

FUTURE MAKERS

STEM Inventors Challenge

TEACHER MANUAL



2025



QGC

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Presented by Future Makers
a partnership between Queensland Museum and Shell's QGC business

Future Makers

Future Makers is an innovative partnership between Queensland Museum Network and Shell's QGC business, aiming to increase awareness and understanding of the value of science, technology, engineering, and maths (STEM) education and skills in Queensland.

This partnership aims to engage and inspire people with science and increase the participation and performance of students in STEM-related subjects and careers – creating a highly capable workforce for the future.



World Science Festival Brisbane



Each year World Science Festival Brisbane paints the town red and takes science out of the laboratory and into the streets, parks, museums, galleries and performing arts venues of Brisbane and regional Queensland. Queensland Museum holds exclusive licence to host the festival in the Asia Pacific – the only global extension of this initiative, attracting over 1.5 million attendances since launching in 2016.

World Science Festival Brisbane reinforces Queensland Museum's position as a leader in Science, Technology, Engineering and Mathematics (STEM) education and engagement. The festival provides Queensland Museum an opportunity to engage audiences outside the traditional education sphere and promote a whole of life "entanglement"

with STEM – delivering on our mission of creating authentic and compelling experiences and stories that inspire, enrich, and empower. The festival is delivered to regional Queensland throughout the calendar year under the banner of World Science Festival Queensland.

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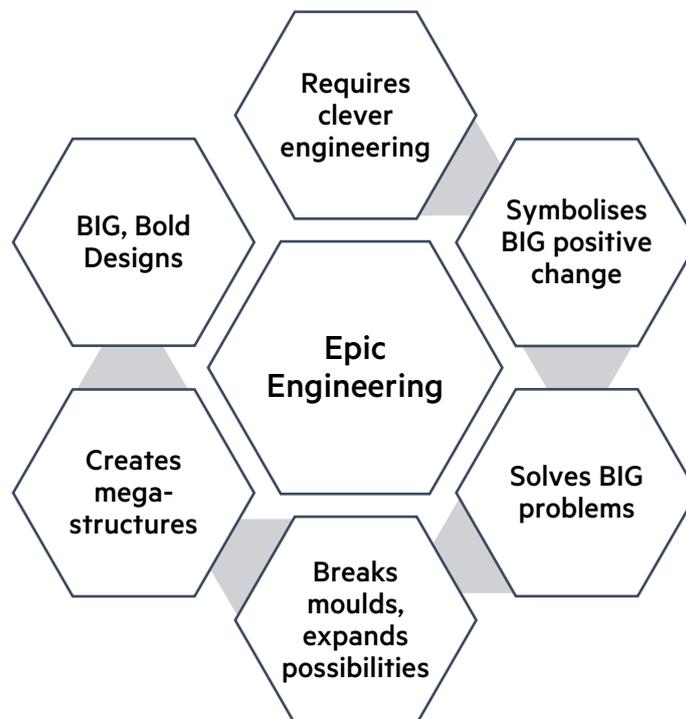
Future Makers STEM Inventors Challenge 2025: Epic Engineering

Introduction

Epic Engineering uncovers the technological challenges, creative problem-solving and collaborative efforts that drive extraordinary projects, revealing the bold ideas and teamwork behind achieving the seemingly impossible. Working in groups of 2-4, your students will have 10 weeks (including school holidays) to explore amazing engineering feats which have changed the local community and the world, and to generate, define, design, refine and produce an EPIC Engineering prototype and prototype exhibit, and submit their entries to a panel of judges at the World Science Festival Queensland!

The STEM Inventors Challenge 2025 is:

Identify a significant challenge people face in your community and beyond and think BIG to design an EPIC engineered solution.



This challenge integrates with World Science Festival Queensland's Epic Engineering program and submissions will be judged and celebrated at World Science Festival Queensland!

Submission at the World Science Festival Queensland MUST include:

- A prototype
- A prototype exhibit including:
 - Student names, year level and school
 - A prototype
 - Prototype name
 - A sketch or virtual design
 - An engineering problem statement
 - An overview of the design
 - An explanation of how the design meets the design criteria
 - Timeline for potential construction
 - The results of refining and testing the prototype and any improvements made.

Timeline

Western Downs	Gladstone	Tasks
Term 1, Week 10 Mon 31 March – Fri 4 April	Term 2, Week 10 Mon 23 June – Fri 27 June	Online launch webinar - Consider the steps to success for the STEM Inventors Challenge Contact your STEM Mentor and arrange times for consultations in Weeks 1-5 next term. Create teams – Are students hustlers, hipsters, hackers or humanists? Investigate Epic Engineering: <ul style="list-style-type: none"> Introduction to engineering and the design process Discover epic engineering feats in Queensland and the problems they solved.
April School Holidays Sat 5 – Sun 20 April	June/July School Holidays Sat 28 June – Sun 13 July	Optional school holiday activities Students may use the school holidays to: Investigate the challenge: <ul style="list-style-type: none"> Research and identify local, regional or Queensland problems that epic engineering could solve. Gather research on the problem they wish to solve and create a problem statement.
Term 2, Week 1-2 Tues 22 April – Fri 2 May	Term 3, Week 1-2 Mon 14 – Fri 25 July	Investigate the challenge Investigate forces and point of failure Design solutions: <ul style="list-style-type: none"> Choose a solution to design as a team. Consider design criteria Develop a project timeline Consultation 1 with STEM Mentor (if applicable).
Term 2, Week 3-4 Tues 6 – Fri 16 May	Term 3, Week 3-4 Mon 28 July – Fri 8 August	Create a prototype: <ul style="list-style-type: none"> Design a prototype. Sketch and label materials and features. Collect materials/plan 3D design. Build the prototype. Consultation 2 with STEM Mentor (if applicable).
Term 2, Week 5 Mon 19 – Fri 23 May	Term 3, Week 5 Mon 11 – Fri 15 August	Test and refine the prototype: <ul style="list-style-type: none"> Make observations and test the design using simulated conditions. Improve the design based on testing results. Consultation 3 with STEM Mentor (if applicable).
Term 2, Week 6-7 Mon 26 May – Thurs 5 June	Term 3, Week 6-7 Mon 18 – Thurs 28 August	Make a prototype exhibit: <ul style="list-style-type: none"> Design and create a prototype exhibit to display at World Science Festival Queensland. Create an exhibition poster on supplied tri-fold board. Decide on exhibit set-up and any additional components to add. Complete a risk assessment Final teacher check-in to ensure students are ready to display their work
Term 2, Week 7 Fri 6 June at WSFQ Chinchilla	Term 3, Week 7 Fri 29 August at WSFQ Gladstone	Submit entry at World Science Festival Queensland! Set up and display prototype exhibit at World Science Festival Queensland. Winners, Highly Commended and Commended entries announced and awarded prizes, trophies, and certificates on the day.

Curriculum Links – Version 9

Design and Technologies

Investigating and defining

Years 5-6 - investigate needs or opportunities for designing, and the materials, components, tools, equipment, and processes needed to create designed solutions (AC9TDE6P01)

Years 7-8 - analyse needs or opportunities for designing, and investigate and select materials, components, tools, equipment, and processes to create designed solutions (AC9TDE8P01)

Years 9-10 - analyse needs or opportunities for designing; develop design briefs; and investigate, analyse, and select materials, systems, components, tools, and equipment to create designed solutions (AC9TDE10P01)

Generating and designing

Years 5-6 - generate, iterate, and communicate design ideas, decisions and processes using technical terms and graphical representation techniques, including using digital tools (AC9TDE6P02)

Years 7-8 - generate, test, iterate and communicate design ideas, processes and solutions using technical terms and graphical representation techniques, including using digital tools (AC9TDE8P02)

Years 9-10 - apply innovation and enterprise skills to generate, test, iterate and communicate design ideas, processes, and solutions, including using digital tools (AC9TDE10P02)

Producing and implementing

Years 5-6 - select and use suitable materials, components, tools, equipment, and techniques to safely make designed solutions (AC9TDE6P03)

Years 7-8 - select, justify, and use suitable materials, components, tools, equipment, skills, and processes to safely make designed solutions (AC9TDE8P03)

Years 9-10 - select, justify, test, and use suitable technologies, skills, and processes, and apply safety procedures to safely make designed solutions (AC9TDE10P03)

Evaluating

Years 5-6 - negotiate design criteria including sustainability to evaluate design ideas, processes, and solutions (AC9TDE6P04)

Years 7-8 - develop design criteria collaboratively including sustainability to evaluate design ideas, processes, and solutions (AC9TDE8P04)

Years 9-10 - develop design criteria independently including sustainability to evaluate design ideas, processes, and solutions (AC9TDE10P04)

Collaborating and managing

Years 5-6 - develop project plans that include consideration of resources to individually and collaboratively make designed solutions (AC9TDE6P05)

Years 7-8 - develop project plans to individually and collaboratively manage time, cost, and production of designed solutions (AC9TDE8P05)

Years 9-10 - develop project plans for intended purposes and audiences to individually and collaboratively manage projects, taking into consideration time, cost, risk, processes, and production of designed solutions (AC9TDE10P05)

Marking Criteria

This is the marking criteria that will be used by the judges during World Science Festival for the **STEM Inventors Challenge 2025: Epic Engineering**.

