Teachers’ Guide

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The Brief

Western Australia is the world-leader in iron ore production with stores of approximately 24 gigatonnes. The world requires iron ore for making steel – a $900 billion industry annually. Steel is used to create many of the things we use every day such as, electric cars, wind farms and solar panels. Steel also helps build new cities in some of the most disadvantaged places in the world.

Technological changes provide new uses for mined elements. Nickel, which was used to harden steel, is now playing a more vital role as an ingredient in developing rechargeable electric vehicle batteries. Minerals are extracted from open-cut mines using a combination of blasting, drilling and excavating. Throughout this process, mining companies are required to adhere to strict environmental conditions before, during and after mining to reduce impacts on the environment.

Current circumstances have led the mining and resources industries to find innovative ways to secure a successful future, including considering artificial intelligence, robotics, drones, automation and data analytics to find effective solutions.

The Mission

Your mission — should you choose to accept it — is to Think Big! Create teams of 3-5 students in your class and select one of the mini mining missions listed on page 4. Pages 23-28 have links to the STEM curriculum outcomes in each subject area for each year level — to assist teachers in making connections between classwork and the mission. There is also a week-by-week guide that follows the NoTosh Design Thinking process with ideas of what to do in class.

So, what’s taking so long?! Let’s get started!
Mini Mining Missions

CHOOSE ONE OF THE FOLLOWING MINI MISSIONS

1. The rehabilitation of the mining area is an important part of the project. How might we develop innovative uses for closed or discontinued mines?

2. Nickel is a key commodity in the make-up of electric vehicles batteries. How might WA contribute to EV battery development to capitalise on the growing EV market?

3. WA is one of the largest iron ore producers feeding the world’s steel industry. As technology and innovation evolve, what might iron ore mining in WA look like in 50 years?

4. Reducing carbon emissions is a challenge faced by industries globally. How might we reduce the mining and resources sector’s carbon footprint?

5. Having completed your own research into iron ore mining, its production, transportation and processing into steel, identify what you perceive to be the biggest challenge for the industry and why?
How does it all work?

**Step 1:**
Determine which challenge you will attempt with your class. We’ve created a three-week suggested schedule for the challenge to give time for teacher planning, but you can take the full four-week period allowed if you prefer.

**Step 2:**
If you have any questions send an email to stem@notosh.com and someone will respond to you ASAP.

**Step 3:**
Complete the challenge by December 2nd, 2019. Each school may submit a maximum of three entries. The entries can be from any year group and you may submit multiple entries from different teams from the same year group. All team members must be from the same year group. Please see terms and conditions for more.

**Step 4:**
Visit thewest.com.au/bhpfutureready to upload your final entry in a two-page pdf. If more information is required by the judges you will be contacted, so don’t discard any of your work.

**Step 5:**
Winners will be notified by xx date. For more information on the terms and conditions of the challenge, visit thewest.com.au/bhpfutureready.
The Set-up

Visible
Make everything visible, from the research to the ideations — seeing things together helps make connections.

Hands-on
This STEM mission is hands-on. You’ll need poster paper, post-it-notes and craft materials on hand.

Open-ended
There aren’t any right answers in this mission — release your students to get carried away.

Collaborative
Organise students into groups of 3-5.
School Curriculum & Standards Authority

NoTosh Design Thinking Process

- Suggested approach to investigating and solving the BHP Future Ready STEM Challenge
- Minimum time: 6 hours in class time
Phase 1
Immersion

1. Share the Mission and Brief
2. Research
3. Have an experience
4. Activate Thinking
5. Record everything
Mission: Week 1

**Immersion**

- Approximately 30% of your time should be Immersion (minimum duration: 2-hours in class time)
- Explicit Teaching
- Experiences
- Questioning
- Experiments
- Empathy
- Recording of Observations

Immersion is all about divergent thinking. Students are on a quest to gather as much information about the concept and the context as possible. There’s opportunity for explicit teaching, learning experiences and learning experiments.

In Immersion, students’ curiosity is piqued and the real-life importance of the mission is amplified by boldly kicking off the mission.

By the end of Immersion, students should feel like they’ve exhausted many different avenues and gathered information about the mission and the context.

Although, English, Geography and History could be included in this mission; this is a STEM challenge so content for Science, Technology, Engineering and Mathematics will need to be explicitly taught, encountered, experimented with and questioned.

