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Information + competency + literacy = fluency

A thought piece.

In part one of an article series, June Wall, Library Coordinator, NSW Department of Education, considers the nature of information fluency and launches a collaborative discussion for teachers.

Information literacy

How do you see information literacy in your learning process? Is it a set of skills, a process or an end product? Can we say that students will be information literate by the end of school or is this a lifelong process? These questions are core to the learning and teaching responsibilities of teacher librarians and teachers.

Information fluency

In recent years, information fluency has also become a discussion point.

> Information fluency may be envisioned as the nexus of information literacy (i.e. the library dimension); computer literacy (i.e. the information technology dimension) and critical thinking.
>
> (Rettig & Hagen, 2003)

To be information fluent then requires a series of sub sets of learning or processes. This progression involves the learner being:

- **skilled** – having the knowledge, ability or training to perform a certain activity or task well. For example, thinking 'how do I create a reference list?'
- **competent** – going beyond the skill level; being equipped with the abilities and behaviours to be successful. For example, 'I can create a reference list in correct format and can do this easily'.

  literate – having the ability to judge the appropriate skill or competence for a particular purpose. For example, 'I can identify when I need to use a reference list and what type of

- method is required'.
- **fluent** – having the ability to think critically while engaging with, creating, and utilising information and technology regardless of the platform, coupled with the natural disposition to operate without conscious thought in an information environment. For example, 'I automatically start my research by keeping references in an appropriate tool and include citations as needed. It is done automatically.'

Fluency should be the goal in school libraries. So, the question is now – what are the steps or processes we need to consider to develop information fluent lifelong learners? Our challenge is to identify specific skills, and then consider how they can be developed in a spiral approach for students to become fluent across the wider skill set.

Developing our thinking about information fluency

Become part of the collaborative thinking about information fluency and how it can be developed. Contribute to the discussion via our shared Google Doc – Developing information fluency. This collaboration will form the basis of the next article on how we can move forward to support students' progression to fluency.

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Literature and technology

Jackie Child, teacher librarian/Junior School technologies coordinator at St Aidan's Anglican Girls' School, shares how she uses literature and technology to engage students in gaining a deeper understanding of texts.

Introduction

Sharing stories through storytelling and reading is 'what teacher librarians do' to engage students in further developing their comprehension of themes, characters, issues, plots, styles and concepts in literature. Having fun with stories and following up with discussions, questions and hands-on activities gives students opportunities to gain a deeper understanding of the text, clarify the author's intent and meaning, and make inferences and predictions. Creative use of technology can support and enrich these learning experiences.

Texts and technology

This article examines some of the engaging texts and technology I have used at St Aidan's Anglican Girls' School in Brisbane. These activities also support descriptors in the Digital Technologies curriculum and outcomes and objectives in the NSW Science and Technology K-6 Syllabus and NSW English K-10 Syllabus. For example:

- Students identify and explore a range of digital systems with peripheral devices for different purposes, and transmit different types of data (ACTDIK007).
- A student uses materials, tools and equipment to develop solutions for a need or opportunity (ST1-2DP-T).
- A student selects and uses materials, tools and equipment to develop solutions for a need or opportunity (ST2-2DP-T).
- A student plans and uses materials, tools and equipment to develop solutions for a need or opportunity (ST3-2DP-T).
- A student describes how contact and non-contact forces affect an object's motion (ST2-9PW-ST).

- A student identifies digital systems and explores how instructions are used to control digital devices (STe-7DI-T).
- A student identifies the components of digital systems and explores how data is represented (ST1-11DI-T).
- Students communicate through speaking, listening, reading, writing, viewing and representing (objective A).
- Students think in ways that are imaginative, creative, interpretive and critical (objective C).

A Very Unusual Pursuit by Catherine Jinks

After reading excerpts from the book and whetting the girls' appetite to read more, we brainstormed mythological creatures. The girls then designed their 'Bogles' (term taken from the story), including a light-emitting diode (LED) on part of the creature. This activity required students to understand circuitry and enabled them to use copper tape, electric paint and/or Chibitronics to illuminate their LED with a 1.5v coin battery.

