SCHOOL OF ANTS: LESSON 1 – An introduction to ANTS

Learning objectives:

At the end of this lesson, students in STAGE 3 should be able to

1. Confidently distinguish between a vertebrate (animals with backbones) and an invertebrate (animals without backbones)
2. Appreciate the abundance and diversity of invertebrates in a small area
3. Recall or create a story about ants
4. Understand the aim of School of Ants data collection
5. Recognise how this project is related to their current science topic

Aligning with the curriculum:

These three School of Ants lessons align with outcomes across the K-12 Science and Technology curriculum in STAGE 3. Content is based on the skill strand Working Scientifically (WS), and the knowledge and understanding strands Natural Environment (NE), Physical World (PW), Earth & Space (ES) and the Living World (LW).

The lessons loosely follow the 5E's of Primary Connections teaching and learning model – Engage, Explore, Explain, Elaborate, Evaluate.

For this lesson you will need:

- School of Ants stimulus letter
- At least 20 pictures of both vertebrates (mammals, birds, reptiles etc) and invertebrates (crustaceans, insects, worms etc). Take these from magazines, old books, or print them out.
- School of Ants video clip (on webpage or USB)
- Lined paper or book for students to write their ant story
- Print-outs of ant line drawing to stick into book/onto paper

LESSON DETAILS

***** Independent teacher activity – Long onto and register for School of Ants Australia collection http://schoolofants.net.au/**

Opening: 10 – 15 minutes

Engage

Introduce the School of Ants project with stimulus letter and video

Read the stimulus letter provided by the School of Ants and watch the participation video found either on the School of Ants webpage (http://schoolofants.net.au/participate/) or on your USB stick. Ask the students to think about what they already know about ants.

Our objectives: To determine the diversity, distribution and diet of Australia's dominant ground foraging ants.

Vertebrate/Invertebrate: 20 minutes

Explore

The difference between vertebrates (animals with a backbone) and Invertebrates (without a backbone)

Have pictures of both vertebrates and invertebrates, and either as a class, or as a pair or group activity, have students categorise them. 90% of all organisms on earth are invertebrates, so it's great to know something about who they are, and what they do here on earth. Use the link below from the Australian Museum to help this discussion.

What is an invertebrate? http://australianmuseum.net.au/What-are-invertebrates

Go outside! Contextualise vertebrates & invertebrates: 10 - 20 minutes

Don hats and spend 10 minutes looking at the ground outside the classroom

Explore

Head to an oval or grassy spot. Students can squat, sit or lie and watch a space of about $1m^3$ for around 5 minutes. Ask them to use adjectives and verbs to describe what they see. These things will all be invertebrates. Then get them to look up and name the vertebrates they can see. They will most likely only be humans and birds. There might be a lizard or dog or similar.

While you are outside, make a note of where there are ants in a PAVED and GREEN habitat adjacent to each other. This is where you will put out the food baits in the next lesson.

Everyone has an ant story: 20 minutes

Students write a paragraph about their experiences with insects, or ants specifically if they'd like

Explain

Back inside, get out pens and paper and write a short paragraph about insects or ants. Recalling or creating a story (narrative, factual recount or other) will help explore and consolidate what students already know about ants, and helps the teacher facilitate discussions on the results of the experiment. Include the words: nest, colony, worker, queen, bi te, sting, trail, mandibles.

Prepare for data collection in lesson 2: 20 minutes

Review the requirements for lesson 2 and collection of data

Hand out the instructions for lesson 2 so that students can read them in pairs. Review the aim, methods, and the logistics of running the lesson with them. The logistics will include your own rules for being in the school yard for project purposes as well as:

- Do not touch the bait cards once they have been put out on the ground
- Keep lizards and birds away from the food baits (if you'll be outside for the hour)

Assign students to pairs ready for lesson 2 and allocate a habitat for collecting ants in the next lesson (PAVED or GREEN area). Together, start ONE DATA SHEET for lesson 2. You can fill out the collector name, address and date sections now.

FINISH and let the students know when they will be collecting the data.

If you have any questions, NOW is a good time to email Kirsti at School of Ants for some quick answers about lesson 2. Or just have a good read over the instructions again, and peruse some links on the School of Ants website. catchme@schoolofants.net.au

EXTENSION OF THIS LESSON

You can set homework or extend your students in the following ways.

Developing dichotomous identification keys

Have a look at the CSIRO Entomology online key at http://www.ento.csiro.au/education/key/couplet_01.html then ask the students to develop their own. A dichotomous key always only chooses between two characters of animals.

Put food out for ants at home

What foods do ants at your own house like? Put out a range of different foods and leave them for a little while. Record how many ants come to each food type. Describe these ants.

SCHOOL OF ANTS: LESSON 2 – Collecting the data

Learning objectives:

At the end of this lesson, students in STAGE 3 should be able to

6. Recount the question they are answering as part of the School of Ants citizen science project
7. Recognise how this project is related to their science topic
8. Understand why it is important to take detailed, accurate notes during a science experiment
9. Describe the methods of the experiment undertaken
10. List at least 4 different places ants are found.

