

Dee Why Public School

Small steps, big changes

Sustainability Case Study: Waste & Biodiversity





Small steps, big changes

Building on its previous sustainability initiatives and learning from the experiences of other schools, Dee Why Public School embarked on a multi-faceted initiative to increase biodiversity at the school and reduce waste going to landfill.

The project was called 'Small steps, big changes', reflecting the behaviour change ethos of the activities that the students, teachers and wider school community participated in.

This case study provides an overview of the project and then goes into deeper detail about how the school achieved that behaviour change through planning, education and engagement.

Overview

Background and context

Sustainability efforts at Dee Why Public School were previously focused on the reduction of single-use plastics and waste recycling. Teachers on the Environment and Sustainability Committee had worked collaboratively with the P&C Sustainability Sub-committee to support and promote a number of initiatives including:

- conducting waste audits and collecting products for off-site recycling
- coordinating education sessions about waste reduction
- establishing classroom paper recycling.

A composting system had also been set up, however, the system could not be sustained through the COVID pandemic and there were also very few opportunities to use the generated compost within the existing landscaped garden beds.

At the same time, many of the school's students had become interested in growing food after a collaboration between the STEM teacher and the Gardening Club coordinators. The school was also given the chance to trial an aeroponic kit from STEM. T4L. The Gardening Club students grew vegetables in the aeroponic system, which was placed in a prominent location near the school playground. Other students used the aeroponic garden as part of weekly STEM lessons focused on data collection and linked to the Digital Technologies content strand.

Through these experiences the school identified a need to establish a more efficient composting system that could divert organic food waste from landfill while providing a high-quality resource for the garden. This led to the development of the 'Small steps, big changes' project, and the school successfully applied for a Sustainable Schools Grant to fund those plans.

Project summary

This holistic project involved all students from K-6 in authentic learning activities to increase awareness and deepen knowledge about sustainability practices. The project was implemented between May-December 2023.

New garden areas were created to grow food for pollinators and humans, as well as make habitat spaces for local wildlife. The new composting system sees organic waste diverted from landfill to fertilise school gardens. The outcomes of the project were celebrated at a Student STEM and Sustainability showcase at the project's culmination.

Project goals

- Increase the biodiversity of the school environment through 'rewilding' and creating habitat for wildlife.
- Establish a composting system to accommodate students' fruit break scraps and produce high-quality compost for new and existing garden beds.
- Produce student-created educational resources highlighting the importance of waste reduction strategies and which could be shared with other students, staff and community members.
- Enable students to learn about Aboriginal culture and foster a deeper connection with nature through the creation of a bush tucker garden.
- Develop and increase the school's collaborative partnerships with local community groups and organisations including the Coastal Environment Centre, Kimbriki Waste Education Centre, local businesses (including Aboriginal-owned businesses), parents and carers.

School operations

Research, consultation and planning were important steps before the physical implementation of the waste and biodiversity components of the project.

Current state and research

The school had previously undertaken a waste audit, an important first step in assessing the current state of waste disposal on site and how to reduce it going to landfill.

That audit had led to the earlier set up of a compost system, but the school quickly learned that composting requires a whole-of-school approach to manage, as well as sufficient garden beds for the compost to be used on site.

From this grew the idea to undertake a new project which increased the number of garden beds, not only to provide sufficient end-points for the compost, but to also provide additional spaces for the school's growing gardening club to utilise.

To support their idea with educational evidence, the project leads then explored the academic literature, including research conducted at James Cook University which found that gardens in schools are an important resource to help students connect to nature and become more environmentally aware.

The research further found that gardens are also a way for students to engage with the entire curriculum in 'place-oriented education', and that being outdoors in a garden has a positive impact on student and staff wellbeing.

Preparation and planning

The development of the 'Small steps, big changes' project plan was informed by consulting with various staff members, external agencies and organisations.

During preparation, the project leads obtained the support of all stakeholders including the school principal, school executive staff and the P&C Sustainability Sub-committee. These discussions included explaining the proposed project goals, asking for suggestions, explaining the commitment required and obtaining quotes where applicable.

Educators from the Northern Beaches Coastal Environment Centre provided advice about local wildlife in the school environment, rewilding and pollinators. Kimbriki Waste Education Centre was consulted on composting systems. Bush to Bowl were engaged to advise on Aboriginal culture and choosing suitable plants for the bush tucker garden.

The P&C Sustainability Sub-committee provided information on how to improve the previous composting set-up.

The project co-leaders attended a Waste and Sustainability Professional Learning session to deepen their knowledge on sustainability practises. They also sought advice from the school's Instructional Leader (Learning and Support) on the social-emotional and wellbeing aspects of the project.