Bogle

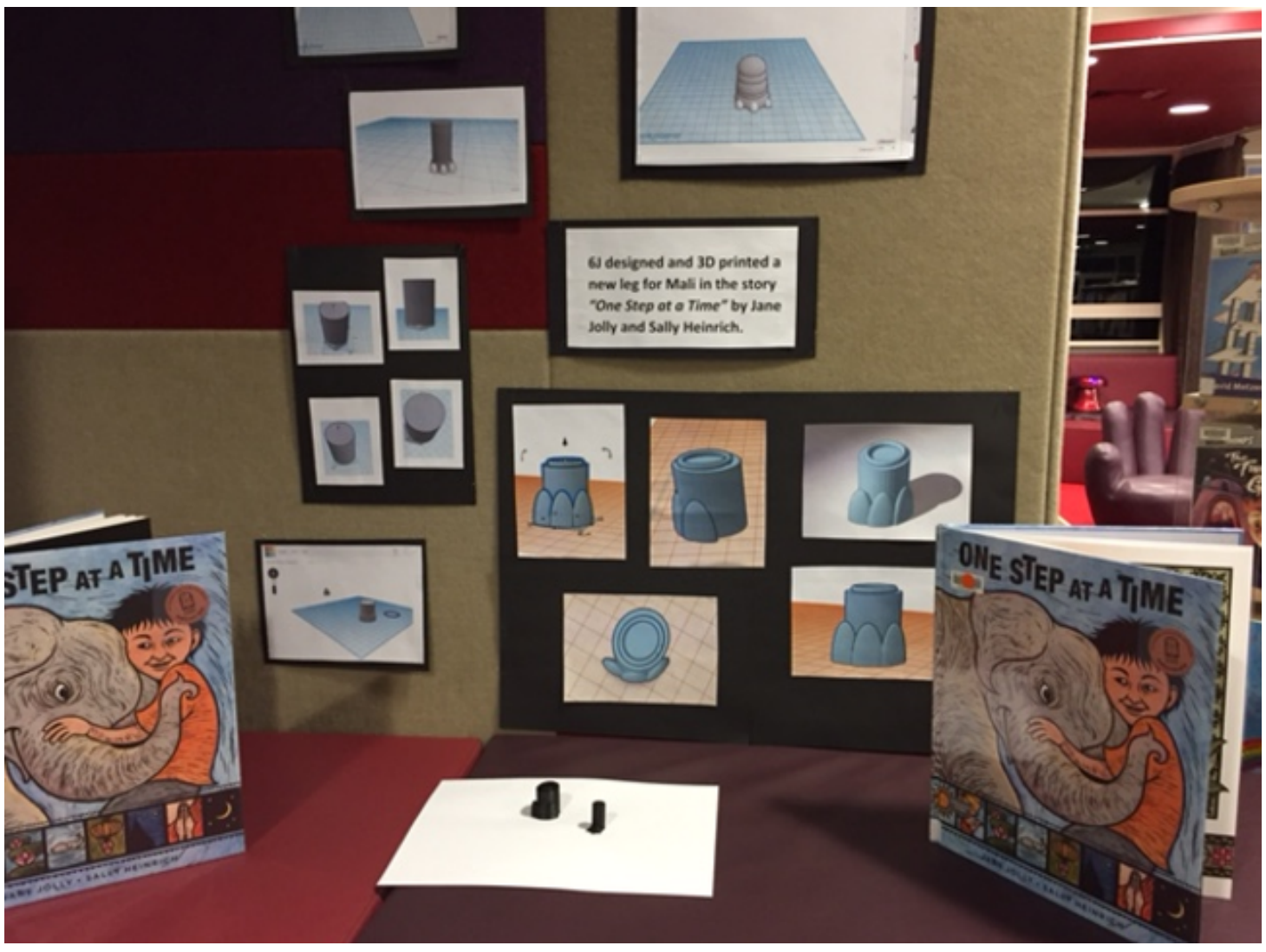
Mechanica by Lance Balchin

This amazing book is about robotic animals that start to evolve on their own in the wild. The story is set 200 years from now, in a future where humans have destroyed the environment. Liberty Crisp, a 15 year old girl who has studied science all her life, is caught in the middle of a brewing war between humans and machines. The girls and I spent a long time analysing the incredible illustrations, prompting plenty of discussion. Students went on to design and create incredible creatures made from recycled items found in the home. As part of a competition, they were invited to make a 'Mechanica' move. Many students used elastic bands, others used small motors. One design, pictured below in the video, Moving with magnet by Jackie Child (9 secs), even used magnets to animate the object!