Criteria	Description
Investigating and defining	<ul style="list-style-type: none"> ● Identified and justified a major problem that effects the local community, region, or Queensland. ● Provided information, data, surveys and/or statistics to support why this is a problem. ● Provides explanation on how the design will make long-term positive change.
Generating and designing	<ul style="list-style-type: none"> ● Generated a detailed physical prototype model solution (or partial section). ● Communicated design ideas, processes and solutions using technical terms and graphical representations. ● Applied innovative engineering techniques to create design.
Producing and implementing	<ul style="list-style-type: none"> ● Provided a detailed sketch/diagram which labels materials, components, tools, and equipment. ● Included justification for why materials, components, tools, and/or equipment have been used. ● Provided information about the skills and processes to safely make/use the designed solution.
Evaluating	<ul style="list-style-type: none"> ● Evidence of testing prototype and refinement of ideas ● Considered the impacts this solution could have on the broader community. ● Showed evidence of refinement using STEM Mentor feedback (if applicable). ● Explained how sustainability has been considered in design solution.
Collaborating and managing	<ul style="list-style-type: none"> ● Estimated the cost of solution, with an explanation included on how it could be made more economical, or why it is the most economical solution long-term. ● Showed a possible timeline for the proposed project. ● Includes allocation of resources and constraints.

Design and Technologies Criteria Sheet

This criteria sheet has been provided to assist with assessing Design and Technologies achievement at a school-based level. Feel free to share this with your students and modify it as necessary for assessment purposes.

	A	B	C	D	E
INVESTIGATING AND DEFINING	<p>Comprehensively:</p> <ul style="list-style-type: none"> Identified and justified a major challenge that effects the local community, region, or Queensland. Provided information, data, surveys and/or statistics to support why this is a problem. Chose tools and materials necessary to create designed solution. Included a design brief which demonstrates understanding of the project challenge, the solution, design criteria, constraints, timeframes and resources. 	<p>Effectively:</p> <ul style="list-style-type: none"> Identified and justified a major challenge that effects the local community, region, or Queensland. Provided information, data, surveys and/or statistics to support why this is a problem. Chose tools and materials necessary to create designed solution. Included a design brief which demonstrates understanding of the project challenge, the solution, design criteria, constraints, timeframes and resources. 	<p>Adequately:</p> <ul style="list-style-type: none"> Identified and justified a major challenge that effects the local community, region, or Queensland. Provided information, data, surveys and/or statistics to support why this is a problem. Chose tools and materials necessary to create designed solution. Included a design brief which demonstrates understanding of the project challenge, the solution, design criteria, constraints, timeframes and resources. 	<p>Partially:</p> <ul style="list-style-type: none"> Identified and justified a major challenge that effects the local community, region, or Queensland. Provided information, data, surveys and/or statistics to support why this is a problem. Chose tools and materials necessary to create designed solution. Included a design brief which demonstrates understanding of the project challenge, the solution, design criteria, constraints, timeframes and resources. 	<p>Did not complete all tasks:</p> <ul style="list-style-type: none"> Identified and justified a major challenge that effects the local community, region, or Queensland. Provided information, data, surveys and/or statistics to support why this is a problem. Chose tools and materials necessary to create designed solution. Included a design brief which demonstrates understanding of the project challenge, the solution, design criteria, constraints, timeframes and resources.
GENERATING AND DESIGNING	<p>Comprehensively and effectively:</p> <ul style="list-style-type: none"> Generated a detailed physical prototype model solution (or partial section) featuring technologies suitable for communities and environments. Communicated design ideas, processes and solutions using technical terms and graphical representations. Applied innovative approaches to process and solutions using design thinking, for example designs inspired by nature or transforming a solution into an enterprise for target marketing. 	<p>Effectively:</p> <ul style="list-style-type: none"> Generated a detailed physical prototype model solution (or partial section) featuring technologies suitable for communities and environments. Communicated design ideas, processes and solutions using technical terms and graphical representations. Applied innovative approaches to process and solutions using design thinking, for example designs inspired by nature or transforming a solution into an enterprise for target marketing. 	<p>Adequately:</p> <ul style="list-style-type: none"> Generated a detailed physical prototype model solution (or partial section) featuring technologies suitable for communities and environments. Communicated design ideas, processes and solutions using technical terms and graphical representations. Applied innovative approaches to process and solutions using design thinking, for example designs inspired by nature or transforming a solution into an enterprise for target marketing. 	<p>Partially:</p> <ul style="list-style-type: none"> Generated a detailed physical prototype model solution (or partial section) featuring technologies suitable for communities and environments. Communicated design ideas, processes and solutions using technical terms and graphical representations. Applied innovative approaches to process and solutions using design thinking, for example designs inspired by nature or transforming a solution into an enterprise for target marketing. 	<p>Did not complete all tasks:</p> <ul style="list-style-type: none"> Generated a detailed physical prototype model solution (or partial section) featuring technologies suitable for communities and environments. Communicated design ideas, processes and solutions using technical terms and graphical representations. Applied innovative approaches to process and solutions using design thinking, for example designs inspired by nature or transforming a solution into an enterprise for target marketing.

	A	B	C	D	E
PRODUCING AND IMPLEMENTING	<p>Comprehensively and effectively:</p> <ul style="list-style-type: none"> • Provided a detailed diagram which labels materials, components, tools and equipment. • Included justification for why materials, components, tools, and/or equipment have been used. • Provided information about the skills and processes to safely make/use the designed solution. 	<p>Consistently:</p> <ul style="list-style-type: none"> • Provided a detailed diagram which labels materials, components, tools and equipment. • Included justification for why materials, components, tools, and/or equipment have been used. • Provided information about the skills and processes to safely make/use the designed solution. 	<p>Adequately:</p> <ul style="list-style-type: none"> • Provided a detailed diagram which labels materials, components, tools and equipment. • Included justification for why materials, components, tools, and/or equipment have been used. • Provided information about the skills and processes to safely make/use the designed solution. 	<p>Highly guided production of:</p> <ul style="list-style-type: none"> • Provided a detailed diagram which labels materials, components, tools and equipment. • Included justification for why materials, components, tools, and/or equipment have been used. • Provided information about the skills and processes to safely make/use the designed solution. 	<p>Did not complete all tasks:</p> <ul style="list-style-type: none"> • Provided a detailed diagram which labels materials, components, tools and equipment. • Included justification for why materials, components, tools, and/or equipment have been used. • Provided information about the skills and processes to safely make/use the designed solution.
EVALUATING	<p>Comprehensive and discerning:</p> <ul style="list-style-type: none"> • Development of design criteria and evidence of testing and refinement of ideas. • Explanation of how sustainability has been considered in your design solution. • Consideration of the impacts this solution could have on the broader community. • Considered and implemented feedback from experts (if applicable) 	<p>Detailed and informed:</p> <ul style="list-style-type: none"> • Development of design criteria and evidence of testing and refinement of ideas. • Explanation of how sustainability has been considered in your design solution. • Consideration of the impacts this solution could have on the broader community. • Considered and implemented feedback from experts (if applicable) 	<p>Adequate:</p> <ul style="list-style-type: none"> • Development of design criteria and evidence of testing and refinement of ideas. • Explanation of how sustainability has been considered in your design solution. • Consideration of the impacts this solution could have on the broader community. • Considered and implemented feedback from experts (if applicable) 	<p>Partial:</p> <ul style="list-style-type: none"> • Development of design criteria and evidence of testing and refinement of ideas. • Explanation of how sustainability has been considered in your design solution. • Consideration of the impacts this solution could have on the broader community. • Considered and implemented feedback from experts (if applicable) 	<p>Fragmented:</p> <ul style="list-style-type: none"> • Development of design criteria and evidence of testing and refinement of ideas. • Explanation of how sustainability has been considered in your design solution. • Consideration of the impacts this solution could have on the broader community. • Considered and implemented feedback from experts (if applicable)
COLLABORATING AND MANAGING	<p>Comprehensively:</p> <ul style="list-style-type: none"> • Collaborated to develop project plans and task • Estimated the cost of your solution, and explained how you could make it more economical, or why it is the most economical solution. • Included a timeline for the production of the design solution. 	<p>Effectively:</p> <ul style="list-style-type: none"> • Collaborated to develop project plans and task • Estimated the cost of your solution, and explained how you could make it more economical, or why it is the most economical solution. • Included a timeline for the production of the design solution. 	<p>Adequately:</p> <ul style="list-style-type: none"> • Collaborated to develop project plans and task • Estimated the cost of your solution, and explained how you could make it more economical, or why it is the most economical solution. • Included a timeline for the production of the design solution. 	<p>Partially:</p> <ul style="list-style-type: none"> • Collaborated to develop project plans and task • Estimated the cost of your solution, and explained how you could make it more economical, or why it is the most economical solution. • Included a timeline for the production of the design solution. 	<p>Did not complete all tasks:</p> <ul style="list-style-type: none"> • Collaborated to develop project plans and task • Estimated the cost of your solution, and explained how you could make it more economical, or why it is the most economical solution. • Included a timeline for the production of the design solution.

OVERALL RESULT: _____

Term 1 Week 10

Please make contact this week with your STEM Mentors to arrange consultations during week 1 or 2, 3 or 4, and 5 of next term.