Finally, the project team visited a neighbouring school, Fisher Road Public School, which was a successful applicant for a Sustainable Schools Grant Funding in a prior round, to learn about how they had implemented their successful composting system on site.

In the project plan, the co-leaders took care to demonstrate how the project aligned with the goals of the school's Strategic Improvement Plan (SIP), chiefly through:

- Strategic Direction 3: Collaboration. The project had a focus on collaborative practices and nurturing authentic community partnerships.
- Strategic Direction 2: Wellbeing. The project also supported a focus on relationships and belonging through the opportunity for students, teachers and the wider community to garden together and build something positive.



The fruit break scraps from each class were weighed and recorded during the project to obtain an average estimate of how much organic waste was being diverted from landfill.

Waste

All 23 classes in the school were given recycled yoghurt tubs to collect fruit and vegetable scraps from their Crunch 'n' Sip break.

Class Compost Champions were elected and responsible for bringing the compost tubs to the Gardening Club area to be processed. Tubs were collected 3 times a week. Compost scraps were weighed and recorded using Google Sheets, and a record kept of which classes returned tubs.

The school's original compost bins were re-used and clear instructions applied about how and when to use. A worm farm was donated and quickly became a favourite amongst the students.

An excursion to Kimbriki Eco-House allowed Stage 2 and Support class students to learn about general waste management and waste reduction strategies, and specifically about how to make compost and the role of worms therein. They then created educational videos using equipment from STEM.T4L.

Through these efforts the school is now diverting approximately 5 kg of organic waste from landfill each week.

Looking ahead, the school has plans to improve its composting system by implementing a class roster system, and to build-on student-led waste reduction initiatives, for example formalising the "litter-picking" (Litter Busting) club idea to complement the existing Compost Champions.

"Throughout the project we have been buoyed by students' enthusiasm and engagement, for example when two Year 6 students from LBOTE backgrounds volunteered to aerate the compost after becoming fascinated by the worms. After the student-created 'Waste Matters' videos had been viewed by all classes, Year 1 students in the playground eagerly announced the formation of a 'litter-picking' club. These responses indicated that our efforts to promote Sustainability measures were taking effect."

Sharon Raj, project co-lead.

Stage 2 students learned all the important steps in making compost, including how to aerate the compost to provide airflow.





Biodiversity

‘Small steps, big changes’ also included a biodiversity component, through the rewilding of small areas around the school grounds and the planting of a bush tucker garden.

Stage 3 students attended an incursion led by educators from Bush to Bowl to learn about Aboriginal culture, bush tucker plants and uses. The incursion included a walk around the school to identify native plants.

Additional biodiversity activities included:

- Kindergarten students learning about local wildlife and then planting native species provided by Northern Beaches Council with their Year 6 buddies.
- Stage 1 and Year 5 students creating insect hotels to encourage pollinators.

These habitat development areas are now maintained by the Gardening Club, who regularly undertake mulching, weed control and vegetation litter management. Garden waste is composted or mulched.

Looking ahead, the school has identified areas to add to the bush tucker garden which were suggested by students during the initial garden design, but which were not included in the ‘Small steps, big changes’ project due to budget and time constraints. As part of the consultation Bush to Bowl created a planting plan for the school to include a pond and other student suggestions such as lizard and bee habitats.

“It was interesting to find out we have so many native plants in our school and we didn’t know. I liked learning about the bottlebrush which produces nectar when you tap it on your hand.”

Dejan, Year 6.



Year 5 students worked together with Stage 1 students to make insect hotels during the whole school Green Day Incursion.

Teaching and learning

Careful educational design saw the project provide ample links to curriculum and cross-curriculum priorities, as well as practical activities to enhance student engagement.

Linking to curriculum

The project was linked to the NSW Science and Technology syllabus by innovatively delivering components of the Living World content strand in combination with the Digital Technologies strand.

Specific science outcomes across K-6 included exploring, describing, comparing and examining the interactions between living things and their environment. Other cross-curricular outcomes include examining, describing and comparing interaction between people, places and environments (Geography), creating texts (English) and selecting, using and applying appropriate ways to collect and display data (Mathematics).

The curriculum requirements of the project were delivered through weekly STEM and EAL/D lessons by the co-project leaders. These units of learning included the cross-curriculum priorities of Sustainability and Aboriginal and Torres Strait Islander histories and cultures. Student work produced during these units of learning was displayed during the STEM and Sustainability Showcase that was held at the end of the project.

