Future Earth

resource book of ideas

for national science week 2017

national science week 2017
12–20 August 2017 www.scienceweek.net.au

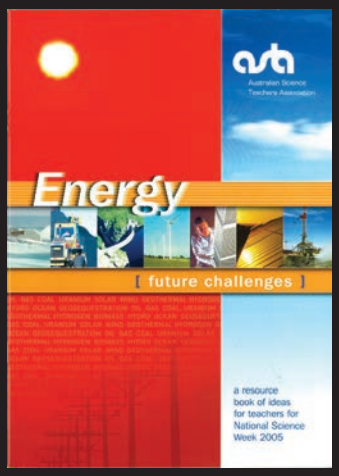
Australian Science Teachers Association

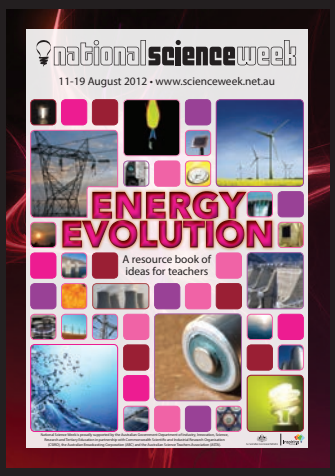
An Australian Government Initiative

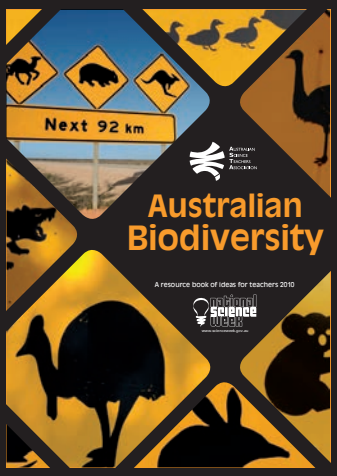
Inspiring Australia

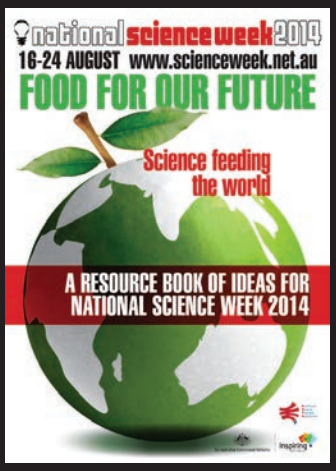
More Resources

for teaching future earth









National Science Week teacher resource books

All available FREE on the ASTA website as either a digital book or downloadable PDF

asta.edu.au/programs/natscienceweek/resources

- Energy: Future Challenges (2005)
- Energy Evolution (2012)
- Australian Biodiversity (2010)
- Food for our future: Science feeding the world (2014)

SPECTRA SCIENCE AWARDS PROGRAM

- Clean and Green (Junior)
- Biodiversity (Senior)
- Science and the Environment (Senior)

Order one card per student. Students complete the activities on their card and receive a certificate and badge from ASTA.

See **asta.edu.au/resources/spectra** for more details on SPECTRA.

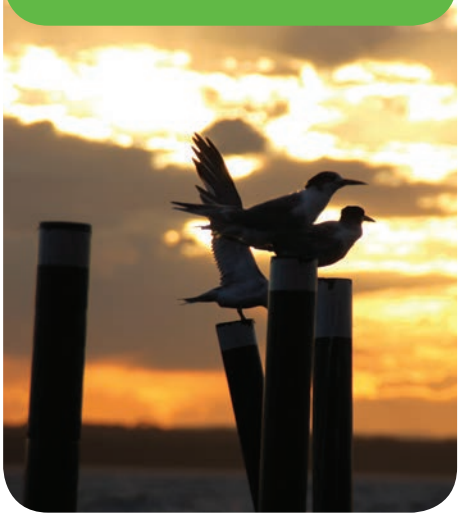
SPECTRA AWARDS

Contents

national science week 2017

Future Earth

resource book of ideas



Acknowledgements

This online curriculum-linked resource was produced by the Australian Science Teachers Association (ASTA).

The curriculum-linked resource is designed to introduce young people to the importance of science and technology in generating the knowledge and actions needed to support transformations to sustainability.

The materials in this educational resource have been developed by Angela Colliver from Angela Colliver Consulting Services Pty Ltd and designed by Carl Davies, CMDphotographics.

We would like to acknowledge the following people for their assistance and feedback: Anne-Maree Dowd, CSIRO; Dr. Mark Howden, ANU; Dr. Mark Stafford Smith, CSIRO; and Ross Kingsland.

All links to websites were accessed in January 2017. As content on the websites used in this resource book is updated or moved, hyperlinks may not always function.

Minister's Foreword

The Australian Government is proud to be the major supporter of National Science Week.

National Science Week is Australia's national celebration of the sciences and is held in August each year. The week provides high profile science engagement activities across the nation. It is also an important opportunity for the science community to celebrate and showcase science to the Australian public and the world.

'Future Earth' is the school theme for National Science Week in 2017. This is an exciting and important theme for teachers and their students to explore sustainability, energy, agriculture, water, technology and current research.

This 'Future Earth Resource Book of Ideas for National Science Week' offers teachers and students the opportunity to explore and research a range of real-world scenarios.

Australia is at the forefront of science and innovation and is committed to the principles of sustainable development. For the Government, there is a clear link between scientific endeavours, economic benefits and the growth of business opportunities providing a lasting contribution to sustainable development.

Young people who are active in sustainability, science and innovation today will play a leading role in shaping future decision making.

I look forward to hearing the inspiring stories and actions taking place within your school community as a result of National Science Week 2017.

Senator the Hon Arthur Sinodinos AO

Minister for Industry, Innovation and Science

national science week 2017

An Australian Government Initiative

Inspiring AUSTRALIA

Australian Science Teachers Association

Introduction

National Science Week is Australia's annual celebration of science and technology.

It aims to provide an opportunity to acknowledge the contributions of Australian scientists to the world of knowledge. It also aims to encourage an interest in science pursuits among the general public, and to encourage younger people to become fascinated by the world in which we live.

The school theme of 2017 National Science Week is 'Future Earth', and is focussed on Australia's sustainability science. It highlights those sustainability issues that are unique to Australia and our region.

This resource book aims to raise awareness of sustainability science and all the sciences—social, natural, and applied sciences, and encourage positive actions that make a direct contribution to the Earth becoming more sustainable.

What is 'Future Earth'?

'Future Earth' is a major international research platform providing the knowledge and support to accelerate transformations to a sustainable world.

Launched in 2015, 'Future Earth' is a 10-year initiative to advance global sustainability science, build capacity in this rapidly expanding area of research and provide an international research agenda to guide natural and social scientists working around the world. It is also a platform for international engagement to ensure that knowledge is generated in partnership with society and users of science.

'Future Earth' is a global community of tens of thousands of world-class researchers, projects and institutes brought together around an international research agenda focusing on sustainability science.

'Future Earth' is closely engaged in international processes such as the United Nations' Sustainable Development Goals and climate and biodiversity agreements (United Nations Framework Convention on Climate Change and the Convention on Biological Diversity).

'Future Earth' is built on many decades of international research on global environmental change carried out by projects sponsored by DIVERSITAS, the International Geosphere-Biosphere Programme (IGBP) and the International Human Dimensions Programme (IHDP). Over 20 projects, ranging from the Global Carbon Project to the Earth System Governance project, have joined 'Future Earth'. From this intellectual base, 'Future Earth' is launching Knowledge-Action Networks to catalyse new research and partnerships around eight key challenges to global sustainability.

Source: **Future Earth** *website.*

'Future Earth's' 2025 vision addresses eight key challenges to global sustainability:

- Deliver water, energy, and food for all
- Decarbonise socio-economic systems to stabilise the climate
- Safeguard the terrestrial, freshwater and marine natural assets underpinning human well-being
- Build healthy, resilient and productive cities
- Promote sustainable rural futures
- Improve human health
- Encourage sustainable consumption and production patterns
- Increase social resilience to future threats.

*Source: Adapted from '***Our vision'***, Future Earth website.*

'Future Earth' Australia

In Australia, the Academy of Science is developing a project office for 'Future Earth' Australia. With funding from the Australian Council of Learned Academies (ACOLA), this inter-academy project has developed a strategic plan for 'Future Earth' in Australia. In partnership with Australia's Learned Academies, the CSIRO, Macquarie University and the University of Queensland, the Australian Academy of Science will implement the plan over the coming years.

'Future Earth' Australia's vision is for people to thrive in a sustainable and equitable world.

Source: **http://www.futureearth.org.au/**

Prospects for the Future

A message from Professor Stewart Lockie
Director, The Cairns Institute

On 20 July 2016, Professor Lockie addressed the United Nations High-Level Political Forum (HLPF) on Sustainable Development in New York on science and emerging issues for sustainable development. More information on the HLPF and the Sustainable Development Agenda is available at **sustainabledevelopment.un.org/hlpf**

"It seems obvious that big issues like global environmental change and sustainable development require global collaboration and knowledge building. International research programs like 'Future Earth' play an important role in facilitating global collaboration. They play equally important roles in shaping national research priorities and maybe even more importantly, in motivating budding researchers to tackle the really big issues.

The United Nations 2030 Agenda for Sustainable Development will encourage countries to collect and report data across a wide range of indicators relevant to sustainable development goals and targets. These data provide the foundation for monitoring and accountability, but it is important to remember that indicators have their limits. In isolation, indicators don't tell us about:

- The underlying causes of social, economic and environmental change;
- How specific policies and programs influence development outcomes; or
- What is over the horizon that might support or threaten the sustainability agenda.

While monitoring change is important, understanding what the data are telling us requires complementary research programs across the natural, social and engineering sciences, as well as the humanities.

It is exciting to see National Science Week 2017 for schools engaging with 'Future Earth'.

I'm sure this will encourage young people to ask more questions and to put forward their ideas and solutions. I look forward to seeing these shared globally and enriching our thinking and learning, both about what is over the horizon, and about how young people can be involved in attaining a sustainable 'Future Earth' ".

Sustainability Science

Sustainability science, as described by the Proceedings of the National Academy of Sciences website, is "…an emerging field of research dealing with the interactions between natural and social systems, and with how those interactions affect the challenge of sustainability: meeting the needs of present and future generations while substantially reducing poverty".

*Source: Kates, Robert W. 2011. '**What kind of a science is sustainability science?**', Proceedings of the National Academy of Sciences of the USA, Vol. 108 no. 49, PNAS website.*

Benjamin Warner, a sustainability scientist from the University of Massachusetts Amherst suggests that sustainability science 'was founded upon the idea that scientific research and education should do more to understand and solve our world's complex problems'.

*Source: Warner, Benjamin P. 2015. '**Sustainability science is a new academic discipline. But is it sustainable?**', The Conversation, 21 September 2015.*

The Sustainable Development Agenda

In September 2015, political leaders from around the world committed to the **Global Sustainable Development Goals** (SDGs). The seventeen goals to achieve sustainability on a global scale by 2030 aim to end extreme poverty, fight inequality and injustice, and to address climate actions.

The SDGs offer opportunities for schools to design a 'Future Earth', share these designs during National Science Week and promote how a sustainability agenda can improve our existing understanding of the relationships between social, environmental and economic change.

Aim

The 'Future Earth' National Science Week resource book provides schools with opportunities to:

- develop understandings about the role of sustainability science in understanding and addressing complex real-world scenarios;
- develop understandings about the importance of attaining sustainability for Future Earth;
- discover ideas and solutions to take action to tackle sustainability challenges as individuals, as a community and as the future decision-makers for Future Earth;
- discover and envision a range of creative solutions to real-world problems;
- design research projects with the ultimate goal of reflecting on appropriate local actions to ensure a sustainable Future Earth;
- design the steps required to create sustainable solutions for the problems;
- dream and consider the many possible solutions to deal with sustainability challenges;
- deliver and debrief solutions; and
- practise and reinforce the sustainability messages delivered in the Australian Curriculum Learning Areas and Cross-Curriculum Priority.

In schools, there is scope for teachers to integrate this resource book into their existing classroom programs.

How to use this Resource Book

This resource book provides learning experiences to support your school's involvement in National Science Week 2017.

Teachers can use the following learning experiences to plan, publicise, provoke, stimulate, support and inspire their National Science Week festivities.

The resource book includes ideas to support students' involvement in investigating, exploring, experimenting, designing, creating and communicating their understandings about what's involved in attaining and maintaining a sustainable 'Future Earth'.

The resource book is complemented by two National Science Week journals that can be downloaded from the ASTA 2017 National Science Week **resources page**.

One is for younger students in which they can draw, design and explore ideas about 'Future Earth'. The other is for older students to record their ideas, from defining the problem posed in the suggested activities to debriefing the solutions they devise.

Teachers might also like to view episodes of **PLUS7: Australia Beyond 2020** in which presenters explore Australia's future. Smart houses, driverless cars, magic make-up mirrors, and drone deliveries. The videos help discover technology that will make life smarter, cheaper, and more fun- beyond 2020.

Teachers can get the PLUS7 app at the **iTunes store** for Apple users or from **Google Play** for Android users.

Curriculum Focus

This learning resource has a variety of student activities that link to the Australian Curriculum in Science, Technologies, English, Geography, Mathematics, History, Civics and Citizenship and Health and Physical Education. It also has many opportunities to integrate the Australian Curriculum's Sustainability Cross-Curriculum Priority (CCP) and General Capabilities.

The Australian Curriculum states:

'Sustainability addresses the ongoing capacity of Earth to maintain all life.

Sustainable patterns of living meet the needs of the present without compromising the ability of future generations to meet their needs. Actions to improve sustainability are individual and collective endeavours shared across local and global communities. They necessitate a renewed and balanced approach to the way humans interact with each other and the environment.

Education for sustainability develops the knowledge, skills, values and world views necessary for people to act in ways that contribute to more sustainable patterns of living. It enables individuals and communities to reflect on ways of interpreting and engaging with the world'. (ACARA, 2015)

The **English** curriculum states, 'English assists students to develop the skills necessary to investigate, analyse and communicate ideas and information related to sustainability, and to advocate, generate

and evaluate actions for sustainable futures'. This encourages students to look for patterns and seek explanations...these are higher-order thinking skills that advance students in the learning about learning. The statement goes on to say 'They develop the understanding and skills necessary to act responsibly and create texts that inform and persuade others to take action for sustainable futures'. (**ACARA**, 2015)

When we look at the **History** curriculum in the new Humanities and Social Sciences (HASS) area, it has ten explicit elaborations that embrace sustainability when examining issues such as climate change, national parks, and humankind's impact on landscapes. It states 'The Australian Curriculum: History provides content that supports the development of student's world views, particularly in relation to judgements about past social and economic systems, and access to and use of the Earth's resources. It provides opportunities for students to develop an historical perspective of sustainability. Making decisions about sustainability to help share a better future requires an understanding of how the past relates to the present, and needs to be informed by historical trends and experiences.

In this learning area students learn about the changes in environments over time, the role played by individuals and communities in protecting environments, the emergence of farming and settled communities, the development of the Industrial Revolution and the growth of population, and the overuse of natural resources and the rise of environmental movements'. (**ACARA**, 2015)

This descriptor works well in engaging students in History classes. It enables the students to identify patterns and therefore make a sense of reality; a reality that was initially forged by western dominant agricultural practices, but now sustainability offers up a path to a more positive future.

When we look at the references to the Sustainability CCP in **Mathematics**, we find the Australian Curriculum states that, 'In this learning area, students can observe, record and organise data relating to issues of sustainability from secondary sources. They can apply spatial reasoning, measurement, estimation, calculation, and comparison to gauge local ecosystem health and can cost proposed actions for sustainability'. (**ACARA**, 2015)

In **Geography** in HASS, it is stated that 'sustainability will allow all young Australians to develop the knowledge, skills, values and world views necessary for them to act in ways that contribute to more sustainable patterns of living. It will enable individuals and communities to reflect on ways of interpreting and engaging with the world. The Sustainability priority is futures-oriented, focusing on protecting environments and creating a more ecologically and socially just world through informed action. Actions that support more sustainable patterns of living require consideration of environmental, social, cultural and economic systems and their interdependence'. (**ACARA**, 2015)

Within the **Civics and Citizenship** learning area in HASS, it is stated that 'the priority of Sustainability can provide a context for developing students' civics and citizenship knowledge, understanding and skills. In the knowledge and understanding strand, students have the opportunity to explore sustainability issues as they relate to government services and the different levels of government. They develop the understanding that sustaining a resilient democracy depends on the informed participation of its citizens, and develop skills and dispositions to support active citizenship. They explore contemporary issues and develop action plans and possible solutions to local, national and global issues which have social, economic and environmental perspectives)'. (**ACARA**, 2015)

The **Economics and Business** learning area in HASS 'provides content that supports the development of students' world views, particularly in relation to judgments about access to and sustainable use of the Earth's resources, local and global equity and fairness across generations for the long-term wellbeing of our world.

The curriculum prepares students to be informed consumers, to act in enterprising and innovative ways and to perceive business opportunities in changing local, regional and global economic environments. Students have opportunities to appreciate the need for balancing economic development, environmental sustainability, and society's obligation to meet the needs of the present without compromising the ability of future generations to meet their needs'. (**ACARA**, 2015)

The **Health and Physical Education** curriculum states that, 'Students develop a deeper understanding of the relationship between the health and wellbeing of the individual and the environment. They develop this understanding through a range of activities including learning in, and about, the outdoors; the creation of spaces for outdoor learning; active outdoor recreation; active transport options; and growing, sourcing and choosing food products. As such, they will gain a capacity to advocate and act for a sustainable future.' (**ACARA**, 2015)

Sustainability education is futures-oriented, focussing on protecting environments and creating a more ecologically and socially just world through informed action. Actions that support more sustainable patterns of living require consideration of environmental, social, cultural and economic systems and their interdependence.

In the **Science** curriculum, it is stated that:

'...the priority of sustainability provides authentic contexts for exploring, investigating and understanding chemical, biological, physical and Earth and space systems. By investigating the relationship between systems and system components and how systems respond to change, students develop an appreciation for the interconnectedness of Earth's biosphere, geosphere, hydrosphere and atmosphere. In this learning area, students appreciate that science provides the basis for decision-making in many areas of society and that these decisions can impact on the Earth system. (**ACARA**, 2015)

Additionally, eight elaborations embrace the Sustainability CCP, when classes look at the impact of humans on the earth and another examines the effect of human activity on food chains and food webs and one examines the role of science in natural resource management.

In the **Design and Technologies** curriculum, students are supported to become creative and responsive designers. Students consider 'ethical, legal, aesthetic and functional factors and the economic, environmental and social impacts of technological change, and how the choice and use of technologies contributes to a sustainable future, they are developing the knowledge, understanding and skills to become discerning decision-makers'. This learning area contains 32 elaborations that refer to 'sustainability'.

However here, distinctions are made...distinctions that refer to more than environmental sustainability. 'Sustainability education is futures-oriented, focussing on protecting environments and creating a more ecologically and socially just world through informed action. Actions that support more sustainable patterns of living require consideration of environmental, social, cultural and economic systems and their interdependence.' (**ACARA**, 2015)

Teaching and learning about 'Future Earth' can therefore be integrated into a range of learning areas in the lead up to and during National Science Week.

A Suggested Learning Sequence

This learning sequence is underpinned by the work of Lee Crockett. It uses the ***solution fluency*** through six phases: Define; Discover; Dream; Design; Deliver and Debrief. The phases of the model are based on the Essential Fluencies created by Crockett et al. (2011).

The Essential Fluencies are outlined extensively in the book *'Mindful Assessment'* (Crockett, L. & Churches, A. (2016) *Mindful Assessment*. Solution Tree.

See also 'Solution Fluency', Global Digital Citizenship Foundation website, and the video **'Solution Fluency'**, YouTube (3:13 min)

The fluencies are:

- **Define:** The 'Define 'phase begins with lessons that intellectually engage students with a challenge, problem, question and task. This phase captures their interest, provides an opportunity for them to express what they know about the topic, share understandings being developed, and helps them to make connections between what they know and the new ideas.
- **Discover:** The 'Discover' phase includes activities in which students can explore, investigate, research, read, discuss, gather, organise and compare knowledge and data. They grapple with the challenge, problem, question or phenomenon and describe it in their own words. This phase provides a context and enables students to acquire a common set of experiences that they can use to help each other make sense of the new knowledge or understandings.
- **Dream:** The 'Dream' phase enables students to imagine and develop possible solutions and explanations for the challenge, problem, question and task they have experienced. The significant aspect of this phase is that the students' explanations follow substantive conversations and higher order thinking experiences.
- **Design:** The 'Design' phase provides opportunities for students to apply what they have learned to new situations, to map production processes and so develop a deeper understanding of the challenge, problem, question or phenomenon. It is important for students to extend explanations and understandings, using and integrating different modes such as diagrammatic images, written language and media.
- **Deliver:** The 'Deliver' phase has two stages – production and publication or presentation. In the production phase, the task comes to life – this is the doing phase. At the end of this phase, the student task should be completed. Next, they present or publish their work sample to an audience.
- **Debrief:** The 'Debrief' phase provides an opportunity for students to revisit, review and reflect on their own learning and new understanding and skills. This is also when students provide evidence for changes to their understanding, beliefs and skills.

*Source: '**Solution Fluency**', Global Digital Citizen Foundation website.*

Future Earth

Early Years of Schooling
Foundation – Year 2

national Science Week 2017


WE ARE ALL
ON A JOURNEY
TO SEEK ANSWERS
IT BEGINS HERE
DISCOVERY
SCIENCE
CHANNEL 638
SCI
FOXTEL

Learning Experiences for **Foundation – Year 2**

Activity 1:

We Are What You Do

Overview: Explain to the class that they will be exploring a range of ideas children have had for changing the world. Their task is to choose a selection of five actions to help children in the school to better understand and appreciate what they can do to protect and enhance Earth, our only home.

Background science for students: What is 'science'?

Have you ever wondered why the Earth has an atmosphere, rivers, seas, clouds, trees, soil, mountains, deserts, and all kinds of animals? If you have ever asked questions like this about the natural world, then you were thinking like an inquiring scientist. The word 'science' comes from the Latin word that means 'knowledge'. Science is a way of creating knowledge about the natural world that starts with a question and then tries to answer that question with lots of evidence and logic.

Science is more of a process than a body of knowledge and scientists are continually testing and revising their ideas, and as new knowledge is gained or new observations are made, ideas may be replaced with new ideas.

The global research program, 'Future Earth' is a 10-year initiative to work out how to live on the Earth sustainably, and bring researchers together who live and work across the world to help in this.

Sustainability science is a different kind of science—it is multidisciplinary, applicable to real-world challenges and is committed to translating research into tangible action.

The essential question:

What happens when we understand how science is used in activities such as caring for our Earth?

The scenario:

National Science Week is searching for schools to discover ways they can attain sustainability for 'Future Earth'.

In the past, scientists, governments and grownups thought of ways to care for plants and animals and protect the environment. Now it's your turn! What kind of scientist will you be and what laws of science will you discover as you create your own ways to attain sustainability for 'Future Earth'?

What science investigations can assist you in your mission?

Your challenge is to use other children's ideas and your own thinking to help others understand what we all can do to help attain sustainability for 'Future Earth'. Are you up for the challenge?

If so, then create a poster using photographs or illustrations showing the scientific steps involved in making 'Future Earth' sustainable to share as part of National Science Week!

A suggested learning process:

Define:

Capture students' interest and display the cover of the book titled '**31 ways to change the world: By 4386 children**' or use the image provided below.

Display the cover on the electronic whiteboard and talk about the children's messages.

Choose a selection of actions to discuss and extend. For example, survey the number of appliances that are left on standby at night in each student's home.

Discover:

Pose the question 'What's the one thing you would do to change the world to make it more sustainable?'

Discuss students' ideas.

Create displays to show what has been discussed and learned, and how together, a difference can be made.

Categorise the different actions and make word lists for each category. For example: 'using less stuff'; 'wasting less'; 'learning to expect to have less'; and ;'looking after other species'.

Students might also collate energy saving actions; recycling actions; water conservation actions; biodiversity conservation ideas; soil conservation ideas; food and farming actions; and actions to tackle a changing climate.

Undertake some 'scientific research' for your story into the scientific steps involved in making 'Future Earth' sustainable.

Dream:

Ask students to visualise being on a sustainable 'Future Earth'. What might it look like? What might it sound like? How might it feel?

Create a '**Y-Chart**' and record ideas.

Brainstorm and develop possible solutions for attaining a sustainable 'Future Earth'.

Ask students to imagine the actions and steps involved in making their poster.

Challenge students to think about the materials, tools, and equipment they will need to make their poster.

Ask students to imagine how their poster and the actions it includes might feature in the school's National Science Week activities.

Invite students to think about how they might present their poster during National Science Week.

Design:

Ask students to design their poster's layout and decide on its title.

Ask students to be scientists and draft their poster's text and plan what illustrations will complement the text.

Invite a peer class group to the class and ask students to explain their poster's concepts to this audience and seek feedback on their ideas.

Deliver:

Create the posters about 'Future Earth'.

Prepare a display of students' posters about ways to attain a sustainable 'Future Earth'.

Visit a local pre-school, kindergarten, Foundation class or day-care centre and share and discuss the poster ideas with younger children.

Read aloud and share the ways to attain a sustainable Future Earth, stopping periodically to ask younger students to find the picture or object or idea that was just read about.

Share photos and students' work samples via National Science Week's online community. The Australian Science Teachers Association loves to see pictures of children in the classroom learning, and to share photos via email at **nscwk@asta.edu.au** or share what has been created via Facebook, Instagram or Twitter with #natsciwk! Please ensure that you have parental permission prior to posting any images of students.

Debrief:

Ask students to recall what they discovered about how a sustainable 'Future Earth' could be attained.

Talk about what they might still like to discover and whether there is anything they would like to change in what they do day to day.

Ask students to describe their favourite part of creating a poster and sharing it with others as part of National Science Week.

Links to the National Quality Standards

Element 3.3.2 Children are supported to become environmentally responsible and show respect for the environment. Source: Australian Children's Education & Care Quality Authority. 2016. **Guide to the National Quality Standard**, p.103, ACECQA website.

Links to the Australian Curriculum

Science

Foundation, Year 1 and Year 2

Science as a Human Endeavour – Nature and development of science

Science involves observing, asking questions about, and describing changes in, objects and events **ACSHE013** **ACSHE021** **ACSHE034**

Science as a Human Endeavour – Use and influence of science

People use science in their daily lives, including when caring for their environment and living things **ACSHE022**

General Capabilities:

Literacy; ICT capabilities, Critical and creative thinking

Cross-Curriculum Priority:

Sustainability

Organising ideas:

OI 2: All life forms, including human life, are connected through ecosystems on which they depend for their wellbeing and survival.