Creating with squishy dough

One Step at a Time by Jane Jolly

This is a very touching story of Luk and his elephant, Mali, who steps on a landmine. Luk cares for Mali, who is fitted with a prosthetic leg. This accident brings the boy and his elephant even closer. The Year 6 girls used Tinkercad to design a new leg for Mali and 3D printed their leg designs.

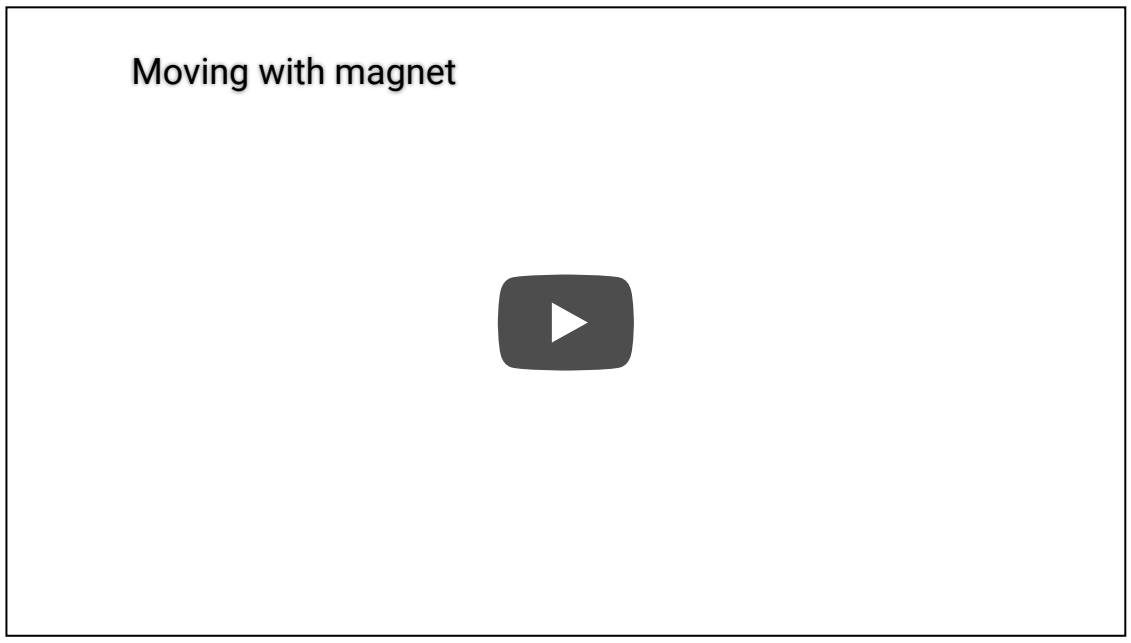


Designing and 3D printing an elephant leg

Fluke by Lesley Gibbes

Before reading this lovely story of being lost and found, I immersed students in an underwater world using virtual reality. We used the VR diving app to provide a sense of Fluke's environment.

Are We There Yet? by Alison Lester



Different Like Coco by Elizabeth Matthews

Our girls loved this story of Gabrielle 'Coco' Chanel - a poor, orphaned, skinny child who was 'different' but believed in herself to create and become a fashion icon. Again, there was plenty of discussion and sharing of ideas. As a follow-up activity, students were invited to make a marble run using ideas and questions from the text to guide the marble's progress through the run. When the marble came to a question or discussion point, the issue had to be considered before the marble was released to move on. Many girls decided to do the same with other books they had enjoyed. This activity resulted in the creation of a large marble run wall, featuring spinning wheels, LEDs and pulleys, which we filmed and timed.

Marble run

The Duck and the Darkling by Glenda Millard

This enchanting story of friendship, hope and joy inspired our Year 1 girls to use squishy dough to make something light from dark. In the story, Peterboy wants to bring light into his grandpa's life. He does this through Idaduck. It's a beautiful story and the girls demonstrated going from darkness to light in their creations. For example, a blob becoming a snail, and a cocoon becoming a butterfly.

This popular story, loved by adults and children alike, lent itself beautifully to students recreating Grace's journey around Australia using a Pro Bot. After reading parts of the story, the girls took turns to program the Pro Bot, navigating it to the location mentioned.

In a variation on this concept, another activity involved students navigating a robot to a desired location on a map, then using the Oliver library catalogue to locate a book which is set in that area.