Googling the “answer” won’t cut it for this mission. There is no one answer... but there are many questions. Questioning is a key element of immersion. Encourage students to ask questions constantly:


Each mission will uncover other problems that will have consequences on the final design, and those problems also need solving.

Immersion is the first phase in the PROBLEM-FINDING space of Design Thinking.
Phase 1
Immersion

Look for...

Energy created and consumed
Environment
Mining processes
Transportation
Locations

1. Share the mission and brief
No boring introductions! No, title-pages, no “Introducing the topic” with a PowerPoint. Find a creative way to engage students in the mission. Consider kicking-off with an excursion or simulation exercise. Even this early on, start gathering questions and wonderings from your students.

2. Research all aspects of mining
We have gathered a range of texts to get you started at thewest.com.au/bhpfuturereadylinksforteachers, but we encourage you to find more that students might encounter based on their own wonderings. In this STEM Mission, however, it's vital to expose students to foundational information about the context through the disciplines of Science, Mathematics, Technology and Engineering. Whatever you do, don't destroy curiosity by showing students text after text as a whole class - group students by interest and keeping feeding their curiosity.

3. Have an experience
Consider an excursion (in person or VR), interviewing an expert and text based research. At Murdoch University there are school programs that bring science careers to life schools students, including terrestrial mining based activities.

4. Activate Thinking
Thinking routines are a helpful way to wonder more deeply about a concept and/or context. A simple routine such as; I see..., I think..., I wonder..., either spoken aloud or written down can encourage students to push beyond surface-level thinking. Using DeBono’s Thinking Hats is another active thinking routine that can help students think about the concept and/or context from a variety of different perspectives.

5. Record everything
Recording shouldn't be primarily written. In real life, scientists use images, data and film to record findings. Mathematicians use numbers, graphs, maps and diagrams. Consider where and how your students might record their findings both together and alone in visible ways.
Phase 2
Synthesis

1. Group similar information
2. Create graphs
3. Draw conclusions
4. Find THE Problem
Mission: Week 2
Synthesis

- Approximately 20% of your time should be Synthesis (minimum duration: 1-hour and 15-minutes in class time)
- Converging thinking
- Making connections
- Understanding affect
- Forming conclusions
- Representing data

Synthesis is all about convergent thinking. Students are focussing on making connections and forming conclusions about the concept and the context. Importantly, in this phase, students are searching for problems that need solving.

Teachers can plan to conduct a series of large synthesis sessions once the Immersion phase is complete OR conduct a series mini-synthesis sessions after each Immersion session with the aim to consistently reflect back on previous learning encounters.

By the end of the Synthesis phase, students should have identified a core problem worth solving.

The visible data wall, or Project Nest, (for all of the techniques, theories and project ideas, visit thewest.com.au/bhpfuturereadylinksforteachers, or see the references section of this booklet on pages 30-31) really comes into its own here. Data represented as post-it-notes, images and sketches can be clustered together according to topic or theme to help make connections and see correlations emerge.

In addition to the relationships between the clusters, students can consider cause and effect between each cluster.

Graphs and data are an excellent way to converge big data into manageable chunks allowing students to identify trends.

Synthesis is the last phase in the PROBLEM-FINDING space of Design Thinking and, therefore, at the end of Synthesis, students should have identified ONE core problem worth solving.
Group similar information
The physical movement of notes, images and sketches into 'like' groups/categories, helps to consolidate the understanding of complex situations involving knowledge of concept/s and its application to the context. Students should aim to name clusters and explain the relationships between clusters, a good tool to use to understand the connections between clusters is Hexagonal Thinking.

Create graphs
Infographics are a quick and simple way for students to present data in interesting and easily understandable ways. Students might choose one element to collect data and report on or several connected elements. Canva is a simple online tool students can use (and it’s Aussie made and owned, too).

Draw conclusions
Students need be able to draw conclusions about both the concept and the context. Encourage students to use scientific and mathematical language to explain mining processes, effects and end products, especially from a West Australian perspective.

Find the problem
Within any context, there are many problems that can be solved. The holy grail for designers is to find the problem that’s worth solving. Once an existing problem has been revealed, it’s been determined that it is REALLY is a problem and it’s the most worthwhile problem to solve; we must frame the problem so as to generate a broad range of possible solutions.
Phase 3 Ideation

1. Generate LOTS of ideas
2. Filter ideas
3. Choose one idea
Mission: Week 2

Ideation

• Approximately 10% of your time should be Ideation (minimum duration: 30-minutes)
• Divergent thinking
• Wild ideas
• Suspend judgement
• ‘Yes, and...’ attitude
• Filtering based on criteria

Ideation requires stamina in divergent thinking. Students are focussing on generating a large quantity of solutions to the identified problem. The aim is for students to generate a large quantity of solutions to the identified problem.

