**Engineering is futures-focused and multidisciplinary Lesson context:** In this lesson, students explore the multidisciplinary nature of contemporary engineering, and how engineering is pivotal to solving future challenges such as climate change, renewable energy and food security. Students use their knowledge of global cycles to explore solutions proposed in the Earthshot Prize and present their findings to the class.

**Target year level/s:** 9 and 10

**Curriculum alignment**

***Design and Technologies***

Analyse how people in design and technologies occupations consider ethical and sustainability factors to design and produce products, services and environments [(AC9TDE8K01)](https://v9.australiancurriculum.edu.au/f-10-curriculum/learning-areas/science_design-and-technologies_digital-technologies/year-8/content-description?subject-identifier=TECTDEY78&content-description-code=AC9TDE8K01&detailed-content-descriptions=0&hide-ccp=0&hide-gc=0&side-by-side=1&strands-start-index=0&subjects-start-index=0&view=quick)

Analyse the impact of innovation and the development of technologies on designed solutions for global preferred futures [(AC9TDE8K02)](https://v9.australiancurriculum.edu.au/f-10-curriculum/learning-areas/science_design-and-technologies_digital-technologies/year-8/content-description?subject-identifier=TECTDEY78&content-description-code=AC9TDE8K02&detailed-content-descriptions=0&hide-ccp=0&hide-gc=0&side-by-side=1&strands-start-index=0&subjects-start-index=0&view=quick)

***Science***

Represent the carbon cycle and examine how key processes including combustion, photosynthesis and respiration rely on interactions between Earth’s spheres (the geosphere, biosphere, hydrosphere and atmosphere) ([AC9S9U03](https://v9.australiancurriculum.edu.au/f-10-curriculum/learning-areas/design-and-technologies_science/year-9/content-description?subject-identifier=SCISCIY9&content-description-code=AC9S9U03&detailed-content-descriptions=0&hide-ccp=0&hide-gc=0&side-by-side=1&strands-start-index=0&subjects-start-index=0&view=quick))

Use models of energy flow between the geosphere, biosphere, hydrosphere and atmosphere to explain patterns of global climate change ([AC9S10U04](https://v9.australiancurriculum.edu.au/f-10-curriculum/learning-areas/design-and-technologies_science/year-10/content-description?subject-identifier=SCISCIY10&content-description-code=AC9S10U04&detailed-content-descriptions=0&hide-ccp=0&hide-gc=0&side-by-side=1&strands-start-index=0&subjects-start-index=0&view=quick))

Investigate how advances in technologies enable advances in science, and how science has contributed to developments in technologies and engineering ([AC9S10H02](https://v9.australiancurriculum.edu.au/f-10-curriculum/learning-areas/science/year-9_year-10/content-description?subject-identifier=SCISCIY10&content-description-code=AC9S10H02&detailed-content-descriptions=0&hide-ccp=0&hide-gc=0&side-by-side=1&strands-start-index=0&subjects-start-index=0&view=quick))

**Learning hook**

The video ‘[The map of engineering](https://www.youtube.com/watch?v=pQgxiQAMTTo)’ shows the diverse specialisations within engineering. As students watch the video, challenge them to create a mind map that connects the different types of engineering. As a challenge, see if students can add other related STEM specialisations to their mind map, such as meteorology, geology, chemistry and ecology.

**Learning input**

Engineering is key to a more sustainable future. Engineers have an important role to play in solving some of the world’s most pressing challenges, such as climate change, renewable energy and food insecurity.

Students can listen to the [Engineering the Future podcast series](https://www.unsw.edu.au/engineering/news-events/events/engineering-the-future) from UNSW to learn more about the diverse ways engineering can contribute to a more sustainable future.

**Learning construction**

As a class, explore the [Earthshot Prize](https://earthshotprize.org/) winners and finalists for 2021–2023. View one or two projects as a class. For each project, see if you can identify where engineering played a role in the solution.

Challenge students to select one Earthshot finalist who inspires them and develop a brief presentation on the solution being proposed. Students should use their knowledge and understanding of global cycles to explain how the solution works and identify the role that engineering plays in the solution, as well as other professions required for the project’s success.



**Girls in focus**

Girls are highly motivated by meeting role models they can relate to. Consider inviting a woman with an engineering background or sustainability role to speak to students about her work, career pathway, experiences and interests.

You can search for local women in STEM using the Australian Academy of Science’s [STEM Women website](https://www.stemwomen.org.au/search). Try searching using the terms ‘engineering’ or ‘sustainability’ and select ‘Outreach activities’.

**References**

Lopez A (2020) [Building a more sustainable world will need more women engineers](https://www.weforum.org/agenda/2020/03/women-engineers-sustainable-solutions-gender-equality/).

Harrison J & Klotz L (2010) [Women as sustainability leaders in engineering: evidence from industry and academia in the US](https://www.researchgate.net/publication/283513452_Women_as_Sustainability_Leaders_in_Engineering_Evidence_from_Industry_and_Academia_in_the_US).

**Rubric**

|  |  |  |  |
| --- | --- | --- | --- |
| **Criteria** | **Beginning** | **Achieved** | **Exceeded** |
| *Explanation of project solution* | Links the project to a global issue. | Describes the solution with reference to global cycles of matter and/or energy. | Explains the solution with reference to flow-on effects to global cycles of matter and/or energy. |
| *Role of engineering* | Identifies the type of engineering involved in the project. | Describes the role of different types of engineering in the project. | Explains how different types of engineers collaborate to design multidisciplinary solutions in the project. |
| *Role of other professions* | Identifies some other professionals involved in the project. | Describes how other professionals are involved in the project. | Explains how other professionals collaborate with engineers to design multidisciplinary solutions in the project. |
| *Presentation* | The presentation covers the main points and considers audience engagement. | The presentation is well organised to cover the main points effectively and uses visual and verbal devices to engage the audience. | The presentation is creatively organised and presented to cover key points in an impactful way. Visual and verbal devices are used to engage the audience and highlight key messages. |