

STEM Learning Package

The impacts we survive

8

Adaptability and constant innovation
is key to the survival of any company
operating in a competitive market.

Shiv Nadar

Nobody talks of entrepreneurship as survival, but that's exactly what it is and what nurtures creative thinking.

Anita Roddick

We don't even know how strong we are until we are forced to bring that hidden strength forward. In times of tragedy, of war, of necessity, people do amazing things. The human capacity for survival and renewal is awesome.

Isabel Allende

It is not the strongest of the species that survive, nor the most intelligent, but the one most responsive to change.

Charles Darwin

Learning intention & student outcomes



Inhabiting Planet B

Students are given a scenario where humans have discovered 'Planet B' in pristine conditions and are tasked with planning our inhabitation systems from scratch. The new planet has all conditions to maintain life but is in a blank-canvas state where there are untouched living organisms and no human populations yet.

Students will first learn to see our inhabitation of this earth with critical and creative perspectives, examining the existing issues within human activities such as governance, agriculture, economy, social structures, agriculture, health, education, etc.

Students study the earth and biological sciences, holistic well-being (mental, physical and emotional), politics and governance and the industries that sustain us, They then create a system that holds our societies alive, well, in peace and in balance with our environment.

Establishing what humans need

Students study Maslow's Hierarchy of Needs to identify and collect information that helps them form the main prerequisites for inhabitation of planet B.

Students plan and design for all aspects of human life. Students start by studying governance and designing a worldwide constitution based on the identified human needs.

Students then work to establish industries to maintain the world running well for all its new inhabitants and their mental, physical and emotional wellbeing.

It is my fervent hope and prayer that by exposing my mistakes and by pointing out the things that were a part of my early life, some who might be following the same paths might not make those same mistakes.

John Clayton

ACARA Learning Areas

Year 7 Humanities and Social Sciences

Achievement standards: By the end of Year 7, students explain features of Australia's Constitution, including the process for constitutional change. They explain how Australia's legal system is based on the principle of justice. Students explain the diverse nature of Australian society and identify the importance of shared values in promoting a cohesive society.

When researching, students develop a range of questions and gather and analyse information from different sources to investigate Australia's political and legal systems. They consider different points of view on civics and citizenship issues. When planning for action, students take into account multiple perspectives to develop solutions to an issue. Students develop and present arguments on civics and citizenship issues using appropriate texts, terms and concepts. They identify ways they can be active and informed citizens.

ACARA Learning Areas

Year 7 Health and Physical Education

Achievement standards: By the end of Year 8, students evaluate strategies and resources to manage changes and transitions and investigate their impact on identities. Students evaluate the impact on wellbeing of relationships and valuing diversity. They analyse factors that influence emotional responses. They investigate strategies and practices that enhance their own, others' and community health, safety and wellbeing. They investigate and apply movement concepts and select strategies to achieve movement and fitness outcomes. They examine the cultural and historical significance of physical activities and examine how connecting to the environment can enhance health and wellbeing.

Students apply personal and social skills to establish and maintain respectful relationships and promote safety, fair play and inclusivity. They demonstrate skills to make informed decisions, and propose and implement actions that promote their own and others' health, safety and wellbeing. Students demonstrate control and accuracy when performing specialised movement sequences and skills. They apply movement concepts and refine strategies to suit different movement situations. They apply the elements of movement to compose and perform movement sequences.

ACARA Learning Areas

Year 7 Science

Achievement standards: By the end of Year 7, students describe techniques to separate pure substances from mixtures. They represent and predict the effects of unbalanced forces, including Earth's gravity, on motion. They explain how the relative positions of Earth, the sun and moon affect phenomena on Earth. They analyse how the sustainable use of resources depends on the way they are formed and cycle through Earth systems. They predict the effect of human and environmental changes on interactions between organisms and classify and organise diverse organisms based on observable differences. Students describe situations where scientific knowledge from different science disciplines and diverse cultures has been used to solve a real-world problem. They explain possible implications of the solution for different groups in society.

