Teaching design technology through science inquiry

Workshop facilitators:
Nicola Dziadkiewicz
Angela Gigliotti
Introductions

• My school or organisation
• My role
• My teaching style described as an animal and why?
ENGAGE
WHERE ARE WE AT?
Our STEM learning journey
1. How confident are you in your understanding of technology and its relationship to science?

2. How confident are you in your ability to teach design technology through a science inquiry approach, such as used by PrimaryConnections?
What does STEM look, feel and sound like in primary classrooms?
### Workshop Outline

#### Agenda

**Teaching design technology through science inquiry**

**Thursday 28th March (8.30 am for an 8.45 am start)**  
Melbourne Polytechnic, 77 St Georges Rd, Preston, VIC

<table>
<thead>
<tr>
<th>Time</th>
<th>Phase</th>
<th>Focus</th>
</tr>
</thead>
</table>
| 8:45 – 9:10 | Introduction | Welcome; introductions; sign-on; housekeeping  
STEM – an introduction |
| 9:10 – 9:30 | ENGAGE   | Perceptions of STEM  
Workshop outline, purpose and intended outcomes |
| 9:30 – 10:30| EXPLORE  | Perceptions of science and technology  
• Defining technology  
STEM in a contemporary example |
| 10:30 – 11:00 | EXPLORE  | How is technology at the heart of a Primary Connections inquiry?  
• A whole unit approach |
|             |          | **Morning Tea 11:00 – 11:30am** |
| 11:30 – 11:45 | EXPLORE (cont.) | • A whole unit approach |
| 11:45 – 12:45 | EXPLORE | How can a science inquiry lesson be given a technology focus?  
• A focussed approach |
| 12:30 – 1:15 | EXPLAIN | Design technology and the 5Es  
• How do we make the links between the 5Es and design and technology? |
|             |          | **Lunch 1:15 – 2:00 pm** |
| 2:00 – 3:30 | ELABORATE | Applying understanding about STEM to Primary Connections units.  
Modifying inquiries; creating new inquiries with a design focus. |
| 3:30 – 4:00 | EVALUATE | Reflection and evaluation |
PURPOSE: Learning intentions

- To establish a shared understanding of how teaching technology through science enhances both disciplines.

- To experience working technologically with existing PrimaryConnections units.

- To explore how to include design briefs and prototypes in a science inquiry approach.
PURPOSE: **Intended learning outcomes**

- Analyse the nature of **design technology** and its relationship to **science**.

- Experience and describe how to **modify** existing **science inquiries** to meet requirements of science and technology curriculums.

- Have a deeper understanding of aspects of **working technologically**.
What would you like to know and do by the end of the workshop today?

Please write one idea or question per post-it note.
EXPLORE
Explore

STEM IN CONTEXT
Thinking about STEM

Image A

Q3. Which image highlights best practice for STEM learning?

Image B

Image: Primary Connections 5Es DVD ‘Engage’

Beliefs and attitudes towards Science

Looking at STEM skills (% respondents):
• **more than 90%** use technology skills at least a number of times a week
• **nearly 80%** use maths skills at least a number of times a week
• **more than 50%** also said they use science skills at least a number of times a week
• **engineering skills** used by a little less than 40%.

STEM matters

(Office of the Chief Scientist 2013, p. 4)
• What does it mean to provide our children in 2018 with a fit for purpose twentyfirst century education in science and mathematics?
• Who has access to that education today, and why are we failing to provide access to others?
• How can we learn to do better?
Why does the acronym ‘STEM’ work for policy discussions, yet present challenges for education programs and classroom practices?
What STEM story are we telling?

Why are we telling it?

What does it look like in Australian primary classrooms?
Purpose of STEM Education

To promote STEM learning in which:

• Students learn discipline-specific knowledge and STEM skills,

• Students learn Enterprise skills (communication, creativity, critical thinking, collaboration and teamwork, personal and social capability, resilience, ethical understanding) and

• Students increase their Digital proficiency (ICT capabilities)

In our classroom:

• The 5Es teaching and learning model is an inquiry practice, informed by a strong evidence-base, that supports STEM learning.
Of the four components, which align best? Why?