OI.7: Actions for a more sustainable future reflect values of care, respect and responsibility, and require us to explore and understand environments.

OI.8: Designing action for sustainability requires an evaluation of past practices, the assessment of scientific and technological developments, and balanced judgments based on projected future economic, social and environmental impacts.

*Source: (**ACARA**, 2015)*

case study:

Bridgewater Kindergarten, South Australia

Committing to sustainability outcomes by integrating the curriculum within diverse environments

Bridgewater Kindergarten has a strong focus on outdoor learning, which is detailed in their quality improvement plan. They feel it is essential for children to experience and enjoy stimulating outdoor environments, regardless of weather conditions.

Their key values are trust, respect, professionalism, fairness, equity, honesty, diversity, caring, responsibility and fun. All of these are represented in their learning environments and everyday experiences.

Of significant importance is the value that is placed on active student voice. What students want to know about is highly valued and even though staff may not have expertise in a particular area or topic they can undertake co-learning with the children, have fun in the process and develop great relationships.

They have established inquiry groups, which have major input from the students. These include student involvement in risk assessments and setting acceptable behaviours. The students have discussed what they like/don't like about the kindergarten, what's important to them, and what they want to know more about.

Students have been involved in mapping the site to find out what's located in the playground and bush blocks, which has led to discussions about what their world looks like and how they should care for it.

For example, they've mapped out where the Hopper Ant and Inch Ant nests are and have marked out these areas with bunting so that the children and ants can co-exist. They won't remove the nests because they understand the value and rights of wild creatures, but they are also aware of managing risks and having these important conversations with the students. These cost/benefit analyses have enabled them all to look at the pros and cons of biodiversity. Working with the students has enabled them to manage the risks to increase the benefits.

Recently a tree in the yard fell down after a storm. It was going to be removed but they've decided to leave it for now as it has provided a great opportunity for play, climbing, and exploration.

They've had great discussions about wind and the exposed roots have provided the chance to investigate plant form and function. Everything that occurs at the kindergarten, positive or negative, is embraced as an opportunity to learn.

Source: NRM Education 2016. Committing to sustainability outcomes by integrating the curriculum within diverse environment. Weekly Digest, 15th May 2016. **Adelaide and Mount Lofty Ranges Natural Resource Management Board**.

Activity 2:

Science Week Project – Habitats

Overview: Explain to the class that their task is to design and make a model of an Australian animal's ultimate sustainable habitat! Create a safe and fun place for one of Australia's lizards, frogs, fish or furry friends!

Background science for students: Habitats

Every plant or animal lives in a habitat. A habitat is another name for their local environment.

A habitat is a place where a collection of plants and animals live and which provides them with food and shelter.

Seashores, gardens and ponds are all examples of habitats. Habitats can be big (a forest, for example) or small (a leaf, for example).

Everyone should be expected to take action for habitats.

The essential question:

What might kangaroos, koalas, wombats, bilbies, bandicoots or other Australian animals need to be safe and healthy?

The scenario:

You are invited to create a safe and fun place for an Australian animal to live.

Animals have to have space, shelter, food to eat and good clean water to drink. Your task is to imagine what their ultimate sustainable habitat might look like!

Your group can either write and draw, record and video, or design and make a model of the ultimate sustainable Australian habitat, accompanied by a text about what an Australian animal might need, now and in the future, to grow and survive in nature.

A suggested learning process:

Define:

Share the essential question with the class and talk about what they need to be safe and healthy.

Present the scenario, assign teams if appropriate, and ask students to define the task they have been set.

Discover:

Go outside, visit a home garden or park and observe any animals. Brainstorm what these animals might need to remain safe and healthy.

Play a digital interactive (for example, '**Legendairy Cow Breeds Interactive'**) and explore what an animal, like a dairy cow, needs to be safe and healthy.

Share stories about animals, their habitats and needs. For example:

- 'Big Red Kangaroo' by Claire Saxby and Graham Byrne (2013 Walker Books)
- 'Fire' by Jackie French (2014 Scholastic Australia)
- 'Platypus' by Sue Whiting and Mark Jackson (2015 Walker Books)
- 'Emu' by Claire Saxby and Graham Byrne (2014 Walker Books)
- 'Koala Sam' by Heather Freeman and Peter Townsend (2009 JB Books)

Dream:

Ask students to visualise their chosen animal, its habitat and what it might look, sound, and feel like.

Ask students to imagine the steps involved in creating their animal's ultimate habitat.

Challenge students to think about the materials, tools, and equipment they will need to make or draw their healthy and safe habitat.

Ask students to imagine how they are going to create a text about what an Australian animal might need, now and in the future, to grow and survive in nature.

Design:

Ask students to decide on their Australian animal.

Invite students to design its ultimate habitat.

Ask students to write/scribe a text about what an Australian animal might need, now and in the future, to grow and survive in nature.

Talk about the importance of a good title and ask students to decide on a title for the text.

Ask students to draft the steps involved in making their chosen habitat for an Australian animal.

Ask students to gather the materials, tools, and equipment needed and then make the safe and healthy habitat for their chosen animal.

Photograph students at work.

Deliver:

Share student work samples showing what animals need to be safe and healthy and read aloud texts about what Australian animals might need, now and in the future, to grow and survive in nature.

Create a display of student's work and enjoy a day of learning about healthy and safe habitats for Australian animals.

Set up tables or booths in the class and invite students, teachers and parents to 'Discover National Science Week in 2017'!

Debrief:

Ask students to:

Reflect on what things outside their local place might affect the habitat they created.

Draw something new they discovered regarding what Australian animals need to be safe and healthy.

Describe their favourite memory of creating their work samples for National Science Week.

Discuss what they learned about what Australian animals might need, now and in the future, to grow and survive in nature.

Links to the National Quality Standards

Element 3.3.2 Children are supported to become environmentally responsible and show respect for the environment. Source: Australian Children's Education & Care Quality Authority. 2016. **Guide to the National Quality Standard**, p.103, ACECQA website.

Links to the Australian Curriculum

Science

Foundation and Year 1

Science Understanding – Biological sciences

Living things have basic needs, including food and water **ACSSU002**

Living things live in different places where their needs are met **ACSSU211**

Science as a Human Endeavour – Nature and development of science

Science involves exploring and observing the world using the senses **ACSHE013**

Science as a Human Endeavour – Use and influence of science

People use science in their daily lives, including when caring for their environment and living things **ACSHE022**

General Capabilities:

Literacy; ICT capabilities, Critical and creative thinking.

Cross-Curriculum Priority:

Sustainability

Organising ideas:

OI 2: All life forms, including human life, are connected through ecosystems on which they depend for their wellbeing and survival.

OI.7: Actions for a more sustainable future reflect values of care, respect and responsibility, and require us to explore and understand environments.

OI.8: Designing action for sustainability requires an evaluation of past practices, the assessment of scientific and technological developments, and balanced judgments based on projected future economic, social and environmental impacts.

*Source: (**ACARA**, 2015)*

case study:

Aldgate Kindergarten, South Australia

Aldgate Kindergarten is located in the Adelaide Hills on the edge of the township of Aldgate. It has its very own 'Kindy Wirra' (scrub) on its grounds, with an adjoining larger wirra over the road.

The Kindy Wirra is dominated by stringybark trees and has a wonderful diversity of shrub and understorey plants including native cherry, sticky wattle, rock correa, orange bell creeper, maroon hood and donkey orchids, and the bandicoot-friendly wire rapier-sedge. The habitat provided by these plants attracts a number of bird species, including eastern spinebills, Adelaide rosellas, rainbow lorikeets, kookaburras and common bronze wing pigeons, to name just a few.

The Early Years Learning Framework, learning outcome 2 states: 'Children are connected with and contribute to their world'. As a result of this, Bianca Stanbridge, Aldgate's Kindergarten Director, saw the Kindy Wirra with its birds and other creatures as an important learning resource.

Being an AuSSI-SA site, Bianca was aware of NRM Education's resources and the kindergarten has used the Bushland Birds of the Adelaide Hills identification chart in the following way with the children.

Bianca said "We laminated and cut up the chart to make sets of bird spotting ID cards, connected with a metal ring via punched holes in the corner of each card. Each page of cards created one set – larger birds and smaller birds – to make it easier and quicker for the children to flick through. We have several sets of these cards for the children to independently access in our 'outdoor explorer bag', which also includes binoculars and a camera. The bag is available at all times in our outdoor learning area, whenever we spend time in our small patch of adjoining native bushland (the Kindy Wirra) and on our many frequent hikes to the nearby nature reserves".

Children use the cards to identify the different birds in the Wirra. "Through the children's use of the bird ID cards, we document their increased knowledge of, and engagement with, local birdlife in their learning journals, which is then shared with their families".

The skills that children develop in being able to differentiate between birds, for example rosellas and lorikeets, which are both parrots but have different colours, helps them develop important literacy and numeracy learning processes such as noticing and communicating.

The bird card idea was shared with a staff member at the Mount Barker Library who then made up 'outdoor explorer bags' using the bird ID charts for families to borrow from the toy library.

Source: NRM Education 2016. Aldgate Kindergarten. Weekly Digest, 3rd July 2016. **Adelaide and Mount Lofty Ranges Natural Resource Management Board.**

Learning Experiences for **Foundation–Year 2**

Activity 3:

Invitation to join the Future Earth Children's Science Committee

Overview: Explain to the class that their task is to imagine they are a member of the Future Earth Children's' Science Committee. They all have one thing in common – they are tired of seeing the Earth's waterways and seas polluted.

Background science for students: Water pollution

Water pollution is when waste, chemicals, or other particles cause a body of water (i.e. rivers, oceans, lakes, wetlands) to become harmful to the fish and animals that need the water to survive. Water pollution can disrupt and negatively impact nature's water cycle as well.

Most people are affected in some way by water pollution and we have all read stories about dead fish and polluted rivers and beaches. However, fewer people are aware of the many sources of water pollution.

Human causes of water pollution

A lot of water pollution comes from human activity. Some human causes include what we tip down pipes or flush down the toilet at home. Other causes include pesticides, insecticides, herbicides and fertilisers from farms, wastewater and chemicals from factories, schools and offices, silt from construction sites, and rubbish from people littering.

The thoughtless disposal of toxic or hazardous waste is a serious problem because these chemicals can cause pollution, even if they are in small quantities.

Industry is not permitted to discharge materials or chemicals directly into waterways or into the stormwater system. However, many industries are allowed to dispose of materials or chemicals into the wastewater system. They must do so under strict guidelines.

Natural causes of water pollution

Sometimes water pollution can occur through natural causes like volcanoes, algal blooms, animal waste, and silt from storms and floods.

The essential question:

What happens when we understand that our seas and waterways are under stress from pollution?

The scenario:

The Chair of Future Earth's Science Committee is seeking schools to be involved in the Future Earth Children's Science Sub-Committee.

"As chair of the Science Committee, I strongly urge the establishment of an Australia-wide water carers project staffed by children...designed to rescue our seas, oceans, wetlands and fresh waterways."

What science investigations can assist you in your mission to leave our creek, dam, bore, river, sea, and ocean waters in a better condition than we find them today?

Your challenge is to help others understand the effects of pollution and waste in our fresh waterways, seas and oceans and empower them to know what they can do. Are you up for the challenge?

If so, then National Science Week would like you to celebrate clean water and host a 'Future Earth Water Carers Day' as part of National Science Week.

A suggested learning process:

Define:

Share the essential question with the class and talk about 'Future Earth' and the need to have clean, healthy water in our fresh waterways, wetlands, dams, bores, seas and oceans.

Present the scenario, assign pairs or small groups if appropriate, and ask students to define the task they have been set.

Discover:

Locate where water can be found in the classroom area. Talk about what it is used for e.g. washing hands, cleaning paint brushes and paint containers, making glue, cooking, watering plants, watering classroom animals.

Talk about the water that goes down the drain in the classroom area. Discuss how water pollution here affects others downstream, and how pollution upstream affects you.

In pairs or small groups, talk about the ways the class can be more careful of what they put down the sink, and care for their water resources. Encourage pairs or small groups to report back their ideas.

Collate ideas. For example:

Ways we can care for water in the classroom

- Scrape left-over paint back into paint pots
- Clean paint from palettes using newspaper
- Don't rinse paint down the sink
- Let cooking water cool and then water the plants
- Don't use too much detergent or soap
- Water plants with water from vases

As a class, describe how class members brush their teeth. Ask questions like: Do we leave the taps on or turn them off while we're brushing our teeth? Do we use wasteful amounts of toothpaste?

Consider and decide on water-caring ideas for the class to use while cleaning teeth. Record these on a chart.

Use these ideas as a springboard to help the students consider ways they can show care for water when drinking, washing hands, cooling themselves and playing with water.

Identify areas in and around the school and children's homes where water is found.

Discuss any environmental issues connected with those areas.

Draw cause and effect charts to show the issue and the problem. For example: drains → blocked with leaves and litter → polluted water.

Talk with students about what happens to leaves and litter that are washed into drains. Follow their path to the sea.

Brainstorm ways the class could get involved in activities for the protection of the water environment e.g. sweep gutters and asphalt, collect leaf litter, compost leaf litter, collect litter and recycle.

Discuss the environmental issues and possible ways to solve the problems.

Set up teams of Tap-watchers and Litter-busters to ensure all taps are turned off, drains are cleared, and litter is collected, sorted and disposed of wisely during and after play periods.

Make certificates to acknowledge other students who do the right thing by turning off taps thoughtfully or disposing of rubbish wisely during play periods. Award these during assemblies.

Dream:

In pairs or small groups, envision or dream about the many possible solutions to pollution problems in our waterways, seas and oceans.

Further develop ideas for possible solutions using sketches and labels.

Ask students to visualise their most creative solution.

Invite students to think about what materials, tools, equipment and ingredients they will need to make their solution a reality.

Remind students that their solution needs to explain the effects of pollution and waste in our fresh waterways, seas and oceans as well as empowering others to know what they can do to help.

Record a video, sing a song or read an announcement to explain this.

Design:

Invite students, in pairs or small groups, to begin drafting their designs for their solutions.

Ask students to draft the steps involved in making their '***Future Earth Water Carers Day***' item.

Ask students to gather the materials, tools and equipment needed and then design and create the solution.

Invite a peer class group to the class to hear from the Future Earth Children's Science Sub-Committee and find out more about water caring, the effects of pollution and wastes in our fresh waterways, seas and oceans and know what they too can do as water carers.

Deliver:

In pairs or small groups, showcase the creations and associated messages explaining the effects of pollution and waste in our fresh waterways, seas and oceans and know what they too can do as water carers.

Classes host a 'Future Earth Water Carers Day' as part of National Science Week and invite students, teachers and parents to discover what they can do as a water carer!

Debrief:

Ask students to reflect on their learning and draw something they learnt that was new.

Ask students to describe what worked well and not so well in their efforts to create a solution to pollution problems in our waterways, seas and oceans.

Links to the National Quality Standards

Element 3.3.1 Sustainable practices are embedded in service operations.

Element 3.3.2 Children are supported to become environmentally responsible and show respect for the environment. Source: Australian Children's Education & Care Quality Authority. 2016. **Guide to the National Quality Standard**, p.103, ACECQA website.

Links to the Australian Curriculum

Science

Foundation, Year 1 and Year 2

Science as a Human Endeavour – Nature and development of science

Science involves observing, asking questions about, and describing changes in, objects and events **ACSHE013** **ACSHE021** **ACSHE034**

Science as a Human Endeavour – Use and influence of science

People use science in their daily lives, including when caring for their environment and living things **ACSHE022** **ACSHE035**

Year 2

Science Inquiry Skills

Respond to and pose questions, and make predictions about familiar objects and events **ACSIS037**

Participate in different types of guided investigations to explore and answer questions, such as manipulating materials, testing ideas, and accessing information sources **ACSIS038**

Use informal measurements in the collection and recording of observations, with the assistance of digital technologies as appropriate **ACSIS039**

Use a range of methods to sort information, including drawings and provided tables **ACSIS040**

Through discussion, compare observations with predictions **ACSIS214**

Compare observations with those of others **ACSIS041**

Represent and communicate observations and ideas in a variety of ways such as oral and written language, drawing and role play **ACSIS042**

General Capabilities:

Literacy; ICT capabilities, Critical and creative thinking

Cross Curriculum Priority:

Sustainability

Organising ideas:

OI 2: All life forms, including human life, are connected through ecosystems on which they depend for their wellbeing and survival.

OI.7: Actions for a more sustainable future reflect values of care, respect and responsibility, and require us to explore and understand environments.

OI.8: Designing action for sustainability requires an evaluation of past practices, the assessment of scientific and technological developments, and balanced judgments based on projected future economic, social and environmental impacts.

*Source: (**ACARA**, 2015)*

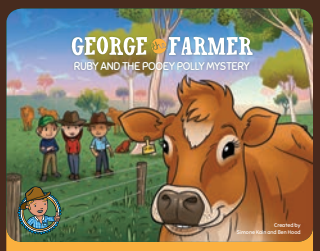
Watch the video '**Tangalooma EcoMarines, Bulimba State School**', YouTube (2:00 min) to find out what this Queensland primary school does to enhance the marine environment of Moreton Bay.

Watch the video '**Student Dedication**', YouTube (1:52 min). Bulimba State School students demonstrate and discuss the ways they reduce, recycle, recover, rethink and remanufacture wastes at their school.

50¢ of each book sale reinvested into FREE educational resources

GEORGE the FARMER

Educating children about farming, food and fibre production through award-winning stories, apps, songs, videos curriculum-aligned teacher's guides and performance.



Ruby and the Dairy Dilemma

George the Farmer Cuddle Doll

Numbers on the Farm Board Book

George the Farmer Shears a Sheep

Ruby Farmer Cuddle Doll

"I loved how it linked to the curriculum. I will definitely look to use it again. The website, books and resources worked so well... the students loved it".

TANIELLE, TEACHER,
ALLENDALE EAST AREA SCHOOL, SA

Visit www.georgethefarmer.com.au to shop online for these and many more products!

Learning Experiences for **Foundation–Year 2**

Activity 4:

Quest for a Greener Earth

Overview: Explain to the class that their task will be to explore George the Farmer's website and find out more about George's wife Ruby who has a science degree, is an agronomist and how she uses her science understandings to help solve problems.

Background science for students: Scientists

A scientist is someone who uses a systematic approach to acquire new knowledge. A scientist can also be defined as someone who uses the 'scientific method' and performs research work.

A scientist may be an expert in one or more areas of science, such as biology, or agriculture, space, food, nutrition or plants! Some scientists think about how all of these fit together to make up our whole 'life support system'.

Being a scientist begins by ***thinking*** like a scientist. Scientists are curious about how the world works. They have many questions and go about answering those questions using the scientific methods.

If you are fascinated by how things work and why they work a certain way, you too could become a scientist!

To work as a scientist, a person usually needs a degree in science. A degree is obtained by attending university and getting a Bachelor of Science or Engineering degree.

The essential question:

What happens when we understand that science involves observing, asking questions about, and describing changes in, objects and events?

The scenario:

National Science Week is searching for schools to discover what a sustainable 'Future Earth' might look like, sound like and feel like through the development of short illustrated books.

We are calling on your school because we have heard about the wonderful sustainability and science program at your school. Your school is well known for its food garden, composting program, worm farm and the ability for all children to be involved in the 'magic of sustainability'.

Your challenge is to produce a short illustrated book for a pre-school or kindergarten that explains how science involves solving problems and how it could help create a sustainable Future Earth!

I wonder how your school could promote a 'Sustainable Future Earth' through a short illustrated book. Does anyone have any thoughts?

Are you up for the challenge? If so, then we would like you to create a short illustrated book that explains:

- Something about what science involves.
- How sustainability science could help create a sustainable 'Future Earth'.
- A description of a sustainable 'Future Earth'.

I wonder will you create a paperback or an e-Book?

A suggested learning process:

Define:

Capture students' interest and share **George the Farmer's website**.

Choose the 'About' feature on the top toolbar, meet the characters in the stories and songs.

Locate Ruby, who is a scientist and read all about her science qualification.

If the school has a copy, read the story titled 'Ruby and the Dairy Dilemma'. Alternatively, look at **two illustrated pages from the story** and read the paragraph to the left of the images that describes what the story is about.

Using the second image, locate Ruby and imagine the scientific questions she might be asking? Might they be about the soil? Might they be about the pasture? Might they be about when the paddocks last had rain?

Think about three questions that a 'plant scientist' might ask a farmer in a paddock on a dairy farm. Share these as a class.

Ruby also runs some scientific tests in the paddock. Ask students to find in the second image the scientific equipment Ruby used as a scientist, to collect scientific samples and data.

Agronomists like Ruby also use pH papers and soil test kits that measure the pH in soils. These tools tell agronomists about the acidity or alkalinity of the soil that is being tested. To find out how you can make your own pH paper, see '**Berry pH paper – Sick Science**', Steve Spangler website.

Talk about what a sustainability scientist might need to observe, and what information they might need to collect.

As a class, talk about all stories having an illustrated cover, an inside front cover, a title page, and the other pages available for the story, including the back cover.

Talk about stories needing an action starting point where something exciting happens and the characters are introduced to the reader. Talk about the place or 'setting' in which the story happens, and how the story then unfolds around a problem moves to a really strong ending.

Ask students what they might need to know more about, in order to undertake the challenge set by National Science Week. Might they need to know something about science, what scientists do, and sustainability?

Discover:

Watch what's '**Growing in the Garden at Plunkett Street Public School**', Filmpond (4:07 min)

Talk about whether the students 'green' quest might be a great idea for 'Future Earth'.

Consider whether growing a garden, raising chooks, watering plants, collecting seed, adding veggie scraps to worm farms, creating soil, planting seeds, controlling bugs, making compost, using compost on the garden, and harvesting fresh food, cooking and eating it might be the way to sustain life on 'Future Earth'.

Check out how Pennant Hills Public School in NSW has created a solution...a 'bird haven'. Watch '**Small Bird Haven at Pennant Hills Primary School**', Filmpond (5:33 min).

Talk about the value of a 'bird haven' that provides nests, food and shelter on Future Earth.

View a '**Planting Lilly Pillies to Improve Air Quality at Belmore South PS**', Filmpond (6:33 min) and discover how Belmore South Public School has created a range of outdoor spaces, environmental assets, in particular, how lilly pilly plants are protecting them from more than 39 000 cars that pass by each day and the pollution and noise created by that volume of traffic

Hear about the problem solving activities and thinking the students have used and developed while creating their native garden.

Talk about the importance of working together to create solutions.

Discover what solutions for 'Future Earth' are being created at Cambridge Gardens Public School. Watch '**Cambridge Gardens Gardening Club**', Filmpond (3:01 min)

Brainstorm the science in all the things that happen in their gardening club.

Brainstorm six ideas for the story. Select the idea that really 'grabs' the class and draft a story sequence. Ask questions like; 'And then what happens?' Encourage students to think deeply about how the story might reveal the way we can use science to create a sustainable Future Earth in a funny, exciting and creative way. Talk about the ending as well, asking 'what will happen at the end of the story on 'Future Earth'?'

Ask students to create a short illustrated book that explains:

- How sustainability science could help create a sustainable 'Future Earth'.
- A description of a sustainable 'Future Earth'.

Dream:

Ask students to visualise an illustrated cover for their 'Future Earth' book as well as an inside front cover and a title page.

Ask students to imagine what their short illustrated story book might look like. Will it be a paperback or an e-Book? Will it include photographs, pop-ups, pull-tabs, textures or other features to increase a reader's interaction with the book?

Design:

Ask students to design their draft story for their book.

Ask students to gather the materials, tools, and equipment needed and then design their book.

Invite a peer class group to the class and to find out more about how a short illustrated book can explain:

- How sustainability science could help create a sustainable 'Future Earth'.
- A description of a sustainable 'Future Earth'.

Deliver:

Create the stories about 'Future Earth'.

Prepare a display of students' stories about how sustainability science could help create a sustainable 'Future Earth'.

Visit the local pre-school, kindergarten, Foundation class or day-care centre and share and discuss the stories with younger children.

Share photos and students' stories via National Science Week's online community. The Australian Science Teachers Association loves to see pictures of children in the classroom learning, and to share photos via email at **nscwk@asta.edu.au** or share what has been created via Facebook, Instagram or Twitter with #natsciwk! Please ensure that you have parental permission prior to posting any images of students.

Debrief:

Ask students to recall what they learned.

Talk about what they might still like to find out.

Ask students to describe their favourite part of creating a story and sharing it with others as part of National Science Week.

Links to the National Quality Standards

Element 3.3.1 Sustainable practices are embedded in service operations.

Element 3.3.2 Children are supported to become environmentally responsible and show respect for the environment. Source: Australian Children's Education & Care Quality Authority. 2016. **Guide to the National Quality Standard**, p.103, ACECQA website.

Links to the Australian Curriculum

Science

Foundation, Year 1 and Year 2

Science as a Human Endeavour – Nature and development of science

Science involves observing, asking questions about, and describing changes in, objects and events **ACSHE013** **ACSHE021** **ACSHE034**

Science as a Human Endeavour – Use and influence of science

People use science in their daily lives, including when caring for their environment and living things **ACSHE022** **ACSHE035**

English

Foundation

Literature: Creating Literature

Retell familiar literary texts through performance, use of illustrations and images **ACELT1580**

Year 1

Literature: Creating Literature

Recreate texts imaginatively using drawing, writing, performance and digital forms of communication **ACELT1586**

Year 2

Literature: Creating Literature

Create events and characters using different media that develop key events and characters from literary texts ACELT1593

General Capabilities:

Literacy; ICT's capabilities, Critical and creative thinking

Cross-Curriculum Priority:

Sustainability

Organising ideas:

OI 2: All life forms, including human life, are connected through ecosystems on which they depend for their wellbeing and survival.

OI.7: Actions for a more sustainable future reflect values of care, respect and responsibility, and require us to explore and understand environments.

OI.8: Designing action for sustainability requires an evaluation of past practices, the assessment of scientific and technological developments, and balanced judgments based on projected future economic, social and environmental impacts.

*Source: (**ACARA**, 2015)*

case study:

Food gardens create spaces for diverse learning

Allenby Gardens Primary School, in South Australia, has over 500 pre-school to Year 7 students from the local zoned area. With a high level of English as an Additional Language or Dialect, students coming from a wide variety of cultures, the school is a highly valued hub of diversity.

The vision of the school is focussed on the wellbeing of the students and the provision of learning opportunities for children that cater for their individual differences and learning styles.

The food garden has been the main sustainability focus for the last few years. Its aim is to increase the skills, confidence and knowledge of educators and students, to get the students outside, meet curriculum outcomes, and to provide a place that contributes to their wellbeing and learning through hands-on activities.

