

# STEM Learning Package

The impacts we feel

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If I had an hour to solve a problem, I'd spend 55 minutes thinking about the problem and 5 minutes thinking about solutions. The formulation of the problem is often more essential than its solution, which may be merely a matter of mathematical or experimental skill.

Albert Einstein

A sum can be put right: but only  
by going back till you find the error  
and working it afresh from that  
point, never by simply going on.

C.S. Lewis, *The Great Divorce*

# Learning intention & student outcomes



- **Study** the big world problems affecting humanity and choose and investigate one of them in depth.
- **Examine** the impacts of their selected issue of concern, from a global perspective down to a national, local, and, more specifically, personal level.
- **Design and collaborate** to present their findings of ‘The Impacts They Feel’ in the form of a class book, slideshow, or poster presentations.
- **Learn and understand** the connections between the world’s problems and their influence on them.
- **Communicate** the impacts of their chosen problem through texts, graphs, and visual designs.

# ACARA Learning Areas

## Year 9 & 10 Visual Arts

*Achievement standards:* Students manipulate materials, techniques, and processes to develop and refine techniques and processes to represent ideas and subjects in their artworks.

## Year 9 English

*Achievement standards:* Productive modes – Students create texts that respond to issues, interpreting and integrating ideas from other texts. They make presentations and contribute actively to class and group discussions, comparing and evaluating responses to ideas and issues. They edit for effect, selecting vocabulary and grammar that contribute to the precision and persuasiveness of texts and using accurate spelling and punctuation.

# ACARA Learning Areas

## Year 9 Mathematics

*Using reasoning:* Following mathematical arguments, evaluating media reports and using statistical knowledge to clarify situations, developing strategies in investigating similarity and sketching linear graphs.

*Achievement standards:* Students calculate relative frequencies to estimate probabilities, list outcomes for two-step experiments and assign probabilities for those outcomes. They construct histograms and back-to-back stem-and-leaf plots.

# Pedagogical/Androgogical/Heutagogical Options

Cross-disciplinary learning package for:

- Enquiry based learning
- Project/Problem-based learning
- STEM-focused learning design

Provides teachers with resources for delivering the learning intentions against cross-disciplinary ACARA achievement standards.

Teachers are encouraged to provide students with self-directed learning opportunities rather than opting to deliver in traditional teacher-guided modes.

# General capabilities

- **Critical & Creative Thinking:** Inquiring, analysing, synthesising, evaluating
- **Numeracy:** Interpreting statistical information
- **Literacy:** Composing texts through writing
- **Ethical Understanding:** Understanding ethical issues
- **Personal & Social:** Social Awareness

# Entrepreneurial skills & dispositions

- Questioning and problem posing
- Social intelligence
- Listening with understanding and empathy
- Curiosity and inquisitiveness
- Perceptive awareness
- Analytical thinking
- Communication
- Collaboration

# Time duration

Day's challenge to full term's study

# Mode

Face to face | Online in synchronous & asynchronous learning

- Can be delivered across a collaborative class shared between English, Maths, and Visual Arts teachers
- Can be implemented face to face or online in synchronous interaction

# Lesson implementation

Lesson aims:

- Familiarise students with the big world problems affecting humanity
- Understand the intended learning and learning objectives

# Task summary

1. Research the 'Big World Problems' affecting humanity
2. Select one problem to explore more in-depth
3. Find evidence of the problems affecting you and your inner circles, peers and community
4. Design a two-sided page with evidence for all design inclusions

## Part 1: Introduction

- Introduce students to the ‘Global Issues’ or ‘Big World Problems’ (BWP) that affect humanity [Please see [Additional Resources on page 20](#)].
- Explain to students that they will be selecting an issue to examine in-depth individually, as a group, or within the class. Students will ultimately explore the evidence of the selected issue in their own surroundings and the effects on themselves and the people around them.
- Students will collect data and use it to create a page in a collaborative book titled ‘The Impacts We Feel – [Selected Problem]’, a collaborative slideshow, or poster presentation, depending on their time allowance.

Note: Students will focus on the evidence of the issue they find amongst themselves and their inner circles. Content may be added about the medium of production, such as bookbinding, software use or maker platform.

## Part 2: Body & Content

- Students will select democratically as a class, in groups or individually (as per teacher discretion) the problem they would like to examine in more depth.
- Use the scaffold on page 9 of the ETPG toolkit to help students undertake contextual research from a global perspective to a personal viewpoint.
- When they arrive at the personal level of the scaffold, they interview each other and people in their inner circles using relevant questions regarding the effects of their chosen ‘big world problem’.

**Primary data:** Students should collect data on the impacts and effects of the BWP in their immediate community. Students design data collection tools such as surveys or use quantifiable observations such as counting rubbish, counting birds or traffic.

**Secondary data:** Research should be done on the existing relevant and contextual information. This will help students make comparisons and create tools to capture the difference.

## Part 3: Story-fying their findings

Students share their findings with the class to evoke empathy amongst their peers before they start constructing a draft design of their page.

Note: Although this learning plan can be implemented on an individual basis by assigning a page per student (based on teacher discretion), if the work is undertaken in groups, jobs need to be distributed and group dynamics established.

