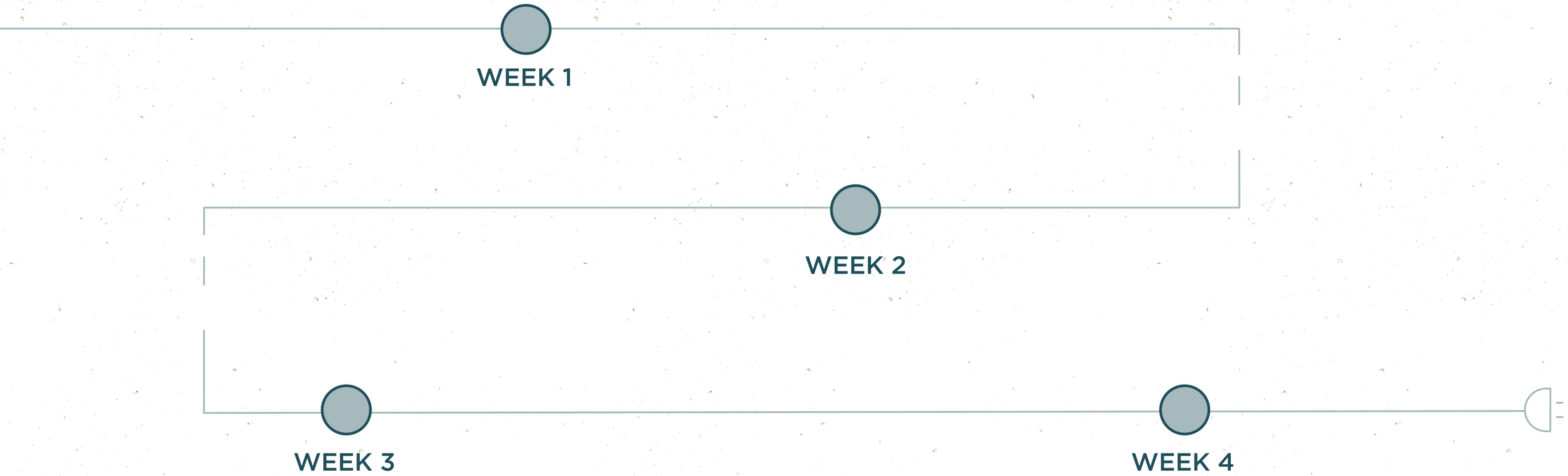
GREEN INNOVATION IN ECOLOGY

TABLE OF CONTENT

SUMMARY

RESOURCE MANAGEMENT THROUGH INNOVATION

This unit gives students the opportunity to study the living world and how it interacts with the non-living world. Students will study the interactions between living things and their environment as well as human impacts on these systems and the methods we are developing to decrease our impact on ecosystems. Students will use the STEM Design Thinking Process to identify an environmental problem and develop an innovative solution to that problem. Students will have the opportunity to enter their project in the Green Innovation Awards.



DURATION

4 weeks 3 hours/week

OUTCOMES

- **SC4-5WS** collaboratively and individually produces a plan to investigate questions and problems
- **SC4-7WS** processes and analyses data from a first-hand investigation and secondary sources to identify trends, patterns and relationships, and draw conclusions
- **SC4-8WS** selects and uses appropriate strategies, understanding and skills to produce creative and plausible solutions to identified problems
- **SC4-9WS** presents science ideas, findings and information to a given audience using appropriate scientific language, text types and representations
- **SC4-14LW** relates the structure and function of living things to their classification, survival and reproduction

UNIT OVERVIEW

Students develop their understanding of ecology and how the living and non-living world interact. They study human impacts on ecosystems and through the use of the STEM Design Thinking Process, students will develop their problem solving skills as they undertake a project to identify an environmental issue and develop an innovative solution, which will form their entry into the Green Innovation Awards.

KEY INQUIRY QUESTIONS

How can we develop an innovative solution to a local ecological problem?

what is a food web and what role do producers, consumers and decomposers play in them?