Students explore their environment through their five senses, learn to care for the environment and are encouraged to use the resources around them wisely. All classes are involved in the composting, using Bokashi bins and worm farming, to learn about waste breakdown, natural systems and cycles.

Examples of the students' previous learnings are:

- Observing the water cycle, which involved students making structures out of sand and watching what happened if there was rainfall, where the water went to, and what happened to the environment around the waterways.
- Understanding procedural texts by making bird feeders.

One group within the class videos and photographs the other students working in the garden at the beginning, middle and end of the session. Discussion about the films and photos encourages teachers and students to reflect on what they've learned. This reflection expands the students' vocabulary and ability to explain their learning. Collaboration is emphasised during the process and they are more aware of how to undertake the other activities when it is their turn.

They have developed a sense of responsibility for their own learning, an understanding of what they are setting out to learn and how to go about it.

Parents have been recognising the value of the garden and are making donations of items such as sheets, pots and pans, containers and other play things. Some parents even provide their own learning ideas for the students and work with them in the garden program.

Staff and school meetings regularly include discussion and communication of ideas around the garden. The facilities group agenda includes discussing and planning regular working bees.

NRM Education has supported the school by running workshops on Education for Sustainability, providing information and resources, and helping with school planning for future initiatives.

Source: NRM Education 2016. Food gardens create spaces for diverse learning. Weekly Digest, 19th June 2016. **Adelaide and Mount Lofty Ranges Natural Resource Management Board.**

Future Earth

Early Childhood Activity Pages for National Science Week

Create a Mini Earth

You will need

- Plastic soft drink bottle with the top cut off
- Gravel
- Potting soil, sand, peat moss
- Small plants
- A few worms if you can find them
- Spoon and sticks (like chopsticks)

What to do

- Remove the label from your bottle. Cut the bottle according to what size you want your terrarium to be.
- Place a layer of sand or gravel in the bottom of the bottle for drainage.
- Spoon the soil into the bottle and fill it until it is around 1/3 full.
- Poke a hole in the soil with your finger or stick and add plants or seeds. Water the soil well at first, but rarely thereafter unless no moisture condenses on the inside of the terrarium top.
- Put in a few worms and slaters.
- Place the top of the bottle back on and seal with sticky tape. You can also use the top or bottom of another bottle for extra height.

What's happening?

You have made a small ecosystem. For an ecosystem to survive there must be micro-organisms in the soil and healthy plants.

A terrarium is like a small Earth and can show us how elements such as land, water, air, animals and plants interact and change together. It is a system, which is a group of elements that function together as a whole.

The survival of the plants and animals in this terrarium depends on the conditions inside the bottle. If the plants and animals can maintain their environment inside the bottle, they will be able to grow.

In a terrarium, the water cycle is easily observed. Terrariums recycle their moisture, so they rarely need to be watered, requiring almost no attention. Often, a closed terrarium can be left for a month or more between watering.

When the air in the terrarium warms, the water begins to evaporate from the soil. When the air cools, the moisture condenses on the walls and the top, and when enough water condenses and builds up, it 'rains' back down to the soil.

Plants are also part of the water cycle. Plants absorb water from the soil through their roots. This water moves up the stem to the leaves, where 90 percent is lost through the pores of the leaf. The loss of water through pores in the leaves is called transpiration.

Source: Colliver, A. & McRae, M. (2012) Investigating Microclimates. CSIRO. Page 25.

Build a Biojar

Warning: Even shallow ponds and creeks can present hazards for young people. Younger scientists should be accompanied by an adult when collecting samples for this activity.

You will need

- A large jar with a lid (a pickle jar works well)
- 3–4 sea shells (or a single large one)
- Pond water
- Algae and pond weed
- Aquatic snails (see below for where to get these)
- Soap / detergent
- Magnifying glass
- Small fishing net or old kitchen strainer (optional)

What to do

Make sure your jar is completely cleaned, using detergent and water. Rinse all detergent residue from the inside.

Wash and soak the shells in clean, fresh water to remove any salt. Leave them to dry in the sun.

Visit a local pond where the water isn't flowing very fast. Take care to look at the water's condition—if it looks or smells polluted, try somewhere else.

Fill your jar to the top with pond water while scooping in some of the muck from the bottom of the pond. If you can find algae (the green furry stuff often growing on rocks, etc.) growing anywhere, use your fingers to scrape some off and put into your jar.

Search for some small aquatic snails—a net or strainer is useful here—and add them to the jar. While you can always purchase them from a pet store, those in the pond would be more suitable to the conditions present and are more likely to survive. They can be found on or under rocks or on bits of wood. Just take care where you put your fingers!

Place your sea shells into the jar and close the lid tight.

Put the jar somewhere where you won't have to move it much, and in full sunlight, such as on a window sill. It will take a day or two for the sediment to settle and the water to clear.

Wash your hands thoroughly with soap.

Once settled, use a magnifying glass to look at the pond life in your Biojar. With luck, your ecosystem-in-a-bottle should thrive over the coming weeks.

What's happening?

Organisms die when they no longer get what their bodies need to survive. The most vital resources are nutrients, water and energy. Of course, many living things also produce waste chemicals, which can be bad for their health if they build up. In a closed jar, there is no way to get more nutrients in or get waste products out. So how can they survive?

Ecosystems are made of many different living and non-living components. They rely on cycles to function. For example, oxygen is used by animals and released by plants. In our jar, the animals use oxygen in the water and produce carbon dioxide in the process of respiration, while plants, such as algae, use carbon dioxide and release oxygen in the process of photosynthesis. The only thing coming into the jar is light, and the only thing coming out is a tiny amount of heat.

The shell is added so the water doesn't become too acidic – because it is made of calcium carbonate, it dissolves in acid. As carbon dioxide in water is acidic, the dissolving shell should keep the water at the right pH for the animals to survive. pH describes how acidic or basic (the opposite of acidic) something is.

It might take a few weeks for the cycles to settle down. Sometimes there will be a lot of algae growing, or sometimes you'll see a lot of tiny animals such as copepods. Hopefully your larger animals will breed just like my snails did!

Source: Colliver, A. & McRae, M. (2012) Investigating Microclimates. CSIRO. Page 24-25.

Early Childhood Fun Ideas for National Science Week

Read about it!

There are many stories about sustainability. See **'100 of the best books for children on sustainability'**, Children's Books Daily website.

Sing it!

Include a song about taking care of the Earth during circle time. Sing '**Jump if you Love the Earth**', YouTube (2:27 min) or '**Mother Earth with Lyrics | Kids Earth and Environment Song | Children Love to Sing**', YouTube (1:50 min)

Check out more songs at '**Earth Day Songs'**, Songs for Teaching website.

Create it!

Art is a fun way to explore a new concept. Create a range of craft samples to celebrate the planet.

Act it out!

Make your own puppets and act out a puppet show about a sustainable 'Future Earth'.

Dress up and dance!

Make your own masks and costumes and create a dance about how to build and maintain a healthy Future Earth.

Feel it!

Sensory play is an important part of learning. Create a 'Feely Bag' using a pillowcase and place a range of natural items inside it. Play 'Pass the Parcel' and discover all that is needed on a healthy Earth!

Paste it!

Create collages about what we can all do to sustain a healthy planet.

Snack on it!

After all that exploration about sustaining a healthy Earth, create a range of snacks from the school garden.

Future Earth

Primary Years of Schooling
Year 3 - Year 6

national science week 2017

Activity 1:

What if?

Overview: Explain to the class that they will be exploring a range of ideas children have had for changing the world. Their task is to:

- consider how posing questions helps us plan for the future,
- define questions that we may need to ask to help us then plan for a sustainable Future Earth
- create a pop up display, showing the questions and solutions needed to help us design a sustainable 'Future Earth'.

Background science for students: What is 'science'?

Have you ever wondered why the Earth has an atmosphere, rivers, seas, clouds, trees, soil, mountains, deserts, and all kinds of animals? If you have ever asked questions like this about the natural world, then you were thinking like an inquiring scientist. The word 'science' comes from the Latin word that means 'knowledge'. Science is a way of creating knowledge about the natural world that starts with a question and then tries to answer that question with lots of evidence and logic.

Science is more of a process than a body of knowledge and scientists are continually testing and revising their ideas, and as new knowledge is gained or new observations are made, ideas may be replaced with new ideas.

The global research program, 'Future Earth' is a 10-year initiative to advance global sustainability science, build capacity in this rapidly expanding area of research and provide an international research agenda to guide natural and social scientists working around the world.

Sustainability science is a different kind of science—it links across many different areas of research, applicable to real-world challenges and is committed to translating research into tangible action.

The essential question:

What happens when we understand how posing questions can help us plan for the future?

The scenario:

National Science Week is searching for schools to discover ways they can attain sustainability for 'Future Earth'.

In the past, scientists, governments and grownups thought of ways to care for, conserve and protect the environment and people. Now it's your turn! What kind of scientist will you be and what questions will you pose, and what solutions will you design to attain sustainability for 'Future Earth'?

What science investigations can assist you in your mission?

Your challenge is to use other children's ideas and your own thinking to help others understand what we all can do to help attain sustainability for 'Future Earth'. Are you up for the challenge?

A suggested learning process:

Define:

Capture students' interest and display the cover of the book titled '**31 ways to change the world by 4386 children**' or use the image provided below.

Display the cover on the electronic whiteboard, and talk about the children's messages.

Choose a selection of actions to discuss and extend. For example, survey the number of appliances that are left on standby at night in each student's home.

Discover:

Discover a young girl in Uganda whose life is all about sharing. Watch '**A day in the life of Lucy | World Vision Australia**', YouTube (4:02 min).

Talk about the words 'sustainability' and 'sharing'. Could sustainability mean sharing the Earth's resources equally and saving some for later?

Using an apple that represents Earth, discover how much of its soil is useful and fertile. Ask students to think of the Earth as an apple. Then, using kid-friendly knives and boards, ask students to slice the apple into quarters, and set aside three of the quarters.

Talk with the students about how these three pieces represent the 'oceans' of the Earth. The fourth quarter roughly represents the Earth's total 'land area'.

Ask students to slice the 'land area' in half, and set aside one of the pieces. Talk about this portion representing the land area where people find it 'difficult to live'. For example deserts, polar areas, and high mountainous areas.

Explore the remaining piece, and discuss how this represents 'land where people can live, but do not necessarily grow the food needed for life'.

Ask students to peel away the skin of this piece, and then talk about the fact that the skin represents the Earth's land that is suitable to grow food.

Source: '**An Apple for Learning'**, *Manitoba Education and Training website*

Talk with students about the discovery they have made.

Reflect on the activity and describe what we all can do to help conserve and improve soils.

Talk about how most Australian soils are of poor quality and how 'feeding' the soil with organic matter such as manure, vegetable peelings and other plant and animal wastes can increase soil fertility.

Investigate leaf litter which builds up around the base of trees. Talk about how it is one of nature's ways of providing compost material.

Talk about worms being useful for the soil because they make burrows in the soil and aerate it, making it easier for plants to tap into organic matter. Their burrows also allow for water to soak easily into the soil. Make a worm farm. See **page 53**.

Make some compost. See **page 52**.

Find out about Darwin's Girraween Primary School's worm farm and how it has benefitted the school. Junior Landcare. 1992. '**How-to-Guide. Building a worm farm…it's fun and easy!'**, Landcare Australia website.

Undertake some 'scientific research' for your pop up display. Look at the scientific questions that we may need to ask to help us then plan for a sustainable Future Earth.

Talk about the many ways to ask questions.

Use the following 'Question Grid' and encourage students to devise questions that we may need to ask to help us then plan for a sustainable Future Earth.

What is?	Where/ when is?	Which is?	Who is?	Why is?	How is?
What did?	Where/ when did?	Which did?	Who did?	Why did?	How did?
What can?	Where/ when can?	Which can?	Who Can?	Why can?	How can?
What would?	Where/ when could?	Which could?	Who would?	Why would?	How would?
What will?	Where/ when will?	Which will?	Who will?	Why will?	How will?
What might?	Where/ when might?	Which might?	Who might?	Why might?	How might?

Take one idea in Lucy's world and design solutions to attain a sustainable 'Future Earth' for children who live in places like Uganda.

Pose the question 'What's the one thing you would do to change the world and make it more sustainable?'

Discuss student ideas, categorise the different actions and make word lists for each activity. For example:

- Collate soil conservation ideas.
- Collate water conservation ideas.
- Collate ways to grow food sustainably.
- Collate ideas to improve people's health and well-being.
- Collate ideas to change lives and the Earth.

Introduce students to '**trioramas**' and discuss the range of ways they might be used in the task being undertaken for National Science Week.

Dream:

Ask students in pairs or in small teams to visualise a sustainable 'Future Earth'. What might it look like? What might it sound like? How might it feel?

Invite students in their pairs or small teams to sketch a plan of what their pop up display might contain and look like.

Develop possible solutions for attaining a sustainable 'Future Earth'.

Ask students to imagine the actions and steps involved in making their pop up display.

Challenge students to think about the materials, tools, and equipment they will need to make their display.

Revisit sketches and ask students to think about the story their pop up display might tell others about how to attain a sustainable 'Future Earth'.

Look at ways museums display their exhibition pieces. Using digital devices, search for museum exhibits. Talk about how some exhibits use frames to provide a window to the exhibit.

Imagine ways frames can be created using different recycled materials. For example, recycling cereal boxes or packaging boxes.

Talk about colour and how students can use it to bring their exhibition pieces to life.

Talk about how digital tools and devices can also be used to design and create pop up displays.

Ask students to visualise their pop up display. What features might they include? How will the pop up display include the questions and solutions needed to help us design a sustainable 'Future Earth'?

Ask students to imagine how their pop up display, and the questions and solutions it includes, might feature in the school's National Science Week activities.

Invite students to think about how they might present their pop up display during National Science Week too.

Design:

Ask students, in their pairs or small teams to design their pop up display's layout and decide on a title for it. Will it be a question that can help us plan for the future?

Ask students to take on the role of a scientist and draft their pop up display's question and solution, and plan what illustrations will complement the text.

Invite a peer class group to the class and ask students to explain their concepts to this audience and seek feedback on their ideas.

Deliver:

Create the pop up displays about 'Future Earth'.

Prepare an exhibition of students' pop up displays about ways to attain a sustainable 'Future Earth'.

Visit the school's Foundation class or local day-care centre and share and discuss the pop up displays with younger children.

Share photos and students' work samples via National Science Week's online community. The Australian Science Teachers Association loves to see pictures of children in the classroom learning, and to share photos via email at **nscwk@asta.edu.au** or share what has been created via Facebook, Instagram or Twitter! Please ensure that you have parental permission prior to posting any images of students.

Debrief:

Ask students to recall what they learned and undertake a 'Positive, Negative, Interesting' activity (PMI) recalling something positive, something negative and something interesting they learned about attaining a sustainable 'Future Earth'.

Talk about what they might still like to find out about how they could do this.

Ask students to describe their favourite part of creating a pop up display and share it with others as part of National Science Week.

Links to the Australian Curriculum

Science

Year 3 and Year 4

Science as a Human Endeavour – Nature and development of science

Science involves making predictions and describing patterns and relationships **ACSHE050**

Science involves making predictions and describing patterns and relationships **ACSHE061**

Science as a Human Endeavour – Use and influence of science

Science knowledge helps people to understand the effect of their actions **ACSHE051**, **ACSHE062**

Design and Technologies

Processes and Production Skills

Generate, develop, and communicate design ideas and decisions using appropriate technical terms and graphical representation techniques **ACTDEP015**

Select and use materials, components, tools and equipment using safe work practices to make designed solutions **ACTDEP016**

Evaluate design ideas, processes and solutions based on criteria for success developed with guidance and including care for the environment **ACTDEP017**

Plan a sequence of production steps when making designed solutions individually and collaboratively **ACTDEP018**

Civics and Citizenship

Civics and Citizenship Knowledge and Understanding: Citizenship, diversity and identity

Why people participate within communities and how students can actively participate and contribute **ACHCK003**

General Capabilities:

Literacy; ICT's Capability, Critical and Creative thinking, Ethical Understanding, Intercultural Understanding, and Personal and Social Capability.

Cross Curriculum Priority:

Sustainability

Organising ideas:

OI. 2: All life forms, including human life, are connected through ecosystems on which they depend for their wellbeing and survival.

OI.5: World views are formed by experiences at personal, local, national and global levels, and are linked to individual and community actions for sustainability.

OI.7: Actions for a more sustainable future reflect values of care, respect and responsibility, and require us to explore and understand environments.

OI.8: Designing action for sustainability requires an evaluation of past practices, the assessment of scientific and technological developments, and balanced judgments based on projected future economic, social and environmental impacts.

*Source: (**ACARA**, 2015)*

case study:

Narrabeen Lakes Public School, NSW

Trialling New Project-Based Learning Approaches by Susan Mayo

As each new term starts, I look for ways to engage my class in exciting, innovative and real-world learning tasks.

In recent months a colleague has been developing new units of inquiry that use Project Based Learning (PBL) methods that take students on a journey of creativity, exploration and real-world relevance, and I was invited to trial them.

PBL involve giving students a complex question or problem. Students then use various collaboration methods as well as their critical thinking skills to solve it.

In today's age and time, Narrabeen Lakes Primary School has been discovering more about how we can deliver innovative and 21st Century learning in our classrooms.

We moved through the 6 Ds of Project Based Learning; Define, Discover, Dream, Discover, Deliver, Debrief. The phases of the model are based on based on the 21st Century Fluencies created by Crockett et al. 2011.

With my class I also use the '8 Ways Aboriginal Pedagogy' which meshes well with the Quality Teaching Framework and the Sustainability Cross-Curriculum Priority.

Through connecting with our community, students found interesting and knowledgeable sources, within the parent body and other community members.

We are also involved in a local, national and global Bandicoot project and PBL was a great way to engage my class in driving a student-led investigation into bandicoots and their habitats as there was evidence of bandicoots within our school grounds.

The conversation started with 'I wonder' questions about this evidence.

The PBL task was: 'To develop a proposal to submit to the principal outlining the need to address the conservation of healthy bandicoot habitats within our school by presenting the areas of the school where there is evidence of bandicoot occupation (scats, holes), the pricing of plants, soil, etc., necessary to build a bandicoot habitat and the travel corridors needed for them to travel between their preferred food sources within the school'. This was in the hope that a budget could be arranged for students to work on a habitat for our bandicoots!

After visiting the **Field of Mars Environmental Education Centre** (EEC) where we were involved in sessions about using our digital devices to take great videos, the class and I returned to school full of ideas about how to approach our PBL tasks.

I saw a fantastic opportunity to involve the junior leaders from the local high school (Narrabeen Sports High School) as mentors. They were able to question Year 4 students in a way that enhanced their understanding of this topic and aid in digital presentations. Of course the mentors learnt a great deal about bandicoots too!

Since our visit to the Field of Mars EEC, and after designing our presentations, the students have been instrumental in identifying and communicating their achievements through mechanisms ranging from class reports, presentations to whole school assemblies and local or regional conferences e.g. Taronga Zoo, Narrabeen Sports High School mentors, WIRES representatives, and via video conference to Gibberagong and Field of Mars EECs.

PBL makes their learning real! Students love presenting their concepts and sharing their ideas; collaborating in hands-on experiments; and engaging in leadership opportunities in public speaking and as host-school representative.

Students in my class have surprised me with their ability to collaborate to gain deep knowledge of their topic. They understand the ways in which different agencies have worked towards sustainable practice and are aware of its benefits.

Acting as a facilitator of students' learning instead of 'teaching the content' has been an enriching experience for me.

Source: Australian Association for Environmental Education (AAEE) NSW, **Conversations Newsletter**, *August 2015.*

Activity 2:

Australia's Wildlife

Overview: Explain to the class that their task is to show their support for Australian native wildlife and inform others at the same time, by creating a poster and brochure for improved awareness about wildlife issues!

Background science for students: Biodiversity

Biodiversity or biological diversity is the variety of all forms of life—the different plants, animals and micro-organisms, the genes they contain and the ecosystems of which they form a part.

There are currently 1.4 million known species living on Earth. While this might seem like a large number, the truth is that it only represents a fraction of the total. Nobody is sure how big this number might be. What truly matters is how each of these species differs from one another.

Ecosystems are self-organising and self-supporting collections of species living together. They are formed by a combination of biotic (living) and abiotic (non-living) factors. Many of these factors are influenced by one another. For instance, temperature and humidity might vary with the density of the trees, which depends on the rain and soil conditions. The animals living within a forest might rely on one another for food. Some relationships may result in protection, or the production of homes for smaller animals, or any number of tasks that make it possible for another living thing to flourish.

Why is biodiversity important?

Occasionally, a sudden change in the environment leaves a species unable to cope. As the species population reduces in size, other species that relied on its presence also struggle to survive. This 'knock-on' effect can dramatically change the nature of an ecosystem in a short time. A new ecosystem will eventually take its place. Forests can become grasslands, grasslands can become deserts, deserts might even become wetlands and wetlands turn to forests. In other words, small changes can have large consequences.

Biodiversity improves the chance that an ecosystem will cope with such changes. Across the world, we all rely on different ecosystems to provide us with resources. Changing one ecosystem into another could create a number of problems, such as depriving people of food and water or increasing the risks of disease. Maintaining natural levels of biodiversity in our ecosystems also contributes to the maintenance of 'healthy' ecosystems – that is, ecosystems that are maximally productive (carbon fixation), that provide both a store and a supply of clean water, that provide adequate vegetation cover thus preventing erosion and other soil problems like salinity, and that provide habitat for animals.

Source: QuestaGame. nd. **Biodiversity Teacher Resource**, *p10–11, Questabird website*

The essential question:

What is the best way to get people thinking about finding solutions to the issues Australian native wildlife face?

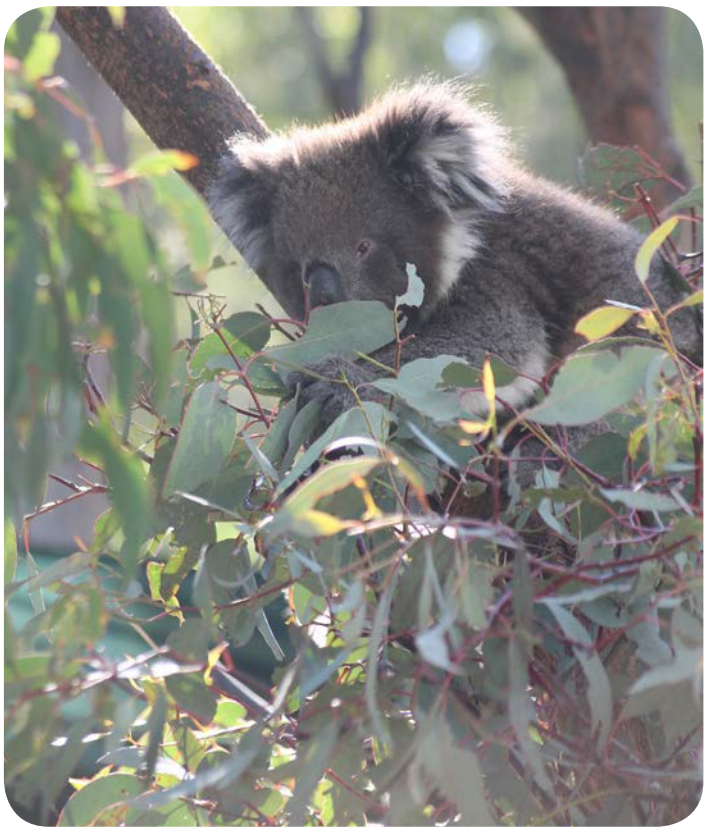
The scenario:

'Bio' means life, as in biology, the science of life. Diversity means the variety of life—30 million species according to one estimate. Trouble is one species seems intent on wiping out the other 29,999,999!

Your advertising team has been approached by a local chapter of Future Earth Australia. They want you to create a poster and brochure designed to bring awareness to the way local people can better protect and not hurt, injure or kill native wildlife in your community.

In your designs, use powerful images and write 'action statements' and suggestions for what can be done to address these concerns.

Inspire people to work together by informing your community about the best ways to assist wildlife carers who dedicate their lives to rescuing, raising, rehabilitating and releasing those Australian native animals who have been found sick and injured!



A suggested learning process:

Define:

Share the essential question with the class and talk about the problem that needs to be addressed.

Present the scenario, assign teams if appropriate, and ask students to define the task they have been set.

Discover:

Using the **Atlas of Living Australia** (ALA) website, find out about Australia's amazing biodiversity.

- Browse iconic Australian species. Check out **Australian birds**
- Find out about **Australian fish**.
- Discover **Australian frogs**.
- Investigate types of **Australian mammals**.
- Explore **Australian reptiles**.

Use the '**Explore by address or location**' function of the Atlas of Living Australia and ask students to enter the suburb or postcode in which they live. Then students will see a list and map of all species recorded in their own community.

Encourage students to make a record of the wildlife that can be found living in their local area.

Share stories about animals, their habitats and needs. For example:

- ''Big Red Kangaroo' by Claire Saxby and Graham Byrne (2013 Walker Books)
- 'Fire' by Jackie French (2014 Scholastic Australia)
- 'Platypus' by Sue Whiting and Mark Jackson (2015 Walker Books)
- 'Emu' by Claire Saxby and Graham Byrne (2014 Walker Books)
- 'Koala Sam' by Heather Freeman and Peter Townsend (2009 JB Books)

Talk about wildlife carers and what they do.

Did you know Wildcare volunteers rescue, raise, rehabilitate and release native wildlife that are found sick, injured or orphaned; that Australian native wildlife are protected and that it is illegal to kill, injure or keep native wildlife as pets?

Discover more information at the **Wildcare Australia** website and the **Wildcare NSW** website .

Brainstorm the many ways people can better protect and not hurt, injure or kill native wildlife in your community and on 'Future Earth'.

As a class, build understanding by sharing ideas and record issues that the class would like to know more about. Particularly on how people can better protect and not hurt, injure or kill native wildlife in their community and on 'Future Earth'.

Encourage students to find examples of what actual wildlife carers are doing to address sustainable practices and promote ways people can better protect and not hurt, injure or kill native wildlife and bring their findings back to class.

Go further and discuss the bigger picture too. Talk about how all people can manage the use of natural resources like the land, freshwater and the ocean more sustainably to ensure other species' needs can be supported too.

Dream:

Ask students to imagine the steps involved in designing their poster and brochure.

Check out '**50 Outstanding Posters to Inspire Your Next Design**' on Pinterest.

Challenge students to think about the materials, tools, and equipment they will need to design their individual work samples. Will they use digital or non-digital equipment and tools?

Ask students how they might communicate ways people can better protect and not hurt, injure or kill native wildlife.

Design:

Talk about the importance of a clear layout and design that makes it easy for an audience to understand and interpret the information that is being given.

