- Design and Technology
- Ideas and Innovations

MATERIALS REQUIRED

- Basswood or Balsawood, Axles, Wheels (can be purchased from hardware store or online).

  Light weight balsa wood is easy to work with and is a great choice for this activity. It can be used for an endless list of innovations and ideas, from futuristic trains, to towers and bridges. Balsawood is available from hardware stores in a variety of sizes and shapes.
- Glues – Super glue or hot glue sticks depending on materials
- Hot glue guns
- Hobby/Stanley knives
- Cutting mats
- Sandpaper
- Icy pole sticks
- Hobby saws
- Hole punch tool
- Scissors
- Ruler
- Pencils
- Protractor
- Graph paper
- Acrylic paint
- Paint brushes
- Nails
- Hammers
- Variety of different sized wooden wheels - 4 to 6 per train
- Axles – 4 to 6 per train (to match wheel size)
- "Design and Technology project" evaluation sheets

POWER TOOLS (OPTIONAL)

- A drill
- Screws
- Drill press
- Carving tool set
- Rotary multi-tool with accessories
- Jigsaw
- Electric Motors (Optional)

Note: As an alternative task there are some great model construction kits that students would thoroughly enjoy. They are detailed in design and provide a challenge to build. The DIY Mechanical Wooden Puzzle (Locomotive) is a replica of a classic locomotive and comes with all the materials included. Whether students assemble from a kit or from scratch it provides an engaging and rewarding challenge.

INSTRUCTIONS

This activity is designed to promote critical thinking, innovation, design and technology engineering. This will in turn encourage teamwork and leadership from all those involved. A hands-on and fun activity to do using information students have learnt from their excursion to Puffing Billy Railway.

The Task Is for students to design and build their own railway across a classroom/space, capable of transporting "passengers" or "goods" from point to point. This activity can be adapted to provide different levels of insight into the railways. Students investigate the components that make up the railway, such as rails, sleepers, and gauge. They are introduced to design, project planning, and most importantly teamwork.

Students need to decide on the best working group to successfully complete the project. All team members need to equally contribute to the project, bringing different skills to work together to achieve an innovative outcome.

1. INTRODUCTION – Outline the task briefing and general layout of session area. Answer student questions and clarify information. Assign student groups. Allow students to gather their writing materials and excursion notes. As a whole class watch some you tube clips (from the references below) to provide some inspiration and examples of construction.

2. PLANNING – Is a crucial stage to the success of the task. Allocate the most time of the task to this stage. Students gather all their information. thoughts and ideas. They discuss, sketch, draw and measure a range of ideas and concepts. They outline all design and technology details and step by step instructions. Let students know they will experience both success and failure along the way. It is all part of the process.

3. DESIGN AND CONSTRUCTION

- Sketch design onto graph paper or create design templates.
- Encourage students to make a paper model as a practise. This will allow them to solve any problems and discuss solutions and make necessary design changes before they make their final wood model.
- Once the final design is complete, carefully trace the outlines onto the blank wood and cut out each piece.
- Make sure you also transfer the placement of the axile holes onto the wood. Or students may create a chassis/axile and wheels separately that the train sits on top of.
- It may be easier to leave the template attached to the wood while you drill the axile holes.
- When cutting, make the first cut across the grain this will prevent splitting of the wood.
- Place each piece of balsawood on the cutting mat.
- Use a saw, stanley knife or scissors to cut out each piece.
- Pre paint and stain construction before you start to assemble.
- Glue and/or nail all pieces together

MAKING A BOILER, CHASSIS AND AXILE

- The boiler can be made by gluing six strips of wood together to form a hexagonal shape. A shallow hole can be drilled to fit the smokestack. A paper disc/ wood can be glued on each end to help plane/sand it round. The dome shape on the front of the boiler is carved and sanded smooth.
- The Chassis, axile and wheels can be constructed using balsa wood or cardboard. Icy pole sticks also work well for the chassis. A battery powered motor is also a great addition.

4. DEMONSTRATION

This is where the real fun begins! Each group presents their project to the whole class or year level and demonstrates their innovative design and construction.

5. EVALUATION

The Puffing Billy Railway team would love to see your designs. Email photos or videos of students' designs to info@pbr.org.au.

SUGGESTIONS FOR ASSESSMENT

Ability to work as a team and contribute equally. Team assessment of planning, design and construction stages. Class presentation of completed train and trains ability to demonstrate the transport of passengers or goods from point to point successfully. Completed "Design and Technology project" evaluation sheet.

CURRICULUM LINKS

DESIGN AND TECHNOLOGIES

Investigate characteristics and properties of a range of materials, systems, components, tools and equipment and evaluate the impact of their use (VCDSTC037)

Critique needs or opportunities for designing, and investigate materials, components, tools, equipment and processes to achieve intended designed solutions (VCDSCD038)

Generate, develop, communicate and document design ideas and processes for audience using appropriate technical terms and graphical representation techniques (VCDSCD039)

Apply safe procedures when using a variety of materials, components, tools, equipment and techniques to produce designed solutions (VCDSCD040)

Negotiate criteria for success that include consideration of environmental and social sustainability to evaluate design ideas, processes and solutions (VCDSCD041)

BACKGROUND INFORMATION

REFERENCES

You Tube: Quazar - How to make a Cardboard Transport Train

www.youtube.com/watch?v=hqdXoVM0yG0

You Tube: Mr K - How to make a highly detailed train out of cardboard

www.youtube.com/watch?v=4dCc501ZNY0

You Tube: DIY Channel - Coolest Cardboard Train

www.youtube.com/watch?v=Uf9TqjK6NU0

DESIGN AND TECHNOLOGY PROJECT EVALUATION SHEET

AIM OF THE PROJECT	**WHAT WORKED WELL**
CHALLENGES I FACED	**HOW I DEALT WITH CHALLENGES**
WHAT I WOULD DO DIFFERENTLY NEXT TIME	**WHAT DID I CONTRIBUTE TO THE GROUP**
WHAT WAS OUR GREATEST ACHIEVEMENT	**WHAT NEW SKILL DID I LEARN**