Programming robots to navigate maps

Ride Ricardo Ride! by Phil Cummings

This is a powerful story of WWII and the effects the war had on a village, especially the lives of Ricardo and his father. The significance of the bike in the story prompted the girls to use materials from the makerspace to build a bike. One student recreated a scene from the story and used LittleBits to make the bike travel across the scene.

Josephine Wants to Dance by Jackie French

This delightful story is about a kangaroo who loves to dance. Our girls love dancing, so they filmed their dances against a black backdrop and then inserted their video into a black PowerPoint slide. Using sealed laminating sheets, the girls drew a square pyramid to make a hologram.

Hologram

Lester and Clyde by James Reece

An oldie but a goodie! After sharing this story about two frogs and discussing the pollution of waterways, the girls used Makey Makey with SoundPlant to make the school garbage bins thank people for disposing of their rubbish.

Seven skills students need for their future

Providing opportunities for our students to enjoy literature and technology is lively, fun and supports plenty of learning. As a teacher librarian who is passionate about literature and the maker movement, I've been able to introduce a makerspace into the Junior School library. The maker movement is still spreading and becoming increasingly relevant in today's society. Our makerspace creates an environment which fosters most of the essential skills for the future as identified by Dr. Tony Wagner (2014, pp 14-42), co-director of Harvard's Change Leadership Group:

- critical thinking and problem solving
- collaboration across networks and leading by influence
- agility and adaptability
- initiative and entrepreneurialism
- effective oral and written communication
- accessing and analyzing information
- curiosity and imagination.

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SPaRK – NSW ecosystems on show

What are the systems within ecosystems?

By Gaye Braiding - teacher at Field of Mars Environmental Education Centre, Epping North Public School, and NSW Schoolhouse Museum of Public Education.

Resource overview

A Shared Practice and Resource Kit (SPaRK) for geography and science Stage 2 (Years 3-4) and Stage 5 (Years 9-10).

NSW ecosystems on show by NSW Department of Education (2018).

Showcasing fourteen natural ecosystems and one urban ecosystem in New South Wales, NSW ecosystems on show is an interactive resource that supports teaching and learning in science and geography. Each ecosystem is introduced by an overview of its characteristics, climate, plants and animals. Further tabs outline the significance of the ecosystem to animals, people and the environment, and describe strategies for its conservation and protection.

When used in Google Chrome, a Google Earth link takes users to an example of each ecosystem, positioning them within a photo sphere for a rich, virtual, immersive experience. Clicking out of Street View delivers a bird's eye view of the ecosystem, its location and surrounding land uses. This, and links to further examples of the ecosystem, enable virtual fieldwork experiences.

For those seeking hands-on fieldwork investigations in the natural environment, the department's widespread network of environmental education centres is featured in the resource. Related reading and other secondary sources are also suggested, and could be used in preparation for, or as follow-up to, the collection of primary data in the field.

Using the resource to build understanding of the functioning of ecosystems enables students to consider and determine personal sustainability actions that contribute to protecting these ecosystems into the future.

Educational significance

Highlighting the diversity of environments and ecosystems in NSW and their ecological functioning, NSW ecosystems on show supports the Science and Technology K-6 Syllabus, Science 7-10 Syllabus and Geography K-10 Syllabus. It strongly aligns with a systems thinking approach to understanding and working towards sustainability.

With a focus on ecology, the website also supports the Living world modules and strands of the science syllabuses, particularly assisting investigations into the interdependence of living things. It enables students to use systems thinking and the skills of working scientifically as they explore and observe the interrelated living and non-living components of virtual ecosystems. The structure of the resource models ways in which scientific information can be organised and communicated.

For Stage 2 students investigating the survival of living things, the 'significance' tab for each ecosystem provides information on the interrelationships among and between species and their habitats. Students in Stages 4 and 5 investigating and evaluating strategies for conserving and maintaining sustainable ecosystems will find examples of human impacts, threats and management strategies in the 'conservation' tabs.

From a geography perspective, NSW ecosystems on show enables students to acquire information through a variety of geographical tools including photographs, virtual maps, satellite images and web tools. With an emphasis on the characteristics of and interconnections within each ecosystem, the resource reinforces the geographical concepts of place, space, environment, interconnection and sustainability. In particular, it supports the Geography K-10 Syllabus focus areas: The earth's environment (Stage 2) and Environmental change and management (Stage 5). It could also support Features of places (Stage 1) and Factors that shape places (Stage 3).