Discuss the importance of sourcing graphics, photos and information correctly.

Discuss the importance of responsible digital citizenship.

Talk with students about responsible digital citizenship in online environments. Work with students to have them understand appropriate use. Emphasise the principles:

- Respect themselves
- Protect themselves
- Respect others
- Protect others
- Respect intellectual property
- Protect intellectual property.

Source: Crockett, L. & Jukes, I. & Churches, A. (2011) Literacy is not enough. 21st Century Fluency Project Inc, p 81.

Review rules on personal safety, group safety, and classroom and furniture safety with the students.

Ask students to establish a workstation and to gather the materials and tools they require.

Talk about safely storing their design and keeping a record of the processes they use to create it.

Ask students to draft the steps involved in making their chosen digital or non-digital designs.

Ask students to gather the materials, tools, and equipment needed and then plan each step involved in creating the digital or non-digital designs.

Invite students to start creating the design of a poster and a brochure that people can help people better protect and not hurt, injure or kill native wildlife.

Talk with students about how they might share and present their designs to an audience.

Ask students to explain how they plan to finalise and create their designs with another peer in the class and seek feedback on their ideas.

Invite students to design their work samples.

Photograph students at work.

Deliver:

Share work samples including the poster and a brochure that describe what people can do to protect and not hurt, injure or kill native wildlife, now and in the future.

Ask students to share their designs with others.

Video student presentations of their poster and brochure, and enjoy a day of learning about how Australians can better protect and not hurt, injure or kill native wildlife.

Set up tables or booths in the class and invite students, teachers and parents to 'Discover National Science Week in 2017'!

Debrief:

Ask students to:

Evaluate their designs and write four sentences about whether each design:

- matched the definition of the task
- used a clear layout and design
- was feasible, and
- included sources of the ideas and information each design piece used.

Write about the quality of their planning, their finished design and whether they enjoyed the task.

Describe their favourite memory of creating their work samples for National Science Week.

Links to the Australian Curriculum

Science

Year 3 and Year 4

Science – Biological understandings

Living things depend on each other and the environment to survive **ACSSU073**

Science as a Human Endeavour – Nature and development of science

Science involves making predictions and describing patterns and relationships **ACSHE050**

Science involves making predictions and describing patterns and relationships **ACSHE061**

Science as a Human Endeavour – Use and influence of science

Science knowledge helps people to understand the effect of their actions **ACSHE051**

Science knowledge helps people to understand the effect of their actions **ACSHE062**

Design and Technologies

Processes and Production Skills

Generate, develop, and communicate design ideas and decisions using appropriate technical terms and graphical representation techniques **ACTDEP015**

Select and use materials, components, tools and equipment using safe work practices to make designed solutions **ACTDEP016**

Evaluate design ideas, processes and solutions based on criteria for success developed with guidance and including care for the environment **ACTDEP017**

Plan a sequence of production steps when making designed solutions individually and collaboratively **ACTDEP018**

Civics and Citizenship

Civics and Citizenship Knowledge and Understanding: Citizenship, diversity and identity

Why people participate within communities and how students can actively participate and contribute **ACHCK003**

General Capabilities:

Literacy; ICT Capability, Critical and Creative thinking, Ethical Understanding and Personal and Social Capability.

Cross Curriculum Priority:

Sustainability

Organising Ideas:

OI. 2: All life forms, including human life, are connected through ecosystems on which they depend for their wellbeing and survival.

OI.7: Actions for a more sustainable future reflect values of care, respect and responsibility, and require us to explore and understand environments.

OI.8: Designing action for sustainability requires an evaluation of past practices, the assessment of scientific and technological developments, and balanced judgments based on projected future economic, social and environmental impacts.

*Source: (**ACARA**, 2015)*

case study:

Curtis and the 'Bird Motel'

Have you ever watched a flock of birds flying high in formation and wondered where have they come from and where are they going?

Chances are you are watching birds travelling along one of many bird routes that are travelled annually as birds undertake their annual migration, using Australia to escape the northern hemisphere winters, before taking the return flight back to Asia or Europe to feed and/or breed.

Unfortunately, bird habitat globally has been declining, therefore supporting and conserving remaining habitat, including wetland sites both within Australia and along bird migration routes, is essential to the survival of many different species.

The Gwydir Wetlands, in northern NSW provides just such a spot with its wide floodplains and watercourses containing grass and sedge meadows, cumbungi and marsh club-rush and coolibah woodlands. It's a perfect place for migratory birds to rest and recover as well as a vital place where many local water and woodland birds feed and live.

If you are a marsh sandpiper flying in from Russia—it is the perfect spot to rest and recover.

The management of environmental water by the NSW Office of Environment and Heritage in the Gwydir Wetlands has been vital in maintaining this important natural asset. So too has been the input by the local community in developing the watering plans and monitoring the outcomes.

Involving the local community, especially students, has proven that 'learning by doing' is essential in creating lifelong passion and potentially a career path—as Moree student Curtis Hayne has found.

Curtis has joined teams surveying waterbirds in the Gwydir Wetlands on several occasions since 2010, most recently in November 2015 and March 2016.

The 16 year-old from Moree began birding at the age of nine and is now a regular volunteer with the NSW Office of Environment and Heritage.

'Migratory shorebirds were particularly abundant during the November 2015 survey,' Curtis said.

'As well as 60 marsh sandpipers, we saw 30 sharp-tailed sandpipers, two black godwits, six Latham's snipes and a common greenshank. Knowing that these birds have travelled thousands of kilometres from Europe, Arctic Siberia and northern China to be here is truly amazing.'

'These birds are listed and protected under international agreements between Australia and other countries that the birds visit including Japan, China and the Republic of Korea,' he said.

Other birds seen during the survey included an adult female black-necked stork, brolgas, red-necked avocets, magpie geese, chestnut teal, Australian pratincoles, black-chinned and painted honeyeaters, white-throated needletails and glossy black cockatoos.

Curtis, along with staff from Office of Environment and Heritage (OEH) and Eco Logical Australia (ELA), observed a total of 137 bird species during the joint waterbird surveys under OEH monitoring and Australian Government-funded Long Term Intervention Monitoring (LTIM) programs.

When visited again by local OEH staff member David Preston, along with Curtis, Lew Macey and Ainslee Lines who are local Moree NSW 'Bird Atlassers', the water levels at the sites had dropped resulting in fewer waterbirds.

Local OEH Wetland and Rivers Conservation Officer Jane Humphries said the Gwydir, Gingham and Mallowa watercourses were nationally important areas and a unique and highly productive part of the western Gwydir catchment floodplain.

'With the help of volunteers like Curtis, we are able to record the diversity of vegetation and animal life and see the effects of environmental water and natural flows in action,' Ms Humphries said. 'We have also worked with many local schools and a couple from more distant areas over the last few years to undertake school excursions to the Gwydir Wetlands.'

The students get a 'hands on and muddy feet' approach to learning about the wetland with activities ranging from bird recording, vegetation identification, waterbug sampling, frog finding and practical activities around food webs, water sharing and social perspectives. Classes range from Year 5 to Year 12 and materials have been prepared for the different stages and curriculum needs. Other interested groups have also had tours of the wetlands ranging from bird enthusiasts to local Probus and community organisations.

In late November 2015, Curtis, Lew, Ainslee and David also spotted a koala during the local bird atlassers survey—an added bonus for the volunteers and OEH staff alike!

Curtis plans to study Environmental Science or Zoology after he finishes school and has found his experiences volunteering with OEH have given him firsthand knowledge of the importance maintaining wetlands.

Source: Australian Association for Environmental Education (AAEE) NSW, Conversations Newsletter, August 2016.

Fast facts
about water for the environment

- Environmental water is a share of the total water within a system which is managed to benefit the environment by either protecting it from extraction or releasing it into rivers, creeks and wetlands in a controlled way to support aquatic habitat and vegetation.
- Environmental water works by improving water quality, supporting habitat for native fish and other macro invertebrates, as well as native birds, animals and riparian and wetland vegetation.
- Each year, a plan of where environmental water will be used is published by the Office of Environment and Heritage on their website. The plan outlines where the water is expected to be used and when. The plans are developed with the local Environmental Watering Advisory Group, which has membership including landowners and government stakeholders.

For more information and opportunities to visit local wetlands in NSW contact:

Bunty Driver 02 6022 0632
Bunty.Driver@environment.nsw.gov.au

Visit **www.environment.nsw.gov.au**

Looking After Country

Read '**Tagging green turtles with Bardi Jawi rangers keeps Kimberley students busy during school holidays**', 20 April 2016, ABC News website The students assist by tagging turtles with satellite transmitters to discover more about their genetics, life cycle, travel and feeding patterns.

Quoin Island Turtle Rehabilitation Centre

Find out about the **Quoin Island Turtle Rehabilitation Centre** and how Quoin Island staff and volunteers rehabilitate sick and injured green turtles off Gladstone in Queensland.

Underwater World rescue, rehabilitate and release marine turtles

Discover how Underwater World in Mooloolaba helps '**Turtles in Trouble'**. The centre rescues, then rehabilitates and releases marine turtles in south east Queensland.

Rescuing, rehabilitating and re-homing parrots

Investigate what the **Parrot Rescue Centre** does and achieves.

Learning Experiences for **Year 5 and Year 6**

Activity 3:

Invitation to join the Future Earth Young People's Science Committee

Overview: Explain to the class that their task is to imagine they are a member of the Future Earth Young People's Sustainability Science Committee. They all have one thing in common—they are concerned about the ongoing pollution of the Earth, and of cultures not caring and respecting their homes.

Background science for students: Sustainability science

According to the U.S.-based journal Proceedings of the National Academy of Sciences (PNAS) 'Sustainability Science is about examining the interactions between the natural and social systems and how those interactions affect the challenge of sustainability meeting the needs of the present and future generations while substantially reducing poverty and conserving the planet's life support systems.

Some researchers go so far as to call sustainability science a different kind of science. It's different because it is interdisciplinary, applicable to real-world challenges and is committed to translating research into societal action. Sustainability science therefore has an inherent responsibility to ensure it is informing and is informed by what's happening in the world. It is a science that is committed to changing how people behave and transforming systems'.

*Source: '**Mobilising for sustainability: Celebrating and strengthening stories of connection**', 3 October 2016, Future Earth Blog.*

The essential question:

What happens when we understand that unless we define the future we would prefer, it may be left to others to create?

The scenario:

The Chair of Future Earth's Science Committee is seeking schools to be involved in the Future Earth Young Peoples' Sustainability Science Sub-Committee.

"As chair of the Science Committee, I strongly urge the establishment of an Australia-wide futures project staffed by young people...designed to discover or invent, examine, evaluate and propose possible, probable and preferable futures for own global life support system, our planet Earth."

Futurists seek to know:

- What can or could be the possible future?
- What is likely to be the probable future?, and
- What ought to be the preferable future?

Your challenge is to describe and predict the effect of current environmental changes on individual living things and help others understand that preferred futures can be envisioned, invented, implemented, evaluated, revised and re-visioned and empower them to know what they can do. Are you up for the challenge?

If so, then National Science Week would like you to celebrate a sustainable Future Earth and host a 'Future Earth Day' as part of National Science Week.

A suggested learning process:

Define:

Capture students' interest and share the image below of a mural that was showcased at Questacon, Australia's National Science and Technology Centre in Canberra.

*Source: UNESCO's 17 Sustainability Development Goals Mural at Questacon. **Ian Dudley** and **Anna Trundle** , 2016. Photo courtesy of Questacon, Canberra, ACT.*

Talk about Ban Ki Moon's message and brainstorm what 'Plan A' might consist of.

Share the essential question with the class and talk about Future Earth and talk about what contemporary issues students think schools should help young people explore. For example: the environment, wealth and poverty, peace and conflict, race and racism, gender and sexism, children's voices, political debates, globalisation and the future.

Present the scenario, assign pairs or small groups if appropriate, and ask students to define the task they have been set.

Discover:

Share the following 'scenarios' with the class.

Business as Usual

This future has come about because people feel comfortable with things as they are and don't imagine things being very different. It is based on the assumption that things worked reasonably well in the past and will therefore continue to do so in the future. Similar problems will occur and be dealt with in similar ways we do today. This future benefits those who are already well off and those who don't like change. It could, on the other hand, lead to an edge of disaster scenario.

Edge of Disaster

This future has come about because people and governments responsible for making decisions were too slow to act. They worked on the assumption that the problems were not serious. This assumption was wrong and the scenario shows various disasters, not all of which would necessarily occur at the same time. However, for those living in the 'poor world', many of these disasters are already here as a result of 'rich world' policies. This future doesn't benefit anyone. It can, however, encourage people and governments to make significant changes in the way that they live.

Technological Fix

This future has come about because people felt that rapid growth of science and technology would solve all their problems. It is based on the assumption that what can be invented always should be invented. This future can bring many benefits but can have many unforeseen consequences. At the same time it also involves dominating nature and thus cuts people off from the natural environment on which all life depends.

Sustainable Development

This future has come about because people recognised the need for major change. It is based on the assumption that caring for the environment, other people and future generations also brings a better quality of life than at present. This future brings less stressful and simpler lifestyles for many people. Developments in science and technology are used by the community to meet their own local needs.

Source: Hicks, D. (2014) ***Educating for Hope in Troubled Times: Climate change and the transition to a post-carbon future****, London: Trentham Books/Institute of Education Press.*

Talk about the fact that these scenarios are not predictions about the future, but rather possible futures that could occur in industrialised countries, like Australia, if different trends and events occurred.

Ask students questions like:

- Do you think people might like living in these possible futures?
- What are some of the positive things about these possible futures?
- What are some of the negative things about them?
- What might be the advantages and disadvantages of living in each of these scenarios?
- Who might benefit and who might lose in these possible scenarios?
- What might make any of these futures more or less likely in terms of what you do?
- Can you describe why you would or wouldn't like to live in these possible futures?
- If not these scenarios, then what other alternatives might there be for 'Future Earth'? Elaborate on your own preferred scenario and explain the factors that could lead to this coming about.

Collate and display ideas.

Source: Adapted from: Hicks, D. (2014) ***Educating for Hope in Troubled Times: Climate change and the transition to a post-carbon future****, London: Trentham Books/Institute of Education Press.*

Dream:

In pairs or small groups envision or dream about the many possible solutions to a preferred future in which there can be a sustainable 'Future Earth'.

Further develop ideas for possible solutions using sketches and labels.

Ask students to visualise their most creative solution.

Invite students to think about what materials, tools, equipment and ingredients they will need to make their solution a reality.

Remind students that their solution needs to also explain and help others understand that preferred futures can be envisioned, invented, implemented, evaluated, revised and re-visioned and empower them to know what they can do.

Design:

Invite students in their pairs or small groups begin drafting their designs for their solutions.

Ask students to draft the steps involved in making their 'Future Earth Day' item.

Ask students to gather the materials, tools and equipment needed and then design and create their solution.

Invite a peer class group to the class to hear from the Future Earth Science Sub-Committee and find out more about the preferred futures can be envisioned, invented, implemented, evaluated, revised and re-visioned and empower them to know what they can do.

Deliver:

Pairs or small groups, showcase their preferred future for 'Future Earth'.

Classes host a 'Future Earth Day' as part of National Science Week and invite students, teachers and parents to discover what they can do too!

Debrief:

Ask students to reflect on their learning and draw something new they learnt about.

Ask students to describe what worked well and not so well in their efforts to create a preferred 'Future Earth'.

Links to the Australian Curriculum

Science

Year 5 and Year 6

Science as a Human Endeavour – Nature and development of science

Science involves testing predictions by gathering data and using evidence to develop explanations of events and phenomena and reflects historical and cultural contributions **ACSHE081** **ACSHE098**

Science as a Human Endeavour – Use and influence of science

Scientific knowledge is used to solve problems and inform personal and community decisions **ACSHE083** **ACSHE100**

Science Inquiry Skills

With guidance, pose clarifying questions and make predictions about scientific investigations **ACSIS231ACSIS232**

Identify, plan and apply the elements of scientific investigations to answer questions and solve problems using equipment and materials safely and identifying potential risks **ACSIS086** **ACSIS103**

Compare data with predictions and use as evidence in developing explanations **ACSIS218** **ACSIS221**

Communicate ideas, explanations and processes using scientific representations in a variety of ways, including multi-modal texts **ACSIS093** **ACSIS110**

General Capabilities:

Literacy; ICT capability, Critical and creative thinking, Ethical Understanding and Personal and Social Capability.

Cross Curriculum Priority:

Sustainability

Organising Ideas:

OI 2: All life forms, including human life, are connected through ecosystems on which they depend for their wellbeing and survival.

OI.3: Sustainable patterns of living rely on the interdependence of healthy social, economic and ecological systems.

OI.4: World views that recognise the dependence of living things on healthy ecosystems, and value diversity and social justice are essential for achieving sustainability.

OI.5: World views are formed by experiences at personal, local, national and global levels, and are linked to individual and community actions for sustainability.

OI.6: The sustainability of ecological, social and economic systems is achieved through informed individual and community action that values local and global equity and fairness across generations into the future.

OI.7: Actions for a more sustainable future reflect values of care, respect and responsibility, and require us to explore and understand environments.

OI.8: Designing action for sustainability requires an evaluation of past practices, the assessment of scientific and technological developments, and balanced judgments based on projected future economic, social and environmental impacts.

*Source: (**ACARA**, 2015)*

case study:

Tomorrow's Leaders for Sustainability

Background

The Tomorrow's Leaders for Sustainability (TLfS) program helps young people to understand the key principles and issues of sustainability while gaining the knowledge and skills to become leaders in their communities. Through the TLfS program students learn about the world around them; how to live more sustainably; develop their skills in leadership, thinking, problem-solving, teamwork and communication; apply those skills to meaningful sustainability projects; and to act ethically and responsibly.

The TLfS program is delivered by trained facilitators and mentors who spend a couple of hours per week over one or two terms, guiding students through leadership activities, sustainability projects, and time investigating local environments. It involves three elements; Education Activities, Project Activities and Leadership Activities. It can be delivered in various formats across different year levels. Its strength lies in the community partnerships it builds through targeted projects and events.

The TLfS vision is to inspire people everywhere to live more connected to the natural world and lead their communities towards a sustainable future.

Stella Maris Primary School

Through the TLfS program the Year 6 students at Stella Maris Primary School, Beaumaris Victoria, participated in weekly TLfS sessions delivered by the Port Phillip EcoCentre that focused on developing leadership skills, understanding the local environment and strengthening the student's connection to these specific sites.

Students visited three sites—Ricketts Point Marine Sanctuary, Balcombe Park and Long Hollow Heathland—all within 30 minutes walking distance of the school. Each outdoor session was followed by sessions at the school focussing on:

- Science of flora and fauna
- Change over time at these sites
- How to experience these rich local environments.

Students' experiences at these sites was enriched by meeting local experts from Port Phillip EcoCentre, City Wide Bushland and Nursery staff, Friends of Native Wildlife volunteers and an Indigenous educator from the Boon Wurrung Foundation.

The student projects focused on improving their school grounds including designing and installing productive gardens and installing habitat extras to attract native wildlife into their school. Through the leadership skills learnt through the program the students worked in groups to develop and complete these projects. The students also involved the broader school community through their 'Greening our school' survey. The Tomorrow's Leaders for Sustainability program also assists the school with completing their ResourceSmart Schools (known as AuSSI outside of Victoria) in sustainability actions. Stella Maris Primary School completed this program through financial support from Bayside City Council.

Ricketts Point Marine Sanctuary, Beaumaris

As we arrived at Ricketts Point there was the really strong smell of gum leaves in smoke. In the distance I could see smoke coming from behind the bushes. We walked and saw it was a bonfire. Our group sat in a circle and watched him add gum leaves and ballee (cherry ballart) to the fire. The ballee made it smell really nice. ***Caitlin.***

Dean immediately told us who he was and that he was from the Boon Wurrung Foundation where he talks to different schools about Aboriginal culture and tries to make awareness that this is and used to be Aboriginal's land. Some of the facts he told us were very horrific, I was very surprised of the some things he told us about. This experience definitely made me, as a leader; realise how special it is to keep the land clean and healthy. I would recommend this experience as it builds awareness and also tells you facts about what life was like back then. ***Lucie***

I recommend that people take the time to get to know our country better. ***Zoe***

Ricketts Point Marine Sanctuary. Dean Stewart from the Boon Wurrung Foundation explains to students the Aboriginal connection to Port Phillip.

Balcombe Park, Beaumaris

To the normal passer by Balcombe Park looks like a normal soccer pitch with a bunch of tress around it. Even after just a couple of minutes walking through the park, you realise that it is so much more. The most plain and useless logs are home to 100s of ants and you can only see the ants once you lift up the logs. I recommend going through the park during spring when the orchids flower, the love creeper and the wedding bush are in flower. *Adam*.

When I arrived at Balcombe Park all I thought it was were trees and nature for animals. We walked around and saw how logs are left on the side for a reason. They leave the logs on the side so an animal can make a home. *Jarrod.*

Long Hollow Heathland, Beaumaris

Students kept reflective journals to record what they knew about the site before visiting and what they learnt, felt or experienced after visiting the site.

Additional information:

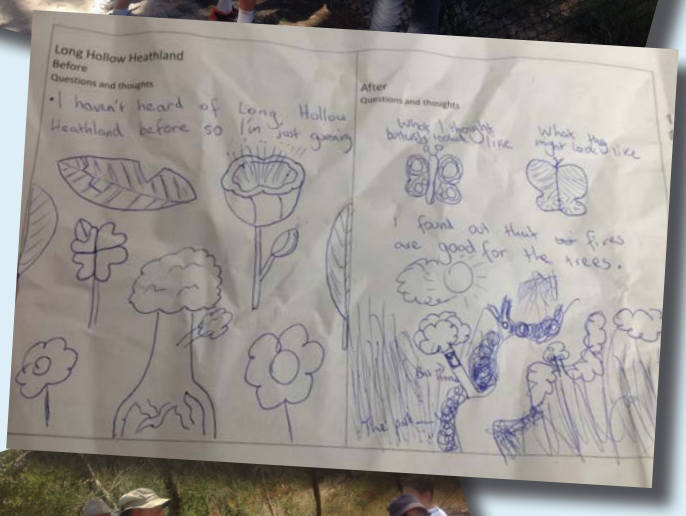
'**School Programs'**, Tomorrow's Leaders for Sustainability website

Port Phillip EcoCentre. 2016. **School Programs 2016–2017**, EcoCentre website.

ResourceSmart Schools | Embedding sustainability in Victorian schools website.

'**Australian Sustainable Schools Initiative (AuSSI)**', National Library of Australia, Australian Government Web Archive website.

When students visited Balcombe Park, they learned from City Wide Bushland staff about fire regeneration and evidence of a local creek.



Students heard from local Friends of Native Wildlife volunteers on how local bats are tracked and identified when they visited Long Hollow Heathland.

additional case studies:

Watch '**ResourceSmart Schools – Engaging students in sustainability**', YouTube (3:32 min). A case study about the ResourceSmart Schools Program in Victoria and check out the range of real life learning activities students are involved in.

Discover more about Coolbina Primary School's 10 Tonne Carbon Emission Reduction Plan. Read their case study at '**A school and community case study: carbon emissions reduction at Coolbinia PS**', Sustainability in Schools website.

Find out about Girraween Primary School in the Northern Territory and how it uses a worm farm to reduce waste and create fertilisers. See Junior Landcare. 2015. **I'd like to make that: How to build a worm farm**, Landcare Australia website.

Activity 4:

Lead the Way to Sustainability

Overview: Explain to the class that their task will be to explore a range of ways students are leading the way and tackling sustainability issues. Their task is to think about and find solutions to local environmental issues and living sustainably as part of National Science Week in 2017.

Background science for students: What is a scientist?

A scientist is someone who uses a systematic approach to acquire new knowledge. A scientist can also be defined as someone who uses the scientific method and performs research work.

A scientist may be an expert in one or more areas of science, such as biology, or agriculture, space, food, nutrition or plants.

Being a scientist begins by ***thinking*** like a scientist. Scientists are curious about how the world works; they have many questions and go about answering those questions using the scientific method.

If you are fascinated by how things work and why they work a certain way, you too could become a scientist!

To work as a scientist, a person usually needs a degree in science. A degree is obtained by attending university and getting a Bachelor of Science or Engineering degree.

The essential question:

What is the best way to get people thinking about finding solutions to local environmental issues and living sustainably as part of National Science Week in 2017?

The scenario:

The National Science Week team is searching for schools to investigate ways to bring awareness to the social and environmental issues that feature as part of National Science Week this year!

There are ways to bring awareness to the theme 'Future Earth' and to the issues of responsible management of the planet's natural resources and living sustainably.

Future Earth's 2025 vision addresses eight key challenges to global sustainability:

- Deliver water, energy, and food for all
- Decarbonise socio-economic systems to stabilise the climate
- Safeguard the terrestrial, freshwater and marine natural assets underpinning human well-being
- Build healthy, resilient and productive cities
- Promote sustainable rural futures
- Improve human health
- Encourage sustainable consumption and production patterns, and
- Increase social resilience to future threats.

*Source: Adapted from '**Our vision'**, Future Earth website.*

Bring your ideas alive with rich images and a unique story about living sustainably and share them with ASTA and others in your community. What about a video, animated cartoon, or documentary...???

Show the National Science Week team and other audiences ways to bring awareness to the theme 'Future Earth' and to the issues of responsible management of the planet's natural resources and living sustainably.

A suggested learning process:

Define:

Capture students' interest and share a selection of paintings from the **International Children's Painting Competition** (United Nations Environment Programme).

Choose the 'Videos' feature on the top toolbar rand view an array of videos created by students globally about issues affecting the planet Earth.

Delve into the photo gallery about 'Food Waste'.

Check out the photo gallery that features students ideas about other social and environmental issues affecting planet Earth.

Ask students what they might need to know more about, in order to undertake the challenge set by the National Science Week team. Might they need to know something about the key challenges to global sustainability?

Brainstorm what students know about sustainability, sustainable development, and key challenges to global sustainability. List key words and create a flow chart to show links between the students' ideas.

Discover:

Read the '**Voice of Children and Youth for Rio+20'** created during the 2011 Tunza International Children and Youth Conference in Bandung in Indonesia.

Discover their 'Promises', 'What they are going to do', 'What a Green Economy Means to Children and Youth', 'What Governments and Corporations Need to Deliver', and 'What Governance Means to Children and Youth'.

Talk about their declaration for environmental justice for all the generations to come.

Ask the students the question: 'What can we do?', 'What can we talk about?'; 'What can we speak out on?'