Students identify questions that can be investigated scientifically. They plan fair experimental methods, identifying variables to be changed and measured. They select equipment that improves fairness and accuracy and describe how they considered safety. Students draw on evidence to support their conclusions. They summarise data from different sources, describe trends and refer to the quality of their data when suggesting improvements to their methods. They communicate their ideas, methods and findings using scientific language and appropriate representations.

Pedagogical/Androgogical/Heutagogical Options

Cross-disciplinary learning package for:

- Enquiry-based Learning
- Project- and 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

- pose questions
- identify and clarify information and ideas
- organise and process information.
- imagine possibilities and connect ideas
- consider alternatives
- seek solutions and put ideas into action
- think about thinking (metacognition)
- reflect on processes
- transfer knowledge into new contexts
- apply logic and reasoning
- draw conclusions and design a course of action
- evaluate procedures and outcomes

General capabilities

Intercultural Understanding

- investigate culture and cultural identity
- explore and compare cultural knowledge, beliefs and practices
- develop respect for cultural diversity
- consider and develop multiple perspectives
- empathise with others
- reflect on intercultural experiences
- challenge stereotypes and prejudices
- mediate cultural difference

General capabilities

Ethical Understanding

- recognise ethical concepts
- explore ethical concepts in context
- reason and make ethical decisions
- consider consequences
- reflect on ethical action
- consider points of view
- examine values
- explore rights and responsibilities

General capabilities

Personal & Social Capability

- appreciate diverse perspectives
- contribute to civil society
- understand relationships
- communicate effectively
- work collaboratively
- make decisions
- negotiate and resolve conflict
- develop leadership skills
- develop self-discipline and set goals
- work independently and show initiative
- become confident, resilient and adaptable

Entrepreneurial skills & dispositions

- Questioning and problem posing
- Ability to recognise opportunities
- Creating, imagining and innovating
- Critical thinking
- Flexibility and adaptability
- Authentic design thinking
- Collaborative skills
- Metacognition
- Global competency
- Social intelligence
- Valuing diversity
- Cultural understanding
- Taking responsible risks
- Thinking interdependently
- Being open to continuous learning and improvement
- Listening with empathy and understanding
- Curiosity towards things around them
- Reflective thinking
- Resilience
- Discovering and developing interests and passions

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 HPE, HASS and Science teachers

Our most successful method was to develop integrated products, and that meant our process had to be integrated and collaborative.

Steve Jobs

Working with others is, in my mind, the future of business. You have a larger audience, more ideas, shared risk, shared workload and you will be getting a portion of something greater than had you done it alone.

Seth Nichol

Collaborate with people
you can learn from.

P. Pharrell

Coming together is a beginning,
staying together is progress, and
working together is success.

Henry Ford

Lesson implementation



Inhabiting Planet B

The setting: Planet B is found within human reach. It has the exact same conditions as our earth, but there has never been any human interference with nature. The planet is pristine in condition.

To avoid the destruction of this habitat and the harmonious co-existence of all living things within it, you and your class are the leaders designing new human habitation, including rules, use of resources, systems and structures.

Big World Problems: Students are introduced to the 'Global Issues' or 'Big World Problems' (BWP) that affect humanity. Students will then gather two lists, one with core guiding principals which will guide their decisions and another with reminders of what not to think about when making decisions.

Establishing what humans need

Students study Maslow's *Hierarchy of Needs* to identify and collect information that helps them form the main prerequisites for inhabitation of planet B.

Students study, plan and design for all aspects of human life's needs.

Students start by studying governance and designing a worldwide constitution based on the identified human needs.

Students then work to establish industries to maintain the world running well for all its new inhabitants and their mental, physical and emotional wellbeing.

This basic constitution will consist of two sections, one which will guide students to make the right decisions and another which will help students not make mistakes already made with our current earth.

Section 1

Not to-do list: Students respond to their investigation about big world problems by creating a list of unrepeatable errors. This list will guide students design of innovative systems to inhabit planet B in a more harmonious manner that provides for all.

Section 2

To-do list: Students focus on values and principles that will help them make decisions to keep the health and wellbeing of Planet B and all its inhabitants. Students discuss what's needed to shift from world crisis to world harmony, they investigate paradigms that shift competitive and individualistic interests into systems of mutual cooperation globally.