Online Launch: Welcome to the Future Makers STEM Inventors Challenge 2025

Preparing for the Online Launch Webinar:

You will receive an email from the Future Makers team following registration for the STEM Inventors Challenge 2025. Your class will participate in a 45-minute online launch webinar which will be held through Microsoft Teams. This online webinar will introduce your students to the Future Makers STEM Inventors Challenge for 2025 in Week 10. For this session ensure students are set-up in their groups of 2-4 **prior** to joining.

The online session will:

- Reveal the challenge.
- Discover examples of epic engineering for positive change.
- Encourage students to see themselves as big problem solvers.
- Introduce the Future Makers STEM Inventors Challenge Design Brief Booklet.
- Discuss steps for success.

Questions? Contact the Future Makers team at futuremakers@qm.qld.gov.au

Step 1: Create a team!

Use the BOP Industries *Team Building Tool Kit* to help students make the best teams possible. This can be downloaded for free here:

<https://www.bopindustries.com/product-page/team-building-toolkit-free-resource>

The collage consists of four images from the 'Team Building Tool Kit' resource. The first image is the cover page, which is blue and white and features the title 'Team Building Tool Kit: Hipsters, Hackers, Hustlers & Humanists'. The second image is a page titled 'How To Use This Resource' which provides instructions on how to use the tool kit in a classroom. The third image is a 'TEAM ROLES' poster with four categories: HIPSTER (Creative, Design Focused), HACKER (Problem Solvers, Product Focused), HUSTLER (Leaders, Planning & Goals), and HUMANIST (User Advocate, Task Alignment). The fourth image is a smaller version of the 'TEAM ROLES' poster.

This activity allows students to decide their own 'persona' based on their personal skills, then create groups which will work most effectively together.

Students then use the table provided in their Student STEM Inventors Challenge Booklet to list their persona/s and skills.

Step 2: Introduction to the design process

The design process is a series of iterative steps that are used in Science, Technology and Engineering to help solve problems. While these steps lead to each other, it is important to remember that good design always involves embracing failure –the design process allows you the flexibility to back track and try again in order to succeed. This process is used throughout the Future Makers STEM Inventors Challenge.

Students watch the design process videos and discuss ways Design Thinking has been used to solve problems. You could watch these videos as a class and have a class discussion, or allow students to discuss in groups.

SparkLab, Queensland Museum: The SparkLab Design Process

<https://www.youtube.com/watch?app=desktop&v=xJl2dDHYVNk>

Vox and TED-ED: How to solve problems like a designer

<https://www.youtube.com/watch?v=wOrmr5kT-48>



Step 3: Engineering Your World

Have you ever wondered why buildings don't fall in the wind? Or how bridges can hold the weight of huge, fast-moving trains? Epic engineering is all around us! Engineering makes our lives easier and safer, and helps us to gain a deeper understanding of the world we live in.

This activity gives students the opportunity to explore their local surroundings to discover that engineering impacts almost every aspect of their lives.



Able Point Marina © Queensland Museum, Gary Cranitch

Lesson Steps

1. As a class, brainstorm the question: **What is engineering?** (Students may respond with: Design, innovation, solving problems, improving efficiency, making life easier, solving mathematical or scientific questions, architecture or infrastructure systems)

Explain to students that engineering is defined as the, “Application of science to the optimum (best) conversion (change) of natural resources to the uses of humankind” (Britannica). Discuss with students that engineered design is all around us, in our buildings, computer systems, transport and even our food production.

2. In small groups, students walk around their school grounds and develop a list of all the feats of engineering that they see.
3. This task could be extended as a homework task where students explore their wider community area to discover more variety of engineering feats.

Step 4: The Impact of Engineering: Community of Inquiry

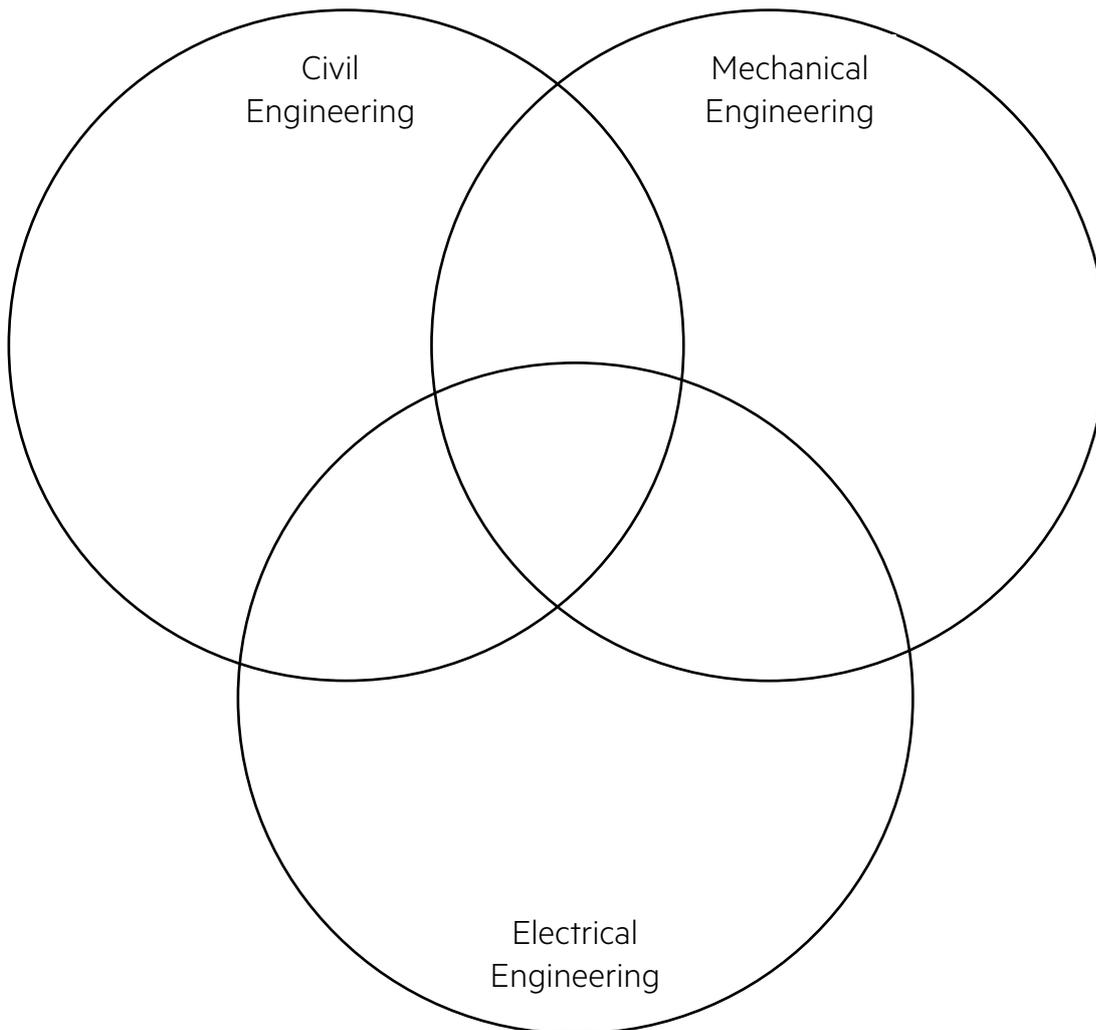
In this activity, students participate in a community of inquiry to consider the **impact** of engineering in our lives. The community of inquiry is a structured, dialogic process that requires participants to ask open inquiry questions, listen and think, share ideas and consider alternative viewpoints. Problematic issues and concepts are discussed collaboratively within a supportive learning environment where all views are considered and respected. Reflecting on thinking is integral to the process.

The following engagement protocols are used during the community of inquiry process, and these should be displayed for all students to see:

- Listen attentively
- Build on and connect ideas
- Respect self, others and place
- Disagree reasonably and respectfully
- There may be many responses considered to be correct

Detailed step-by-step instructions for this activity can be seen below. It is recommended that you use these instructions to guide your students through the activity as a class.

1. On return from the lesson in Step 3, as a class group, sort the listed engineering feats into the main three types of engineering: **Civil, Mechanical, Electrical**, you may like to include an '**Other**' category as there are many other types of engineering! Use the Venn diagram below to identify any overlap of engineering types.



2. Ask students to discuss the following questions in small groups:

What impact does engineering have on our daily lives?

Encourage students to think about how it makes life easier, safer, or more convenient.

3. Ask students to report their group discussion back to the class.

4. Pose the next questions:

What problems can be solved by engineering?

Are any problems created because of feats of engineering?

Encourage students to think critically about the ways that engineering is used in society.

5. Ask students to share their responses to this question in a class discussion which can be recorded on the board or digitally for future reference.