Brainstorm ideas and collate them around the eight key challenges to global sustainability:

- Deliver water, energy, and food for all
- Decarbonise socio-economic systems to stabilise the climate
- Safeguard the terrestrial, freshwater and marine natural assets underpinning human well-being
- Build healthy, resilient and productive cities
- Promote sustainable rural futures
- Improve human health
- Encourage sustainable consumption and production patterns, and
- Increase social resilience to future threats.

Discover more about what schools in Australia are achieving and the different approaches they are undertaking to 'Lead the Way to Sustainability'.

Explore how students from Silkwood School in south-east Queensland teach others to connect and build deeper understandings to themselves, others and the environment. See '**Little River'**, Vimeo (3.30 min) and '**Silkwood School Spirit'**, YouTube (4:25 min).

Talk about whether these students' understandings and projects might be a great idea for 'Future Earth'.

Check out how Pennant Hills Public School in NSW has created a solution...a 'bird haven'. Watch '**Small Bird Haven at Pennant Hills Primary School**', Filmpond (5:33 min).

Talk about the value of bird havens that provide nests, food and shelter on 'Future Earth'.

View a '**Planting Lilly Pillies to Improve Air Quality at Belmore South PS**', Filmpond (6:33 min) and discover how Belmore South Public School has created a range of outdoor spaces, environmental assets, in particular, how lilly pilly plants are protecting them from more than 39 000 cars that pass by each day and the pollution and noise created by that volume of traffic

Hear about the problem solving activities and thinking the students have used and developed while creating their native garden.

Talk about the importance of working together to create solutions.

Discover what solutions for 'Future Earth' are being created at Cambridge Gardens Public School. Watch '**Cambridge Gardens Gardening Club**', Filmpond (3:01 min).

View the video '**SolarBuddy featuring on Totally Wild – Ten Network'**, YouTube (3:15 min) that features the 'SolarBuddy' program which provides an authentic platform for the students to gain a deeper understanding about how our actions can change a place and its people.

Brainstorm ideas for videos, animated cartoons, and documentaries.

Invite students, to select the idea that really 'grabs' them, and then draft their storyboard.

Dream:

Ask students to visualise a work sample that speaks 'Future Earth'.

Ask students to imagine what their work samples might look like and how they will bring awareness to the theme 'Future Earth' and to the issues of responsible management of the planet's natural resources and living sustainably.

Design:

Ask students to design their work sample.

Ask students to gather the materials, tools, and equipment needed and then design their work sample.

Deliver:

Create the work samples about 'Future Earth'.

Deliver work samples to real audiences during National Science Week and discuss the issues of responsible management of the planet's natural resources and living sustainably.

Share photos and students' work samples and presentations via National Science Week's online community. The Australian Science Teachers Association loves to see pictures of young people in the classroom learning, and to share photos via email at **nscwk@asta.edu.au** or share on what has been created via Facebook, Instagram or Twitter with #natsciwk! Please ensure that you have parental permission prior to posting any images of students.

Debrief:

Ask students to recall what they learned.

Talk about what they might still like to find out.

Discuss the phrase spoken by John F. Kennedy, "One person can make a difference and everyone should try it". Discuss with students whether they feel empowered and whether they can make a difference post their learning in this unit of work?

Ask students to describe their favourite part of creating a work sample about 'Future Earth' and showcasing the issues of responsible management of the planet's natural resources and living sustainably.

Links to the Australian Curriculum

Science

Year 5 and Year 6

Science as a Human Endeavour – Nature and development of science

Science involves testing predictions by gathering data and using evidence to develop explanations of events and phenomena and reflects historical and cultural contributions **ACSHE081** **ACSHE098**

Science as a Human Endeavour – Use and influence of science

Scientific knowledge is used to solve problems and inform personal and community decisions **ACSHE083** **ACSHE100**

Science Inquiry Skills

With guidance, pose clarifying questions and make predictions about scientific investigations **ACSIS231** **ACSIS232**

Identify, plan and apply the elements of scientific investigations to answer questions and solve problems using equipment and materials safely and identifying potential risks **ACSIS086** **ACSIS103**

Compare data with predictions and use as evidence in developing explanations **ACSIS218** **ACSIS221**

Communicate ideas, explanations and processes using scientific representations in a variety of ways, including multi-modal texts **ACSIS093** **ACSIS110**

General Capabilities:

Literacy; ICT capability, Critical and creative thinking, Ethical Understanding and Personal and Social Capability.

Cross Curriculum Priority:

Sustainability

Organising Ideas:

OI 2: All life forms, including human life, are connected through ecosystems on which they depend for their wellbeing and survival.

OI.3: Sustainable patterns of living rely on the interdependence of healthy social, economic and ecological systems.

OI.4: World views that recognise the dependence of living things on healthy ecosystems, and value diversity and social justice are essential for achieving sustainability.

OI.5: World views are formed by experiences at personal, local, national and global levels, and are linked to individual and community actions for sustainability.

OI.6: The sustainability of ecological, social and economic systems is achieved through informed individual and community action that values local and global equity and fairness across generations into the future.

OI.7: Actions for a more sustainable future reflect values of care, respect and responsibility, and require us to explore and understand environments.

OI.8: Designing action for sustainability requires an evaluation of past practices, the assessment of scientific and technological developments, and balanced judgments based on projected future economic, social and environmental impacts.

*Source: (**ACARA**, 2015)*

case study:

The Moth Mob, Berry Springs Primary School, NT

Not all schools have a zoo in their back yard, but not all schools are Berry Springs Primary School.

Uniquely positioned next door to the Territory Wildlife Park, the school has a history of students, teachers, parents and community members participating in exciting projects and learning activities both on school grounds, as well as within the rich and engaging environment of the Territory Wildlife Park.

In 2016, a collaborative partnership was formed between Berry Springs Primary School and the Territory Wildlife Park, working together with various agencies and individuals to develop and implement the Atlas Moth project. Learning about the moth's history, biology, biogeography, threats and breeding requirements, students started preparing for assisting with captive breeding by investigating different propagation techniques for known food plants and conducting monitoring for invasive ant species.

The Atlas Moth (***Attacus wardi***) is a very large moth with a wing span that reaches up to 17 cm. They are limited in their distribution to monsoon vine forests in Northern Australia. They are classified as vulnerable as they are only found in a few locations and there are threats to their habitat. These include introduced weeds and inappropriate fire regimes that penetrate the forest edges where the caterpillars make their cocoons.

Atlas Moth populations in the Darwin region have declined over the years from insecticide used during World War II, the impact of habitat loss from Cyclone Tracey and population growth in urban regions.

A number of propagation trials have been carried out by Berry Spring's students on one of the Atlas Moth's known food plants ***Pittosporum moluccanum***. By growing food plants the students are actively participating in revegetation of Atlas Moth habitats and growing the large amount of food required for captive breeding to further study the moth's reproductive biology behaviour.

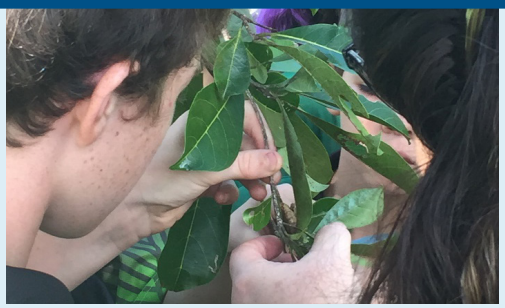
Interpretive material in the form of signs with QR codes are being co-created with Territory Wildlife Park Staff. Visitors are able to view video and multimedia presentations created by the students as they explain the significance of the food plants, the life cycle and the threats the moths are experiencing.

Students conducting seed propagation trials

Field trip to the Atlas Moth habitat monsoon vine forest with our Scientist in School partner Dave Liddle

Students learning about propagation techniques with Territory Wildlife Park horticulturist Sarah Hirst

Students working with local lepidopterist Geoff Martin



Students collecting cuttings

"The Felted Forrest" is a community arts project that will be hosted at the Territory Wildlife Park when Berry Springs' students, staff local artists and crafters will together be creating various stages of the life-cycle of the Atlas Moth. Using a variety of techniques including quilting, wet and dry felting and silk collage, a dynamic art installation will be created for display in the Nocturnal House alongside live Atlas Moths and caterpillars. This project will connect communities through arts and craft. It will also assist in empowering the community to become interpreters and educators in raising awareness of critical issues around species extinctions.

Students are the scientists and just as importantly, the voice for this vulnerable species. Strongly linked to the science curriculum in knowledge, inquiry and human endeavour, innovative pedagogy and rich partnerships see the development of futures focused, real, rich and relevant project based learning. Students are designing experiments, preparing interpretive material, participating in exhibitions of arts based learning and embracing technology to tell the plight of the Atlas Moth.

Source: Jenni Webber, Assistant Principal, Berry Springs Primary School, Northern Territory, January 2017.

Trial interpretive signage by Berry Springs students

Atlas Moth larval food plants at the Territory Wildlife Park

Female Atlas Moth

additional case studies:

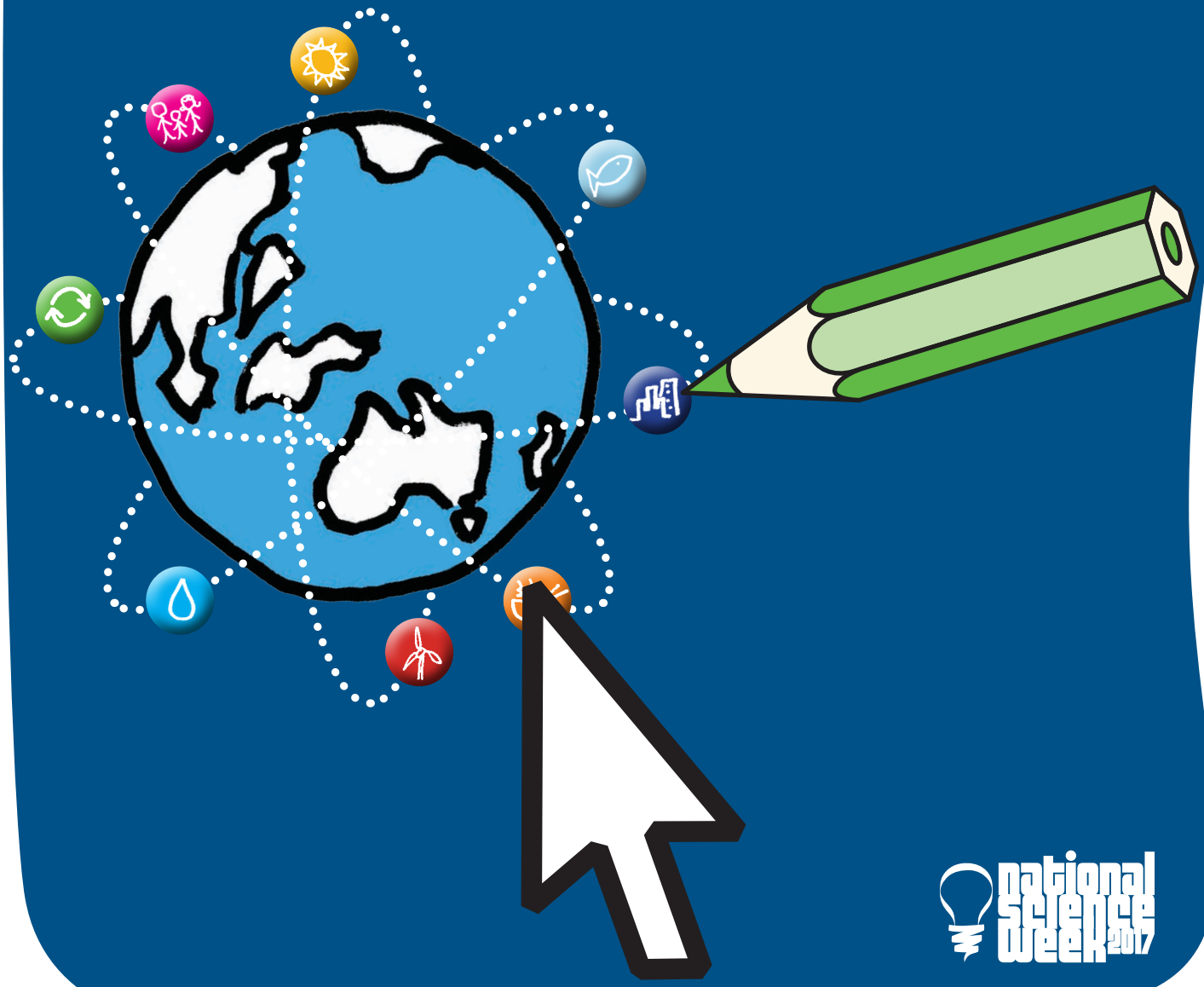
Discover some of the sustainability projects undertaken by ResourceSmart Schools in Victoria by watching '**ResourceSmart Schools awards 2014**', YouTube (5:44 min)

Find out about '**Grow Lightly, South Gippsland**', YouTube (3:00 min) and their community project to support their community access locally grown fruits and vegetables

Find out about '**Youngtown Primary School**' YouTube (4:59 min) in Tasmania and how students are being prepared for the future.

Future Earth

Primary School Activity Ideas for National Science Week



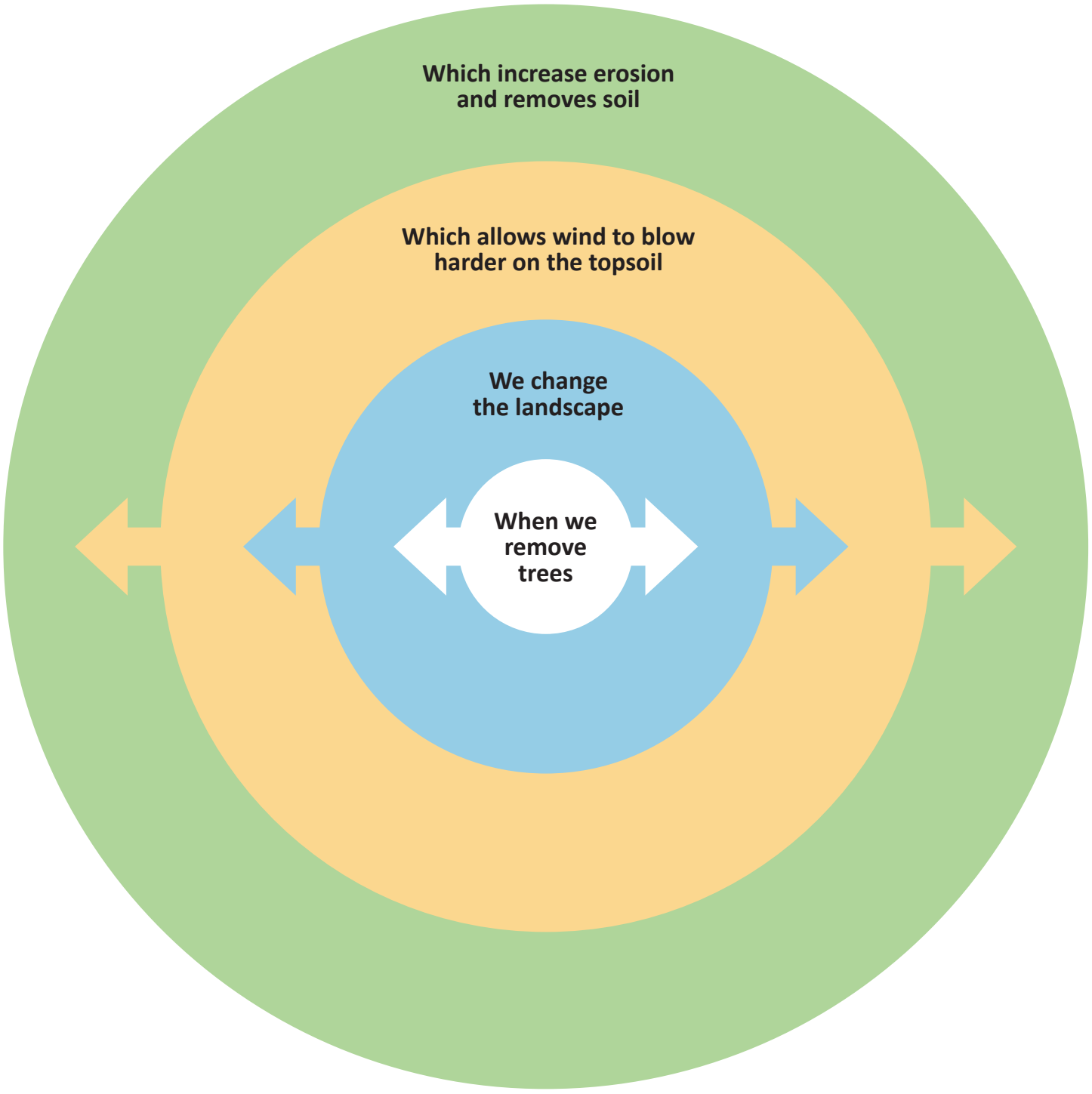
Futures Wheels

Futures Wheels are used to explore wide ranging consequences that can follow from a particular decision, trend or event in the present.

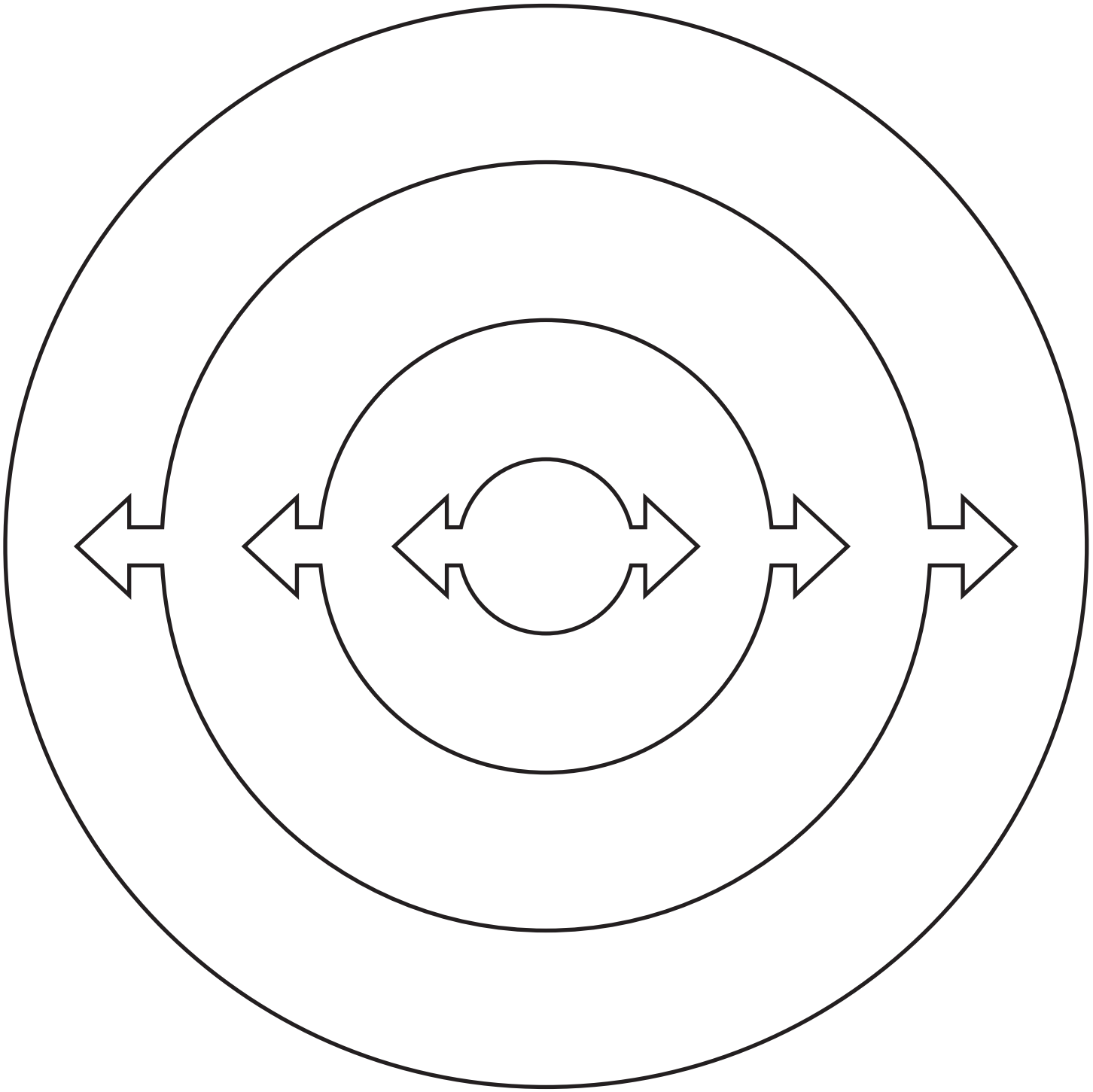
Look at the example below and explore the focus by asking the question "What are the immediate consequences?"

Write the immediate consequences in the inner ring around the main idea. Link each consequence to the main idea with a single line. This indicates that they are first order consequences. Continue exploring second, third and forth order consequences using the outer circles.

Use the four concentric circles below to explore the consequences of an action, issue or trend relevant to the solutions you have considered for ways to attain a sustainable 'Future Earth'.



Create your own ‘Futures Wheel’ using the illustration below and a local issue.



Create a Talking Avatar

Imagine how a talking 'Future Earth' might be able to share information on how we can all build and maintain a strong healthy 'Future Earth' throughout our lifetime.

Task students with creating their own talking avatar, one that shares tips on how to build and maintain strong healthy 'Future Earth'.

What might their avatars say?

Find out more about creating avatars at **http://www.voki.com/**

Make Your Own Compost

Select a suitable site in your garden or the school yard. The site should not get too hot, so find a spot that gets some shade.

Set up the compost bins or build a series of compost bays of timber, bricks or sheets of iron (2 x 2 metres with side walls 1.3 metres high is a common size).

Start the compost heap by layering materials, e.g. small prunings on the bottom followed by layers of lawn clippings and weeds, food scraps, clippings, prunings, food scraps, and so on until the bin or bay is full. Cover the compost with straw or old carpet underlay to keep it moist. Let this pile go through its composting process; don't add to it but rather start a new compost pile.

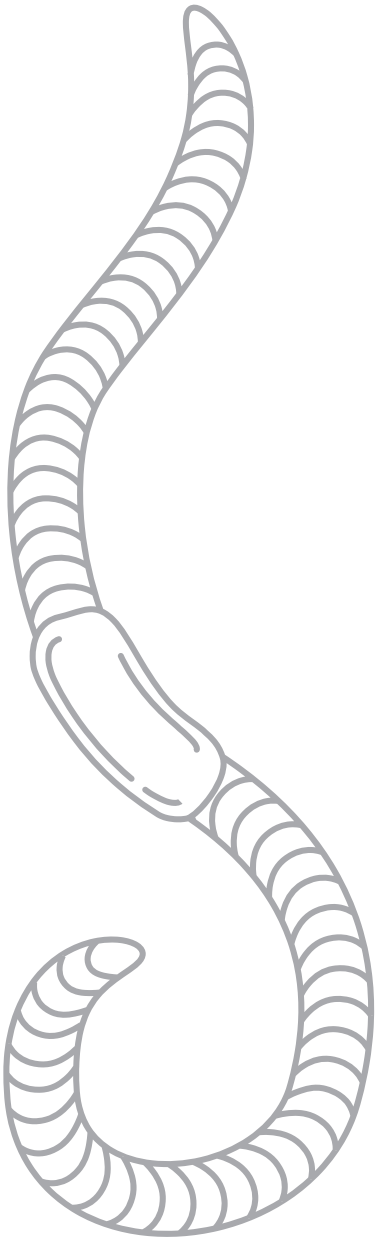
Check the compost regularly. Keep it moist (not wet) and turn it once every 1-2 weeks. Turning is made easier if you have two bins or bays that you can use. Simply fork the pile from one area to the other. The pile will get quite hot during the composting process, reaching 50–60°C. You can keep track of the temperature changes using a thermometer.

Worms will help the composting process but will only be present once the temperatures drop below 30°C.

After 2–6 months (time will depend on size of heap, materials being composted and seasonal conditions) your compost will be ready to use. Finished compost is dark in colour, friable and sweetly smelling. Dig it into new garden beds or spread it on top of existing beds. Watch your plants grow!!

Build a Worm Farm

Building a worm farm requires a styrofoam box which has small holes in the bottom of the box so that there are no problems with drainage and so that the worms will not drown.



You will need to:

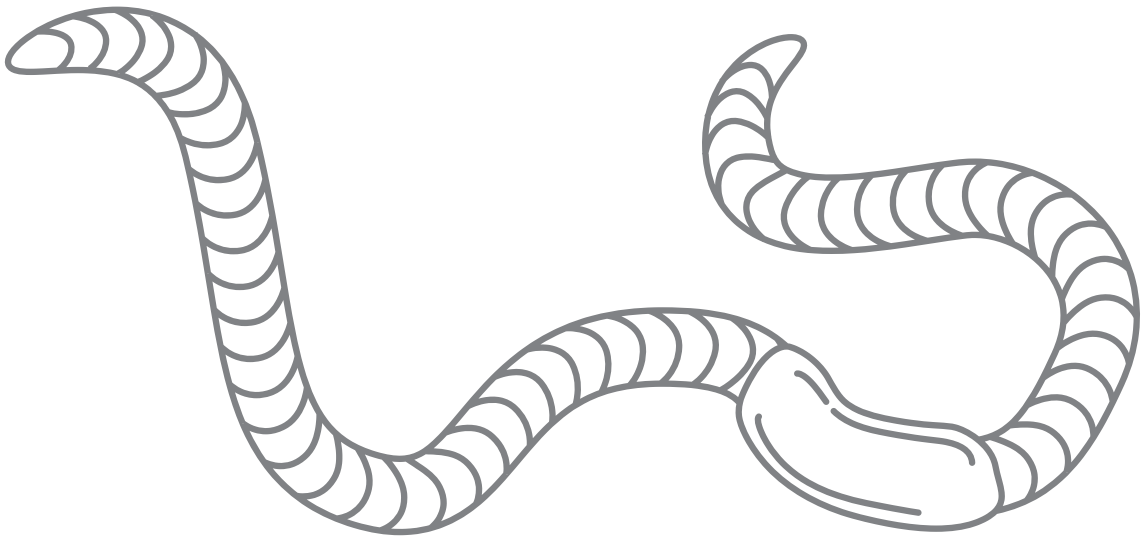
- Half fill the box with bedding material for the worms—this may be garden soil which can be mixed with organic matter such as decomposed compost, cow manure, sheep manure or horse manure.
- Moisten the bedding with a fine spray of water, as worms need moisture to survive.
- Add small pieces of food scraps in heaps on areas of the bedding surface.
- Add a layer of composting earthworms on top. The worms will congregate in the scraps or tunnel beneath the surface.