Ideas should be made visible as soon as possible so encourage sketching out ideas, it also helps students hold their ideas lightly by reminding them that once an idea is visible, it’s no longer owned by a single person.

Timing is really important in Ideation. Teachers should facilitate heavily in this phase to ensure timings are adhered to. Idea Generation requires an air of anticipation and is best conducted as a whole class, at the same time. If possible, it works well if students can stand up while ideating.

NB Teachers, if you REALLY have potential ideas to share, here is where you add your ideas, non-verbally – without expectation that students will choose your idea... no matter how good it appears to be.

Criteria for filtering the mass of ideas down to 10 or even less is helpful to use AFTER generating ideas.

Ideation is the first phase in the PROBLEM-SOLVING space of Design Thinking.

By the end of the Ideation phase, students should have identified a loose idea of a good solution to their identified problem.
Phase 3
Ideation

Be prepared to...

1. **Generate LOTS of ideas**
   Generating a lot of ideas ensures a level of sophistication. 100 Ideas in 10 mins is the most divergent of the ideation tools. Before you begin, students should have a “How Might We...?” question clearly written at the top of a large piece of poster paper. Clear away all the chairs and have markers and post-it-notes at the ready. Students should be gathered around each poster in groups of about 4. Put some music on and start the timer for 10 mins. You might like to break up the 10 mins like so: 3 mins= silent, 5 mins= serious and 2 mins= crazy; but that's not the only way. Encourage students to ideate thick and fast - this activity is about quantity of ideas.

2. **Filter Ideas**
   Choosing a good idea needs to have more rigour than just intuition. The filtering tool, How? Now. Wow! Helps students to sort the 'wheat from the chaff'. Have groups grab another piece of poster paper and divide it into 4 quadrants. Each quadrant should then be labelled as follows - Impossible, How?, Now., and Wow!. Students simply take each idea and decide if it’s impossible, unsure how to make it work (how?), an existing idea (now) or an exciting new idea (wow!). Students place each idea in the appropriate quadrant.

3. **Choose an Idea**
   Once students have filtered down their ideas, it’s time to choose the most sustainable, cost effective and impactful solution. Students might choose the best 5 ideas from the How? Now. Wow! Grid and rate each according to these criteria to make the best choice.

Look silly
Have stamina
Get excited about others' ideas
Phase 4 & 5
Prototyping & Feedback

1. Draw a rough prototype
2. Get feedback
3. Improve your prototype
Mission: Week 3
Prototyping & Feedback

• Approximately 30% of your time should be Prototyping (minimum duration: 2-hours in class time)
• Approximately 10% of your time should be spent gathering feedback on prototypes (minimum duration: 30 minutes in total over a few sessions in class)
• Converging thinking
• Prototyping for feedback
• Hold prototypes lightly
• Minimum Viable Idea

Prototyping works hand-in-hand with Feedback. Students prototype just enough to get helpful feedback in order to make their prototype better.

Once students have determined a viable idea that’s worth taking forward, they create a sketch that’s just enough to communicate the bare bones of the idea. This is prototype 1.

*Students should keep their first prototype unsophisticated. A 10-minute detailed sketch is appropriate at this stage.*

Feedback is the seeking of advice about the prototype in order to advance it and make it better. The Prototyping/Feedback phases should be coupled together and cycle through a few times like so:

1. Prototype #1 & Feedback round #1 (peers)
2. Prototype #2 & Feedback round #2 (professional)
3. Prototype #3 & Formal Feedback

By developing a short pitch, students can communicate the features, advantages and impact their prototype might have in order to gather quick yet effective feedback.

All feedforward advice should be recorded so as to show how the prototypes have evolved.

Prototyping and Feedback are the last phases in the process.
**Draw a rough prototype**

Students should draw a labelled sketch of their chosen solution for the first prototype. Give students time to develop an Elevator Pitch; a 30 second pitch that can be shared in the space of time a short elevator ride, which helps their audience understand what their solution is all about. If students are prototyping a product/app, encourage students to build a low-fidelity physical model that can be used alongside their pitch. REMEMBER: A prototype is created for feedback.