Is this a suitable representation? If not, how might you represent STEM?
Explore

WHY LINK TECHNOLOGY AND SCIENCE?
Defining technology

1. Write a list of 10 words that best describe your understanding of technology.

2. Compare the list with a partner.

3. Underline each word that is exactly the same.
Catalyst – Strentrode

• What resonated most with you in that clip about how innovative technology is developed?
• How does this inform your thinking about:
  – What STEM subjects share in common?
  – How they are different?
Catalyst – Strentrode

<table>
<thead>
<tr>
<th>Science</th>
<th>Technology</th>
</tr>
</thead>
<tbody>
<tr>
<td>Engineering</td>
<td>Maths</td>
</tr>
<tr>
<td>Ways of thinking</td>
<td>Ways of working</td>
</tr>
</tbody>
</table>
Data, symbolic representation, components of digital thinking, information systems, computational thinking…

What the Technologies have in common...
Focus on science and literacy

Primary Connections teaching and learning approach

Collaborative learning

Investigation

5Es model

Embedded Authentic Assessment

Science integrated with curriculum
How are science & design technology linked, & what are the benefits?
Explore

A WHOLE UNIT APPROACH
How *can* design technology be at the heart of a science inquiry?
Package it better (Year 4 Chemical Sciences)

From the Australian Curriculum:
Natural and processed materials have a range of physical properties; these properties can affect their use [ACSSU074].

From the Victorian Curriculum:
Natural and processed materials have a range of physical properties; these properties can influence their use [VCSSU060]
Package it better (Year 4)

Design challenge

How can we make a package that is able to protect a fragile gift?
Package it Better
Engage phase

Students consider the design brief

Students work collaboratively to define the task.
Hands-on investigations

Students investigate using hands on approaches and, where appropriate, in collaborative teams.
L5: Strong Shapes

How do you make paper stronger?

Suggest ways to change the paper to support more weight

Suspended A4 paper with weight supported
Lesson 5: Strong Shapes

Explore the task and complete the pages in your booklet

**Equipment:**
Several A4 sheets of paper
2 tissue boxes
1 container to hold weights
small weights
masking tape

**Parameters:**
- Conduct as many trials as you like
- Maximum 2 sheets A4 per trial
- Maximum 2 layers per trial
- Minimum distance between tissues boxes 1 hand span
- Masking tape cannot be used to strengthen the paper

**Fair test mnemonic**
Remember: **c**ows **Moo** **S**oftly

- Change one thing
- Measure one thing (dependent on the change)
- Keep everything else the **S**ame
Reflections

Having experienced this ‘Explore’ activity:

Does it support STEM learning in the classroom? How?
Investigating images
Package it Better

Explain phase

Daring designs

Students:

- Interview a guest speaker
- Write a procedural text plan for their design task
- Create a prototype
- Develop explanations about materials science and the design process.
Package it Better
Elaborate phase

Package performance

Students:

• Evaluate their prototype against design criteria

• Review prototype and suggest changes to design

• Modify procedural text to reflect updated design features

• Make the revised package develop an evaluation survey to dispatch with the package.
Students:

- Evaluate the performance of their package using feedback from the survey.
- Reflect on their learning of materials, properties and the design process.
- Plan and deliver an oral presentation about their design and the design process.
Explore

A FOCUSED APPROACH
How can a science lesson be given a design focus?

Exploring design technology through the Physical Sciences - Year 2

From the Australian Curriculum:
A push or pull affects how an object moves or changes shape *(ACSSU033)*.

From the Victorian Curriculum:
The way objects move depends on a variety of factors including their size and shape: a push or a pull affects how an object moves or changes shape *(VCSSU048)*.
Design briefs

1. Background statement

2. Challenge or task statement

3. Design criteria

Inspired by the Pay it forward movement, a group of high rise offices are thinking about a Helping hands project. They will launch little contraptions from their office windows carrying acts of kindness – such as greeting cards, vouchers or a tasty morsel of food.

The project team are still working out the details of when they might do this, how often, and how to manage potential frustrations if people don’t get one. For example, the Jafflechutes website strongly recommends people not climb trees in pursuit of their toasted sandwiches that float down on parachutes. While considering the options, the project team would like a technical design to inform their decisions.