To maintain your worm farm, you will need to:

- Ensure that citrus peel, onions, garlic and artichokes are not given to the worms.
- Ensure that the bedding remains a neutral environment, around pH 7.
- Sprinkle the surface with lime or dolomite every 2 or 3 weeks, as this keeps the mixture sweet and palatable for the worms.
- Keep the worm farm in a cool well-protected shady place, which can be either inside or outside the classroom.
- Cover the worm farm, keeping it dark and well protected. Weed matting, hessian or old, clean carpet is useful as they help the farm to retain moisture and do not seal the surface, but allow water to pass into the soil. It also allows oxygen to get into the soil for the worms to breathe.
- Add more food scraps when the worms have partially eaten the available scraps.
- Observe how over time the scraps and bedding will be converted into rich organic substance called vermi-compost or worm castings.
- Harvest the vermi-compost or castings after approximately three months. Separate the worms from the vermi-compost and use it on the school garden. Worms are light sensitive, therefore use a desk lamp to help in the separating process.

Vermi-compost or worm castings can be packaged and sold as a great fundraiser too!

Adapted from: Junior Landcare. 1992. ***'How-to-Guide. Building a worm farm…it's fun and easy!'****, Landcare Australia website.*




CUBE RIDER
WE TEACH TO
inspire
WHAT'S MORE EXCITING THAN SENDING YOUR CODE TO OUTER SPACE?
JOIN OUR MISSION TO INSPIRE STUDENTS THROUGH PROJECT BASED LEARNING THAT IS LITERALLY OUT OF THIS WORLD.
JOIN OUR 2017 SPACE MISSION TODAY!
#LIFTOFF17
WWW.CUBERIDER.COM

Future Earth

Secondary Years of Schooling
Year 7 - Year 10

national science week 2017

Activity 1:

Designing and Implementing Sustainable Solutions

Overview: Explain to the class that they will be exploring green infrastructure and the creation of sustainable residential areas.

Background science for students: Landscape science

People who study landscape science might be known as landscape architects, but also as landscape geographers, landscape engineers, and landscape anthropologists, landscape ecologists, landscape archaeologists, and landscape urbanists, or they might call themselves, more generally, landscape scientists.

Like sustainability science, landscape science is multidisciplinary, applicable to real-world challenges and is committed to translating research into tangible action.

The global research program, 'Future Earth' is a 10-year initiative to advance Global Sustainability Science, build capacity in this rapidly expanding area of research and provide an international research agenda to guide natural and social scientists working around the world. 'Future Earth' works with landscape architects to see how cities can best play their role in contributing to global sustainability whilst being very liveable,

The essential question:

What is the best way to get people thinking about finding solutions to local environmental issues and living sustainably?

The scenario:

The National Science Week team is searching for schools to investigate ways residential developments can be designed in ways where water, energy and waste is used and managed sustainably, where fresh food is available and grown locally—thereby keeping food miles to an absolute minimum—and where cooler environments are planned with lots of green-spaces. Your task is to build awareness of these opportunities as part of National Science Week this year!

Become an environmental designer and use your ingenuity and creativity and design a new residential development. Your design needs to include sustainable water, energy, waste, food and green-space solutions that can benefit the environment, and those living there.

Are you up for the challenge? How could this change your town?

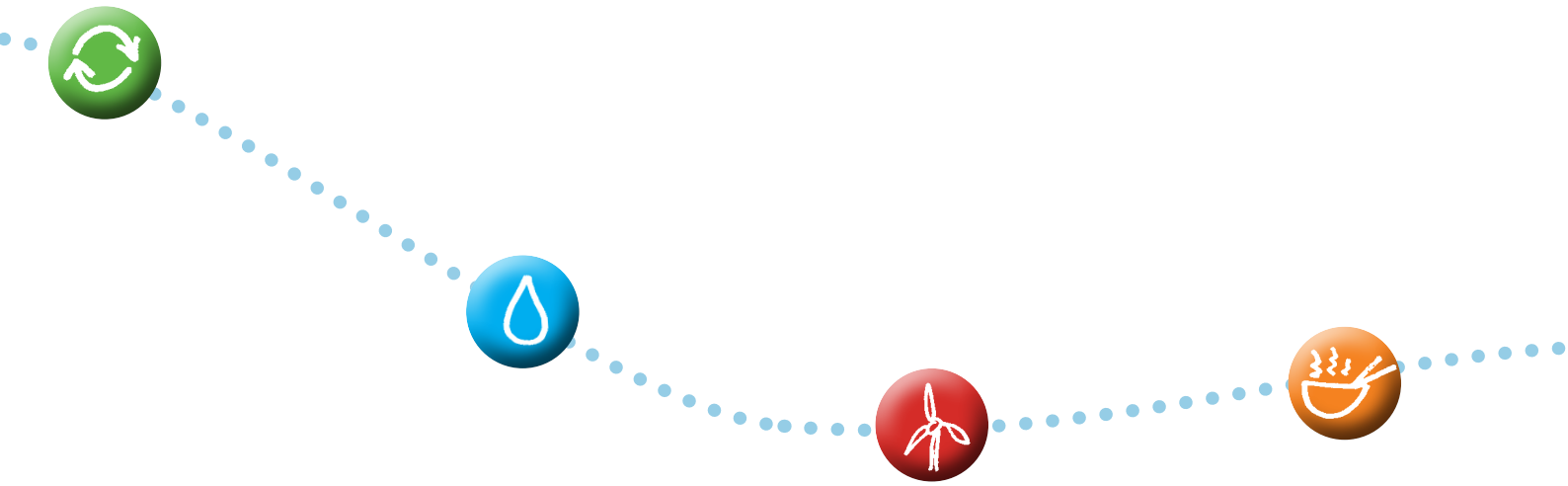
High, low and no tech options are available.

High Tech: You can design and produce your new look residential development digitally using an app or software to create original graphics.

Low Tech: You can design and produce your new look residential development using a standard computer, graphics provided and editing software. How about designing and building in **Canva**?

No Tech: You can design and produce your new look residential development using art materials, poster board and hand written information and drawings.

What kind of researcher and environmental designer will you be?



A suggested learning process:

Define:

Capture students' interest and display the design ideas that a South Australian Company 'Ecocreative' created for a '**CRC Water Sensitive Cities**' project.

Talk about the design and how it showcases approaches that connect with and respond to sustainability challenges.

Discover:

Discover another Ecocreative project, **Sustainability at the Summit: green retrofitting explained** that actually introduces sustainability features into an older building.

Check the interactive—**Living Sustainably: an interactive neighbourhood supporting greener lifestyles**'—developed by Ecocreative for the **Mount Barker Regional Council**. This interactive helps others understand what 'living sustainably' might mean.

Take one idea, and like these designers, design solutions to attain a sustainable residential development on 'Future Earth'.

Discuss students' ideas.

Create displays to show what has been discussed and learned, and how together, sustainable choices and differences can be made.

Categorise the different actions and make word lists for each category.

Collate energy saving actions.

Collate reducing, reusing, recycling, recovering, rethinking and remanufacturing solutions.

Collate water conservation and best practice management actions.

Collate biodiversity enhancement ideas.

Collate sustainable food and farming actions.

Collate actions to tackle a changing climate.

Collate ideas to improve people's health and wellbeing.

Collate ideas to change lives and the Earth.

Ask students to undertake some 'scientific research' for their solutions.

Talk about the many ways to ask questions.

Use the following 'Question Grid' and encourage students to devise questions that we may need to ask to help us then plan for a sustainable residential development on Future Earth.

What is?	Where/ when is?	Which is?	Who is?	Why is?	How is?
What did?	Where/ when did?	Which did?	Who did?	Why did?	How did?
What can?	Where/ when can?	Which can?	Who Can?	Why can?	How can?
What would?	Where/ when could?	Which could?	Who would?	Why would?	How would?
What will?	Where/ when will?	Which will?	Who will?	Why will?	How will?
What might?	Where/ when might?	Which might?	Who might?	Why might?	How might?

Dream:

Ask students to visualise a sustainable residential development on 'Future Earth'. What might it look like? What might it sound like? How might it feel?

Invite students to sketch a plan of what their sustainable residential development might contain and look like.

Develop possible solutions for attaining a sustainable residential development on 'Future Earth'.

Ask students to imagine the actions and steps involved in making their work sample for National Science Week.

Challenge students to think about the materials, tools, and equipment they will need to make their work sample too.

Ask students to visualise their work sample. What sustainable living features might they include?

Ask students to imagine how their work sample might feature in the school's National Science Week activities.

Invite students to think about how they might present their work sample during National Science Week.

Design:

Ask students to design their sustainable residential development's layout and sustainability features.

Ask students to take on the role of an environmental designer and draft their solution, and plan what illustrations will complement the text.

Invite a peer class group to the class and ask students to explain their concepts to this audience and seek feedback on their ideas.

Deliver:

Create the sustainable residential development designs.

Prepare a display of students' designs.

Visit local councillors during National Science Week to show them the designs of sustainable residential developments.

Share photos and students' work samples via National Science Week's online community. The Australian Science Teachers Association loves to see pictures of students in the classroom learning, and to share photos via email at **nscwk@asta.edu.au** or share what has been created via Facebook, Instagram or Twitter with #natsciwk! Please ensure that you have parental permission prior to posting any images of students.

Debrief:

Ask students to recall what they learned about how we can design sustainable residential developments.

Talk about what they might still like to find out about how we can do this, and whether they want to do something in their own city, suburb, town, school or street as a result.

Ask students to describe their favourite part of creating a designed solution and sharing it with others as part of National Science Week.

Links to the Australian Curriculum

Year 7, Year 8, Year 9 & Year 10

Technologies

Design and Technologies Knowledge and Understanding

Year 7 & 8

Investigate the ways in which products, services and environments evolve locally, regionally and globally and how competing factors including social, ethical and sustainability considerations are prioritised in the development of technologies and designed solutions for preferred futures **ACTDEK029**

Year 9 & 10

Critically analyse factors, including social, ethical and sustainability considerations, that impact on designed solutions for global preferred futures and the complex design and production processes involved **ACTDEK040**

Science

Science as a Human Endeavour: 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** **ACSHE135**

People use science understanding and skills in their occupations and these have influenced the development of practices in areas of human activity **ACSHE121** **ACSHE136**

Science as a Human Endeavour: Nature and use of science

Science knowledge can develop through collaboration across the disciplines of science and the contributions of people from a range of cultures **ACSHE223**

Cross Curriculum Priorities:

Sustainability

Organising Ideas:

OI 2: All life forms, including human life, are connected through ecosystems on which they depend for their wellbeing and survival.

OI.3: Sustainable patterns of living rely on the interdependence of healthy social, economic and ecological systems.

OI.4: World views that recognise the dependence of living things on healthy ecosystems, and value diversity and social justice are essential for achieving sustainability.

OI.5: World views are formed by experiences at personal, local, national and global levels, and are linked to individual and community actions for sustainability.

OI.7: Actions for a more sustainable future reflect values of care, respect and responsibility, and require us to explore and understand environments.

OI.8: Designing action for sustainability requires an evaluation of past practices, the assessment of scientific and technological developments, and balanced judgments based on projected future economic, social and environmental impacts.

*Source: (**ACARA**, 2015)*

case study:

A Water Conscious School by Philip Roberts, Coomandook Area School, SA

Coomandook Area School is located 140 km east of Adelaide, adjacent to the Dukes (Adelaide to Melbourne) Highway, on the outskirts of a small rural township. It is not situated in a large town but rather it forms a focal point for the surrounding rural communities. Students come from the towns or communities surrounding Coomandook and mainly come from farming families or from agriculturally based businesses. There is a strong sense of community in the school and district.

The school offers a large range of different subjects from Reception to Year 12, through creative timetabling and vertical grouping of classes across the school. The core business is providing teaching and learning opportunities through the curriculum. The Australian Curriculum is the basis of all that has being implemented as directed by the Department for Education and Child Development (DECD). Within these curriculum areas staff are constantly developing structures which allow for individual interest and growth. Literacy, Numeracy, Sustainability and Information Technologies are integrated within all the Learning Areas. Enterprise is integrated within Agricultural and Horticultural Studies.

Coomandook Area School has well-developed and resourced Agricultural facilities. The school farm consists of 10 ha divided into a number of paddocks. Students, as part of their Certificate 2 in Rural Production, crop these paddocks planting a range of crops from wheat, oats and barley as well as break crops including lupins, beans and canola.

Animal production is also an important enterprise of the school farm. Students have opportunities to develop skills handling a range of farm animals including layer and meat birds, turkeys ducks, cattle, sheep, pigs and goats. Students have prepared animals successfully for presentation at the Royal Adelaide Show for many years.

Coomandook Area School developed a Stephanie Alexander kitchen garden in 2010 and from that time have integrated this program into the primary curriculum from Year 2 to Year 7. Any produce not used in the kitchen has been marketed by the Year 6/7 Enterprise students and is sold to the community through a pre-ordering system.

The school is a water conscious community. The community and school access water from the River Murray. Water is piped to Coomandook by SA Water. Like other schools, it is a major user of water and as such the staff, students and community members have implemented a water conservation program at the school to reduce water usage.

The school community, being concerned about the sustainable use of water at the school have:

- constructed an extra water catchment;
- recycled water lost from refrigerated and evaporative air conditioners onto garden beds;
- installed an appropriate oval irrigation system operated only at night;
- established low maintenance mulch gardens instead of lawns;
- planted extra kikuyu grass in heavy traffic areas;
- recycled all surplus water from the school, pumping it through a filter and onto the school's woodlot of Eucalyptus Occindentalis and onto plots of native trees, with an emphasis on research into salinity and the Mallee lands; and
- planted over 1000 trees in the school grounds in responses to the salinity issues.

Reduced water consumption is the aim of the school's water conservation program. It uses less than half of what it used in previous years. Achieving this aim has:

- saved the school money in water rates;
- saved the local council money in water treatment and pumping costs;
- provided a greater available water supply for the Coomandook township;
- enabled soils on the oval to recover through appropriate water use in the school, and
- enabled the community to benefit from improved environmental management.

The water conservation program involves staff and student education. Engaging the staff and students has been one of the most important elements of implementing the program in the school.

Source: Australian Association for Environmental Education (AAEE) NSW, **Conversations Newsletter**, *February 2016.*

Activity 2:

Sustainable Choices

Overview: Explain to the class that their task is to consider how human activity in the community can have positive and negative effects on the sustainability of ecosystems.

Background science for students: Sustainability science

According to the U.S.-based journal ***Proceedings of the National Academy of Sciences*** (PNAS) 'Sustainability Science is about examining the interactions between the natural and social systems and how those interactions affect the challenge of sustainability meeting the needs of the present and future generations while substantially reducing poverty and conserving the planet's life support systems.

Some researchers go so far as to call sustainability science a different kind of science. It's different because it is interdisciplinary, applicable to real-world challenges and is committed to translating research into societal action. Sustainability science therefore has an inherent responsibility to ensure it is informing and is informed by what's happening in the world. It is a science that is committed to changing how people behave and transforming systems.'

*Source: '**Mobilising for sustainability: Celebrating and strengthening stories of connection**', 3 October 2016, Future Earth Blog.*

Most people are affected in some way by water pollution and we have all read stories about dead fish and polluted rivers and beaches. However, fewer people are aware of the many sources of water pollution.

Sustainability

Sustainability rests on the knowledge that we do not exist in isolation from our planet—rather, we are part of planet Earth and it's functioning. The decisions we make have an impact on everything in our biosphere, including our economies, political systems and societies. These factors do not, and cannot, exist outside the physical biosphere in which we live.

What does sustainable development involve?

The concept of sustainability is complex and dynamic; it incorporates multiple dimensions.

Sustainable development requires simultaneous and balanced progress across four interdependent dimensions:

- Ecological
- Social
- Economic
- Political

These dimensions are closely linked and decisions and actions in one area always affect the others. For example: If economic development is going to be sustainable it:

- cannot neglect environmental constraints or be based on the destruction of natural resources;
- cannot succeed without the parallel development of social (human) resources;
- will require transformation of the existing industrial base and the development of more Earth-friendly technologies;
- must consider the needs of all species;
- must support fairness between all people so that everyone can enjoy the same level of access to resources and quality of life; and
- must consider the needs of future generations.

As a result of the close relationships between the four dimensions of sustainable development, achieving this goal requires a dynamic balance between:

- production and consumption
- ecology and economics
- development and conservation

However, the particular nature of the balance between these factors will vary between the developing countries of the south and the industrialised countries of the north.

*Source: '**Teaching and Learning for a Sustainable Future**', UNESCO website.*

It requires a holistic change in the way we act—a rethink of how we relate to one another and how we interact with the ecosystems that support our lives.

*Source: '**Teaching and Learning for a Sustainable Future**', UNESCO website.*

The essential question:

What happens when we understand that all choices, large and small, that we and others make today, will influence the sustainable future and the lives of future generations?

The scenario:

Increasingly we wish to be recognised by what we have bought—whether it's our clothes, digital devices, food and drinks or cars and houses.

Many industries including the fashion industry have created a culture of the throw-away society, promoting new clothing for every season, with many not understanding the implications for the environment, or the impact of cheap clothing on people in sweatshops, or in the clothing trade in other countries.

Previous generations took it for granted that one would 'make do and mend', yet today the average life of most products, from tablets and mobiles to shoes and clothes, has become shorter and shorter due to their built-in obsolescence or their becoming unfashionable. So we create more and more consumer waste, and increasingly find there are fewer and fewer places to dispose of it sustainably.

As personal and household consumption grows, environmental pressures grow with increased use of natural resources, energy, transport, packaging, overall waste, pollution and greenhouse gas emissions.

Your advertising team has been approached by a local chapter of Future Earth Australia. They want you to promote the concept of a 'good citizen' along with being a 'good consumer', so that ethical decision-making takes account of wider societal and environmental impacts, especially as they pertain to food consumption (packaging, food miles, processed and take-away foods), textile consumption ('disposable' fashion, low-impact fibres and processing, recycling, biodegradability, packaging) and overall waste.

In your designs, use powerful images and write 'action statements' and suggestions for what can be done, to address these concerns.

A suggested learning process:

Define:

Share the essential question with the class and talk about the problem that needs to be addressed.

Present the scenario, assign teams if appropriate, and ask students to define the task they have been set.

Discover:

Capture student's interest by viewing the video '**The Story of Stuff**', (21:24 min)

'The Story of Stuff' is narrated by Annie Leonard, who also stars as the sole human figure. Behind her, black line drawings of factories, waste, pollution and the big gold 'arrow of consumption' play across a white background. She describes the process of environmental degradation, the problems of capitalism, and the exploitation of developing world nations, while maintaining a cheerful tone. Leonard makes it clear to kids that excessive consumption has led to our forests being felled, rivers polluted, and animals becoming extinct.

Talk about the connections between consumption and the huge number of environmental and social issues that call us to together create a more sustainable and just world.

Download and read the '**Facts from the Story of Stuff**',

Talk about the sort of changes the class would like to see in relation to consumerism.

Find examples of ethical consumerism and fair trade.

Refer to the **Oxfam website** for a list of ethical and not-so-ethical traders.

Find out how much water is used to make a cotton t-shirt, or a kilo of beef or a wall of concrete; and what materials use less water? E.g. see **The Virtual Water Project**

Discuss the changes that would be needed to help reduce the amount of waste produced.

Talk about where waste currently goes to, and how it affects the environment.

Ask students to find some evidence in the school and community of the changes that will help to create a future where consumption is more sustainable.

Discuss 'ethical shopping'.

Encourage students to think about asking questions like:

- Where do items come from?
- Who made them?
- Where do they live?
- Under what sort of conditions do they work?
- How much do they get paid?
- Are they appropriately rewarded for the work they have put into the product or do the profits benefit someone else?

Dream:

Ask students to imagine the steps involved in designing their designed solution.

Challenge students to think about the materials, tools, and equipment they will need to design their individual work samples. Will they use digital or non-digital equipment and tools?

Ask students how they might communicate ways people can promote the concept of a 'good citizen' along with being a 'good consumer', so that ethical decision-making takes account of wider societal and environmental impacts.

Design:

Talk about the importance of a clear layout and design that makes it easy for an audience to understand and interpret the information that is being given.

Discuss the importance of sourcing graphics, photos and information correctly.

Discuss the importance of responsible digital citizenship.

Talk with students about responsible digital citizenship in online environments. Work with students to have them understand appropriate use. Emphasise the principles:

- Respect themselves
- Protect themselves
- Respect others
- Protect others
- Respect intellectual property
- Protect intellectual property.

Source: Crockett, L. & Jukes, I. & Churches, A. (2011) Literacy is not enough. 21st Century Fluency Project Inc, p 81.

Review rules on personal safety, group safety, and classroom and furniture safety with the students.

Ask students to establish a workstation and to gather the materials and tools they require.

Talk about safely storing their designs and keeping a record of the processes they use to create them.

Ask students to draft the steps involved in making their chosen digital or non-digital designs.

Ask students to gather the materials, tools, and equipment needed and then plan each step involved in creating the digital or non-digital designs.

Invite students to start creating their designed solutions.

Talk with students about how they might share and present their designs to an audience.

Ask students to explain how they plan to finalise and create their designs with another peer in the class and seek feedback on their ideas.

Invite students to design their work samples.

Photograph students at work.

Deliver:

Share work samples that promote the concept of a 'good citizen' along with being a 'good consumer', so that ethical decision-making takes account wider societal and environmental impacts.

Ask students to share their designs with others.

Video the student's presentations as part of National Science Week.

Set up tables or booths in the class and invite students, teachers and parents to 'Discover Science Week and the choices we have in 2017'!

Debrief:

Ask students to:

Evaluate their designs and write four sentences about whether each design:

- matched the definition of the task
- used a clear layout and design
- was feasible, and
- included sources of the ideas and information each design piece used.

Write about the quality of their planning, their finished design and whether they enjoyed the task.

Describe their favourite memory of their work samples for National Science Week, and whether it resulted in anything they would like to change about their lives at home or at school.

Links to the Australian Curriculum

Year 7, Year 8, Year 9 & Year 10

Technologies

Design and Technologies Knowledge and Understanding

Year 7 & 8

Investigate the ways in which products, services and environments evolve locally, regionally and globally and how competing factors including social, ethical and sustainability considerations are prioritised in the development of technologies and designed solutions for preferred futures **ACTDEK029**

Year 9 & 10

Critically analyse factors, including social, ethical and sustainability considerations, that impact on designed solutions for global preferred futures and the complex design and production processes involved **ACTDEK040**

Science

Science as a Human Endeavour: 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** **ACSHE135**

People use science understanding and skills in their occupations and these have influenced the development of practices in areas of human activity **ACSHE121** **ACSHE136**

People use scientific knowledge to evaluate whether they accept claims, explanations or predictions, and advances in science can affect people's lives, including generating new career opportunities **ACSHE160** **ACSHE194**

Values and needs of contemporary society can influence the focus of scientific research **ACSHE228** **ACSHE230**

Science as a Human Endeavour: Nature and use of science

Science knowledge can develop through collaboration across the disciplines of science and the contributions of people from a range of cultures **ACSHE223**

Cross Curriculum Priority:

Sustainability

Organising Ideas

OI 2: All life forms, including human life, are connected through ecosystems on which they depend for their wellbeing and survival.

OI.3: Sustainable patterns of living rely on the interdependence of healthy social, economic and ecological systems.

OI.4: World views that recognise the dependence of living things on healthy ecosystems, and value diversity and social justice are essential for achieving sustainability.

OI.5: World views are formed by experiences at personal, local, national and global levels, and are linked to individual and community actions for sustainability.

OI.7: Actions for a more sustainable future reflect values of care, respect and responsibility, and require us to explore and understand environments.

OI.8: Designing action for sustainability requires an evaluation of past practices, the assessment of scientific and technological developments, and balanced judgments based on projected future economic, social and environmental impacts.

*Source: (**ACARA**, 2015)*

case studies:

Read about Randy Mandez's approach to the 'Trash on Your Back Challenge'. See '**Our say: Hey Randy, why so trashy**?', Ceres The Sustainability Hub website.

Find out about how Melbourne Girls' College have held 'zero waste' events at the school by reading '**A perspective on running waste-wise events – Melbourne Girls College, Victoria**', Sustainability in Schools website.

Read about St. John the Evangelist Catholic High School in Nowra and their vision to become a zero-carbon school, and a leader on climate action in their region. See '**A whole-school case study: St. John the Evangelist**', Sustainability in Schools website.

Activity 3:

Questioning the Future

Overview: *Explain to the class that their task is to imagine they are a member of the 'Future Earth' Young People's Sustainability Science Committee. They all have one thing in common—they are tired of seeing the Earth polluted, tired of increasing inequality, and the lack of opportunity for a sustainable future.*

Background science for students: Futures research

Wendell Bell, Emeritus Professor of Sociology at Yale University, describes the purpose of futures studies as follows:

'To discover or invent, examine and evaluate, and propose possible, probable and preferable futures. Futurists seek to know: what can or could be (the possible), what is likely to be (the probable), and what ought to be (the preferable)' (Bell 1997: 73).

Possible futures are all those that could conceivably come about. Science fiction is the literary field in which wide-ranging possible futures are explored, often in order to reflect on present human dilemmas and the problems that may arise.

Probable futures are all those that seem most likely to come about. We deal with these all the time when pondering our own future or that of the nation, whether in relation to traffic, health care and energy demand or care of the elderly, food supply and climate change.

Preferable futures are of a different order in that they are the futures one would most like to see come about. It is our preferable futures which can act as drivers for change in our lives.

It should be noted at this point that futurists generally talk about futures in the plural rather than in the singular. This is because at any point in time, any number of futures could come about—whether personal, local or global.

Jim Dator, who teaches Futures Studies at the University of Hawaii, has set out what he calls his 'laws of the future' after many years of working in this field:

'The future cannot be studied because the future does not exist. Futures studies do not – or should not – pretend to study the future. It studies ideas about the future (what I usually call 'images of the future') which each individual and group has (often holding several conflicting images at one time). These images often serve as the basis for actions in the present. Individual and group images of the future are often highly volatile and change according to changing events or perceptions. They often change over one's lifetime.

Different groups often have very different images of the future. Men's images may differ from women's. Western images may differ from non-Western. […]

The future cannot be predicted, but alternative futures can, and should be forecast. Thus, one of the main tasks of futures studies is to identify and examine the major alternative futures which exist at any given time and place. The future cannot be predicted, but preferred futures can and should be envisioned, invented, implemented, continuously evaluated, revised, and re-envisioned. Thus, another major task of futures studies is to facilitate individuals and groups in formulating, implementing, and re-envisioning their preferred futures. Part of the activity we do in futures studies is helping people in envisioning a more plausible future than they might otherwise. And we do it by giving them a greater range of images, by helping them to choose the way they want the future to be so that they can move in the right direction' (Dator, 2005).