**Gather feedback**

When gathering feedback, it’s easy to accept a nod and a “That’s good,” from the respondent. However, Feedback like that is unhelpful because it is non-specific. If the point is to improve the prototype, specific feedback is key. The judging criteria is helpful to use here, too. Students can simply ask what the respondent likes about the prototype and what would make the prototype even better.

**Improve your prototype**

Once feedback has been given, students should apply this advice and develop a more sophisticated prototype. Students might also move on to making a model or using technology to show what the solution will look like in a more physicalised way.

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**Real audience**

Kind, Specific, Helpful feedback
The Wrap-up

Document
Ensure the process is documented and prototypes photographed.

Reflect
What worked well?
What was difficult?

Check the Criteria & Submit
Groups should do this together.
Judging Criteria

Explain to your students, what the judges will be looking for, and ensure they have addressed all the criteria and the challenge rules and conditions.

Judges will score all entries out of 30, with 5 marks for each of the following:

- Does the entry fulfil all rules and conditions?
- Is the design and description clear, concise and easily understandable?
- How creative and/or innovative is the design?
- How beneficial would this design be to society?
- How deep, well thought out and substantial is the reason/purpose/back story to this design?
- Has the team gone beyond their school education to come up with the design?

Judges will also consider:

- A justifiable use of unconventional and imaginative materials
- A truly original solution to a problem, and so could have the most impact
- If a genuine problem has been uncovered and addressed.
- If it is a solution that embraces inclusion and diversity.

They will be looking for creativity, innovation and ingenuity, and here’s the scoring scale:

5 marks or below: There’s elements of creativity in the project but the problem identified is vague and the solution lacks detail. The use of Science, Technology, Engineering and Mathematical understanding is not visible.

6-10 marks: The problem-space has been investigated well but the communication of the solution needs clarification about detail and/or it’s affect OR the idea is not original. The use of Science, Technology, Engineering and Mathematical understanding is not clear.

11-15 marks: An attempt to follow the design process has been made and thus, the problem-space has been investigated well. Divergent ideation has led to an original solution. The use of Science, Technology, Engineering and Mathematical understanding is somewhat clear.

16-20 marks: The design process has been followed and thus, the problem-space has been investigated thoroughly. Divergent ideation has led to an original, viable solution that might work in the real world. The use of Science, Technology, Engineering and Mathematical understanding is clear.

21-25 marks: Great project and possible winner. Good understanding of the field and good communication of their unique ideas and benefit to society. Some evidence of extracurricular STEM learning.

26-30 marks: Excellent design and likely winner. Excellent understanding of the field, great communication of their unique ideas and the benefit to society. Evidence of background research and extracurricular STEM learning.
Design thinking
For STEM

• Developed for an interdisciplinary approach
• Multi-age or Year-level flexibility
• Real-life problem-finding and solving
• Real-audience
• Harnesses knowledge of Science, Technology, Engineering and Mathematics
• Mapped to SCASA Curriculum

WHY STEM IS IMPORTANT

“[STEM Learning facilitates] a deeper understanding of why and how our world functions in a holistic (bringing in multiple perspectives) manner. That is of most significance if we are to nurture independent thinkers who can actually create new knowledge and apply these insights in many different ways.”
(Paige and Lloyd, 2016).

By encompassing inter-disciplinary (and cross-disciplinary) approaches to real-world problems, STEM Learning creates deeper, holistic learning about the world while also involving problem-solving, collaboration and critical and creative thinking STEM Learning (Education Council, 2015).

Furthermore, STEM-related skills and knowledge are crucial for future innovation.

“There is strong evidence that skills and understanding in science, technology, engineering and mathematics (STEM) enable us to innovate and drive economic growth, thereby unlocking the jobs of the future. Sixty-five percent of Australia’s economic growth per capita in the past 50 years can be attributed to improvements in the use of capital, labour and technological innovation made possible in large part by STEM capability.”
School Curriculum & Standards Authority

**Primary Curriculum Connections**

- Curriculum Connections for Year 3s and 4s
- Curriculum Connections for Year 5s and 6s
Year 4
In Year 4 there are multiple connections between the Missions and the curriculum, including:
• Forces required in extracting minerals from a mine
• Building a system using forces
• Using technical drawings to communicate a design
• Scale models (mines/solutions)
• Sequenced steps to designing a solution

Year 3
In Year 3 there are multiple connections between the Missions and the curriculum, including:
• Use components to make a solution
• Create a grid map of a mine site
• Suggest different data points to analyse
• Safe practices within a mine

Chemical Sciences
A change of state between solid and liquid can be caused by adding or removing heat (ACSSU046)

