AUSTRALIAN DATA SCIENCE EDUCATION INSTITUTE

Biodiversity with Data - Primary School Project

Biodiversity measures how many different types of plants or animals can be found in a particular place. We are going to measure biodiversity in garden beds around your school.

This project meets outcomes for **Maths, Science,** and **Digital Technologies**. See the table at the end of this document for a listing of Victorian curriculum outcomes. It can also be used for informative writing and related aspects of the English curriculum.

Year levels

Foundation to Grade 6

Curriculum Areas

Science/Biology
Science/Science
Inquiry Skills
Maths/Number and Algebra
Maths/Statistics and Probability
Digital Technologies/Data and Information

Equipment needed

- Garden beds
- Gardening gloves
- Digital camera

Method

With your class in groups of 3-4, have each group select a garden bed; vegetable garden, flower bed, or other. With each garden bed, follow the steps below.

Step 1

- Count the number and type of plants. For those you don't know the names of, group them by features - eg 6 grassy plants, likely the same unidentified species, otherwise group them by name - For example 6 correas.
- Take a photo of of the different plants for later identification and comparison.
- Take a photo of the whole garden bed, too.
- Discuss the clearest way to display this information? What are some more creative ways to display it? For example bar charts made of pictures of the plants.
    - Younger students (F-2) could "graph" the plants by stacking different coloured blocks for different types of plants.
    - Middle School students (3-4) could draw the graph by hand or use software such as Excel or Google Sheets.
    - Senior School students (5-6) could create the graph in a spreadsheet, labelling carefully, and adding images to each bar of the bar chart to show which plant is represented.

Step 2

- Observe the soil type - is it hard, dry, and clay based? Sandy? Rich black soil?
- Is there a layer of deliberate mulch? Is there a layer of leaf litter or other "accidental" mulch, or is the soil exposed?
- How wet is it?
- Set out the results systematically, for example in a table:

Soil Characteristics (entries here are selected examples only)

Colour	hardness	moisture content	mulch	Number of small rocks present
reddish	Very crumbly and soft Very hard to dig	Visible water Damp but no visible puddles Super dry	Covered in leaves Lots of bark mulch No mulch	Lots of rocks A few rocks Hardly any rocks

Step 3

Make sure you wear good gardening gloves for this step to protect your hands in case of bitey bugs!

- Rummage around in the soil, wearing your gardening gloves, and see what mini-beasts you can find. Count and categorise different bugs in the soil and on the plants. You are looking for worms, spiders, beetles, slaters, and anything else you can see.
- Try to get photos of all of the beasties - especially the ones you don't recognise. For each type of bug, note where it is found - in the soil, on the plants, or in the mulch.

- Make a table containing your data, including the names of your beasties (or descriptions for those you can't identify - eg "fast brown spider" - and pictures if you have them), and how many there were. Eg.

Mini-Beast	Number	Location
Slaters	6	3 in soil, 3 on leaves
Fast brown spiders	3	All in mulch
Ants	Lots (more than 50)	Everywhere!
Worms	13	All in soil

Graph this information. What's the clearest way to display it? Are there more creative ways to display it? (eg bar charts made of pictures of the beasties)

Step 4

- Each group presents a summary of total number of bugs, and total number of different types of bugs. For example 48 bugs in total, 5 different types. (It might be easiest to exclude ants from this total as they are really hard to count!)
- Compare the diversity. How many different types of plants are there, and how many different types of mini-beasts are there between the different garden beds, especially the different types of beds.
    - Does the number of types of bugs seem to be related to the number of types of plants?
    - In garden beds with greater plant diversity, is the bug diversity also higher?
    - Does mulch seem to make a difference to diversity? When garden beds where the soil is exposed with those with mulch, are there more bugs or less?
    - Where are the bugs? On the leaves? In the dirt? In the mulch?

Step 5

As a group or a whole class, consider what questions you might like to explore about your data and the garden beds. Here are some examples:

- What effect does mulch have on garden biodiversity?
- What effect does higher plant diversity have on mini-beast diversity?
- What effect does adding compost have on mini-beast diversity?
- What effect does regular watering have on mini-beast diversity?
- What effect would fertilising have on mini-beast diversity?

For each of these questions you can compare immediate impact with impact over time.

Step 6

- Design an experiment to answer your question. Here are some suggestions, or think of new ones to add!
    - Add or remove mulch and count bugs again after two weeks.
    - Water regularly and count bugs again after two weeks.

- Plant some new plants of a different type and count bugs again after two weeks.

Step 7

- Predict an answer to your question.
- Brainstorm some reasons that your answer might be true, and some that it might be false.
- Implement your experimental change
  - Add or remove mulch, water the garden bed regularly for two weeks, add fertiliser or compost - but make sure for each bed you make a change in, you have one control bed that had similar results initially (if possible) that you don't change.

Step 8

Wait for 1 to 2 weeks and repeat Steps 1, 2, and 3. Compare the photos you took in the initial step 1 with the new photos.

- Have the plants changed?
- Does the soil look different?
- Compare your minibeast tally from the collection of data in Step 3 with the second round of data collection after changes were implemented.
  - Are there more or less bugs in total?
  - Are there more or less types of bugs?
  - Have any individual species changed more than the others?
- Compare your control bed with your change bed. Did either bed change more than the other? How does this compare with your prediction?