Prompt **groups** to:

- Identify group name, team members, and why each member cares about the issue they selected. They could also design a team logo, mascot or slogan, depending on time.
- Summarise their understanding of the ‘big world problems’.
- Allocate roles such as designer, writer, analyst or data engineer. You may wish to use the last slide on ‘Jobs of the future’ to help students understand the relevance of the work they are undertaking.
- Allocate jobs and responsibilities such as designing titles and editing images to each team member responsible for completing the tasks.
- Assign due dates for peer reviews, cross-group reviews, and feedback panels.

## Part 4: Iteration of work, editing & compilation

Students manage the collaborative creation of their product by identifying design constraints to help all pages compile seamlessly into one book (or slideshow or poster presentation, based on teacher discretion and time constraints).

# Criteria & Resources



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# Page design inclusions (as per assessment criteria)

Each double-sided page created individually or in groups must include:

- Analysis and interpretation of a text (ACELY1739)
- A persuasive text that presents a point of view (ACELY1746)
- Numerical and categorical data derived from designed questions and secondary sources (ACMSP228)
- Synthesis of graphical data generated through research (ACMSP282)
- Comparison and interpretation of data sets (ACMSP283)
- An artistic theme and style influenced by local artistry (ACAVAM125)
- An explicit artistic intention reflected in the overall design (ACAVAM126)  
(ACAVAM128)

# Additional resources

- PDF: ETPG toolkit
- Video: Global food supply
- Video: Economic growth and social inclusion
- Video: Environment and natural resources
- Video: The future of the global financial system
- Video: Gender parity
- Video: International trade and investment
- Video: Infrastructure and development
- Online article: Top challenges for the future of humanity

Solving complex real-world problems  
requires bringing together insights  
from multiple disciplines.

David Budtz Pedersen

# Multi-disciplinary connections

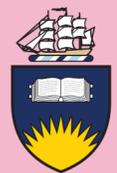
## Design:

- Style (The Arts/English)
- Contrast (The Arts)
- Balance & Symmetry  
(The Arts/Mathematics)

## Communication:

- Written texts (English)
- Images (The Arts)
- Graphs (Mathematics)
- Numerical data (Mathematics)

# Content descriptors



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# English

## Texts in context:

- Analyse how the construction and interpretation of texts, including media texts, can be influenced by cultural perspectives and other texts (ACELY1739)

## Creating texts:

- Create imaginative, informative and persuasive texts that present a point of view and advance or illustrate arguments, including texts that integrate visual, print and/or audio features (ACELY1746)
- Review and edit students' own and others' texts to improve clarity and control over content, organisation, paragraphing, sentence structure, vocabulary and audio/visual features (ACELY1747)
- Use a range of software, including word processing programs, flexibly and imaginatively to publish texts (ACELY1748)

# Mathematics

## 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 (ACMSP228). Construct back-to-back stem-and-leaf plots and histograms and describe data, using terms including 'skewed', 'symmetric' and 'bi modal' (ACMSP282)
- Compare data displays using mean, median and range to describe and interpret numerical data sets in terms of location (centre) and spread (ACMSP283)

# The Arts

- Conceptualise and develop representations of themes, concepts or subject matter to experiment with their developing personal style, reflecting on the styles of artists, including Aboriginal and Torres Strait Islander artists (ACAVAM125)
- Manipulate materials, techniques, technologies and processes to develop and represent their own artistic intentions (ACAVAM126)
- Develop and refine techniques and processes to represent ideas and subject matter (ACAVAM127)
- Plan and design artworks that represent artistic intention (ACAVAM128)

# Jobs & industry



# Associated jobs of the future

The skills, knowledge and experience of undertaking this learning experience can equip students for the following jobs of the future.

Teachers can use this engagement tool to help students understand the relevance of this learning to their future world of work.

<b>Trendwatcher</b>	<b>Media mixer</b>	<b>Fusionist</b>	<b>Digital apiarist</b>	<b>Data commodities broker</b>	<b>Data farmer</b>
Trendwatchers will know what is likely to happen next and how to make the most of it.	Media mixers will combine a variety of media from across time to create blended one-of-a-kind products or experiences.	Fusionists will use design approaches to bring together professionals from art, engineering, research, science, and other disciplines to create innovative ideas, experiences and solutions to complex problems.	Digital apiarists will build, maintain and collect data on bee hives, supporting agriculture and plant life in general.	Data commodities brokers will sell collected data on behalf of people, communities and corporations, feeding the data into machine learning algorithms.	Data farmers will create and manage semi-autonomous algorithms that will identify and trace connections between otherwise unrelated sets of data.

# Links with industry

Depending on the problem chosen, students can examine the effects and impacts of the problem on local businesses. By researching and enquiring about these repercussions on businesses, students can come across opportunities to innovate and collaborate with industry on real issues they face. The ability to ideate and use creative thinking to help solve a problem affecting the community is an essential skill valued by current and future industries. Liaising with local businesses provides students with an increased potential to generate solutions that matter.

Note: Use the ETPG tool '5 Steps to guide any classroom to identify and design a simple reciprocally beneficial interaction with industry and community' (Please see [Additional Resources on page 20](#)).

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