Materials and Technologies Specialisations
Suitability and safe practice when using materials, tools and equipment for a range of purposes (ACTDEK013)

Producing and Implementing
Select, and safely use, appropriate components with given equipment to make a solution (WATPPS18)

Digital Implementation
Use visually represented sequenced steps (algorithms), including steps with decisions made by the user (branching) (ACTDIP011)

Location and Transformation
Create and interpret simple grid maps to show position and pathways (ACMMG065)

Data Representation and Interpretation
Interpret and compare data displays (ACMSP070)

Engineering Principles and Systems
Forces, and the properties of materials, affect the behaviour of a product or system (ACTDEK011)

Designing
Develop and communicate design ideas and decisions using annotated drawings and appropriate technical terms (WATPPS23)

Physical Sciences
Forces can be exerted by one object on another through direct contact or from a distance (ACSSU076)

Digital Implementation
Use visually represented sequenced steps (algorithms), including steps with decisions made by the user (branching) (ACTDIP011)

Location and Transformation
Create and interpret simple grid maps to show position and pathways (ACMMG065)

Data Representation and Interpretation
Interpret and compare data displays (ACMSP070)
Year 5
In Year 5 there are multiple connections between the Missions and the curriculum, including:
- Map different aspects of a mine
- Represent data collected from mines
- Investigate the process of turning iron ore into steel
- Using these missions, define a problem and determine a sequence of steps to create a solution

Year 6
In Year 6 there are multiple connections between the Missions and the curriculum, including:
- Changing properties of minerals
- Using electricity to control movement in a mine
- Using these missions, define a problem and determine a sequence of steps to create a solution
- Map decision making diagrammatically
- Volume and capacity of mined substances

CHEMICAL SCIENCES
Solids, liquids and gases have different observable properties and behave in different ways (ACSSU077)

ENGINEERING PRINCIPLES AND SYSTEMS
Forces can control movement, sound or light in a product or system (ACTDEK020)

INVESTIGATING AND DEFINING
Define a problem, and a set of sequenced steps, with users making a decision to create a solution for a given task (WATPPS27)

COLLECTING, MANAGING AND ANALYSING DATA
Collect, store and present different types of data for a specific purpose using software (ACTDIP016)

LOCATION AND TRANSFORMATION
Use a grid reference system to describe locations. Describe routes using landmarks and directional language (ACMMG113)

DATA REPRESENTATION AND INTERPRETATION
Construct displays, including column graphs, dot plots and tables, appropriate for data type, with and without the use of digital technologies (ACMSP119)

CHEMICAL SCIENCES
Changes to materials can be reversible or irreversible (ACSSU095)

ENGINEERING PRINCIPLES AND SYSTEMS
Electrical energy and forces can control movement, sound or light in a product or system (ACTDEK020)

INVESTIGATING AND DEFINING
Define a problem, and a set of sequenced steps, with users making decisions to create a solution for a given task (WATPPS33)

COLLECTING, MANAGING AND ANALYSING DATA
Collect, store and present different types of data for a specific purpose using software (ACTDIP016)

USING UNITS OF MEASUREMENT
Connect volume and capacity and their units of measurement (ACMMG138)

DATA REPRESENTATION AND INTERPRETATION
Interpret and compare a range of data displays, including side-by-side column graphs for two categorical variables (ACMSP147)

LOCATION AND TRANSFORMATION
Use a grid reference system to describe locations. Describe routes using landmarks and directional language (ACMMG113)

DATA REPRESENTATION AND INTERPRETATION
Construct displays, including column graphs, dot plots and tables, appropriate for data type, with and without the use of digital technologies (ACMSP119)

DIGITAL IMPLEMENTATION
Design, modify, follow and represent both diagrammatically, and in written text, simple algorithms (sequence of steps) involving branching (decisions) and iteration (repetition) (ACTDIP019)
School Curriculum & Standards Authority
Secondary Curriculum Connections

- Curriculum Connections for Year 7s and 8s
- Curriculum Connections for Year 9s and 10s
Year 8
In Year 8 there are multiple connections between the Missions and the curriculum, including:

- Minerals contained within rocks
- Evaluating different designs
- Development of products through creative innovation
- Social/sustainable technologies
- Data collection and representation

Year 7
In Year 7 there are multiple connections between the Missions and the curriculum, including:

- Earth’s renewable/non-renewable resources
- The impact of human activity on food chains/webs
- Forces
- Designing ideas
- Social/sustainable technologies
- Data representation

EARTH & SPACE SCIENCES
Some of Earth’s resources are renewable but others are nonrenewable (ACSSU116)

BIOLOGICAL SCIENCES
Interactions between organisms can be described in terms of food chains and food webs; human activity can affect these interactions.