Design a contraption that is:
- of suitable size to carry a small package (approx 10–15g weight)
- will descend slowly from a second or third story window
- water resistant
- low cost
- made of environmentally responsible materials
- eye-catching

Australian Academy of Science
Design challenge

- Work in **teams** of 3.
- Guided by the **design brief**, use the **materials** provided, **create** a contraption that will deliver a small packet of chocolate.
- Build and **test** your prototypes.
- Be guided by pages 18-22
Argumentation is key to a scientific world view

“Research has shown that students will typically discount the data they have collect and revert to their previous non-scientific ideas… unless they go through this form of discussion.”

Julie Smith, Primary Connections Curriculum writer, 5Es DVD, Elaborate Chapter
### Assessment tool

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<thead>
<tr>
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<th>R</th>
<th>O</th>
<th>W</th>
<th>N</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>What choices</strong> did you make? (With regard to materials, construction, shape, sustainability etc.)</td>
<td><strong>What were the reasons</strong> for your choices?</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>■ What alternatives did you consider?</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>■ How did you make your decision?</td>
<td></td>
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<td></td>
</tr>
<tr>
<td></td>
<td>■ Are there scientific claims you considered?</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>What do you observe</strong> now?</td>
<td><strong>Why do you think that is?</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>■ Did the tests give you the results you expected?</td>
<td>■ Can you explain your test results using scientific claims and evidence?</td>
<td></td>
<td></td>
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</tr>
<tr>
<td>■ Did your choices work as intended?</td>
<td>■ Did the combination of choices work well in the final product?</td>
<td></td>
<td></td>
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</tr>
<tr>
<td>■ Did you notice anything that you didn’t originally think about?</td>
<td><strong>What would you suggest next time?</strong></td>
<td></td>
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</tr>
<tr>
<td></td>
<td>■ What information would you like to inform your next prototype?</td>
<td></td>
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<tr>
<td></td>
<td>■ What factors would influence your next design choices?</td>
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</tbody>
</table>

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Make links in your evaluation of your contraption to the Science Understanding:

‘A push or pull affects how an object moves or changes shape’

Retrieved from ACARA, 2016
The science of toys

EXPLAIN
What is the relationship between...

• Science as inquiry

and

• Technology as design

and

• How does Primary Connections support teachers to incorporate Design and Technologies in a unit of science inquiry?
The 5Es – what is it?

• An inquiry-based model of teaching and learning designed to facilitate conceptual change.

• Science as inquiry
### 5Es teaching and learning model

<table>
<thead>
<tr>
<th>PHASE</th>
<th>FOCUS</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>ENGAGE</strong></td>
<td>Engage students and elicit prior knowledge</td>
</tr>
<tr>
<td></td>
<td>Diagnostic assessment</td>
</tr>
<tr>
<td><strong>EXPLORE</strong></td>
<td>Provide hands-on experience of the phenomenon</td>
</tr>
<tr>
<td></td>
<td>Formative assessment</td>
</tr>
<tr>
<td><strong>EXPLAIN</strong></td>
<td>Develop scientific explanations for observations and represent</td>
</tr>
<tr>
<td></td>
<td>developing conceptual understanding</td>
</tr>
<tr>
<td></td>
<td>Consider current scientific explanations</td>
</tr>
<tr>
<td></td>
<td>Formative assessment</td>
</tr>
<tr>
<td><strong>ELABORATE</strong></td>
<td>Extend understanding to a new context or make connections to additional</td>
</tr>
<tr>
<td></td>
<td>concepts through a student-planned investigation</td>
</tr>
<tr>
<td></td>
<td>Summative assessment of the Science Inquiry Skills (SIS)</td>
</tr>
<tr>
<td><strong>EVALUATE</strong></td>
<td>Students re-represent their understanding and reflect on their</td>
</tr>
<tr>
<td></td>
<td>learning journey and teachers collect evidence about the achievement</td>
</tr>
<tr>
<td></td>
<td>of outcomes</td>
</tr>
<tr>
<td></td>
<td>Summative assessment of the Science Understanding (SU)</td>
</tr>
</tbody>
</table>
5E card sort

- Turn to page 53, cut out each heading and question
- Sort the questions in to the appropriate phase (*Use the handout “5Es teaching and learning model: teacher perspective/ student perspective” to assist you*)
- Glue on to page 28
- Add notes or ideas to page 30.

