Helter Skelter Shelter

Teacher Resource Sheet

science and engineering challenge

ON THE EVENT DAY

Half-day activity

Students will design and construct two towers from common materials. The towers will be tested for strength using small weights, under both static and seismic conditions.

(Please remember that students cannot bring notes, models or other paperwork on the event day)

ACARA LINKS (Year 9/10)

- The theory of plate tectonics explains global patterns of geological activity and continental movement **(ACSSU180)**
- Energy transfer through different mediums can be explained using wave and particle models **(ACSSU182)**
- Energy conservation in a system can be explained by describing energy transfers and transformations **(ACSSU190)**
- The motion of objects can be described and predicted using the laws of physics **(ACSSU229)**
- Values and needs of contemporary society can influence the focus of scientific research **(ACSHE228, ACSHE230)**
- Investigate and make judgements on how the characteristics and properties of materials are combined with force, motion and energy to create engineered solutions **(ACTDEK043)**

Visit the ACARA website...

BACKGROUND

Engineers design buildings to withstand as much sideways motion as possible in order to minimise the damage to the structure and give occupants time to get out safely if needed.

REAL-LIFE EXAMPLES

Although earthquakes in Australia are rare, they still have a history of causing damage, for example in Newcastle during 1989. Construction techniques can have a huge impact on the damage and fatalities from earthquakes. For example, in 2010 approximately 700 people died in an 8.8-magnitude earthquake in Chile, while a much less powerful earthquake in Haiti during the same year killed more than 200,000 people. A major factor in this difference was the more stringent building codes in Chile.

RELATED CAREERS

- Civil Engineer
- Geologist
- Construction Manager
- Geophysicist

RELATED DEGREES (UON)

- Bachelor of Engineering (Civil)
- Bachelor of Science (Earth Sciences/ Geography)
- Bachelor of Construction Management
- Bachelor of Mathematics

Find out more...

Watch VIDEO – "What is Engineering"?

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The Science and Engineering Challenge

THE UNIVERSITY OF NEWCASTLE AUSTRALIA

VOCABULARY

Aftershock	Smaller earthquake that follows a larger one
Buckling	What happens when an object cannot handle the force of compression
Earthquake	Sudden slip on a fault, resulting in a release of seismic energy
Epicentre	The point on the Earth's surface directly above an earthquake's focus
Fault	Break or fracture in the Earth's crust where earthquakes are likely to occur
Focus	Point of origin of an earthquake
Magnitude	Number that quantifies the size of an earthquake
Richter scale	Estimates the energy released from waves generated by an earthquake
Seismograph	An instrument that measures earthquake waves
P-wave	Earthquake wave that moves quickly (in a push-pull motion)
S-wave	Earthquake wave that moves slower than P-waves (in an up-down motion)

RESOURCES/LINKS

Top 5 Earthquake resistant structures around the world – Examples of five buildings which take earthquake engineering to another level.

A flexible bridge bends the rules of earthquake engineering – A new bridge design in Seattle that promises to stand strong after an earthquake.

Earthquake Vocabulary (Quizlet) - Words and definitions relating to earthquakes with flashcards, quizzes and matching games.

Real-world engineering: Using the NXT – Building instructions for a LEGO NXT earthquake simulator (using LEGO bricks and LEGO Mindstorms NXT).

Ready to Go Lessons: Collections of practical lesson plans and ideas from STEM-Works and Queensland University of Technology and Teach Engineering

Ready to Go Lessons: Build a DIY Seismograph from Science Buddies

Earthquakes (Behind the News) – A look at the difference between the 2010 Haiti and Chile earthquakes. Includes full transcript and teacher resources

Deadly earthquake hits New Zealand – Find out why Christchurch was rocked by two earthquakes within six months. Includes real footage and eyewitness accounts.

What is engineering? (UON) – This short video explains engineering through animation – from mobile phones and computer games to toothpaste.

The cool maths behind engineering (UON) – Discover the role maths plays in all kinds of unexpected places.

YouTube Playlist of helpful videos

EXAMPLES OF LEARNING ACTIVITIES

- Look up the definitions of the words in the 'Vocabulary' section above.
- Calculate the epicentre of an earthquake using the speed of P and S seismic waves.
- Demonstrate P and S seismic waves using a slinky or rope.
- Research an earthquake that has occurred within the last 10 years and present to the class.
- Cut and paste continents together (Pangea or Gondwana) to demonstrate the Theory of Plate Tectonics.