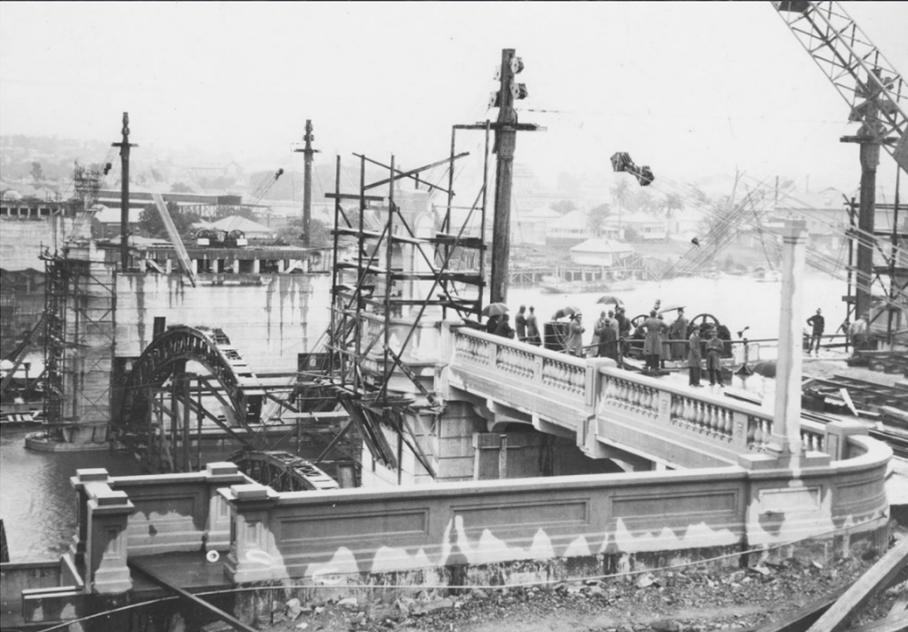
Step 5: Epic Engineering in Queensland

Queensland has a long history of epic engineers. Engineering goes back to pre-European history when Aboriginal communities in Queensland used their engineering skills to design and build weirs and fish traps along Queensland's rivers and coastal regions, and manipulated natural materials into new and innovative designs to make their lives better. With the arrival of Europeans, structural engineering feats took a form which continues to be built on by today's epic engineers.

In this activity, students explore some of the most transformative projects that have shaped the way Queenslanders live their lives.



Stone wall fish traps stretch across tidal flats, Gulf of Carpentaria. Image: ABC, Sean Ulm



Construction of the Grey St/ William Jolly Bridge, Brisbane c1930. Courtesy Queensland Museum Network Collection

Lesson Steps

1. Discuss with students Queensland's long history of epic engineering, and that they will now have the opportunity to do a deep dive into one or more of these amazing feats.
2. Students peruse the *Epic Engineering in Queensland* resource and choose one structure they would like to research further and report back about.
3. Students use the supplied links and resources as well as their own thoughts and investigations to complete the attached worksheet.

Resource: Epic Engineering in Queensland

Story Bridge

- Queensland Museum Blog: <https://blog.qm.qld.gov.au/2020/07/06/80-years-strong-a-story-bridge-anniversary/>
- Engineering Heritage Australia: <https://www.engineersaustralia.org.au/sites/default/files/resource-files/2021-11/QLD-Story-Bridge-Flyer.pdf>
- Queensland Government Heritage Register: <https://apps.des.qld.gov.au/heritage-register/detail/?id=600240>
- Queensland State Archives: <https://www.youtube.com/watch?v=iFTZ-1NLTBE>

Image: Wikipedia



The Clem7 tunnel

- Queensland Museum Talks Science: <https://qmtalksscience.wordpress.com/2012/07/26/brisbane-and-its-tunnels-science-in-action/>
- Australian Tunnelling Society: <https://www.ats.org.au/portfolio-items/north-south-bypass-tunnel-clem7/>
- The Clem7: <https://www.youtube.com/watch?v=uyJUAnpAJII>

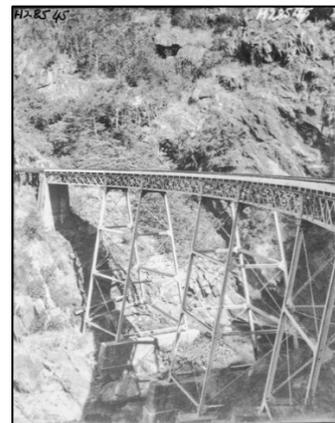
Image: ABC News



Kuranda Range Railway

- State Library Queensland Blog: <https://www.slq.qld.gov.au/blog/building-kuranda-railway-history-pictures>
- Queensland Government Heritage Register: <https://apps.des.qld.gov.au/heritage-register/detail/?id=600755>

Image: QM



Somerset Dam

- Engineering Heritage Australia: https://heritage.engineersaustralia.org.au/wiki/Place:Somerset_Dam
- Engineers Australia: https://www.engineersaustralia.org.au/sites/default/files/resource-files/2017-01/Somerset%20Dam.Panel_Jun%202013.pdf
- SEQ Water: <https://youtu.be/wdgV-ITkCNo>

Image: SEQ Water



Coopers Gap Wind Farm

- Tilt Renewables <https://www.tiltrenewables.com/assets-and-projects/Coopers-Gap-Wind-Farm/#project-details>

Image: Tilt Renewables



Kareeya and Koombooloomba Hydroelectricity power station

- CleanCo Qld <https://cleancoqueensland.com.au/portfolio/owned-and-operated/kareeyaandkoombooloombahydropowerstations/>

Image: CleanCo Qld



Walter Taylor Bridge

- Queensland Government Heritage Register: <https://apps.des.qld.gov.au/heritage-register/detail/?id=600181>

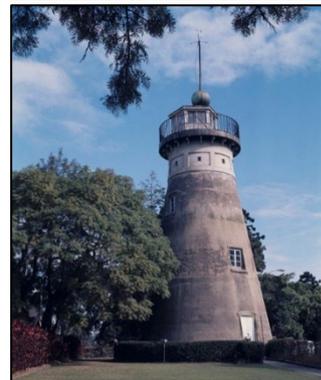
Image: Over the Walter Taylor Bridge



Windmill Tower

- Queensland Museum Blog: <https://blog.qm.qld.gov.au/2021/05/18/tower-mill-an-archaeological-investigation-of-queenslands-oldest-surviving-building/>
- State Library of Queensland: <https://www.slq.qld.gov.au/mappingfuturebrisbane/old-windmill-tower>
- Queensland Government Heritage Register: <https://apps.des.qld.gov.au/heritage-register/detail/?id=600173>

Image: QM



Stone Walled Fish Traps

- Moreton Bay Regional Council: <https://www.youtube.com/watch?v=UO6zONqUpUs>
- Queensland Museum Exhibit (See CABAH Podcast): <https://www.museum.qld.gov.au/kurilpa/whats-on/ngurruwarra-derndernyin#about>
- Australian Research Council: <https://www.arc.gov.au/news-publications/media/making-difference-publication/studying-aboriginal-stone-walled-fish-traps-gulf-carpentaria>

Image: Australian Research Council



Resource: Epic Engineering in Queensland

What is the structure and where is it located?

Who built it and when?

What community problem does this structure address?

Which innovative technology was used?

Why is it important to Queensland?

Optional School Holiday Activities

During the school holidays you could suggest that students:

- Begin to research and identify major problems that affect their local or regional area, or Queensland that epic engineering could solve. (Step 6)

If students do not complete this task during the holidays it will need to be completed during Week 1-2 of the next term.