Design Cycle card sort

- Turn to page 55, cut out each heading and question
- Sort the questions in to the appropriate phase (*Use p25 & p31 to assist you*)
- Glue on to page 29
What we explored...

How? Whole unit in Package it better

A STEM learning task can be:

• a *Design and Technologies focus* through *Science* that uses the design process, is an effective way to structure STEM learning.

• Technology as design
A whole unit approach using a learning journey through *Package it better* – technology *through* the phases of the 5Es science inquiry approach. The design portfolio explains that students move backwards and forwards through the design cycle.

<table>
<thead>
<tr>
<th>Phase</th>
<th>DEFINE</th>
<th>EXPLORE</th>
<th>PRODUCE</th>
<th>EVALUATE</th>
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<tbody>
<tr>
<td>ENGAGE</td>
<td>Be presented with a design task.</td>
<td>Have a range of products to investigate/compare.</td>
<td>Create what they think a product might look like.</td>
<td>Evaluate a ‘bad’ product.</td>
</tr>
<tr>
<td>EXPLORER</td>
<td>Explore contexts and uses for design.</td>
<td>Design investigations and experiences to gain knowledge.</td>
<td>Create prototypes to test ideas.</td>
<td>Conduct product tests.</td>
</tr>
<tr>
<td>EXPLAIN 1</td>
<td>Suggest new success criteria based on what they know.</td>
<td>Explain what they have learned and how that product design.</td>
<td>Create prototypes to show what they know.</td>
<td>Critique prototypes based on what they know.</td>
</tr>
<tr>
<td>ELABORATE</td>
<td>Consider new contexts and success criteria.</td>
<td>Design investigations to gain understanding new contexts.</td>
<td>Produce prototypes, applying they have learned new context.</td>
<td>Suggest improvements on previous designs based on a new context.</td>
</tr>
<tr>
<td>EVALUATE</td>
<td>Create a design task and criteria based on a scenario, suggest what would need to be investigated to meet the brief.</td>
<td>Explain what they have learned, how that applies to the design task and what they still need to know.</td>
<td>Produce a final design to show what you know and suggest how they would modify for production.</td>
<td>Evaluate prototypes using success criteria and suggest improvements.</td>
</tr>
</tbody>
</table>
What we explored…

How? Design briefs in Push Pull

• **Background statement** (usually a narrative of the problem putting to put it in context)

• **Challenge or task statement** (describes the problem to be solved)

• **Design criteria** (lists the tasks underpinning the challenge and sets out the guidelines to be followed during the course of the design problem).
**Technology as design: the design cycle**

<table>
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<td>Conduct product tests.</td>
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<td>Suggest new success criteria based on what they know.</td>
<td>Explain what they have learned and how that affects product design.</td>
<td>Create prototypes to show what they know.</td>
<td>Critique prototypes based on what they know.</td>
</tr>
<tr>
<td>ELABORATE</td>
<td>Consider new contexts and success criteria.</td>
<td>Design investigations to gain understanding of new contexts.</td>
<td>Produce prototypes applying they have learned in a new context.</td>
<td>Suggest improvements on previous designs based on what they know.</td>
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<td>EVALUATE</td>
<td>Create a design task and criteria based on a scenario, suggest what would need to be investigated to meet the brief.</td>
<td>Explain what they have learned, how that applies to the design task and what they still need to know.</td>
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A **focused approach** using *Push Pull* – technology through a specific phase of the 5Es science inquiry approach.

**Design brief**
Design and Technologies

## What? Design and Technologies strands

### Technologies and society: the use, development and impact of technologies in people’s lives

<table>
<thead>
<tr>
<th>Technologies contexts</th>
</tr>
</thead>
<tbody>
<tr>
<td>Technologies and design across a range of contexts</td>
</tr>
</tbody>
</table>