Insanity: doing the same
thing over and over again and
expecting different results.

Albert Einstein

Lesson activities

1. Students are introduced to content related to:
 - The 'big world problems'
 - The earth and biological sciences
 - Holistic well-being (mental, physical and emotional)
 - Politics and governance
 - Economic systems and the industries that sustain us
2. Students gather data about a preferred area through secondary and primary methods before designing their solutions for planet B.
3. Students then create a variety of solutions based on their preferences, all of which hold our societies alive, well, in peace and in balance with our environment.

Science-based designed solutions

Students respond to the task with science-based designs, which may include:

- Rescheduling what a week will involve for the new planet B's inhabitants
- Redesigning what new global governance will look like
- Redesigning what industries we will keep and maintain, including health and education
- Establishing a new economic system
- Re-evaluating hierarchical orders

Their designed solutions should include the presentation of the current problems in the existing models and should try incorporating cyclical production systems rather than finite linear ones. Students should explicitly communicate their idea is of greater value towards: human health and wellbeing; peace and harmony; and balance with our environment.

Presentations

Students are able to undertake the work individually or in groups and create presentations that include 'pitching to humanity' along with their new designed model.

Their presentations should convince the audience of the alternative solution being superior and preferable, through open discussion (debating may be a format incorporated throughout this learning).

Students will help the audience understand the current problems within the existing model before introducing their innovation.

Final presentations should culminate in a collaborative and imaginative narration of Planet B, illustrating their solutions.

Example 1

After the exploration of existing problems, a group of students chose to focus on schools and the education system.

After proving that there are existing problems within the current most predominant local model of education, students generated a range of design ideas that focused on the health needs of students and a global need for education.

Students undertook various investigations, ranging from the number of sleep hours students require at different developmental stages, spaces that promote wellbeing and connection, to other activities in which society could benefit from cross collaborating with schools.

Their new model includes service-oriented community projects, a physical space design, real cooperative projects (such as cooking for the canteen, recycling their school's waste and running school game challenges). They communicated their solution by illustrating the day of three different students in a day at their new school.

Example 2

After the exploration of existing problems, a group of students chose to focus on the waste management system.

After proving that there are problems within the current existing local model, students generated a range of design ideas that focused on health, sustainability and preservation of resources.

Students' ideas involved rules for manufacturers and consumers, as well as transport systems and cyclic management of waste products.

They represented their new model for planet B as a series of diagrams and stories of the day-to-day disposal of different materials. They narrated 'A day in the life of [3 different products]'

Resources



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Additional resources

- ETPG toolkit
- UN Sustainable Development Goals
- Top challenges for the future of humanity
- Global food supply
- Economic growth and social inclusion
- Environment and natural resources
- The future of the global financial system
- Gender parity
- International trade and investment
- Infrastructure and development

Content descriptors



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HASS: Civics & Citizenship

Problem-solving and decision-making

- Appreciate multiple perspectives and use strategies to mediate differences (ACHCS057)
- Use democratic processes to reach a consensus on a course of action relating to a civics or citizenship issue and plan for that action (ACHCS058)

Communication and reflection

- Present evidence-based civics and citizenship arguments using subject-specific language (ACHCS059)

Citizenship, diversity and identity

- How Australia is a secular nation and a multi-faith society with a Christian heritage (ACHCK051)

- How values, including freedom, respect, inclusion, civility, responsibility, compassion, equality and a 'fair go', can promote cohesion within Australian society (ACHCK052)
- How groups, such as religious and cultural groups, express their particular identities; and how this influences their perceptions of others and vice versa (ACHCK053)

Government and democracy

- The key features of government under the Australian Constitution with a focus on the separation of powers, the roles of the Executive, the Houses of Parliament, and the division of powers (ACHCK048)
- The process for constitutional change through a referendum (ACHCK049)

Health & Physical Education

Personal, Social and Community Health

- *Being healthy, safe and active*: Investigate the impact of transition and change on identities (ACPPS070)
- Investigate and select strategies to promote health, safety and wellbeing (ACPPS073)