At a glance, the website's landing page provides Stage 2 students with a snapshot of different environments and the diverse natural characteristics of Australia. Students could select several of the ecosystems to compare their climate, vegetation and animals. For deeper investigations into the significance of environments, students could use one of the featured ecosystems as a case study.

For Stage 5 students investigating the functioning, role and importance of natural environments in Environmental change and management, the resource provides introductory information and an overview of environmental management as a springboard to deeper investigation.

Suggestions for using this resource

As a class, view an ecosystem in NSW ecosystems on show and make connections using text-to-self, text-to-text and text-to-world strategies. For example, ask questions such as:

- Have you seen environments like this?
- Have you visited a place like this?
- Have you seen photographs, documentaries or social media posts of places like this?
- Have places like this been in the news recently?
- How are places like this being used?
- What issues are you aware of relating to places like this?
- Does this information remind you of other information, websites or books you have accessed previously? (eg see References and further reading for related picture books.)

Define the words 'system' and 'ecology', then define 'ecosystem' as an 'ecological system'. Highlight and define terminology relating to systems such as 'relationships', 'interrelationships', 'interactions', 'interdependence' and 'interconnections'. Use images in the resource to provide examples, for instance the image of beetles feeding on blossoms in the sclerophyll forests – Sydney ecosystem.

Provide time for students to personally explore the resource using computers or mobile devices. Students use a Y-chart to identify something that was new knowledge, something that generated an emotive response, and a link they found interesting.

Focussing on interconnections and interdependence, students record any questions which emerge as they browse through the resource. These can be used to generate a set of inquiry questions for a scientific or geographical investigation.

Teaching activities

Stage 2 geography – what are the natural characteristics of Australia?

Working in Google Chrome, students explore the ecosystems in NSW ecosystems on show and view the images within each tab. They select the Google Earth link to view a photo sphere of each environment at the personal scale. Students then select the yellow figure to view the area at a local scale, and the minus icon to zoom out to a regional scale.

Using Google My Maps, students plot the locations of the featured ecosystems. They add photographs and labels to each site.

The earth's environment

A student:

examines features and characteristics of places and environments GE2-1

- acquires and communicates geographical information using geographical tools for inquiry GE2-4.

Content

Different environments

Students investigate the natural characteristics of Australia and a country in Asia (ACHGK020), for example: comparison of climate, natural vegetation and native animals.

Stage 2 geography and science – how does the environment support the lives of living things? How are they interdependent?

Plan a field trip to a nearby natural area for a geographical and scientific investigation. This can be organised through one of the department's environmental education centres or managed independently.

Pre-fieldwork

As a class, using Google Earth in Google Chrome, view a satellite image of the natural area to be visited. Select the yellow figure to view the Street View level. Using NSW ecosystems on show as a reference, determine the ecosystem type and identify the plants and animals it may support.

Create a mind map to show the potential interconnections between:

- plants and animals. For example, plants as food, plants as shelter
- plants and animals and the non-living features of the environment. For example, plants growing in soil, tadpoles in a pond, plants providing oxygen
- people and the living and non-living features of the environment.

Formulate a set of inquiry questions to guide the fieldwork investigation.

Fieldwork

Plan data recording activities with a focus on interconnections and interdependencies between living things and the environment. Fieldwork activities should include sensory observations, time for exploration and creative ways of recording observations using a variety of media. Suggested fieldwork activities include:

- taking photographs of natural living and non-living features of the environment, human features and examples of interactions, such as a water dragon sunbathing on a tree branch or rock
- constructing field sketches that identify and position human and natural features
- creating labelled scientific drawings detailing specific habitats, such as a habitat tree, rock pool or rotting log
- recording natural and human sounds using a sound map
- hunting for invertebrates using sampling techniques such as sifting through leaf litter, shaking shrub branches onto a mat and dip-netting in ponds
- observing and recording evidence of animals using the environment, such as parrots using tree hollows, termite nests on tree trucks, nests and diggings in the soil

- reflecting on personal experiences and perceptions of the environment as student investigators and visitors.

Post-fieldwork

Tables, annotated photo collages and maps could be used to organise and present the components of an ecosystem and some of the interconnections observed. Supplementary information could be acquired from NSW ecosystems on show and other secondary sources to identify relationships and connections.

Students construct mind maps to show the interactions within the ecosystem. With plants in the centre, students insert animals that rely on the plants and use arrows and labels to identify the relationships. Students also include non-living features of the environment. As evidence of knowledge and use of systems thinking, students verbally explain some interdependencies illustrated in their concept map. They start to consider actions they could take which conserve and protect the sustainable functioning of ecosystems.