### Creating designed solutions

| Process and production skills |
How? Creating designed solutions

**Processes and production skills:**

<table>
<thead>
<tr>
<th>Process</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Investigating and defining</td>
<td>Investigating and defining involves students critiquing, exploring and investigating needs, opportunities and information.</td>
</tr>
<tr>
<td>Generating and designing</td>
<td>Generating and designing involves students in developing and communicating ideas for a range of audiences.</td>
</tr>
<tr>
<td>Producing and implementing</td>
<td>Students learn and apply a variety of skills and techniques to make products, services or environments designed to meet specific purposes and user needs.</td>
</tr>
<tr>
<td>Evaluating</td>
<td>Students evaluate and make judgements throughout a design process and about the quality and effectiveness of their designed solutions and those of others.</td>
</tr>
<tr>
<td>Collaborating and managing</td>
<td>Students learn to work collaboratively and to manage time and other resources to effectively create designed solutions.</td>
</tr>
</tbody>
</table>
Designed solutions

• Can be:
  • **Products** – a model, a circuit, a contraption, an app, a poster, a movie
  • **Environments** – a space or place such as a garden, a pet shelter, a solar cooker
  • **Services** – less tangible, such as a menu, water saving system and represented through plans, diagrams and flow charts

• All result from the design process
## Design and Technologies: Foundation – Level 6

<table>
<thead>
<tr>
<th>Foundation – Level 2</th>
<th>Levels 3 and 4</th>
<th>Levels 5 and 6</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Technologies and Society</strong></td>
<td>Recognize the role of people in design and technologies occupations and explore factors, including sustainability, that impact on the design of solutions to meet community needs</td>
<td>Investigate how people in design and technologies occupations address competing considerations, including sustainability, in the design of solutions for current and future use</td>
</tr>
<tr>
<td><strong>Engineering principles and systems</strong></td>
<td>Investigate how forces and the properties of materials affect the behaviour of a designed solution</td>
<td>Investigate how forces or electrical energy can control movement, sound or light in a designed product or system</td>
</tr>
<tr>
<td><strong>Food and fibre production</strong></td>
<td>Investigate food and fibre production used in modern or traditional societies</td>
<td>Investigate how and why food and fibre are produced in managed environments</td>
</tr>
<tr>
<td><strong>Food specialisations</strong></td>
<td>Investigate food preparation techniques used in modern or traditional societies</td>
<td>Investigate the role of food preparation in maintaining good health and the importance of food safety and hygiene</td>
</tr>
<tr>
<td><strong>Materials and technologies specialisations</strong></td>
<td>Investigate the suitability of materials, systems, components, tools and equipment for a range of purposes</td>
<td>Investigate characteristics and properties of a range of materials, systems, components, tools and equipment and evaluate the impact of their use</td>
</tr>
<tr>
<td><strong>Creating Designed Solutions</strong></td>
<td><strong>Investigating</strong></td>
<td><strong>Generating</strong></td>
</tr>
<tr>
<td><strong>Evaluate needs or opportunities for designing, and the technologies needed to realise designed solutions</strong></td>
<td>Critique needs or opportunities for designing and explore and test a variety of materials, components, tools and equipment and the techniques needed to create designed solutions</td>
<td>Generate, develop, and communicate design ideas and decisions using appropriate technical terms and graphical representation techniques</td>
</tr>
<tr>
<td><strong>Visualise, generate, and communicate design ideas through describing, drawing and modelling</strong></td>
<td>Generate, develop, and communicate design ideas and decisions using appropriate technical terms and graphical representation techniques</td>
<td>Generate, develop, communicate and document design ideas and processes for audiences using appropriate technical terms and graphical representation techniques</td>
</tr>
<tr>
<td><strong>Use materials, components, tools, equipment and techniques to produce designed solutions safely</strong></td>
<td>Evaluate design ideas, processes and solutions based on criteria for success developed with guidance and including care for the environment and communities</td>
<td>Evaluate design ideas, processes and solutions based on criteria for success developed with guidance and including care for the environment and communities</td>
</tr>
<tr>
<td><strong>Planning and managing</strong></td>
<td><strong>Sequence steps for making designed solutions</strong></td>
<td><strong>Develop project plans that include consideration of resources when making designed solutions</strong></td>
</tr>
<tr>
<td><strong>Achievement Standard</strong></td>
<td><strong>By the end of Level 4 students explain how solutions are designed to best meet needs of the communities and their environments. They describe contributions of people in design and technologies occupations. Students describe how the features of technologies can be used to create designed solutions for each of the prescribed technologies contexts. Students create designed solutions for each of the prescribed technologies contexts. They explain needs or opportunities and evaluate ideas and designed solutions against identified criteria for success, including sustainability considerations. They develop and expand design ideas and communicate these using models and drawings including annotations and symbols. Students plan and sequence major steps in design and production. They identify appropriate technologies and techniques and demonstrate safe work practices when creating designed solutions.</strong></td>
<td><strong>By the end of Level 6 students describe some competing considerations in the design of solutions taking into account sustainability. They describe how design and technologies contribute to meeting present and future needs. Students explain how the features of technologies impact on designed solutions for each of the prescribed technologies contexts. Students create designed solutions for each of the prescribed technologies contexts, suitable for identified needs or opportunities. They suggest criteria for success, including sustainability considerations and use these to evaluate their ideas and designed solutions. They combine design ideas and communicate these to audiences using graphical representation techniques and technical terms. Students record project plans including production processes. They select and use appropriate technologies and techniques correctly and safely to produce designed solutions.</strong></td>
</tr>
</tbody>
</table>