DESIGNING
Design, develop, review and communicate design ideas, plans and processes within a given context, using a range of techniques, appropriate technical terms and technology (WATPPS41)

EARTH AND SPACE SCIENCES
Sedimentary, igneous and metamorphic rocks contain minerals and are formed by processes that occur within Earth over a variety of timescales (ACSSU153)

CHEMICAL SCIENCES
Chemical change involves substances reacting to form new substances (ACSSU225)

ENGINEERING PRINCIPLES AND SYSTEMS
The use of motion, force and energy to manipulate and control electromechanical and mechanical systems (ACTDEK031)

TECHNOLOGIES AND SOCIETY
Social, ethical and sustainability considerations, in the development of technologies and designed solutions, to meet community needs for economic, environmental and social sustainability (ACTDEK029)

ENGINEERING PRINCIPLES AND SYSTEMS
The design of simple solutions using motion, force and energy, to manipulate and control electromechanical and mechanical systems (ACTDEK031)

DATA REPRESENTATION AND INTERPRETATION
Identify and investigate issues involving numerical data collected from primary and secondary sources (ACMSP169)

DATA REPRESENTATION AND INTERPRETATION
Investigate techniques for collecting data, including census, sampling and observation (ACMSP284)

Represent events in two-way tables and Venn diagrams and solve related problems (ACMSP292)
Year 9
In Year 9 there are Multiple connections between the Missions and the curriculum, including:
- Ecosystems and communities of interdependence
- Applying Design Thinking principles
- Using materials, forces and motion to create solutions
- Designing environmental products and services
- Collecting data from secondary sources

PHYSICAL SCIENCES
Energy conservation in a system can be explained by describing energy transfers and transformations (ACSSU190)

ENGINEERING PRINCIPLES AND SYSTEMS
The characteristics and properties of materials, combined with force, motion and energy, to create solutions (ACTDEK043)

DESIGNING
Apply design thinking, creativity and enterprise skills (WATPPS56)

TECHNOLOGIES AND SOCIETY
Development of products, services and environments, with consideration of economic, environmental and social sustainability (ACTDEK041)

DATA REPRESENTATION AND INTERPRETATION
Identify everyday questions and issues involving at least one numerical and at least one categorical variable, and collect data directly and from secondary sources (ACMSP22B)

BIOLOGICAL SCIENCES
Ecosystems consist of communities of interdependent organisms and abiotic components of the environment; matter and energy flow through these systems (ACSSU176)

ENGINEERING PRINCIPLES AND SYSTEMS
The characteristics and properties of materials, combined with force, motion and energy, to create solutions (ACTDEK043)

DESIGNING
Apply design thinking, creativity and enterprise skills (WATPPS56)

TECHNOLOGIES AND SOCIETY
Impact of emerging technologies on design decisions, and/or economic, environmental and social sustainability (ACTDEK041)

DATA REPRESENTATION AND INTERPRETATION
Evaluate statistical reports in the media and other places by linking claims to displays, statistics and representative data (ACMSP253)

Year 10
In Year 10 there are Multiple connections between the Missions and the curriculum, including:
- Energy conservation within a system
- Applying Design Thinking principles
- Using materials, forces and motion to create solutions
- Impact of emerging technologies on design decisions
- Evaluate statistical data in the media

PHYSICAL SCIENCES
Impact of emerging technologies on design decisions, and/or economic, environmental and social sustainability (ACTDEK041)

ENGINEERING PRINCIPLES AND SYSTEMS
The process of materials being combined with force, motion and energy to create solutions (ACTDEK043)

DESIGNING
Apply design thinking, creativity, enterprise skills and innovation to develop, modify and communicate design ideas of increasing sophistication (WATPPS64)
References

For clickable links to these references and more research links, visit thewest.com.au/bhfuturereadylinksforteachers

ADLC - Elementary Science: Reversible and Irreversible Changes


Austin’s Butterfly: Building Excellence in Student Work


Coalseam | Explore Parks WA | Parks and Wildlife Service

de Bono Thinking Systems | Six Thinking Hats


Education resources for schools teachers and students - ABC Education


Higher order questions = higher order thinking

How Might We

How to build a project nest