Term 2 Week 1-2

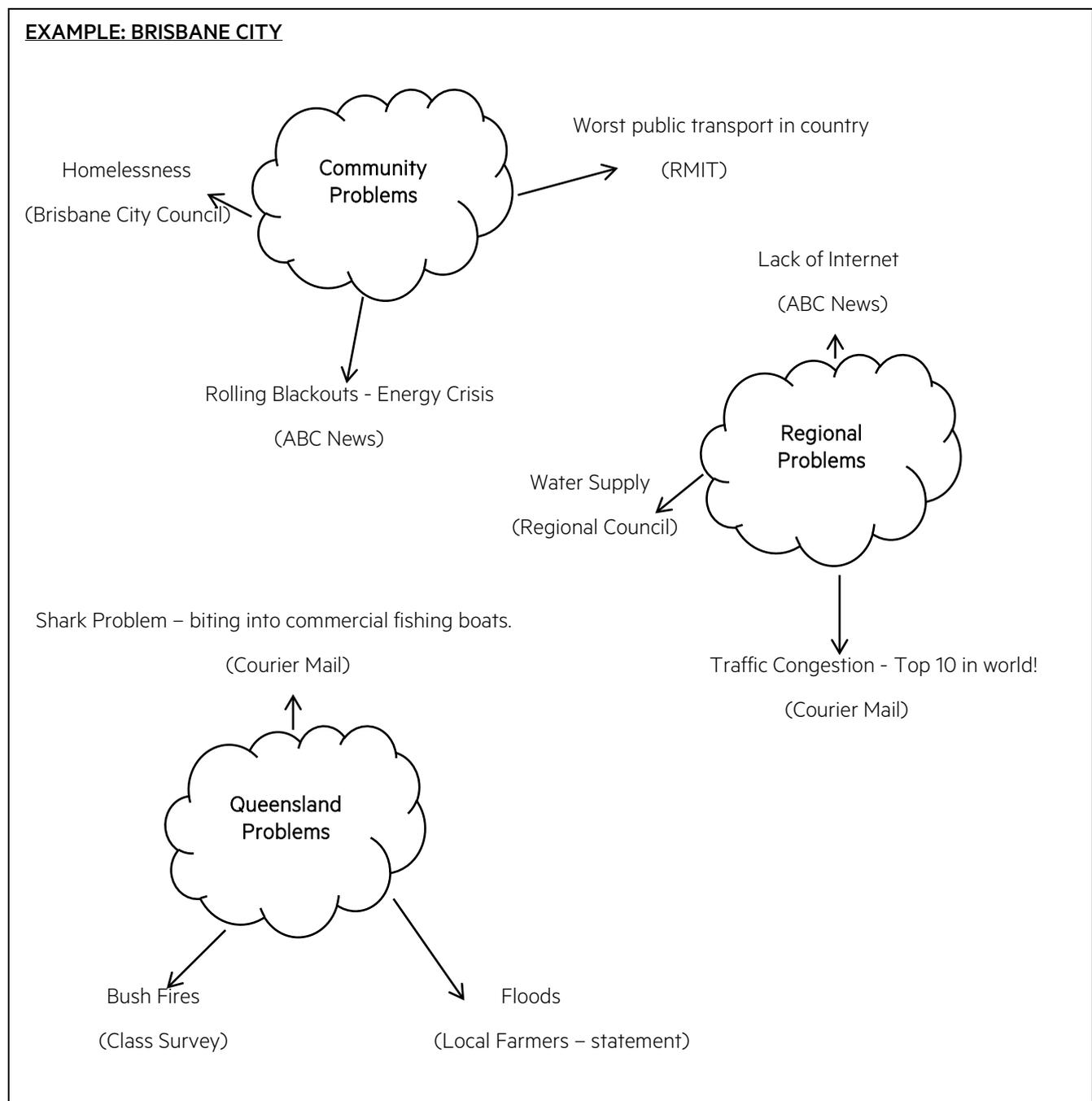


Step 6: Investigate the Problem

Finding an idea for the Future Makers STEM Inventors Challenge 2025: Epic Engineering challenge requires students to identify the major problems which affect your community, your region or Queensland. The act of looking at the world around you to identify these needs is called need-finding.

Students create a mind-map of potential issues for their local community, their region or Queensland.

Note: To complete this task, you may wish to discuss ideas with your students how they may wish to research these problems. Encourage them speak to their family or local community members, or research problems through the internet, or even conduct a class survey to determine what they believe is the most important problem to tackle during the challenge.



Students choose a major problem they wish to tackle as a group and write a problem statement.

A problem statement is a short, clear explanation of an issue or challenge that sums up what they want to change. It helps you as their teacher, all team members, and other stakeholders to focus on the problem, why it's important, and who it impacts.

The problem statement must answer three questions:

- What is the problem or need?
- Who has the problem or need?
- Why is it important to solve?

You may wish to provide them with the following problem statement shown in the space below, as an example:

Engineering problem statement example:

Problem/need:

There is a growing issue with traffic congestion in urban centres, particularly during rush hours. Traffic congestion causes significant delays, fuel waste, and increased emissions, leading to poorer air quality.

Who has the problem/need:

The problem affects city commuters, residents, and transportation authorities. Additionally, businesses that rely on timely delivery services are also impacted by the inefficiencies caused by traffic congestion.

Why is it important to solve:

Addressing traffic congestion is crucial for improving the quality of life in urban areas. Reducing congestion would lead to quicker commute times, lower fuel consumption, and a reduction in carbon emissions, thereby benefiting public health, environmental sustainability, and economic productivity. Moreover, alleviating traffic congestion could improve the reliability of public transportation, benefiting a wide range of urban stakeholders.

Teacher check-in – Check over student problem statements to ensure the problem is appropriate and sufficiently explored.

Step 7: Investigate Forces and Point of Failure

Why are some buildings made of wood while others are glass and steel? How does a machine stay together and not fly apart while it is being used? When civil and mechanical engineers are designing, they need to consider the external forces and internal stressors that will be applied to the materials they chose. These forces determine the load that is placed on a structure or machine and whether it will be able to do what it was designed for.

In this activity, students are introduced to the five fundamental forces that act on structures which forms the groundwork for future understanding of design decisions.



Construction of the Alexandra Bridge, Rockhampton, Henry Goode. Courtesy Queensland Museum Network Collection

Lesson Steps

1. Introduce students to the five fundamental forces that act on structures – tension, compression, shear, bending and torsion – by watching the video *Fairly Fundamental Facts About Forces And Structures* from TeachEngineering <https://www.youtube.com/watch?v=O5DtcJNhOqg> and answering the question below in a table in their notebooks:

What are the five fundamental loads that act on structures? Give an example from the video to illustrate each.

Fundamental Force	Example
1	
2	
3	
4	
5	

2. Use marshmallows and rope candy to demonstrate the effects of the five forces on objects. Students twist, bend, stretch and compress the lollies until they break. Students consider: How much force do you need to use for the material to fail? Where does force need to be applied to reach failure point? Students record their results in the resource provided, *Can you Break it?*
3. To learn more about Failure Points, you can view *Crash Course Kids: Fixing Failure Points* <https://www.youtube.com/watch?v=00tbV8-Mdr4>

Resource: Can you Break it?

What material are you investigating?

Which force are you applying?

Using the scale 0-10, how much force did you apply before it broke/collapsed? (Point of failure)

0	1	2	3	4	5	6	7	8	9	10
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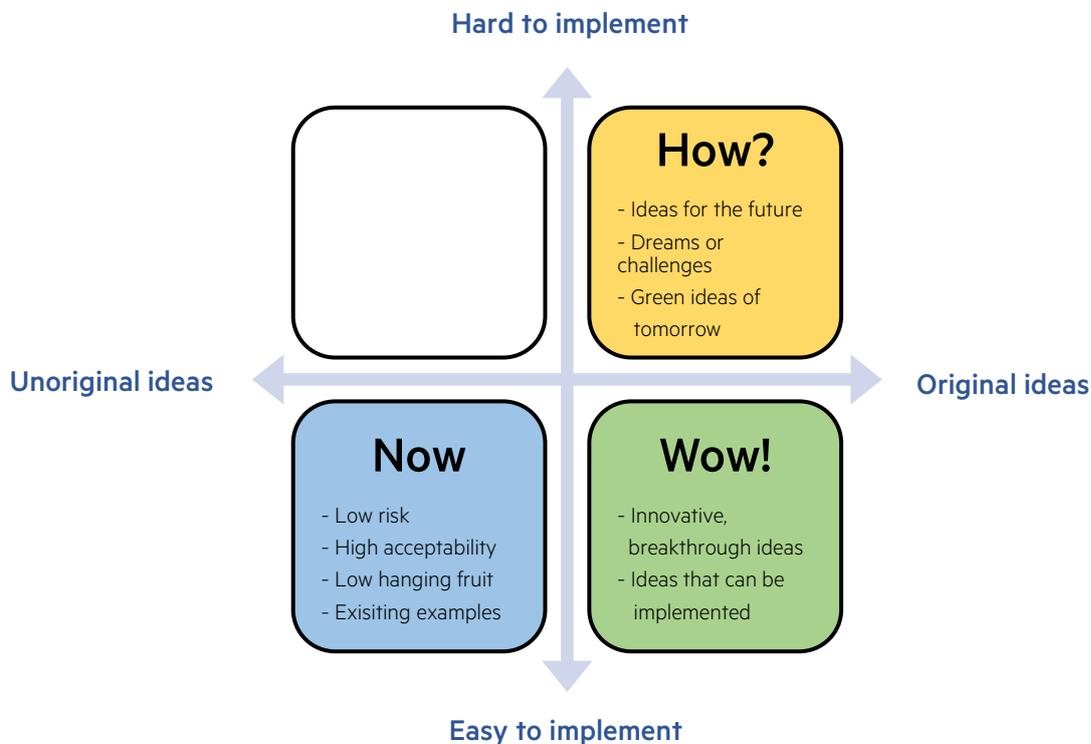
How did the material change with the application of force? Consider before, during and after.



Step 9: Choose a solution

Once each member of their group has individually brainstormed some ideas for some EPIC engineered solutions, it is now time to decide which idea they will work on for their final EPIC Engineering prototype.

Students can use a HOW, NOW, WOW Matrix as a framework to rate ideas as unoriginal or innovative, and easy or difficult to implement.



1. Create a 2-by-2 matrix in a digital or physical space. If using a physical space, use sticky notes on a whiteboard, A3 page or a wall space. For a HOW, NOW, WOW Matrix on a Miro board, visit: <https://miro.com/templates/how-now-wow-matrix/>
2. Leave the top left space blank as this space is for ideas that are good but will be impossible to implement within the challenge time-limit.
3. Fill in the remaining spaces:
 - a. Top right: Yellow Ideas – **HOW?** Futuristic concepts and visions that would be gamechangers if they would really work. But how to manage that isn't known yet. These could be revisited in the future.
 - b. Bottom left: Blue ideas – **NOW:** Ideas that are easy to execute. Not exciting, but effective.
 - c. Bottom right: Green ideas – **WOW!** Big, innovative concepts, real breakthroughs and easy to realise!



HOW, NOW, WOW Matrix Example, Future Makers.

REMEMBER that the judges will be looking for **WOW** ideas!