Students select an ecosystem for independent research using NSW ecosystems on show as a source. In groups, students share their information and identify similarities in interrelationships across ecosystem types.

The earth's environment

A student:

- examines features and characteristics of places and environments GE2-1
- describes the ways people, places and environments interact GE2-2
- acquires and communicates geographical information using geographical tools for inquiry GE2-4.

Content

Significance of environments

Students investigate the importance of natural vegetation and natural resources to the environment, animals and people (ACHGK021, ACHGK022, ACHGK024), for example:

- identification of types of natural vegetation, for example forests, grasslands, deserts
- explanation of the importance of natural vegetation to animals and the functioning of the environment, for example provision of habitats, production of oxygen.

Living world

A student:

- questions, plans and conducts scientific investigations, collects and summarises data and communicates using scientific representations ST2-1WS-S
- compares features and characteristics of living and non-living things ST2-4LW-S.

Content

Survival of living things

Students describe how living things depend on each other and the environment to survive (ACSSU073, SysT), for example:

- bees and flowers
- birds eat and disperse seeds.

Stage 5 geography and science – how can environments be sustainably managed?

As a stimulus, view the dune photograph (within the 'Conservation' tab) showing various management strategies used to restore a coastal dune ecosystem. Note the accompanying list of 'current management issues' for coastal dunes in the Illawarra region of NSW.

Using a jigsaw strategy, students use NSW ecosystems on show to consider a selection of the available ecosystems, determining their significance and identifying conservation issues and management strategies. Students discuss similarities and differences in threats and approaches to conservation of ecosystems.

For one or more selected ecosystems, students summarise their information in a table that lists specific threats and management strategies. Students discuss the immediate and broader impacts of the listed management strategies.

Students undertake fieldwork in an ecosystem, organised through one of the department's environmental education centres or planned independently by the school. Students:

- collect abiotic and biotic data to assess the health of the ecosystem
- identify threats and issues
- record current management strategies.

Following this fieldwork, students use holistic thinking to analyse impacts of management strategies on relationships within the ecosystem and interconnections regionally. Students construct a causal loop diagram that illustrates the impacts of these management strategies. Causal loop diagrams illustrate interconnections and interrelationships and the holistic nature of an ecosystem. Animated diagrams can be created using Loopy, an online tool for systems thinking.

Students consider ways in which they can take individual or collective action to contribute towards ecosystem conservation.

Environmental change and management

A student:

- assesses management strategies for places and environments for their sustainability GE5-5
- acquires and processes geographical information by selecting and using appropriate and relevant geographical tools for inquiry GE5-7
- communicates geographical information to a range of audiences using a variety of strategies GE5-8.

Content

Environmental management

Students investigate environmental management, including different worldviews and the management approaches of Aboriginal and Torres Strait Islander Peoples (ACHGK071, ACHGK072), for example discussion of varying environmental management approaches and perspectives.

Living world

A student:

- processes, analyses and evaluates data from first-hand investigations and secondary sources to develop evidence-based arguments and conclusions SC5-7WS
- analyses interactions between components and processes within biological systems SC5-14LW.

Content

LW2 Conserving and maintaining the quality and sustainability of the environment requires scientific understanding of interactions within, the cycling of matter and the flow of energy through ecosystems.

f. Students evaluate some examples in ecosystems of strategies used to balance conserving, protecting and maintaining the quality and sustainability of the environment with human activities and needs.

Experimenting

Stage 2

Students follow the sustainability action process to improve or enhance biodiversity in an area of the school grounds or local area with a focus on interconnections and relationships between species. Habitat improvement projects could include creating small bird habitat using ground covers and native flowering shrubs, building 'insect hotels', or creating 'lizard lounges' by adding rocks, fallen logs and ground covers to native gardens. The grassy woodland 'Conservation' tab lists suggestions for students to help protect remaining areas of biodiversity.

Stage 5

Using the sustainability action process, students use design thinking and systems thinking to investigate and propose solutions to a local environmental management issue that threatens a local ecosystem, ideally within the school grounds or surrounding area. Informed by their fieldwork and research, students undertake actions that restore or protect the ecosystem and work towards achieving environmental sustainability. Potential actions could include bush regeneration, restorative planting, fencing, signage or a stormwater filtration system.

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