Design cycle and 5Es

Creating design solutions using process and production skills:

<table>
<thead>
<tr>
<th>Processes and Production Skills (ACARA 2016)</th>
<th>5Es Phases of Inquiry</th>
</tr>
</thead>
<tbody>
<tr>
<td>Investigating and defining</td>
<td>ENGAGE/EXPLORE</td>
</tr>
<tr>
<td>Generating and designing</td>
<td>EXPLORE/EXPLAIN</td>
</tr>
<tr>
<td>Producing and implementing</td>
<td>EXPLAIN &amp; ELABORATE</td>
</tr>
<tr>
<td>Evaluating</td>
<td>ELABORATE &amp; EVALUATE</td>
</tr>
<tr>
<td>Collaborating and managing</td>
<td>SCIENCE &amp; TECHNOLOGY LITERACY</td>
</tr>
</tbody>
</table>
Why STEM education?

- Skilled communication and collaboration
- Knowledge construction
- Support learning that enables everyday activities, participation in civic life and secures professional success
- STEM subjects
- Problem solving
- Critical and creative thinking
- Learning how to gather and use evidence to answer questions, solve problems, justify solutions
- Using tools
- Evidence-based

(Primary Connections, in draft 2019)
General Capabilities in the Australian Curriculum encompass:

- Knowledge
- Skills
- Behaviours
- Dispositions
How? Through science...

- Literacy
- Numeracy
- Information and Communication Technology (ICT) Capability
- Critical and Creative Thinking
- Personal and Social Capability
- Ethical Understanding
- Intercultural Understanding

Where?

More info - General Capabilities through science

ELABORATE
RESOURCES

- How does Primary Connections support teachers to incorporate Design and Technologies in a unit of science inquiry?
Literacy focusses

- Design portfolios
- Procedural texts
- Science journals
- Tables
- TWLH charts
Identifying and defining

Researching and planning

Produces during the learning sequence

Producing and implementing

Occurs when students follow the steps they have decided upon to create their designs.
Can also be used to evaluate other products during research.

A self assessment tool for students own designs when Testing and evaluating.
Create a free membership to our website.

In the members’ section you can access teaching information and resources including
- videos,
- professional reading, and
- planning documents
e-Resource sheets, in digital formats, to adapt and customise freely available on the Primary Connections website
Primary Connections digital resources: Accessing e-Resource sheets via the Primary Connections website

1. Log in as a member via the Primary Connections website [https://primaryconnections.org.au/](https://primaryconnections.org.au/)
2. Select Curriculum resources

3. Scroll down the page and find the relevant Primary Connections unit. You can use the filters to support your search.
4. Select View unit

5. Scroll down the page to More for members and select Download

6. A zip file will appear in your Download folder
7. Open the file and each resource sheet will appear as a Word document: ready to be saved and edited for your use.
Teacher background information

Introduction to physical and chemical change

Changes to objects can include changes to the size, shape, smell and appearance. For example, a rock crumbles, a teapot breaks, and a steak changes colour, odour and texture when cooked.

Objects have characteristics such as size, weight and appearance, which are determined by the materials that are used to make them. Materials can be made of several different substances, for example, air is a material made of many different gases. Substances are made of particles, atoms or ions.