Step 10: Consider Design Criteria

After brainstorming and determining a suitable EPIC Engineering solution, your groups should begin to discuss the idea using the design criteria. All engineers have design criteria that they must meet before their design is GREEN LIT to move ahead.

As students complete this section it is important to prompt them to think deeply about each question for example:

Sustainability - ‘What specific environmental impact will it have? Is it a positive effect on the environment? Or negative? If there is a negative impact, how could you develop your design further to be more environmentally friendly?’

Students complete the below table to ensure design criteria are addressed:

Criteria	Group response
Innovation What makes your design modern, ground-breaking and EPIC? Why is it better than anything that has been done before?	
Impact How will your designed solution bring positive, long-lasting change to your community, region, or Queensland?	
Design Why are your structure’s design characteristics or materials the best choices for this project? Have you considered the impact of forces, motion or energy in your design?	
Sustainability What is the environmental impact of your design? How can you make your design more sustainable?	
Production Have you selected, justified and used materials that are safe and appropriate for the project? How will you ensure that the design is safe to use and build?	
Budget and timelines How much will the design cost approximately? Does the benefits it brings to humanity outweigh the cost of production? How long will it take to construct?	

Step 11: Develop a timeline for the project

As a group students should review all the tasks they will need to complete before they submit their final design.

Suggest to students that it can be helpful to work backwards from submission due date and note down if a task is complete and who it was completed by.

Task	Who?	Week 10	School holidays	Week 1	Week 2	Week 3	Week 4	Week 5	Week 6	Week 7
Create team and attend launch	All	✓								
Research and choose problem	All		✓							
Create engineering problem statement				✓						
Brainstorm solutions individually	All			✓						
Choose design using HOW, NOW, WOW Matrix					✓					
Consider design criteria					✓					
Implement feedback from STEM Mentor Consultation 1										
Design a prototype										
Create prototype model										
Refine model using feedback from STEM Mentor consultation 2										
Test your design										
Create prototype exhibit poster										
Complete submission checklist with teacher										
Submit Final Design at World Science Festival Queensland	All									

Teacher check-in – Check over the design criteria and timeline before students meet with their mentors

STEM Mentor consultation 1: Brainstorming and designing (See Page 40)

Week 3-4 Tasks



Step 12: Design a prototype

Students create an initial sketch of their prototype and its overall structure.

Note: When creating the initial sketch of their prototype they may wish to use different methods to showcase the outline, materials, measurements, forces their design needs to account for i.e. pressure, weight etc, and labels for any key technologies included.

PROTOTYPE INITIAL SKETCH EXAMPLE:

CONSTRUCTION SPECS

LOCATION
Kewatkhali, Mymensingh

CONTRACTOR
Consortium of **China State Construction Engineering Corporation** and **Spectra Engineers**

TOTAL COST
TK3,263.63 CRORE

MAIN COMPONENT COST
TK2,138CR

Govt to provide the remaining amount

AIB to provide TK1,909.80 CRORE LOAN

COUNTRY'S BIGGEST ARCH BRIDGE

BRIDGE FEATURES	1.1km bridge has a 320m steel arch main bridge	6.2km four-lane approach road	2 lanes for slow-moving vehicles	3 road overpasses of 671m	2 rail overpasses of 120m each	1 toll plaza	Rest area	Modelled after Sydney Harbour Bridge	No piers in the entire 320m steel arch main bridge
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BENEFITS ► Will facilitate trade and communication in north-eastern region

Image: TBS News. Kewatkhali Bridge, Bangladesh.

You can review the picture above with your class, and ask your students:

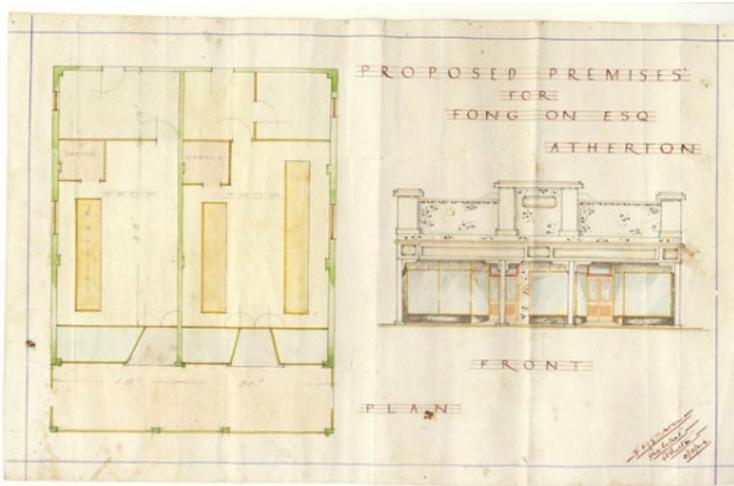
- What details have been included? (the design's purpose, labels for components, measurements etc.)
- What other information would be helpful? (material used, multiple views of the structure, forces affecting the structure etc.)

You may wish to explore Epic Engineering further using the Queensland Museum resource *Epic Engineering* found here: <https://www.museum.qld.gov.au/learning-resources/learnings/epic-engineering>

You may wish to go through a few different examples on how they could develop their initial design sketch, which can be found on the next page. Each image is representative of a Queensland structure and is a part of the Queensland Museum's research, history, and collection.

Sketching Techniques

Aerial Views:

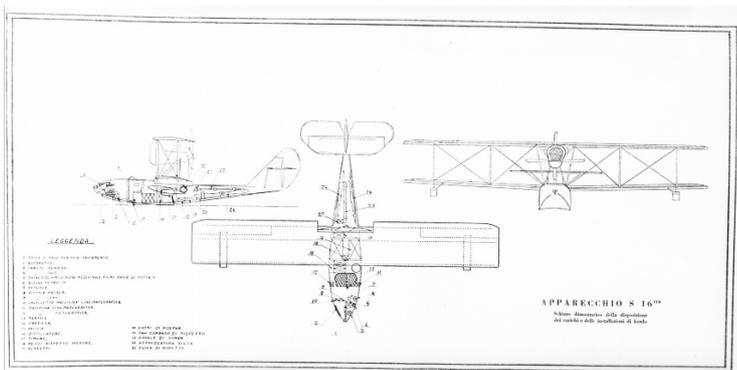


Drawing of a proposed residence for Mr. Fong On, Atherton © Courtesy Queensland Museum Collection

If you are designing a space or a building, it may be necessary to include an aerial view with labels of the various rooms, spaces, and objects.

This is an architectural building plan in Queensland Museum's collection for the proposed retail and grocery shop to be built by George Fong On in Main Street, Atherton. It includes an aerial view and front view. Fong On was a notable Chinese powerbroker who lived in the township of Atherton in the early 1900's.

Orthogonal Drawing (Top View, Front View, Side View):



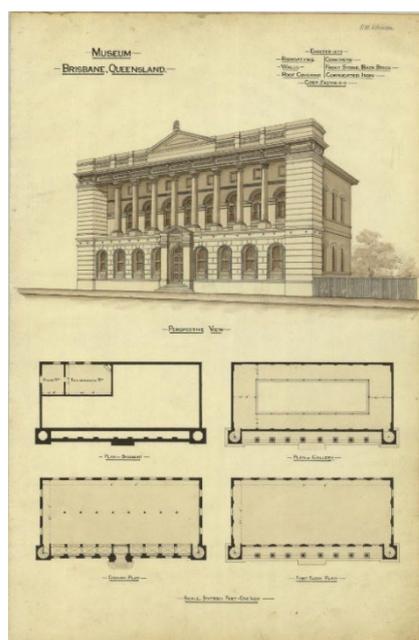
Three-view line drawing of Savoia S.16 flying boat. © Courtesy Queensland Museum Thomas Macleod Qld Aviation Collection

This is an example of an orthogonal drawing (top, front, and side).

The SIAI S.16 was an Italian passenger flying boat, later serving as a military reconnaissance-bomber, claimed to be the most successful flying-boat of the 1920s. Francesco de Pinedo's SIAI S.16 landed on the Brisbane River in Australia in 1925 during his Rome-Australia-Tokyo-Rome flight.

We can also see that it has been labelled using a key.

Perspective Drawing:



The first purpose-built Queensland Museum building was erected in 1879 and used as a museum until 1899. It was later converted into the State Library. The State Library has now also moved, and it is now known as the Old State Library Building.

The architectural plan of this building includes a perspective drawing, that is, the representation of a three-dimensional object on a flat surface.

This plan includes materials and cost in the top right corner, as well as aerial views of each floor.

Step 13: Create a Prototype Model



If your students wish to use virtual modelling during this process, the following online resources have been approved for use in Queensland schools.

Technology	Programs
Augmented Reality and Virtual Reality	Cospaces: https://edu.cospaces.io/
Sandbox game	Minecraft Education: https://education.minecraft.net/en-us/quick-start
3D Printing	Tinkercad - https://www.tinkercad.com/

PLEASE NOTE: The submission for exhibition **MUST** include a physical element.

If only part of their structure is displayed physically, it must be shown and explained in context in the display - this could be as a labelled diagram or as a digital representation. Students should also ensure they include a foundation/base to illustrate the environment it will be built in for context.

Materials

In their groups, students should determine the materials they will require to create their prototype. Consider:

- How will they access the material/s? And who will be responsible for each item?
- Are there any constraints concerning when/how they can access the materials?
- How will they work around this? Discuss any alternative suggestions with them as necessary.