RESOURCES

- GIA Design Thinking Scaffold
- Biodiversity Jenga game
- Fabulous food chains youtu.be/MuKs9o1s8h8?list=PLhz12vamHOnZv8kM6Xo6AbluwIIVpulio
- Crash course food webs youtu.be/Vtb3I8Vzlfg?list=PLhz12vamHOnZv8kM6Xo6AbluwIIVpulio
- Study Jams food webs youtu.be/EtnJhm4B3XE
- Food chains and webs youtube.com/watch?v=2lqhJNgn_Wg
- Crash Course food webs youtu.be/Vtb3I8Vzlfg?list=PLhz12vamHOnZv8kM6Xo6AbluwIIVpulio
- Microbes are essential reactgroup.org/toolbox/understand/bacteria/bacteria-are-essential-for-human-life/ Storm water treatment *youtube.com/watch?v=kTZssgH50mk*
- https://youtu.be/EtnJhm4B3XE

STEM DESIGN PROCESS

RIVERS ACADEMY OF STEM EXCELLENCE

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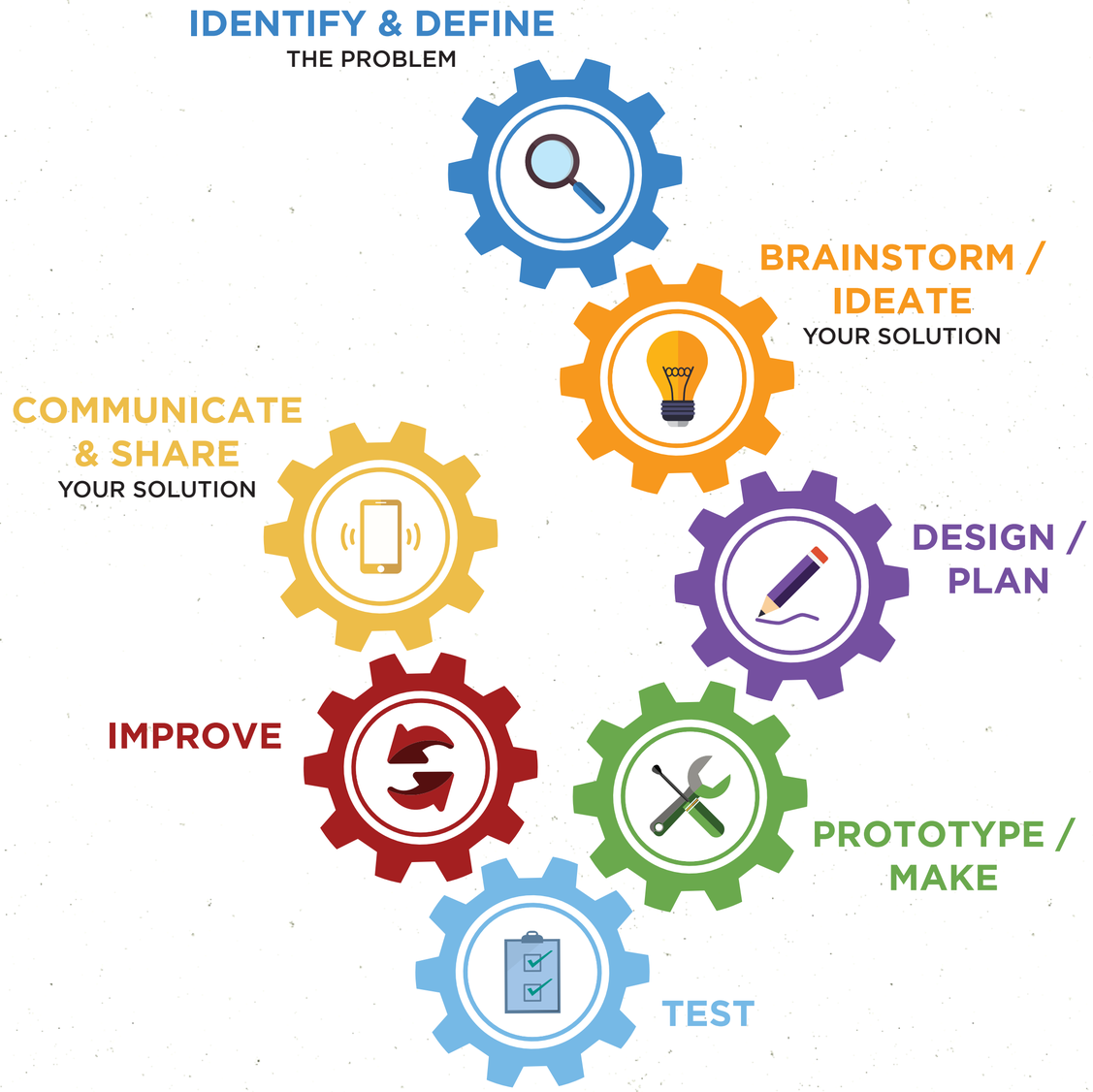