Physical change is a change to the physical properties of an object or material where the substances remain the same. The object itself might not remain the same, such as a rock could be ground to powder or a mug be smashed to pieces, but the substances are still present. There is still rock and porcelain. Physical change occurs when an object receives or loses energy. This might be from a force, for example, by being hit, or when a substance gains or loses heat energy, such as when an ice cube melts or liquid water freezes.

Cross-curriculum priorities

There are three cross-curriculum priorities identified by the Australian Curriculum:

- Aboriginal and Torres Strait Islander histories and cultures
- Asia and Australia's engagement with Asia
- Sustainability

For further information see: www.australiancurriculum.edu.au

Aboriginal and Torres Strait Islander histories and cultures

The PrimaryConnections Indigenous perspectives framework supports teachers' implementation of Indigenous knowledge and Torres Strait Islander histories and cultures in science. The framework can be accessed at: www.primaryconnections.org.au

Change Detectives focuses on the Western science way of making evidence-based claims about the way objects change, whether physically, chemically or through the gaining or losing of heat energy to cause a change of state. Aboriginal and Torres Strait Islander Peoples might have other explanations for the observed phenomenon of materials changing from liquids to solids or vice versa. PrimaryConnections recommends working with Aboriginal and Torres Strait Islander community members to access local and relevant cultural perspectives. Protocol for engaging with Aboriginal and Torres Strait Islander community members is provided in state and territory education guidelines. Links to these are provided on the PrimaryConnections website.

Sustainability

In the Change detectives unit students learn about how changes to materials can be reversible or irreversible. This provides opportunities for students to understand why and how substances change and how the world is made up of constantly moving particles. A deeper understanding of the composition of everyday materials and the factors that influence change can assist them to develop knowledge, skills and values for making decisions about individual and community actions that contribute to sustainable patterns of use of the Earth's natural resources.
34 Units are freely available on Scootle for download
Modifying an existing inquiry unit

1. Select a PC unit that interests you. Find others in the room who would also like to work on that unit.
2. Use the guiding questions on p. 32 to familiarise yourself the unit.
3. Work collaboratively to suggest modifications to incorporate design technology in the unit of work.
   - Record your ideas on a poster to share with the group

• Options for modifying

A. Suggest minor modifications to build on the existing design technology content to incorporate design and technology through science.
B. Replace the current Elaborate/Evaluate phase with design and technology lessons (you may wish to still incorporate a fair test).
C. Create a design brief that draws on the science learning, and addresses Victorian Curriculum outcomes.
Australian Academy of Science


Education Programs

• Primary Connections
• reSolve: Mathematics by Inquiry (Years F - 10)
• Science by Doing (Years 7 - 10)

Science Videos

– accurate and engaging content that everyone can access

34 Units are freely available on Scootle for download

Primary Connections is working with Education Services Australia to ensure:

ALL 41 Primary Connections units will be available on Scootle by June 30, 2019
EVALUATE
Science matters…

Scientific literacy

Refers to an individual’s…

➢ Scientific knowledge and use of that knowledge to:
  • identify questions
  • acquire new knowledge
  • explain scientific phenomena and
  • draw evidence based conclusions about science-related issues

➢ Understanding of the characteristic features of science as a form of human knowledge and enquiry

➢ Awareness of how science and technology shape our material, intellectual, and cultural environments and

➢ Willingness to engage in science-related issues, with the ideas of science, as a reflective citizen.

(OECD 2013, p.127)
Science provides an excellent *context* for learning and teaching design technologies.
My teaching style animal metaphor
Reflection

Discuss answers to the questions

• The most useful thing I discovered…
• Something I will implement in my teaching is...
• The thing I would like to learn more about is…
Evaluation

Your feedback is important. Please complete our survey.

https://www.surveymonkey.com/r/NR9L9R
Join the many teachers around Australia using **Primary Connections**

[www.primaryconnections.org.au](http://www.primaryconnections.org.au)

Create a free membership on our website and freely access additional resources

[facebook.com/PrimaryConnections](http://facebook.com/PrimaryConnections)

[pinterest.com/primaryconn0842/](http://pinterest.com/primaryconn0842/)

Contact the Primary Connections Professional Learning team

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