Providing authentic, hands-on learning opportunities

A project-based learning approach was used to promote hands-on, immersive learning experiences underpinned by design thinking and cross-curricular outcomes. Students were encouraged to use critical-thinking, problem-solving and collaboration skills to design solutions based on real-world problems (e.g. 'How can we help other students remember which bin to use?').

As an example, students were tasked with designing the bush tucker garden to help the school community increase its knowledge about native plants, connect to nature and increase biodiversity at the school. They collaborated in small groups to

measure and photograph the proposed site, created 3D virtual models in CoSpaces licensed through stem.T4L and compiled a jointly-researched list of plants they wanted to include. Selected student designs were sent to Bush to Bowl and the final garden design was made based on these ideas. Students then assisted with the final planting of the area.

Incorporating First Nations perspectives

The project saw collaboration with educators from Bush to Bowl, a local Aboriginal-owned business, which was involved in the project from start to finish. Landscaper Adam Byrne (Garigal/Gadigal) shared his knowledge about local native plants and how and why he cares for the land (caring for Country). At the completion of the project, the whole school assembled for a Smoking Ceremony.

Using data

Collecting, recording and communicating about data featured strongly throughout the project. A number of student activities also supported the collection and analysis of project metrics:

- S1 collected information about the diversity of insects visiting the pollinator-friendly plants.
- S2 used microbit clickers before and after the implementation of the project to collect data on the playground for the litter survey. They also used a catchment model during an incursion by the local council's Coastal Environmental Centre to learn how rubbish and pollutants affect the local catchment.
- S3 students collected data about the current number (and location) of native plants on school grounds. They repeated the same process during and after the planting sessions, and compared it to data from first session. Students also measured garden areas before creating their garden designs.

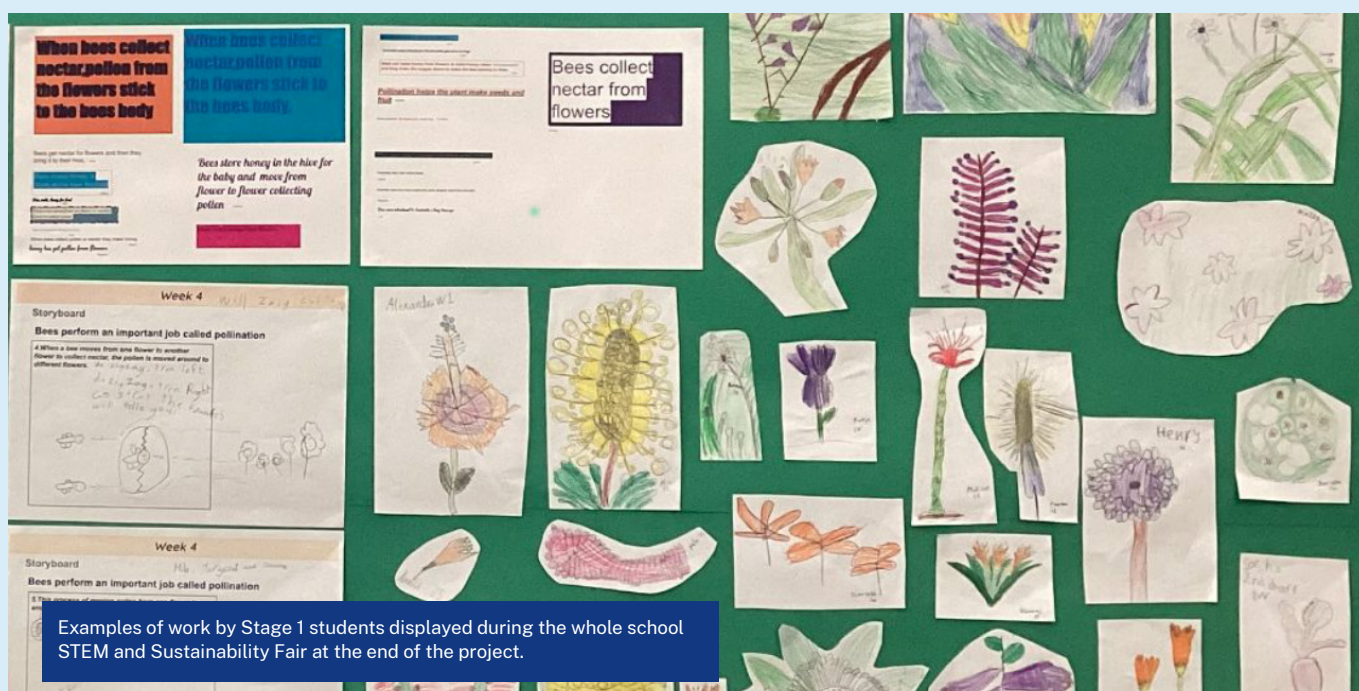


Stage 3 students measuring the area that would be turned into the bush tucker garden. They measured the length and width of the area, estimated the volume of soil in the area and also attempted to measure the circumference of the mature trees and estimated the diameter of the canopy of individual trees.