CONTENT	TEACHING AND LEARNING	EVIDENCE OF LEARNING
Stage 4 - Living World **LW5** Science and technology contribute to finding solutions to conserving and managing sustainable ecosystems. **Students:** **a.** construct and interpret food chains and food webs, including examples from Australian ecosystems **b.** describe interactions between organisms in food chains and food webs, including producers, consumers and decomposers (ACSSU112) **c.** describe examples of beneficial and harmful effects that micro-organisms can have on living things and the environment SC4-8WS, SC4-9WS SC4-8WS, SC4-9WS	**Teacher** introduces students to food chains as a way to show energy movement through an ecosystem. Show this introductory video about food chains. **Students** practice drawing food chains for given sets of organisms. Students then create their own food chains for local Australian organisms. **Students** perform research to answer the inquiry question – what is a food web and what role do producers, consumers and decomposers play in them? **Teacher** may show some short videos to assist students: Crash Course Food Webs Study Jams Food Webs **Students** discuss what affect varying population size of different organisms can have on a food web. **Teacher** Shows these videos to assist: Food chains and food webs Food webs **Students** play this game. **Teacher** leads discussion about some of the aspects of the game – biodiversity and ecosystem resilience, the need for plants and human impacts. **Teacher** instructs students how to play the **Biodiversity Jenga game.** **Teacher** defines the terms micro-organisms and gives examples – bacteria, viruses, fungi. **Students** investigate beneficial and harmful effects of micro-organisms on living things in the environment. **Teacher** may need to lead students to investigate the positive role micro-organisms have in processes such as digestion and breaking down wastes. Showing this video may help students understand the importance of microbes.	Students are able to describe the use of food webs to show energy transfer through an ecosystem. Students can draw and analyse food chains and food webs for a given ecosystem. Students can explain the importance of biodiversity in an ecosystem and describe the different types organisms within an ecosystem.

CONTENT	TEACHING AND LEARNING	EVIDENCE OF LEARNING
Stage 4 - Living World LW5 **Students:** **d.** predict how human activities can affect interactions in food chains and food webs, including examples from Australian land or marine ecosystems (ACSSU112) **e.** explain, using examples, how scientific evidence and/or technological developments contribute to developing solutions to manage the impact of natural events on Australian ecosystems **f.** describe how scientific knowledge has influenced the development of practices in agriculture, eg animal husbandry or crop cultivation to improve yields and sustainability, or the effect of plant-cloning techniques in horticulture SC4-5WS, SC4-7WS SC4-8WS, SC4-9WS	**Teacher** provides students with the following list of activities: food production by large monocultures, inappropriate disposal of plastic waste, commercial fishing, building dams for water storage in natural water ways. **Students** predict the effects of the local examples of the above activities on food chains and food webs. **Teacher** sets students the challenge of identifying an environmental issue affecting ecosystems, then developing a solution to that problem. Initial research will require students to research will require students to look at existing scientific solutions to environmental issues. Hand out the scaffold for students to follow. **Students** work in groups to complete an inquiry-based process to identify a problem and develop a solution. **Teacher** explicitly teaches students how to use the STEM Design Thinking Process to solve a problem. Some key points are: • Identify/Define: Prompt students to look beyond the obvious. What is the underlying cause of the problem? • Brainstorm: Crazy ideas are good. Consider fluency (lots of ideas), diversity (ideas are different to each other), innovation (think outside the square) • Design/Plan: Research, set team roles, develop a timeline • Prototype: Fail early fail fast. Make a quick simple prototype, so if it fails, there is time to improve it • Test: Get feedback from multiple people. If your solution is specific to a particular group, get them to test it • Improve: Use the feedback to make improvements. • Communicate/Share: have an authentic audience. This is where the Green Innovation Awards comes into play.	Students can describe some human impacts on ecosystems and explain how they affect food webs. Students can identify an ecological problem and demonstrate how they have developed a solution by using the STEM Design Thinking Process. They have evidence of research, planning and engaging in a cycle of feedback and improvement.