Source: Hicks, D. 2012. **Sustainable Schools: Sustainable Futures: A resource for teachers**, *WWF-UK.*

The essential question:

What happens when we understand that unless we define the future we would prefer, it may be left to others to create?

The scenario:

The Chair of Future Earth's Science Committee is seeking schools to be involved in the Future Earth Young Peoples' Sustainability Science Sub-Committee.

"As chair of the Science Committee, I strongly urge the establishment of an Australia-wide futures project staffed by young people...designed to discover or invent, examine, evaluate and propose possible, probable and preferable futures for own global life support system, our planet Earth."

Futurists seek to know:

- What can or could be possible futures?
- What is likely to be the probable future? and
- What is your preferred future?

Your challenge is to describe and predict the effect of current environmental changes on individual living things and help others understand the that preferred futures can be envisioned, invented, implemented, evaluated, revised and re-visioned and empower them to know what they can do. Are you up for the challenge?

If so, then celebrate a sustainable Future Earth and host a 'Future Earth Day' as part of National Science Week.

A suggested learning process:

Define:

Capture students' interest and share the image below of a mural that was showcased at Questacon, Australia's National Science and Technology Centre in Canberra.

Source: UNESCO's 17 Sustainability Development Goals Mural at Questacon. **Ian Dudley** *and* **Anna Trundle** *, 2016. Photo courtesy of Questacon, Canberra, ACT.*

Talk about Ban Ki Moon's message and brainstorm what 'Plan A' might consist of.

Talk about what contemporary issues students think schools should help young people in schools explore. For example: the environment, wealth and poverty, peace and conflict, race and racism, gender and sexism, children's voices, political debates, globalisation and the future.

Present the scenario, assign pairs or small groups if appropriate, and ask students to define the task they have been set.

Discover:

Share the following 'scenarios' with the class.

Business as Usual

This future has come about because people feel safe with things as they are and don't imagine things being very different. It is based on the assumption that things worked reasonably well in the past and will therefore continue to do so in the future. Similar problems will occur and be dealt with in similar ways we do today. This future benefits those who are already well off and those who don't like change. It could, on the other hand, lead to an edge of disaster scenario.

Edge of Disaster

This future has come about because people and governments responsible for making decisions were too slow to act. They worked on the assumption that the problems were not serious. This assumption was wrong and the scenario shows various disasters, not all of which would necessarily occur at the same time. However, for those living in the 'poor world', many of these disasters are already here as a result of 'rich world' policies. This future doesn't benefit anyone. It can, however, encourage people and governments to make significant changes in the way that they live.

Technological Fix

This future has come about because people felt that rapid growth of science and technology would solve all their problems. It is based on the assumption that what can be invented always should be invented. This future can bring many benefits but can have many unforeseen consequences. At the same time it also involves dominating nature and thus cuts people off from the natural environment on which all life depends.

Sustainable Development

This future has come about because people recognised the need for major change. It is based on the assumption that caring for the environment, other people and future generations also brings a better quality of life at the present. This future brings less stressful and simpler lifestyles for many people. Developments in science and technology are used by the community to meet their own local needs.

Source: From: Hicks, D. 2014. ***Educating for Hope in Troubled Times: Climate change and the transition to a post-carbon future****, London: Trentham Books/Institute of Education Press.*

Talk about the fact that these scenarios are not predictions about the future, but rather possible futures that could occur in industrialised countries, like Australia, if different trends and events occurred.

Research other documents for information. For example:

Future Earth Media Lab, Future Earth website.

Great Acceleration Graphs, Future Earth website.

Welcome to the Anthropocene website

CSIRO Futures publications (especially '**Australia 2030**' report), CSIRO website

'**Australia 2050: Conversations about our future**', Australian Academy of Science website

Ask students questions like:

- Do you think people might like living in these possible futures?
- What are some of the positive things about these possible futures?
- What are some of the more negative things about them?
- What might be the advantages and disadvantages of living in each of these scenarios?
- Who might benefit and who might lose in these possible scenarios?
- Can you describe why you would or wouldn't like to live in these possible futures?
- If not these scenarios, then what other alternatives might there be for Future Earth? Elaborate on your own preferred scenario and explain the factors that could lead to this coming about.

Collate and display ideas.

Source: Adapted from: Hicks, D. 2014. ***Educating for Hope in Troubled Times: Climate change and the transition to a post-carbon future****, London: Trentham Books/Institute of Education Press.*

Dream:

In pairs or small groups envision or dream about the many possible solutions to a preferred future in which there can be a sustainable 'Future Earth'.

Further develop ideas for possible solutions using sketches and labels.

Ask students to visualise their most creative solution.

Invite students to think about what materials, tools, equipment and ingredients they will need to make their solution a reality.

Remind students that their solution needs to also explain and help others understand that the preferred future can be envisioned, invented, implemented, evaluated, revised and re-visioned and empower them to know what they can do.

Design:

Invite students in their pairs or small groups begin drafting their designs for their solutions.

Ask students to draft the steps involved in making their '***Future Earth Day'*** item.

Ask students to gather the materials, tools and equipment needed and then design and create the solution.

Invite a peer class group to the class to hear from the Future Earth Science Sub-Committee and find out more about the preferred futures can be envisioned, invented, implemented, evaluated, revised and re-visioned and empower them to know what they can do.

Deliver:

Pairs or small groups, showcase their preferred future for 'Future Earth'.

Classes host a 'Future Earth Day' as part of National Science Week and invite students, teachers and parents to discover what they can do too!

Debrief:

Ask students to reflect on their learning and draw something new they learnt about.

Ask students to describe what worked well and not so well in their efforts to create a preferred 'Future Earth', and whether there are things they would like to do differently now?

Links to the Australian Curriculum

Year 7, Year 8, Year 9 and Year 10

Technologies

Design and Technologies Knowledge and Understanding

Year 7 & 8

Investigate the ways in which products, services and environments evolve locally, regionally and globally and how competing factors including social, ethical and sustainability considerations are prioritised in the development of technologies and designed solutions for preferred futures **ACTDEK029**

Year 9 & 10

Critically analyse factors, including social, ethical and sustainability considerations, that impact on designed solutions for global preferred futures and the complex design and production processes involved **ACTDEK040**

Science

Science as a Human Endeavour: 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** **ACSHE135**

People use science understanding and skills in their occupations and these have influenced the development of practices in areas of human activity **ACSHE121** **ACSHE136**

People use scientific knowledge to evaluate whether they accept claims, explanations or predictions, and advances in science can affect people's lives, including generating new career opportunities **ACSHE160** **ACSHE194**

Values and needs of contemporary society can influence the focus of scientific research **ACSHE228** **ACSHE230**

Science as a Human Endeavour: Nature and use of science

Science knowledge can develop through collaboration across the disciplines of science and the contributions of people from a range of cultures **ACSHE223**

General Capabilities:

Literacy; ICT's capability, Critical and creative thinking, Ethical Understanding and Personal and Social Capability.

Cross Curriculum Priority:

Sustainability

Organising Ideas

OI 2: All life forms, including human life, are connected through ecosystems on which they depend for their wellbeing and survival.

OI.3: Sustainable patterns of living rely on the interdependence of healthy social, economic and ecological systems.

OI.4: World views that recognise the dependence of living things on healthy ecosystems, and value diversity and social justice are essential for achieving sustainability.

OI.5: World views are formed by experiences at personal, local, national and global levels, and are linked to individual and community actions for sustainability.

OI.6: The sustainability of ecological, social and economic systems is achieved through informed individual and community action that values local and global equity and fairness across generations into the future.

OI.7: Actions for a more sustainable future reflect values of care, respect and responsibility, and require us to explore and understand environments.

OI.8: Designing action for sustainability requires an evaluation of past practices, the assessment of scientific and technological developments, and balanced judgments based on projected future economic, social and environmental impacts.

*Source: (**ACARA**, 2015)*

case studies:

Read about the River Rangers in the Kimberley in **Cadets WA expands to Kimberley schools**. Explore what Warlawurru Catholic School and John Pujajangka-Piyirn Catholic School in Western Australia undertake to preserve habitats and conserve resources.

Watch '**ResourceSmart schools Engaging students in sustainability'**, YouTube (3:32)—a case study about the ResourceSmart Schools Program in Victoria and check out the range of real life learning activities students are involved in

Find out about **St John The Evangelist Catholic High School in NSW**, and a group of inspired students who created 'Johnies Action Group', that are intent on making St John's a zero-carbon school.

Read about **Bentleigh Secondary College** that has been recognised as a shining light in environmental education. With the commitment of the whole school community, the school has developed the 6.5 hectare site into a rich learning opportunity with an Urban Forest, a large wetland that treats six million litres of water annually, Indigenous food and vegetable gardens and a Meditation and Indigenous Cultural Centre.

Activity 4:

Leading the Way to Sustainability

Overview: Explain to the class that their task will be to explore the range of ways people are leading the way and tackling sustainability issues globally. Their task is to think about finding solutions to global environmental and societal issues, and living sustainably as part of National Science Week in 2017.

Background science for students: Social scientists

Social scientists are people who are interested in the study of human society—from past events and accomplishments to human behaviour and the relationships between groups. Like other types of scientists, they engage in systematic processes in their research activities to gain greater understanding about their particular areas of interest. They operate in fields such sociology, psychology, anthropology, economics, political science, and history. Through their research, social scientists offer important insights into the physical, social, and cultural development of humans, as well as the relationship between human activity and the natural environment.

To work as a social scientist, a person usually needs a specific social science degree from a university, such as a Bachelor of Social Science, Bachelor of Psychology, or a Bachelor of Arts specialising in areas such as history, political science, economics or anthropology.

Source: Anne-Maree Dowd, CSIRO.

The essential question:

What is the best way to get people thinking about finding solutions to global environmental and societal issues and living sustainably as part of National Science Week in 2017?

The scenario:

The National Science Week team is searching for schools to investigate ways to bring awareness to the social and environmental issues that feature as part of this year's National Science Week school theme 'Future Earth'!

There are ways to raise awareness of the theme 'Future Earth' and to the issues of responsible management of the planet's natural resources and living sustainably.

Future Earth's 2025 vision addresses eight key challenges to global sustainability:

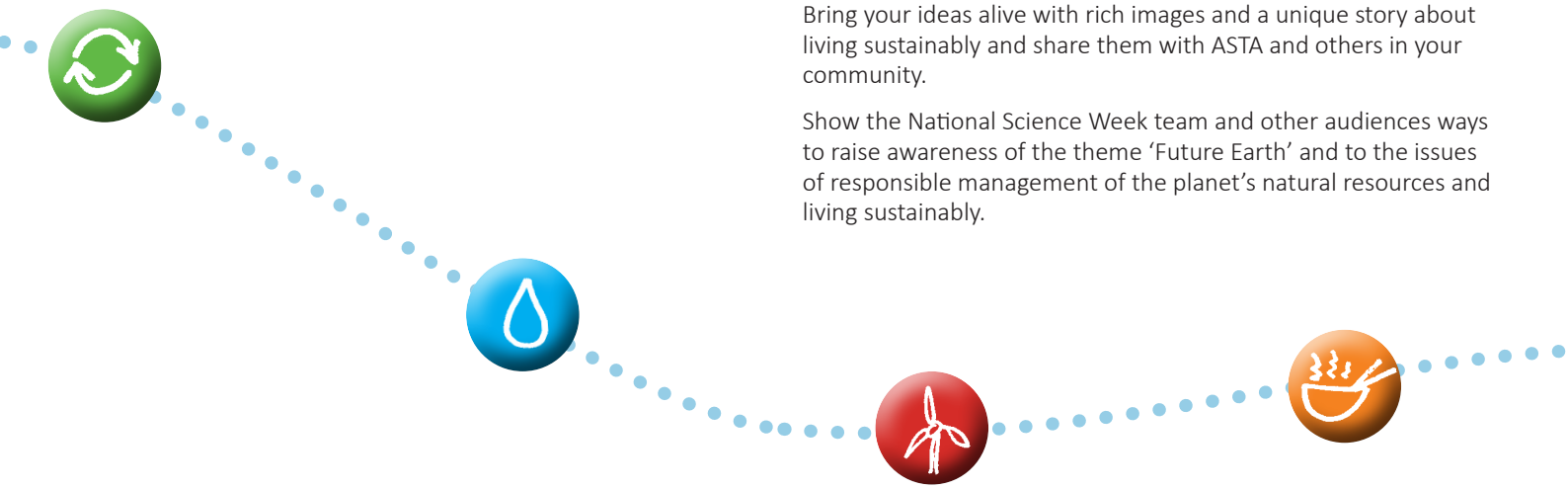
- Deliver water, energy, and food for all
- Decarbonise socio-economic systems to stabilise the climate
- Safeguard the terrestrial, freshwater and marine natural assets underpinning human well-being
- Build healthy, resilient and productive cities
- Promote sustainable rural futures
- Improve human health
- Encourage sustainable consumption and production patterns, and
- Increase social resilience to future threats.

*Source: Adapted from '**Our vision'**, Future Earth website.*

What about a video documentary, song, scientific report...???

Bring your ideas alive with rich images and a unique story about living sustainably and share them with ASTA and others in your community.

Show the National Science Week team and other audiences ways to raise awareness of the theme 'Future Earth' and to the issues of responsible management of the planet's natural resources and living sustainably.



A suggested learning process:

Define:

Capture students' interest and share the trailer to the National Geographic's film '**Before the Flood**', YouTube (2:18 min) and consider the things that Leonardo DiCaprio talks about.

Ask students what they might need to know more about, in order to undertake the challenge set by the National Science Week team. Might they need to know something about the key challenges to global sustainability?

Research other documents for information. For example:

Future Earth Media Lab, Future Earth website.

Great Acceleration Graphs, Future Earth website.

Welcome to the Anthropocene website

CSIRO Futures publications (especially **'Australia 2030'** report), CSIRO website

'**Australia 2050: Conversations about our future'**, Australian Academy of Science website

Brainstorm what students know about sustainability, sustainable development, and key challenges to global sustainability. List key words and create a flow chart to show links between the students' ideas.

Discover:

Find out about the issues and solutions a Year 7 student explores in the video '**Desertification and You'**. (2:32 min) Talk about the fact that two-thirds of Australia is drylands and consider issues that are important to our continent.

View **student work samples** that are featured as part of the '**Hexagon Project**' and where art is used to communicate actions for a better world.

Read the '**Voice of Children and Youth for Rio+20'** created during the 2011 Tunza International Children and Youth Conference in Bandung in Indonesia.

Discover their 'Promises', 'What they are going to do?', 'What a Green Economy Means to Children and Youth?', 'What Governments and Corporations Need to Deliver?', and 'What Governance Means to Children and Youth?'.

Talk about their declaration for environmental justice for all the generations to come.

Ask the students the question: 'What can we do?', 'What can we talk about?'; 'What can we speak out about?'

Brainstorm ideas and collate them around the eight key challenges to global sustainability:

- Deliver water, energy, and food for all
- Decarbonise socio-economic systems to stabilise the climate
- Safeguard the terrestrial, freshwater and marine natural assets underpinning human well-being
- Build healthy, resilient and productive cities
- Promote sustainable rural futures
- Improve human health
- Encourage sustainable consumption and production patterns, and
- Increase social resilience to future threats.

Discover more about what schools in Australia are achieving and the different approaches they are undertaking to 'Lead the Way'.

Explore how students from Silkwood School in south-east Queensland teach others to connect and build deeper understandings to themselves, others and the environment. See '**Little River'**, Vimeo (3.30 min) and '**Silkwood School Spirit'**, YouTube (4:25 min).

Talk about whether these students' understandings and projects might be a great idea for 'Future Earth'.

Check out '**Grossman goes green'**, Landcare Australia website to see how Maitland Grossmann High School in NSW are preserving the environment, revitalising a waterway on the edge of the school, providing homes and habitat for native wildlife and insects, and creating a hub for its Indigenous community

Find out more about Huonville High School in Tasmania and the sustainable energy solutions they have created in '**Huonville students in the running for international renewable energy prize**', ABC News, 23 October 2016.

Talk about the value of initiatives like these on 'Future Earth'.

View '**Leonardo DiCaprio's moving speech on climate'**, YouTube (1:05 min) about the massive changes he believes are needed for the Earth.

Talk about the importance of working together to create solutions.

View a selection of 13 TED Talks about the future—'**What does the future look like?'**

Invite students, to select the idea that really 'grabs' them, and then draft their storyboard.

Dream:

Ask students to visualise a work sample that speaks 'Future Earth'.

Ask students to imagine what their work samples might look like and how they will raise awareness of the theme 'Future Earth' and to the issues of responsible management of the planet's natural resources and living sustainably.

Design:

Ask students to design their work sample.

Ask students to gather the materials, tools, and equipment needed and then design their work sample.

Deliver:

Create the work samples about 'Future Earth'.

Deliver work samples to real audiences during National Science Week and discuss the issues of responsible management of the planet's natural resources and living sustainably.

Share photos and students' work samples via National Science Week's online community. The Australian Science Teachers Association loves to see pictures of students in the classroom learning, and to share photos via email at **nscwk@asta.edu.au** or share what has been created via Facebook, Instagram or Twitter! Please ensure that you have parental permission prior to posting any images of students.

Debrief:

Ask students to recall what they learned.

Talk about what they might still like to know about sustainability and what might they like to do differently themselves?

Ask students to describe their favourite part of creating a work sample about 'Future Earth' and showcasing the issues of responsible management of the planet's natural resources and living sustainably.

Links to the Australian Curriculum

Year 8, Year 9 and Year 10

Science

Science as a Human Endeavour – Nature and development of science

Science involves testing predictions by gathering data and using evidence to develop explanations of events and phenomena and reflects historical and cultural contributions **ACSHE081** **ACSHE098**

Science as a Human Endeavour – Use and influence of science

Scientific knowledge is used to solve problems and inform personal and community decisions **ACSHE083** **ACSHE100**

Science Inquiry Skills

With guidance, pose clarifying questions and make predictions about scientific investigations **ACSIS231** **ACSIS232**

Identify, plan and apply the elements of scientific investigations to answer questions and solve problems using equipment and materials safely and identifying potential risks **ACSIS086** **ACSIS103**

Compare data with predictions and use as evidence in developing explanations **ACSIS218** **ACSIS221**

Communicate ideas, explanations and processes using scientific representations in a variety of ways, including multi-modal texts **ACSIS093** **ACSIS110**

General Capabilities:

Literacy; ICT capability, Critical and creative thinking, Ethical Understanding and Personal and Social Capability.

Cross Curriculum Priority:

Sustainability

Organising ideas

OI 2: All life forms, including human life, are connected through ecosystems on which they depend for their wellbeing and survival.

OI.3: Sustainable patterns of living rely on the interdependence of healthy social, economic and ecological systems.

OI.4: World views that recognise the dependence of living things on healthy ecosystems, and value diversity and social justice are essential for achieving sustainability.

OI.5: World views are formed by experiences at personal, local, national and global levels, and are linked to individual and community actions for sustainability.

OI.6: The sustainability of ecological, social and economic systems is achieved through informed individual and community action that values local and global equity and fairness across generations into the future.

OI.7: Actions for a more sustainable future reflect values of care, respect and responsibility, and require us to explore and understand environments.

OI.8: Designing action for sustainability requires an evaluation of past practices, the assessment of scientific and technological developments, and balanced judgments based on projected future economic, social and environmental impacts.

*Source: (**ACARA**, 2015)*

case studies:

Discover some of the sustainability projects undertaken by ResourceSmart Schools in Victoria in the video '**ResourceSmart Schools awards 2014'**, YouTube (5:44 min)

Watch '**Grow Lightly, South Gippsland**', YouTube (3:00 min) and find out about their community project to support their community to access locally grown fruits and vegetables.

Learning Experiences for **Years 7, 8, 9 and 10**

Activity 5:

Make a Positive Difference for Sustainability

Overview: Explain to the class that their task will be to educate the broader community to understand how 'Future Earth' depends on a healthy environment, a stable climate, clean water supplies, sanitary waste disposal, clean oceans, and active and informed citizens.

Background science for students: Climate science

Climate science looks at past, present and future climate systems and seeks to understand the impact of these on physical, biological and human environments.

Climate science focuses on the longer term (for example, seasonal variability and climate change) whereas meteorology (the study of weather) focuses on the short term day to day changes.

Climate scientists aim to develop a coherent and systematic understanding of linked processes using a vast range of measurements (e.g from the deep oceans to satellites) and sophisticated computer modeling approaches to test our understanding of the factors that affect climate (such as greenhouse gas emissions) and the things climate affects (such as food security). Climate scientists would usually have a strong background in mathematics, physics, biology and environmental systems.

Source: Professor Mark Howden, Director Climate Institute, Australian National University, Canberra.

The essential question:

What happens when we understand how 'Future Earth' depends on a healthy environment, a stable climate, clean water supplies, sanitary waste disposal, clean oceans, and active and informed citizens?

The scenario:

Arguably, there has never been a time in history where knowledge of global environmental change has been greater than it is today. Climate scientists, atmospheric scientists, geochemists, oceanographers, agronomists, and biologists have all researched and published their specialist knowledge and findings about the Earth as it is today and was in the recent past...however still millions of people do not understand what is needed to attain a sustainable 'Future Earth'.

'Future Earth' aims to improve the planet's health and find responses to the complex interactions between the Earth's natural cycles and environmental change.

Your task is to educate the broader community to understand how 'Future Earth' depends on a healthy environment, a stable climate, clean water supplies, sanitary waste disposal, clean oceans, and active and informed citizens?

Might you create a presentation, a series of pod casts, a video, a documentary or write a scientific report?

A suggested learning process:

Define:

Capture student's interest by watching '**Leonardo DiCaprio's moving speech on climate'**, YouTube (1:05 min) about the massive changes he believes are needed for the Earth.

Talk about the importance of working together to create solutions.

Talk about the messages conveyed in the video.

Ask students what they might need to know more about, in order to undertake the challenge set for National Science Week. Might they need to know something about the key challenges to global sustainability? Might they need to know something about the changing climate, the mineral cycle, the water cycle, or the carbon cycle?

Check out **Future Earth Media Lab** for ideas.

Brainstorm what students know about sustainability, sustainable development, and key challenges to global sustainability. List key words and create a flow chart to show links between the students' ideas.

Discover:

Discover more about climate change. Much of the latest climate science is freely available online.

A special report on climate change in the New Scientist (Le Page, 2011) sets out what is now known to be certain and what still needs clarifying about the phenomenon. It is generally agreed that the emission of greenhouse gases during the twentieth century has raised the average global temperature by 0.8 degrees Celsius, and as a result: our planet is considerably warmer; sea levels are rising when the oceans warm and expand; ice sheets have progressively reduced causing worrisome feedback effects; warm air is holding more moisture causing greater frequency in rain events and more intense storm and cyclonic conditions; changes in precipitation patterns; increasing numbers of heat related deaths (particularly among children and old people); and great biodiversity loss.

... Research is in progress to clarify more regarding our changing climate and the likely impacts. Climate sceptics, friends of the fossil fuel industry and media personalities have alternative viewpoints and understandings, but largely, the empirical evidence shows the effects of a changing climate on economies, environments and societies are an important topic of study.

Source: Le Page, M. (2011) 'Special report: climate change'. New Scientist, 22 October, 36-43.

In groups, explore the issues presented and list ideas concerning understandings about climate change.

Ask students to develop a concept map describing what they know about climate change, what it is, what it comprises, what it affects, its potential impacts on living things in a variety of ecosystems, and who and what produces emissions that that can affect the Earth's climate.

Use **Simple Mapper** or the **web map** from the Global Education website to develop a concept map.

Create a mind map and collate ideas or create a '**Wordle**' or word cloud.

Discover more about global temperatures and how they have changed. Explore the website '**Climate Lab Book**' and view **a spiral graph** that highlights global temperature changes from 1850–2016.

Undertake further research and read Ferguson, William. 2013. '**Ice Core Data Help Solve a Global Warming Mystery**', Scientific American website which explains how current polar records show connections between atmospheric carbon dioxide and temperatures in the natural world.

Focus on your school. Think about your school's ecological footprint—in other words how many greenhouse gas emissions, particularly carbon dioxide are produced from its everyday activities, for example:

- Using energy at school and for transport.
- Producing the foods we eat at school and the goods and services used.
- Disposing of waste such as paper, food waste, garden waste and packaging.

Ask students to describe and summarise their understanding of emissions in energy, water, waste, transport and biodiversity contexts at the school.

Talk with the students about the many things they can do to reduce greenhouse gas emissions and improve the school's ecological footprint in the classroom. For example:

- Add or remove layers of clothing depending on how hot or cold one feels
- Use a hand fan when hot to increase air movement
- Use window blinds (if available) to cut down on the heating effects of the sun
- In warm situations, use natural ventilation to let heat out
- If possible, work away from direct sunlight or sources of radiant heat in summer
- Use natural lighting whenever and wherever possible
- Address the management of outputs that affect climate, for example; energy use, transport choices, purchasing, materials use, materials disposal
- Use and develop the school grounds and surrounding areas to increase sequestration (carbon absorption) by planting trees and attracting native wildlife.

Can they think of measures?

Climate change adaption involves taking action to adjust to, or respond to the effects of changes in climate. Talk with students about the many things we can do to adapt to changes in our climate. Discuss how each of the actions described, (both mitigation and adaptation) requires one person to make a difference.

Dream:

Ask students to visualise work samples that can educate the broader community to understand how 'Future Earth' depends on a healthy environment, a stable climate, clean water supplies, sanitary waste disposal, clean oceans, and active and informed citizens.

Ask students to imagine what their work samples might look like and how they will bring awareness to the theme 'Future Earth' and to the issues of a sustainable 'Future Earth'.

Design:

Ask students to design their work sample.

Ask students to gather the materials, tools, and equipment needed and then design their work sample.

Deliver:

Create the work samples.

Deliver work samples to real audiences during National Science Week and discuss the issues of global environmental change that can impact on a sustainable 'Future Earth'.

Share photos and student's work samples and presentations via National Science Week's online community. The Australian Science Teachers Association loves to see pictures of young people in the classroom learning, and to share photos via email at **nscwk@asta.edu.au** or share on what has been created via Facebook, Instagram or Twitter with #natciwk! Please ensure that you have parental permission prior to posting any images of students.

Debrief:

Ask students to recall what they learned.

Talk about what they might still like to find out about sustainability.

Identify and describe what the most surprising thing they learned about was.

Evaluate their work sample and write about whether their work matched the definition of the task

Ask questions like "What would you do differently next time?"

Write about the quality of their planning, their finished work sample and whether they enjoyed the task.