Curriculum-linked learning and activities

Stage	Code	Description
ES1	STe-3LW-ST	Activities were designed to complement the Stage focus on living things.
ES1	STe-1WS-S	Students began with a guided walk around the school environment to observe and photograph living things using iPads. These photographs led to discussions about the characteristics and needs of living things. Students chose one living thing to focus on, for example a lizard, then photographed habitats and food sources. Students discussed the problems these creatures may face living in a busy school environment, for example students accidentally hurting an animal's home or food source while playing.
ES1	STe-2DP-T	To complete the unit, students worked in pairs to create an e-book aimed at teaching others to protect the living things in our environment.
ES1	STe-7DI-T	Students used various digital tools in the Book Creator app on the iPad, including text boxes, drawing tools and photo manipulation.
S1	ST1-5LW-T	This built on the students' knowledge of butterfly life-cycles which was the Stage focus. A quick poll about the students' favourite fruits led to a discussion on the importance of pollinators in helping plants produce fruit and seeds.
S1	ST1-1WS-S	Students explored the school environment, observing and recording the location of flowering plants (pollinator food sources) on maps.
S1	ST1-4LW-S	Year 1 students chose a specific flower to draw, which they refined after analysing their work and receiving peer and teacher feedback.
S1	ST1-3DP-T	This process was aided by the story of 'Austin's Butterfly' about a young student learning to observe 'like a scientist'. The flower-drawings were used to jointly construct a large map of the school grounds. Students then programmed Ozobots to simulate the path of a pollinator from one flowering plant to another. Year 2 students worked together to create a video story highlighting the importance of pollinators. Students jointly created storyboards and illustrated backdrops before programming the Ozobots to simulate the movements of a bee's daily movements. All Stage 1 students used the Ozoblockly visual programming language to control the movements of the Ozobots.
S1	MA1-2WM, MA1-9MG	During coding activities, students used mathematical thinking to measure how many 'steps' the Ozobot needed to take and what type of turn (half turn, quarter turn, an eighth of a turn) to use.
S2	ST2-2DP-T	Using the Design Thinking process to grapple with the problem of litter in our environment, Year 3 students conducted a mini litter-audit, sorting and counting one week's worth of litter collected by the school cleaners from our school playground. After viewing the results, each Stage 2 class chose a specific focus topic, for example how litter from the playground can reach the ocean. Using the stem.T4L filming kits, students created a video series called 'Waste Matters' to educate the school community about the problems caused by litter.
S2	ST2-3DP-T	Students also suggested ways to solve the litter problem with ideas for now and for the future. They created prototypes of their futuristic solutions (e.g. cleaning robots) using recycled materials and used a visual programming language to control Dash robots to simulate how these prototypes might work, for example to drive autonomously around the playground.

Stage	Code	Description
S3	ST3-4LW-S	A Stage 3 STEM unit complemented the Stage focus on food and fibre. Students used a collaborative question and answer process in Google Classroom to discuss the main ingredients of their favourite foods. After realising that all our meals depend on plants, students explored the food production process from farm to plate through various web-based activities including a virtual tour of the Royal Botanic Gardens, Mt Annan.
S3	ST3-2DP-T	Educators from Bush to Bowl led an incursion within our school grounds to investigate the various plants that have been used by Aboriginal people as food or medicine for thousands of years. Students were tasked with designing a bush tucker garden to help the school community increase its knowledge about native plants, connect to nature and increase biodiversity in our school. They collaborated in small groups to measure and photograph the proposed site, created 3D virtual models in CoSpaces licensed through stem.T4L and compiled a jointly-researched list of plants they wanted to include. Selected student designs were sent to Bush to Bowl and the final garden design was made based on these ideas. Students then assisted with the final planting of the area.
NAP S1-3	ESL Scales 4.3.8	In EAL/D lessons, the exploration of sustainability themes, such as sustainable living, composting, and learning about bees and worms, provided a rich context for language acquisition, vocabulary development and comprehension.
S1	ESL Scales 4.3.8	The EAL/D literacy program incorporated a blend of fictional and non-fictional texts about honey bees, enabling students to gain a comprehensive understanding of these crucial pollinators.
S1-3	ESL Scales 3.11.1, ESL Scales 3.4.6, ESL Scales 3.7.2	Engaging activities, such as designing posters about worm farms, following instructions and constructing a worm cafe brought these lessons to life, reinforcing the importance of sustainability practices. Additionally, practical experiences like reading procedural texts on how to grow tomatoes and subsequently growing tomatoes allowed students to apply their knowledge in a tangible way, connecting theoretical learning with real-world applications.



