Marvellous machines

Who and what is Primary Connections?

- A primary school science education program of the Australian Academy of Science funded by the Australian Government.
- Recognised by 94% of primary teachers (1) and used by more than 75% of Australian primary science teachers since beginning in 2004 (2).
- An inquiry approach to primary science education.

What is inquiry learning?

- An approach that promotes curiosity and supports knowledge construction by engaging students in practical and hands-on activities.
- Students demonstrate learning by drawing, making models, videos and in many other ways called representations.

What is the Primary Connections inquiry approach?
A five phase model called the 5E inquiry model.

Phase	From the student's perspective
Engage	What do I think? What do I know about this topic? What am I curious about? What questions do I have about this topic?
Explore	I'll do some activities to investigate.
Explain	What have I learnt so far? How do I know?
Elaborate	I know a bit more now so I'm ready to do more investigating. What have I learnt? How do I know?
Evaluate	How has my thinking changed?

Watch this video for more information about the Primary Connections approach.

(1) Primary Science Teaching Survey, Australian Science Teachers Association, 2014 asta.edu.au/programs/assist/primary_science_teaching_survey
(1) Primary Connections: linking science with literacy Stage 6 Research Evaluation, University of Technology Sydney, 2018
(2) primaryconnections.org.au/sites/default/files/files/primary-connections-stage6-evaluation-report-uts.pdf

At a glance: Marvellous machines

Lesson	Phase of learning	What students will do	What you will need	What students will produce
1	The ENGAGE phase of learning: Stimulate students' interest and thinking about the topic.	• Examine toys and their moving parts. • Discuss what needs to be done to make toys move. • Draw and label, using arrows and words, diagrams showing the toys and how they move.	• 3 toys with moving parts • Paper • Pens and/or pencils Optional: a device for taking photos	Labelled drawings showing toys and how they move. Diagrams should include arrows to show the direction of movement.
2	The EXPLORE phase of learning: Students explore the topic in a hands-on way.	• Brainstorm ways to make a toy move when assisted by materials. • Choose three ideas to investigate. • Predict what will happen before testing. • Recording the results of their investigations. • Write and/or draw about what they have learned about making toys move.	• One toy with wheels, for example a toy car or train. • Materials that can be used to make the toy move, for example string, tape, rubber bands, balloons, magnets, cardboard etc. • Paper • Pens and/or pencils Optional: a device for taking photos	An ideas map containing their ideas on how to make toys move, a table showing their predictions, words and drawing showing what happened during their investigation, and an explanation about what they have learned from their investigation.
3	The EXPLORE phase of learning: Students explore the topic in a hands-on way.	• Discuss what they think they know about ramps and where ramps are found in the community. • Make a prediction about, then investigate what happens to how far a car will roll off ramps of different heights. • Record the results of their investigations. • Make claims about the effects of the height of a ramp on how far a car will roll.	• One toy with wheels, for example a toy car or train. • 5 blocks or books of equal size. • 1 golf ball or ball of similar size. • Something to measure distance, for example pop-sticks or a ruler • A piece of cardboard • Scissors • Tape • Pens, pencils, Optional: a device for taking photos	A table showing their predictions, a series of notes and images taken during their investigation, a data table showing the results of their investigation, and a paragraph explaining what their claim is based on their investigation.
4	The EXPLORE phase of learning: Students explore the topic in a hands-on way.	• Discuss what they think they know about levers and how they work. • Make a prediction about, then investigate what happens to how far a car is pushed by a level under different circumstances. • Record the results of their investigations. • Make claims about the effects of how a lever is pushed on how far a toy car will roll.	• One toy with wheels, for example a toy car or train. • 5 blocks or books of equal size. • 1 golf ball or ball of similar size. • Something to measure distance, for example pop-sticks or a ruler • 1 ruler to make a lever • A piece of cardboard • Scissors • Tape • 1 pen with a loose lid • Pens, pencils Optional: a device for taking photos	A table showing their predictions, a series of notes and images taken during their investigation, a data table showing the results of their investigation and a paragraph explaining what their claim is based on their investigation.
5	The EXPLAIN phase of learning: Opportunity for students to explain what they think, based on previous activities. They look at current scientific research about the topic.	• Identify and explain the reasons why three simple machines involving levers and ramps will not work. • Identify pushes and pulls, and the use of levers and ramps, in a Rube Goldberg machine. Optional: Watch video footage of Rube Goldberg machines. Optional: Design and/or build their own simple Rube Goldberg machine.	• Paper • Pens and pencils Optional: a device for viewing a website Optional: Equipment to re-create the scenarios shown in the images of simple machines.	A table explaining why the pictured simple machine will not work, and a labelled drawing of a Rube Goldberg machine showing the use of pushes, pulls, ramps and levers.

Check with your child's teacher for guidance about the Elaborate and Evaluate phases of learning.