Relevant Primary Connection Science resources

- **Years 1-2 School yard safari (in particular lesson 6)**
- **Years 3-4 Feathers, fur or leaves or Plants in action**

Here are some curriculum points you can target with this project - there are lots of others!

Subject/Topic	Foundation-2	3-4	5-6
Science/ Biology	Living things have a variety of external features and live in different places where their basic needs, including food, water and shelter, are met (VCSSU042) Living things grow, change and have offspring similar to themselves (VCSSU043)	Living things can be grouped on the basis of observable features and can be distinguished from non-living things (VCSSU057) Different living things have different life cycles and depend on each other and the environment to survive (VCSSU058)	Living things have structural features and adaptations that help them to survive in their environment (VCSSU074) The growth and survival of living things are affected by the physical conditions of their environment (VCSSU075)
Science/	Respond to and pose		

Science Inquiry Skills	questions, and make predictions about familiar objects and events (VCSIS050)		
	Participate in guided investigations and make observations using the senses (ACSIS011) Use informal measurements in the collection and recording of observations (VCSIS052) Use a range of methods, including drawings and provided tables, to sort information (VCSIS053) Analysing and evaluating Compare observations and predictions with those of others (VCSIS054) Communicating Represent and communicate observations and ideas about changes in objects and events in a variety of ways (VCSIS055)	With guidance, identify questions in familiar contexts that can be investigated scientifically and predict what might happen based on prior knowledge (VCSIS065) Planning and conducting Suggest ways to plan and conduct investigations to find answers to questions including consideration of the elements of fair tests (VCSIS066) Safely use appropriate materials, tools, equipment and technologies (VCSIS067) Recording and processing Use formal measurements in the collection and recording of observations (VCSIS068) Use a range of methods including tables and column graphs to represent data and to identify patterns and trends (VCSIS069) Analysing and evaluating Compare results with predictions, suggesting possible reasons for findings	Questioning and predicting With guidance, pose questions to clarify practical problems or inform a scientific investigation, and predict what the findings of an investigation might be based on previous experiences or general rules (VCSIS082) Planning and conducting With guidance, plan appropriate investigation types to answer questions or solve problems and use equipment, technologies and materials safely, identifying potential risks (VCSIS083) Decide which variables should be changed, measured and controlled in fair tests and accurately observe, measure and record data (VCSIS084) Recording and processing Construct and use a range of representations, including tables and graphs, to record, represent and describe observations, patterns or relationships in data (VCSIS085) Analysing and evaluating Compare data with predictions and use as evidence in developing explanations

		(VCSIS070) Reflect on an investigation, including whether a test was fair or not (VCSIS071) Communicating Represent and communicate observations, ideas and findings to show patterns and relationships using formal and informal scientific language (VCSIS072)	(VCSIS086) Suggest improvements to the methods used to investigate a question or solve a problem (VCSIS087) Communicating Communicate ideas and processes using evidence to develop explanations of events and phenomena and to identify simple cause-and-effect relationships (VCSIS088)
Maths/Number and Algebra	Subitise small collections of objects (VCMNA071) Compare, order and make correspondences between collections, initially to 20, and explain reasoning (VCMNA072) Represent practical situations to model addition and subtraction (VCMNA073) Sort and classify familiar objects and explain the basis for these classifications, and copy, continue and create patterns with objects and drawings (VCMNA076) Follow a short sequence of instructions (VCMNA077)		
Maths/Statistics and	Choose simple questions and gather	Select and trial methods for data	Construct, interpret and compare a range of data

Probability	responses (VCMSP101) Represent data with objects and drawings where one object or drawing represents one data value. Describe the displays (VCMSP102) Identify a question of interest based on one categorical variable. Gather data relevant to the question (VCMSP126) Collect, check and classify data (VCMSP127) Create displays of data using lists, table and picture graphs and interpret them (VCMSP128)	collection, including survey questions and recording sheets (VCMSP178) Construct suitable data displays, with and without the use of digital technologies, from given or collected data. Include tables, column graphs and picture graphs where one picture can represent many data values (VCMSP179) Evaluate the effectiveness of different displays in illustrating data features including variability (VCMSP180)	displays, including side-by-side column graphs for two categorical variables (VCMSP235) Interpret secondary data presented in digital media and elsewhere (VCMSP236) Pose and refine questions to collect categorical or numerical data by observation or survey (VCMSP237)
Digital Technologies/ Data and Information	Recognise and explore patterns in data and represent data as pictures, symbols and diagrams (VCDTDI014) Collect, explore and sort data, and use digital systems to present the data creatively (VCDTDI015) Independently and with others create and organise ideas and information using information systems, and share these with known people in safe online environments (VCDTDI016)	Recognise different types of data and explore how the same data can be represented in different ways (VCDTDI020) Collect, access and present different types of data using simple software to create information and solve problems (VCDTDI021) Individually and with others, plan, create and communicate ideas and information safely, applying agreed ethical and social protocols (VCDTDI022)	Acquire, store and validate different types of data and use a range of software to interpret and visualise data to create information (VCDTDI028) Plan, create and communicate ideas, information and online collaborative projects, applying agreed ethical, social and technical protocols (VCDTDI029)