Remember! Materials should be gathered equally among team-members.

Students should complete the table below and check in to confirm they have a plan to access all the materials required to create their prototype. Check in with the students and offer any alternatives as necessary.

Prototype section	Material/s required	How will we obtain the materials	Constraints	Alternatives

STEM Mentor consultation 2: Making a prototype (See Page 41)

Week 5 Tasks



Step 14: Test your design

To test the Epic Engineering structure, students first need to develop a design test. They complete this using the *Epic Engineering Design Evaluation* resource.

Students will need to consider:

- Testing criteria – What conditions would impact on the structure in real life? How can you simulate these in the classroom? Choose one to investigate.
- Investigation question – This can be related to the survival of the structure or the ability of it to do its job.
- What are your independent (Cause), dependent (Effect) and control (Same) variables? E.g. Temperature, wind, acidic, pressure, movement, materials.
- What is your **Point of Failure**? E.g. At what point... does it leak? Does it fall over? Does it break? Can it survive a fall? Does something inside it melt or freeze?
- To learn more about Failure Points, you can view *Crash Course Kids: Fixing Failure Points* <https://www.youtube.com/watch?v=00tbV8-Mdr4>
- How are you going to measure and record your testing?

Example: Bridge on the Kuranda Railway

Conditions: Rock falls, mudslides, heavy rain, wind, train weight.

Simulated Conditions: Rolling balls, hair dryer, unstable surface with movement, heavy weights.

Condition to test: Strength of the bridge.

Investigation Question: How much weight can our bridge withstand before collapse?

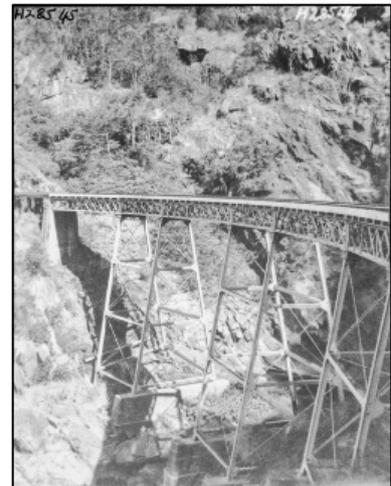
Variables:

Independent –Applying stress to the bridge using a series of increasing weights evenly placed across the top of the bridge.

Dependent – The changes to the bridge structure leading to collapse, bending, twisting or minor breakage.

Control – Bridge structure remains the same with no movement.

Point of Failure: Collapse of the bridge.



Images © Queensland Museum Network Collection; Peter Waddington

Resource: Epic Engineering Design Evaluation

Testing criteria

Real-world condition	Simulated condition

Investigation question

Our group will be testing...

Variables

Independent (Change one thing)	Dependent (Measure what happens)	Control (Keep the same)

(Choose one variable to test)

Point of failure

Our design fails when...

Prediction

We predict that...

Record your results

Dependent Variable	Test 1	Test 2	Test 3
	Result	Result	Result

Use this space to visually graph or record your results

Step 15: Refine your prototype



Students should use this week to refine their prototypes and implement their STEM Mentors suggested improvements.

After implementing their STEM Mentor's feedback, they may wish to consider their design in more detail using the table below.

Refinement considerations	Response
<p>Physical Has your design considered density (in water) or the effect of gravity or movement? What size will the structure be?</p>	
<p>Chemical Is your design resistant to rust or weathering? How could you change your design to slow/stop this from happening?</p>	
<p>Acoustical Does your design need to transmit or reflect sound? If it does, what features does it have to increase/decrease the effect of sound?</p>	
<p>Mechanical How does your design consider the five fundamental forces of engineering? If so, how?</p>	
<p>Thermal Does your design expand when heated? Will it melt at a specific temperature? How could you avoid this?</p>	
<p>Electrical and Magnetic Does your design use electricity or magnetic energy? What safety issues need to be considered?</p>	
<p>Optical Does your structure need to be a certain colour? Does it need to transmit or reflect light?</p>	

STEM Mentor consultation 3: Testing and displaying (See Page 42)

Week 6-7 Tasks

Step 16: Make a prototype exhibit

At Queensland Museum we share our discoveries with a range of audiences including families, schools, universities, the regional community, and researchers from around the world. We also communicate our findings in a variety of ways including hands-on programs, presentations, and exhibitions.

Here are some ways that Queensland Museum's Sparklab displays their interactive exhibits.



Images © QM

To communicate their prototype during The World Science Festival Queensland students will create a **prototype exhibit** to help display and showcase their design. Their exhibit will help share their design with other students, teachers, family, and friends on student day.

The Future Makers STEM Inventors Challenge prototype exhibit must include:

- The prototype
- A tri-fold poster board with the following:
 - The name of their prototype
 - The names of their team-mates, year level and school
 - A labelled sketch or virtual design image
 - Their engineering problem statement
 - An overview of their engineered solution
 - An explanation of how their design meets the design criteria.
 - A timeline for potential construction.
 - The results of testing their prototype and any improvements they made.

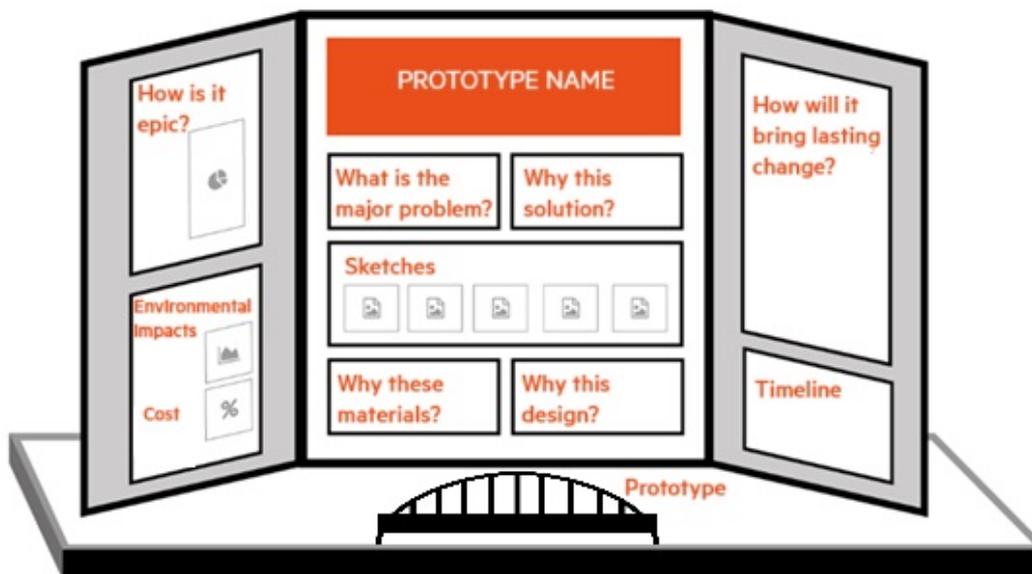
Your prototype exhibit may further include:

- Display objects
- 3D Interactives
- Virtual tours
- Maps
- Floor plans
- Graphs
- Environmental context
- Budget

How to make a Display Poster

Each group will be given a tri-fold poster to display their information. The tri-fold posters will be mailed to the school prior to Week 6.

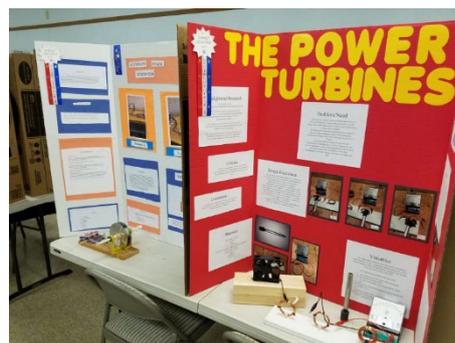
The picture below shows an example of how your students could lay-out the information in the poster.



While designing their poster they may wish to consider the following:

- Does your poster have a title?
- Have you included information on your team, including names and year levels?
- Does it include headings?
- Have you clearly and concisely outlined the problem and your proposed solution?
- Does it contain a mixture of visual and written information?
- Does it include a labelled diagram of your design?
- Have you included clear pictures of your design?
- Is your writing clear and easy to read?
- Have you included information on how your design meets the criteria?
- Have you included pictures of testing and resulting modifications you have made to your design?

You might wish to check this list off after students have completed their posters.



Display board and exhibit examples.

Images: Sciencebuddies.org, Mr. J. Gill Weebly

Additional exhibit components

To make their display more interactive and engaging students could also include additional exciting activations. Some examples of what you may wish to include are shown below:

A Digital/Interactive Model

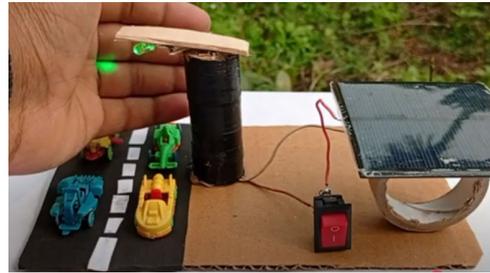


Copyright © 2024 Cospaces – Virtual City Scope

Consider:

- How could displaying the 3D model help show our design in more detail?
- How would we set this up at the festival to run on its own?