Links to the Australian Curriculum

Year 7, Year 8, Year 9 and Year 10

Technologies

Design and Technologies Knowledge and Understanding

Year 7 & 8

Investigate the ways in which products, services and environments evolve locally, regionally and globally and how competing factors including social, ethical and sustainability considerations are prioritised in the development of technologies and designed solutions for preferred futures **ACTDEK029**

Year 9 & 10

Critically analyse factors, including social, ethical and sustainability considerations, that impact on designed solutions for global preferred futures and the complex design and production processes involved **ACTDEK040**

Science

Science as a Human Endeavour: 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** **ACSHE135**

People use science understanding and skills in their occupations and these have influenced the development of practices in areas of human activity **ACSHE121** **ACSHE136**

People use scientific knowledge to evaluate whether they accept claims, explanations or predictions, and advances in science can affect people's lives, including generating new career opportunities **ACSHE160** **ACSHE194**

Values and needs of contemporary society can influence the focus of scientific research **ACSHE228** **ACSHE230**

Science as a Human Endeavour: Nature and use of science

Science knowledge can develop through collaboration across the disciplines of science and the contributions of people from a range of cultures **ACSHE223**

General Capabilities:

Literacy; ICT capability, Critical and creative thinking, Ethical Understanding and Personal and Social Capability.

Cross Curriculum Priority:

Sustainability

Organising Ideas

OI 2: All life forms, including human life, are connected through ecosystems on which they depend for their wellbeing and survival.

OI.3: Sustainable patterns of living rely on the interdependence of healthy social, economic and ecological systems.

OI.4: World views that recognise the dependence of living things on healthy ecosystems, and value diversity and social justice are essential for achieving sustainability.

OI.5: World views are formed by experiences at personal, local, national and global levels, and are linked to individual and community actions for sustainability.

OI.6: The sustainability of ecological, social and economic systems is achieved through informed individual and community action that values local and global equity and fairness across generations into the future.

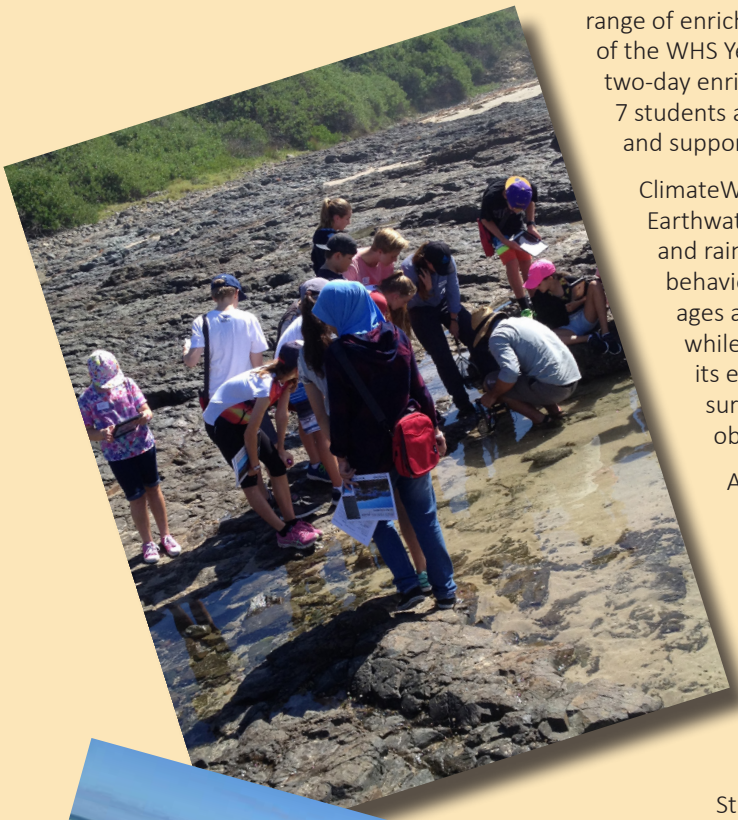
OI.7: Actions for a more sustainable future reflect values of care, respect and responsibility, and require us to explore and understand environments.

OI.8: Designing action for sustainability requires an evaluation of past practices, the assessment of scientific and technological developments, and balanced judgments based on projected future economic, social and environmental impacts.

*Source: (**ACARA**, 2015)*

Warilla High School, NSW by Glen Smart, Warilla High School and Chew Yue Chin, Earthwatch Institute

Situated south of Wollongong, Warilla High School (WHS) has forged a strong partnership with the Illawarra Environmental Education Centre (IEEC) located in Killalea State Park and a stone's throw away from the iconic Farm Beach, which was declared a national surfing reserve in June 2009.



A Core Academic Program was established at Warilla High to provide a range of enrichment and 21st Century skill-building opportunities for two of the WHS Year 7 and 8 classes. A key part of this program included a two-day enrichment camp for each class. In 2015 and 2016 the Year 7 students attended a ClimateWatch Camp at IEEC, jointly developed and supported by IEEC and WHS staff.

ClimateWatch is a citizen science initiative developed by the Earthwatch Institute to understand how changes in temperature and rainfall as a result of climate change are affecting seasonal behaviour of plants and animals. The program allows users of all ages and backgrounds to contribute to climate change research while providing a complete outdoor learning experience with its educational resources such as species guides and beach survey kits, as well as a web and app-based platform to record observations.

As part of the camp, WHS students used iPads to access the ClimateWatch app and spent half a day collecting data on the inter-tidal species they encountered on the shores of Farm Beach and uploading it to the ClimateWatch site. Through this process, students learnt how to work scientifically, investigate living things and demonstrate care for the environment by contributing to scientific research. The marine environment and experiential nature of the investigation provided a stimulating context to pique their scientific curiosity.

Students then were challenged to create an electronic book about their rocky shore survey that would inform, instruct and inspire others to participate in ClimateWatch.

Working in pairs, students demonstrated a strong sense of purpose, self-direction and ownership starting from the initial briefing through to their negotiation of book content, structure and design.

WHS students developed a range of 21st century skills through their participation in the ClimateWatch camp, including:

- Collaboration and teamwork;
- Creativity and imagination;
- Critical thinking; and
- Problem solving.

The two-day camp culminated in each group presenting their e-book to IEEC staff, fellow students and WHS staff. The outstanding presentations clearly demonstrated their deep engagement with and appreciation for the importance of citizen science programs such as ClimateWatch.

Future Earth

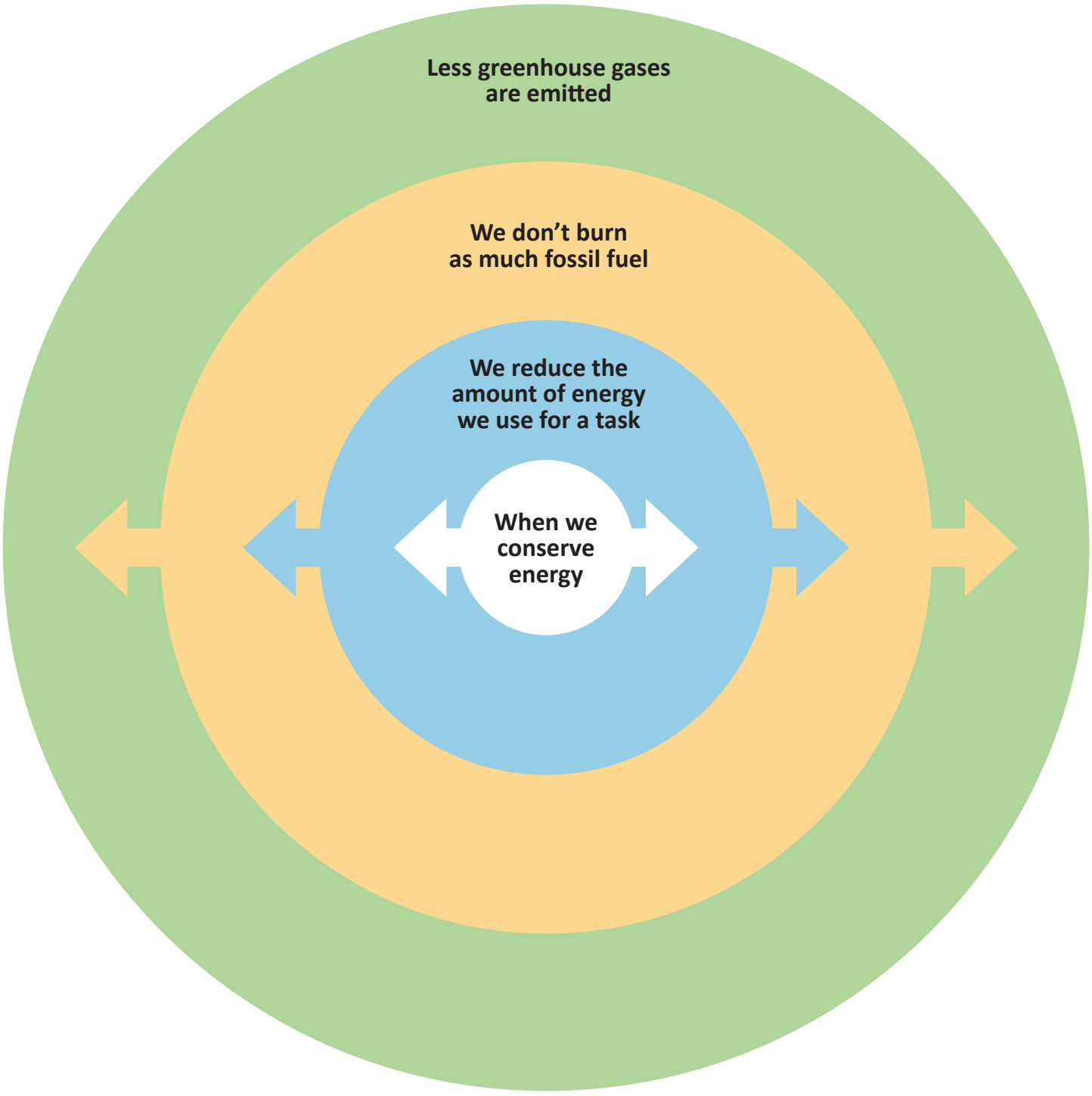
Secondary Students Resource Pages for National Science Week

national Science Week 2017

Consequence wheel

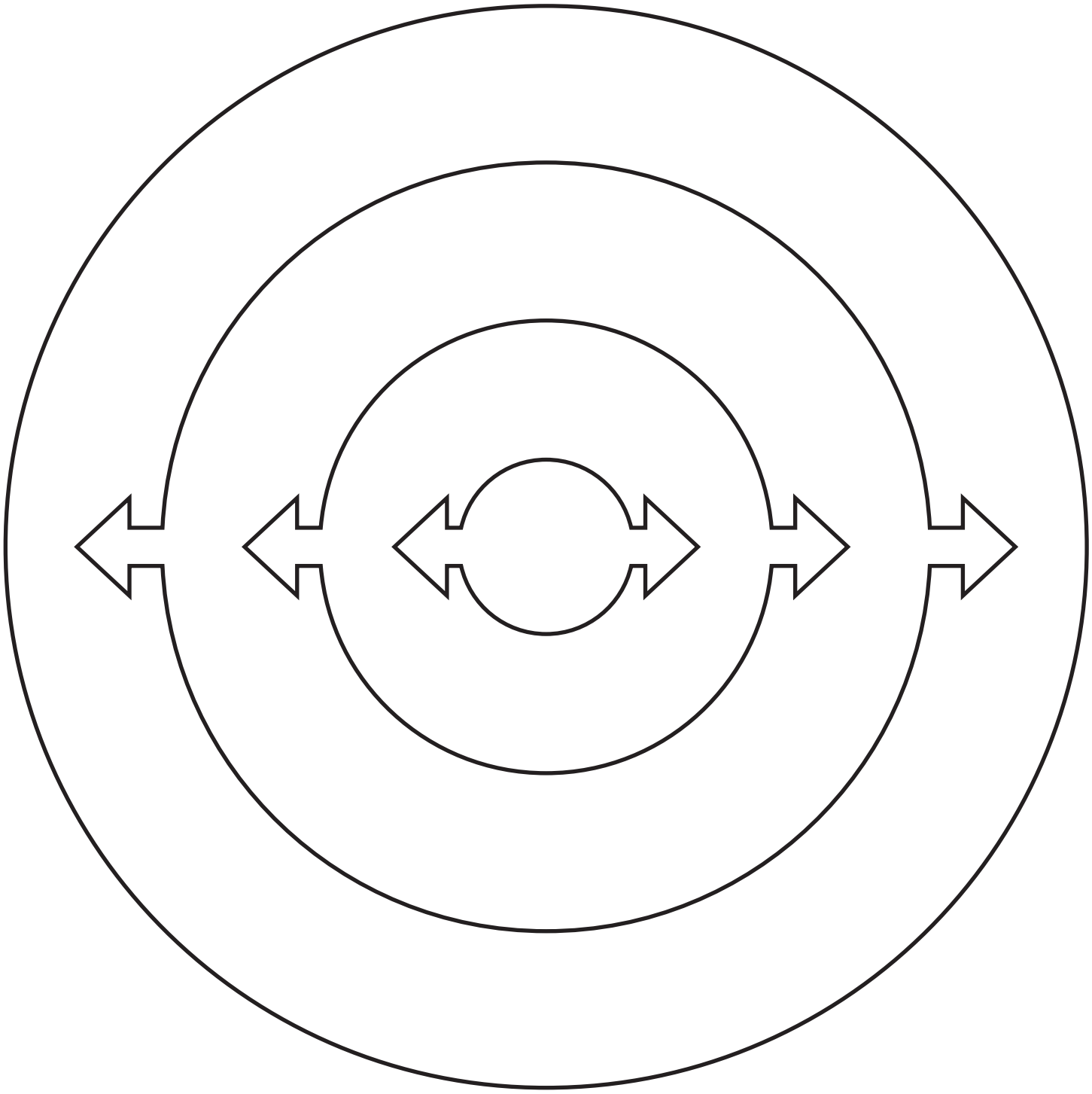
Consequence wheels are used to explore wide ranging consequences that can follow from actions, issues or trends in the present. Look at the example below.

Decide on an issue that is part of understanding the use of sustainable practices a way to reduce greenhouse gas emissions. Place the focus in the centre of the consequence wheel. Then, explore the focus by asking the question "What are the immediate consequences?"



Write the immediate consequences in the inner ring around the main idea. Link each consequence to the main idea with a single line. This indicates that they are first order consequences. Continue exploring second, third and forth order consequences using the outer circles.

Use the four concentric circles below to explore the consequences of an action, issue or trend relevant to the emission of greenhouse gases and/or the changing climate.



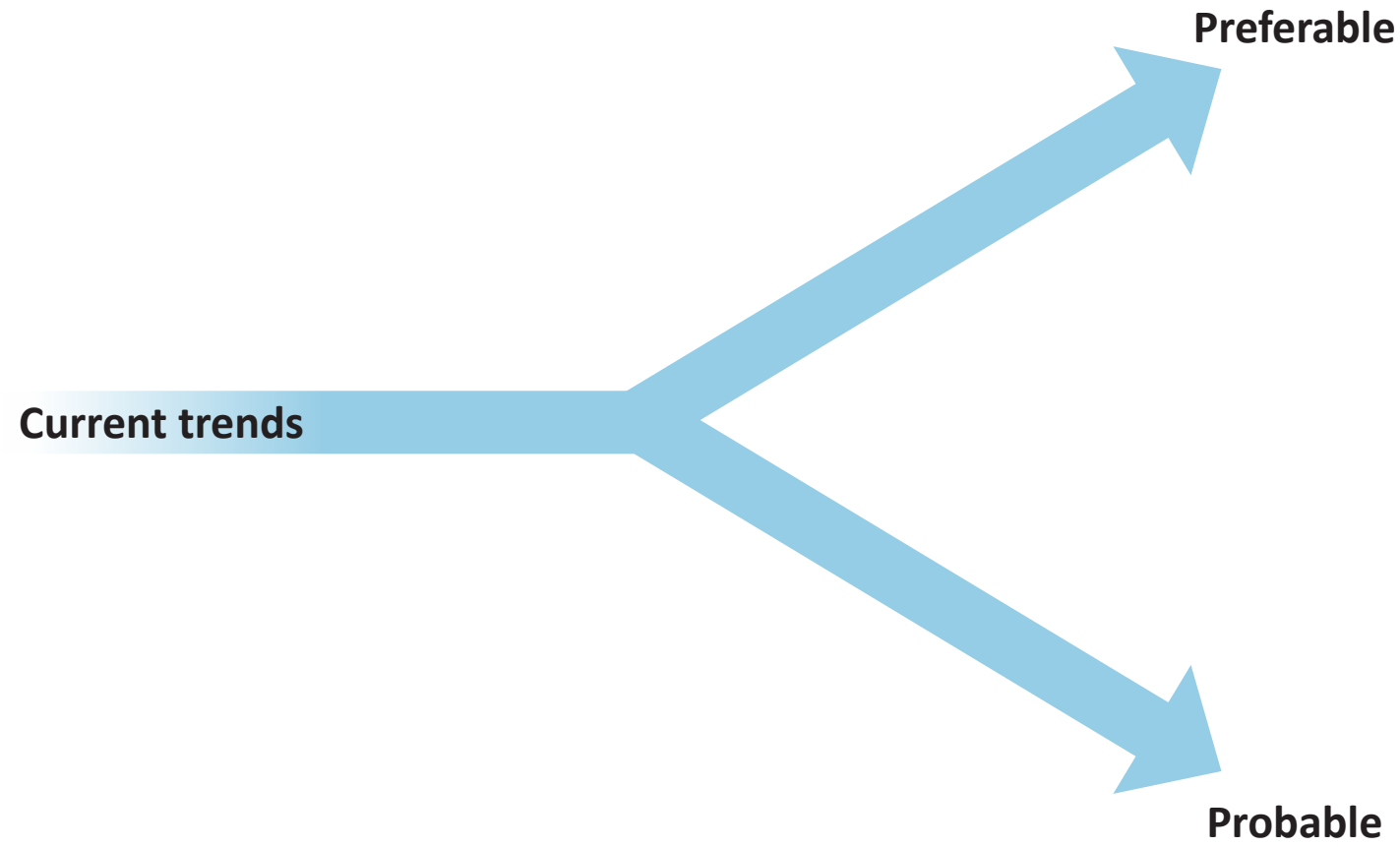
A Futures Timeline

Timelines can be used to explore future possibilities, that is, the future consequences of change.

'Probable' futures are the future we think is ***likely*** to happen because of current trends.

'Preferable futures' are those that we would ***most like*** to come about. Preferable futures reflect our deepest values, wishes and priorities.

Using the timeline below and an issue of interest that is affecting the Earth, think through and sketch a probable and preferable future.



Plus, Minus, Interesting

'PMI' stands for 'Plus, Minus, Interesting', and is a useful way of exploring an issue in terms of its' positive and negative aspects and those which provoke deeper thought.

Reflect on the 'probable future' you have defined for 'Future Earth' and describe:

- Which aspects are most sustainable?
- What directions are not sustainable?
- What needs to change?
- Are there any the economic and health benefits that are identified?
- What environmental impacts that might need to be reduced?
- How developing nations and their economies and people are affected by the situations you have identified?

Plus *– include opportunities*	**Minus** *– include challenges*	**Interesting** *– what we think is interesting*

Reflect on the 'preferable future' you have defined for 'Future Earth' and describe:

- Which aspects are most sustainable?
- What directions are not sustainable?
- What needs to change?
- Are there any the economic and health benefits that are identified?
- What environmental impacts that might need to be reduced?
- How developing nations and their economies and people are affected by the situations you have identified?

Plus *– include opportunities*	**Minus** *– include challenges*	**Interesting** *– what we think is interesting*

Additional Activity Ideas

Emerging Ideas for the Future

Do you have a business idea that can solve a sustainability issue? Develop some ideas. Develop some concepts.

Orange Sky Laundry

Find out about two social entrepreneurs who began **Orange Sky Laundry** to help the homeless and who won the **Young Australian of the Year Award in 2016**.

Cows for Cambodia

Discover more about the '**Cows for Cambodia**' program and how cows help create sustainable lives for villagers in Cambodia.

Cloth Pads with a Cause

Find out about '**Ecopads: Cloth Pads with a Cause'** and the campaign to help women and girls and reduce non-biodegradable waste..

St. Paul's School, Brisbane

St Paul's School in North Brisbane recently launched an Entrepreneurs Club, aimed at helping prepare students for a world where the pace of change is faster than any other time in history and traditional career paths are uncertain. Fifteen students and two staff participated by forming teams and building six lean startups. The businesses created were diverse with the winning entry gaining an opportunity to pitch to investors for future funding.

Investigate how young entrepreneurs at Brisbane's St. Pauls School partnered up with a 'Start Up' company called River City Labs to create an Entrepreneurs' Club. Read about their projects that re-use jumpers and create cushions—'**The Stitch Up to pitch at River City labs after winning inaugural Entrepreneurs Club at St Paul's School'**.

The Stitch Up Co

Founders: Sarah McDonald and Harriet Nixon, Year 11 students at St. Paul's School, Brisbane.

The Stitch Up Co. solves a problem many of us have faced: what to do with the shirts we have collected that, despite having some significance to us, we will never wear. The Stitch Up's solution is to repurpose these shirts into pillows, not only giving them a new lease on life but most importantly, allowing customers to keep cherishing the memories associated with the shirt. By recycling an old product into a new one it's helping to reduce waste, while 20% of the company's profits are donated to charity.

The Plasma Bin

Founders: Jack Whitehead, Josh Halliday, Aiden Molloy, Year 8 students at St. Paul's School, Brisbane.

The Plasma Bin is a waste management solution. The company aims to develop a bin that uses plasma to disintegrate waste and, in the process, generates energy from that disintegration process to power the Bin itself. It thereby produces no net emissions while eliminating waste.

Little Tokyo Two: Thunder Lizard Program

Find out about **Thunder Lizards**, which is Little Tokyo Two's first entrepreneur program for high school students. Students from Brisbane State High School were the first to take part in the program. See the posts on **Facebook**.

Thankyou Water

Read about Social Entrepreneur Daniel Flynn who created **Thankyou** The company was born in 2008 in response to the World Water Crisis. Today, Thankyou has over 40 products available in 5000 outlets in Australia (including 7-Eleven, Coles and Woolworths). The idea was to take a more holistic approach to combating poverty, with 100% of their profits funding safe water, food and hygiene and sanitation services around the world.

Who Gives a Crap

In July 2012, Simon, Jehan and Danny launched '**Who Gives A Crap'**. They donate 50% of their profits to help build toilets and improve sanitation in the developing world. This was initiated when they learnt that 2.3 billion people across the world don't have access to a toilet. That's roughly 40% of the global population and means that diarrhea related diseases fill over half of sub-Saharan African hospital beds and kill 900 children under five every day.

Vivify Textiles

Find out about **Vivify Textiles**, a company that makes sustainable textiles.

FIELDTEST: Dublin, Ireland

Explore some radical adventures in future farming.

View an 'Exhibition of Startups' by the **Science Gallery Dublin** as part of the Global Science Gallery Network Pioneered by Trinity College Dublin. Showcasing: curators and advisors from Farm Cyborgs, Farmstand Forecasts, Grow House, Ag Lab, Loci Food Lab, Seed Boutique.

STARTUP CATALYST: Brisbane, Australia

Find out about **Startup Catalyst**. It was formed to assist in the cultural transformation of the Australian economy to one that is fast paced, startup aware, and "global first". The company takes groups of youths, startups, investors, corporates, and innovation leaders to international startup hotspots including Silicon Valley, Europe, Israel, and Asia with the goal of transforming the startup and innovation landscape in Australia.

Sustainable Community Real Estate (An Idea in the making)

Imagine being part of a start up company with a small team of mechatronic and electrical engineers, business strategists, natural 21st century realists, and tiny home enthusiasts based in Brisbane, Australia who have been strategising a community-based sustainable village concept. They are hoping to launch in 2018 with the idea of breaking down the core cell based hub-&-spoke village IP with tech-integrated and regenerative residential real estate development.

Loosely based off the Netherlands project planning **ReGen Villages**, this project is aimed at the Australian climate and landscape.

The goal of the start up includes utilising Internet-of-Things (IoT) integrated infrastructure to enable thriving communities with surplus energy, water and organic food in the aggregate become asset classes that can amortise and reduce mortgage payments.

Their idea is all about desirable off-grid capable neighborhoods comprised of power positive homes, renewable energy, water management, and waste-to-resource systems that are based upon on-going resiliency research—for thriving families and reduced burdens on local and national governments.

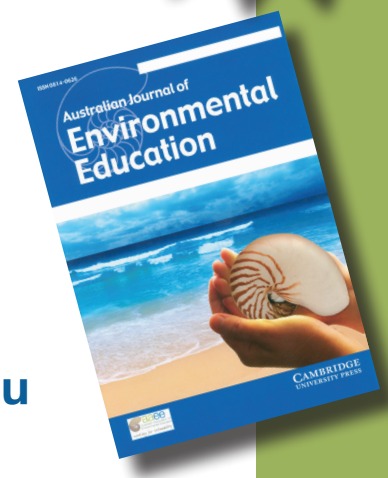
aaee
Australian Association for Environmental Education

Our vision -
connect through education, advance sustainability education and action across all communities in Australia

Mention this **SCIENCE WEEK** ad to receive 18 months' membership for the cost of 12*
Email admin@aaee.org.au to claim this offer.
*Offer ends 31 August 2017.

Join Australia's peak professional body for Environmental Educators and receive:

- Professional development webinars
- Discounted conferences and events
- Australian Journal of Environmental Education
- Monthly industry e-bulletins and quarterly ozEEnews member newsletter
- Resources to integrate sustainability into curriculum and programs
- Tax-deductible membership
- State chapter events, activities, and professional networking



Join Now – www.aaee.org.au

Getting started with Sustainability in Schools

It's time to get started with sustainability

Sustainability is a cross-curriculum priority within the Australian Curriculum. It's time to embed sustainability into your classroom, school and community.

IN THE CLASSROOM

IN THE SCHOOL

IN THE COMMUNITY

CONNECTING TO NETWORKS

Curriculum linked learning resources, case studies and advice on getting started with sustainability in your school.

Get started now
www.sustainabilityinschools.edu.au

aaee
Australian Association for Environmental Education


Inspiring AUSTRALIA
An Australian Government Initiative
WHAT WILL YOU BE DOING THIS NATIONAL SCIENCE WEEK?
national science week
12-20 AUGUST 2017
www.scienceweek.net.au
nationalscienceweek
@aus_scienceweek
ABC
abc.net.au
Australian Science Teachers Association
CSIRO
COSMOS
discovery science
SCI
NewScientist
POPULAR SCIENCE

Future Earth

national science week 2017

12–20 August 2017 www.scienceweek.net.au

Australian Science Teachers Association

An Australian Government Initiative

Inspiring Australia