Community engagement

Learnings were shared with the school community and beyond the school gate to increase the impact of the project.

Policy and reporting

The sustainability learnings of the project continue to be embedded and extended via a number of forums, including the school's Environment and Sustainability Committee and the P&C Sustainability Sub-committee.

The wider staff body enhanced their knowledge of Sustainability topics through a collaborative professional learning session delivered by the project co-leads. As a result of the professional learning, teachers in each stage now work together to incorporate sustainability topics within their Stage programs.

Community and communication links

One of the highlights of the project was the connections that developed through the project, leveraging existing partnerships and forging new ones which will be invaluable as the school continues on its sustainability journey.

“We have been amazed by the amount of support we have received from our local experts and organisations.”

Sharon Raj, project co-lead

The project co-leads have now joined the Northern Beaches Sustainability Teacher's Network and recently presented a case study at the 2024 Waste & Sustainability Professional Development Day at the Kimbriki Eco House and Garden, as well as contributed to Kimbriki's Resource Hive

Activities culminated in a STEM and Sustainability Showcase for the Dee Why Public School community, where a range of student-created 'Waste Matters' videos were premiered and families were invited to view displays of student work documenting the various biodiversity and waste-reduction projects linked to STEM and EALD lessons.

Students particularly enjoyed the naming-competition for the teacher-created giant worm 'mascot' which is used to remind students to collect compost scraps.



At the start of the STEM and Sustainability Showcase, the Dee Why PS community gathered for a Smoking Ceremony led by First Nations educator Charles from Bush to Bowl.

Advice for other schools

There's a few things the project co-leads would do differently if they had their time again. Consider these tips when planning your own similar project in future.

Timing

Scheduling the staff professional learning session earlier in the term could have provided teachers with more opportunities to include authentic lessons linked to different aspects of the project, for example rich Maths tasks based on classroom waste audits or calculating the amount of Greenhouse gases avoided by diverting food scraps from landfill.

"I could incorporate Energy and Waste topics into my lessons tomorrow, starting with a reflection of our current behaviours. I'd like to learn more about biodiversity. Something so different and an eye-opener for our own practises."

Year 4 teacher.

Due to the timing of the grant announcement and term structure, a number of interruptions impacted on the timetable in Term 4. Missed cross-curricular lessons and activities were not easily made-up, leading to delays in implementing certain parts of the project. Ideally, the project co-leads suggest that big projects like these would be better run between Term 1 and 3 of the school year.

Documenting the project

While there were two teachers to implement and manage the project, the project co-leads often found it difficult to find the time to record progress and successes, especially during hands-on tasks such as gardening and composting, or when facilitating incursions and the showcase. They delegated some of the photo-taking duties to students and were

supported by other teachers in this area, however in hindsight they would have assigned a core group of students with the responsibility of documenting and writing about the project, for example recruiting a team of Sustainability Reporters.

Student volunteers

The project leads found that the students who volunteered to help with additional roles like composting or gardening were often involved in other extra-curricular activities and clubs such as Drama or Music, which sometimes resulted in timetable clashes and reduced attendance. Attendance was not made compulsory as these students were volunteering time during their own lunch-breaks. For future project the school will look at encouraging a broader set of students to participate to share this load.

Unexpected tasks

In addition to the lesson and project planning, there were many 'hidden' tasks to consider including managing suppliers, organising and following-up permission notes and coordinating timetables for activities. The project co-leads recommend that time to manage the project should be rostered into the teacher's timetable as additional RFF.

Unexpected visitors

The school's wildlife disrupted the rewilding project! Brush Turkeys uprooted many of the new pollinator plants provided by the Northern Beaches Council for the Green Day incursion. While Gardening Club students managed to replant and save some of the hardier plants, many of the other plants had been left out of the ground over the weekend and dried out.

They've learned from the brush turkey experience and now protect new Bush Tucker garden areas directly after the planting by using fences and tree guards. These steps have ensured the bush tucker plants have survived in their new homes.

We acknowledge the homelands of all Aboriginal and/or Torres Strait Islander people and pay our respect to Country.

Say hello

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