Communicating and interacting for health and wellbeing

- Investigate the benefits of relationships and examine their impact on their own and others' health and wellbeing (ACPPS074)
- Analyse factors that influence emotions, and develop strategies to demonstrate empathy and sensitivity (ACPPS075)

- Evaluate health information and communicate their own and others' health concerns (ACPPS076)

Contributing to healthy and active communities

- Plan and use health practices, behaviours and resources to enhance the health, safety and wellbeing of their communities (ACPPS077)
- Plan and implement strategies for connecting to natural and built environments to promote the health and wellbeing of their communities (ACPPS078)
- Investigate the benefits to individuals and communities of valuing diversity and promoting inclusivity (ACPPS079)

Science Understanding

Personal, Social and Community Health

- *Biological sciences*: Classification helps organise the diverse group of organisms (ACSSU111)
- Interactions between organisms, including the effects of human activities can be represented by food chains and food webs (ACSSU112)
- *Earth and space sciences*: Some of Earth's resources are renewable, including water that cycles through the environment, but others are non-renewable (ACSSU116)

Science as a Human Endeavour

- *Nature and development of science:* Scientific knowledge has changed peoples' understanding of the world and is refined as new evidence becomes available (ACSHE119)
- Science knowledge can develop through collaboration across the disciplines of science and the contributions of people from a range of cultures (ACSHE223)
- *Use and influence of science:* Solutions to contemporary issues that are found using science and technology, may impact on other areas of society and may involve ethical considerations (ACSHE120)
- People use science understanding and skills in their occupations and these have influenced the development of practices in areas of human activity (ACSHE121)

Science Inquiry Skills

- Questioning and predicting: Identify questions and problems that can be investigated scientifically and make predictions based on scientific knowledge (AC SIS124)
- *Planning and conducting*: Collaboratively and individually plan and conduct a range of investigation types, including fieldwork and experiments, ensuring safety and ethical guidelines are followed (AC SIS125)
- Measure and control variables, select equipment appropriate to the task and collect data with accuracy (AC SIS126)
- *Processing and analysing data and information*: Construct and use a range of representations, including graphs, keys and models to represent and analyse patterns or relationships in data using digital technologies as appropriate (AC SIS129)
- Summarise data, from students' own investigations and secondary sources, and use scientific understanding to identify relationships and draw conclusions based on evidence (AC SIS130)

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.

Automated transit system troubleshooter

Automated transit system troubleshooters will address potential problems that occur in a transit system almost entirely comprised of autonomous self-driving vehicles.

Autonomous vehicle profile designer

Autonomous vehicle profile designers will custom design vehicles to suit the individual needs and tastes of the vehicle owner.

Biofilm plumber

Biofilm plumbers will install and maintain coatings of biofilm onto the walls of sewerage and wastewater pipes and liquid composting bins.

Biometric security solutions engineer

Biometric security solutions engineers will create individualised biometric signatures to use when accessing digital and physical access points, replacing online passwords and physical keys.

Human habitat designer

Human habitat designers will develop and design land and built environments to create effective living and working arrangements in large settlements.

Integrated energy systems strategist

Integrated energy systems strategists will design urban energy systems that are efficient, sustainable and safe.

Massive 3D printed building designer

Massive 3D printed building designers will design and build large structures using 3D printing technology.

Net positive architect

Net positive architects will design building solutions to create viable and responsible commercial buildings or houses.

Regional community growth coordinator

Regional community growth coordinators will support people looking to transition from urban to regional living.

Sustainable energy solutions engineer

Sustainable energy solutions engineers will design energy generation, storage, transport, and use systems that are efficient, sustainable and safe.

Links with industry

Depending on the problem chosen, students can examine the effects and impacts of the problem on local businesses and communities. By researching and enquiring about these repercussions, students can come across opportunities to innovate and collaborate on real issues faced. Students may find their ideal clients through these local explorations. 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 members in their neighbourhoods, businesses, organisations, clubs or associations provides students with an increased potential to generate solutions that matter to someone.

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 37](#)).

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