A Working Model



Copyright © 2023 Sourav Creativity – Working Model Science Exhibition Winner

Consider:

- What element of our design can we showcase?
- How will we power our model?

A 3D Printed Model



Copyright © 2020 3D Insider – Wind Energy Stored in Gravity 3D printed model

Consider:

- Do you have access to 3D printing software and hardware?
- Which element of your design will you print?

Objects



Queensland Museum Kurilpa: Say Our Name Exhibit

Consider:

- What does the object represent?
- Why is it important to include?
- Where should we place objects?

Maps

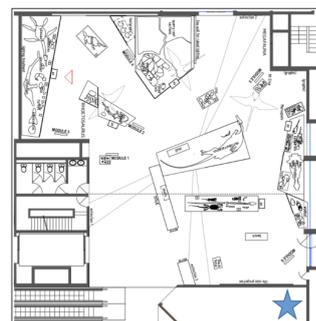


Google Maps – Road between Moranbah and Creek Coal Mine

Consider:

- Would a map help visualise the area our design will be placed in more clearly?
- Could we print out a map using google maps? Or could we make our own?
- How could we draw on the map to show where our design will be placed?

Floor Plans



Floor Plan – Queensland Museum Lost Creatures exhibit

Consider:

- Would a floorplan help visualise the layout?
- Could we use a floorplan to help explain the size of our structure?
- What should we include in a floorplan, symbols, measurements, scalebars etc?

Environmental Context



Wild State exhibit – Queensland Museum Kurilpa

Consider:

- Does the foundation of our display show the environment we would like to place our design in?
- How could we show different environments ie underwater, beaches, farms etc.
- Could we use alternatives to mimic this environment such as lighting or alternative materials?

Virtual Tours



Minecraft Virtual Tour – James Herring (Famous Campaigns)

Consider:

- Would a virtual tour of your design help the judges understand your design thinking process?
- Could it help showcase how the design works?
- How could we set this up at the festival to run on its own?

Other Considerations

Consider how you will arrange your prototype, poster, and any additional exhibit components in your display space.

Display your design:

- Will you mount or raise your prototype?
- How will you arrange your prototype and any additional resources in the space?
- What is the best angle to view your prototype?

Help others understand your design:

- Have you included images?
- Have you included labels?
- Have you checked your spelling?

Ensure safety for yourself and others:

- Have you considered potential risks while setting up?
- What safe practices do you need to follow?

Step 17: Risk Assessment

Students must review the potential risks table and fill in the risk management table with the risks present in the display and how they will keep themselves and others safe.

Potential Risks for the Display Table:

Hygiene	Sun safety	Noise
Slip hazards	Tripping hazards	Sharp objects
Chemicals	Animals/insects	Heat/Cold
Response to incident	Water	Equipment
Electricity	Weather	Crowd management
Tools	Allergies	Technical problems

Risk Management Table:

Risk	How we will keep ourselves and other safe?	Teacher Signature

Teacher check-in – Check over final prototype, prototype exhibit and risk assessment.

Week 7 Task

Step 18: Submit your entry at World Science Festival Queensland!

Students will package up their entries for the Future Makers STEM Inventors Challenge 2025 and bring it to the World Science Festival Queensland student day!

Make sure each student brings along:

- Their prototype
- Completed poster board
- Any additional display considerations

Submissions will be judged at the World Science Festival Queensland by an esteemed panel of judges and winners will be announced and awarded prizes during the festival.

We wish your students the best of luck and thank you for your hard work in participating in the Future Makers STEM Inventors Challenge 2025!



Contact Information

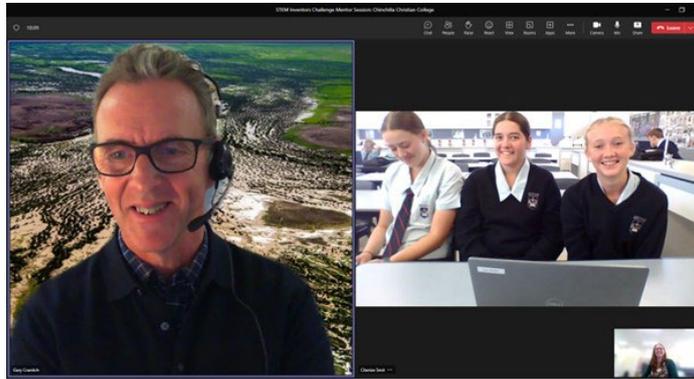
If you need support as your students' progress through the challenge, please reach out and we would be happy to answer any questions or concerns you may have.

Future Makers team: futuremakers@qm.qld.gov.au

STEM Mentor Consultations

Week 1-2: STEM Mentor Consultation 1. Brainstorming and designing

STEM Mentors are experts in an area of STEM, who provide support for STEM Inventors. If you are able to prepare the following tasks for your students, they will be paired with STEM Mentors to provide them with ideas, feedback, and encouragement.



Online Session with Chinchilla CC STEM Club. © Queensland Museum

To prepare for the STEM Mentor Consultation:

- Email your STEM Mentors and provide them with a list of times your student groups are available that week (**set aside approximately 30 minutes per group**).
- Confirm a time that suits both you and the STEM Mentor.
- Set up an online meeting using Microsoft Teams in consultation with the Future Makers team
- Encourage your students to prepare for their consultations – they should be encouraged to lead the sessions.
- Ensure your groups have a quiet space to meet their mentor.
- Have student work on hand to help them explain their problem, solution, potential designs and design criteria considerations.
- Make sure students have their student booklets open to note down their STEM Mentors responses during their consultation.

In Consultation 1, encourage your student groups to:

1. Introduce the members in their team.
2. Invite their *STEM Mentor* to introduce themselves and note any special skills and experience they may have that could help with their designs.
3. Share some research on existing Epic Engineering feats.
4. Share the significant challenge they have chosen to address and justify why it is important.
5. Share their design idea/s for an Epic Engineered solution.
6. Students discuss how they have addressed the design criteria
 - a. Innovation
 - b. Impact
 - c. Design
 - d. Sustainability
 - e. Production
 - f. Budget and timelines
7. Ask their STEM Mentors:
 - a. What do we need to consider in a project plan (Solutions, materials, timelines)
 - b. What will we need to do to complete this by Week 7?
8. Remind students to thank their STEM Mentor for their support.

Week 3-4: STEM Mentor Consultation 2. Making a prototype



In Consultation 2 encourage your student groups to:

1. Be organised with booklets, prototypes and any other materials.
2. Welcome their STEM Mentor.
3. Show the mentor where they are up to with their physical prototype and discuss the innovative techniques they have used.
4. Discuss how they are continuing to meet the design criteria.
5. Discuss ways their group has implemented their *STEM Mentor's* feedback.
6. Discuss their group timeline, how they are on track and where they might be behind.
7. They could ask the following questions:
 - a. What could we do to improve our design?
 - b. What information should we display in our prototype exhibit?
 - c. What do we do to make sure the group stays on task?
8. Decide what everyone in the group will do before presenting at the World Science Festival Queensland.
9. Thank their STEM Mentor for their time.

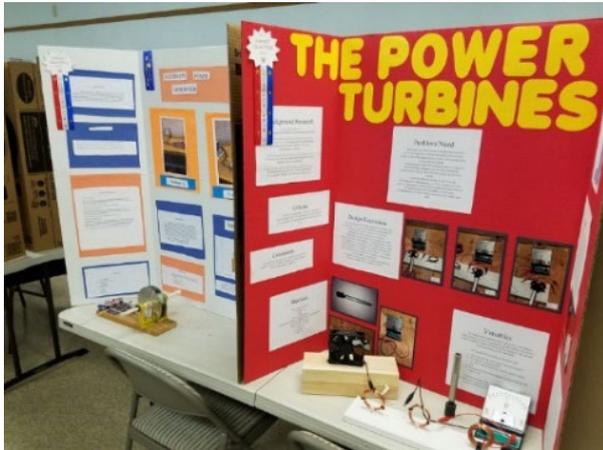
Week 5-6: STEM Mentor Consultation 3. Testing and displaying

This is your students' final consultation before displaying at World Science Festival Queensland.

This week students will refine their prototype after testing their design.

1. **Students share what they have done or are planning on doing to test their design.**
 - a. What conditions impact on the structure in real life? How can you simulate these in the classroom?
 - b. What are the independent (Cause), dependent (Effect) and control (Same) variables? e.g. Temperature, wind, acidic, pressure, movement, materials.
 - c. What is the *Point of Failure*? E.g. At what point... does it leak? Does it fall over? Does it break? Can it survive a fall? Does something inside it melt or freeze?
 - d. How are they going to measure and record the testing?

2. **Students share with their mentor their thoughts on displaying the tri-fold poster.**
 - a. How will they display the name of the prototype?
 - b. Where will they include the problem and the proposed solution?
 - c. Judges will be looking for how the prototype meets the design criteria. Where will they include innovation, impact, design, sustainability, production, budget and timeline?
 - d. How will they make sure it contains a mixture of visual and written information?
 - e. Will it include a labelled diagram of the design?
 - f. Will they include pictures of testing and refining the prototype?
 - g. How will they display the prototype for that 'wow!' factor?





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