For this lesson you will need:

- School of Ants video clip (on webpage or USB)
- All materials in the list on the Instructions sheet
    - 10 x index cards
    - 10 x pieces each of frankfurt, scotch finger biscuit & cotton wool balls with sugar solution
    - 10 x sandwich ziplock bags
    - The data sheet, a pencil and a clock
- Hate & sunscreen for students

The bait cards for this project must be outside for 60 minutes for the data to be useful in our collections. The lesson can be split in half to accommodate the putting bait cards out and collecting the data at the end.

LESSON DETAILS

Re-cap aim and methods: 10 – 15 minutes

Re-cap the aim of the School of Ants project by watching video clip again and reviewing instructions.

Our objectives: To determine the diversity, distribution and diet of Australia's dominant ground foraging ants.

Engage

Make sure you and your students understand exactly what you need to do to set up the bait cards and the important aspects of doing a scientific project to emphasise are:

i) Sticking to the protocol exactly;
ii) Making detailed and accurate notes, and completing the data sheet fully;
iii) Reporting if something goes wrong – it is important that data is NOT USED if it was not collected correctly.

Things that can go wrong in this lesson, and that need to be recorded on the data sheet, include:

- Birds, lizards and/or groundspeople disturbing or taking the food bait from the cards
- Wind blowing card over
- Students disturbing ants on the card (it is really important to not stay near the cards too much while you are waiting the hour)

Preparing the materials: 10 minutes

Get all the food baits ready to place on the cards before you go outside.

Explore

- Label 10 x index cards P1 – P5 and G1 – G5;
- Cut frankfurts into 1cm slices, break scotch finger biscuits into quarters and soak cotton balls in sugar solution (and squeeze out gently so that it is still wet but not dripping). Put these food baits in separate bags to take outside;
- Make sure you have folder, data sheet & pencil allocated to one student responsible for completion of the data sheet.

Outside for set up: 20 minutes

Go outside and place cards with food baits in the 2 different habitats. Follow instructions carefully.

Explore

Have students pair up and take a bait card between two. Have three students stand at the door handing out food stuffs for each card as the pair of students walk out the door. All go outside and place FIVE cards labelled P1 – P5 in the paved area (at least 3 m apart) and FIVE cards labelled G1 – G5 in an adjacent GREEN area.

It is important that you record the time the cards are placed out, and remember that the **CARDS ARE OUT FOR ONE HOUR.**

There are a number of ways you can work your hour waiting for ants to come to the food:

1. Go inside again and set up a table for you to input data into.
2. Go include and do some ant activities.
3. Stay outside and look for ants in different habitats. Talk about and develop hypotheses about why ants are where they are.
4. Have your lunch break. Ask students to think about what foods they like to eat, and if their preference changes throughout the year. But be ready to launch into action on the hour when your students need to count the ants on the cards and collect them.

Counting and collecting ants: 20 minutes

Students go back to the bait card they put out & count ants on each food type.

Ants are disturbed easily, so get students to sneak up on their bait cards and do their best to count the number of individual ants that are touching each food type. The numbers on each food type go directly into the data sheet.

Collect each card into a ziplock bag, but only after counting the ants. The ants will run off the card quickly, so it must be a rapid transfer to the ziplock bag!

COMPLETE EVERY PART OF THE DATA SHEET.

Put all the the ziplock bags into the freezer overnight. In the morning, carefully remove the food from the bags, and send the ants in the ziplock bags AND the data sheet to

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FINISH and let the students know when they will be collating, analysing and interpreting the data.

SCHOOL OF ANTS: LESSON 3 – data analysis & interpretation

Learning objectives:

At the end of this lesson, students in STAGE 3 should be able to

11. Acknowledge any errors made in collecting data and make notes on the data sheet accordingly
12. Complete the data table & graph
13. Make comparisons in the number of ants between food types and habitat type
14. Comprehend the results of the experiment in lesson 2
15. Reflect on what the results might mean for ants at their school.

For this lesson you will need:

- Data sheets (or photocopy of data sheet) from lesson 2
- White or SMART board on which to record class data
- Lined paper or book for students to write their reflection or report
- The ANT DIETS interpretation sheet

LESSON DETAILS

Opening: 15-20 minutes

Recap aims and introduce the concept of working with data.

You are investigating what ant species are in your school grounds, as well as what the overall preference for a food type is there, and you have collected information to this end. The ant species will be identified by the team at School of Ants and posted online at http://schoolofants.net.au/

Explain

This lesson is to hypothesise about the food preferences of the ants, analyse the data you collected, and interpret it in context of what ants like to eat and why. This is the hard part, even for scientists!

Ask the students to formulate hypotheses about what the ants might have preferred to eat in particular habitats. These are PREDICTIONS based on what they know already, and students might like to explain why they have made those hypotheses. For example:

Hypothesis 1: Ants preferred frankfurt (protein) in the green areas
Hypothesis 2: Ants preferred sugar in the paved areas

Tabulate the data: 10-30 minutes

On a black or SMARTboard at the front of the class tabulate your results in a table that looks like the one below.

Explain

Ask students to fill in their own data. Graph this data using excel if you and/or the students are able to, or another program of your choice. Create a bar chart where the food type is on the X axis and either the TOTAL or AVERAGE number of ants is on the Y axis.

Elaborate

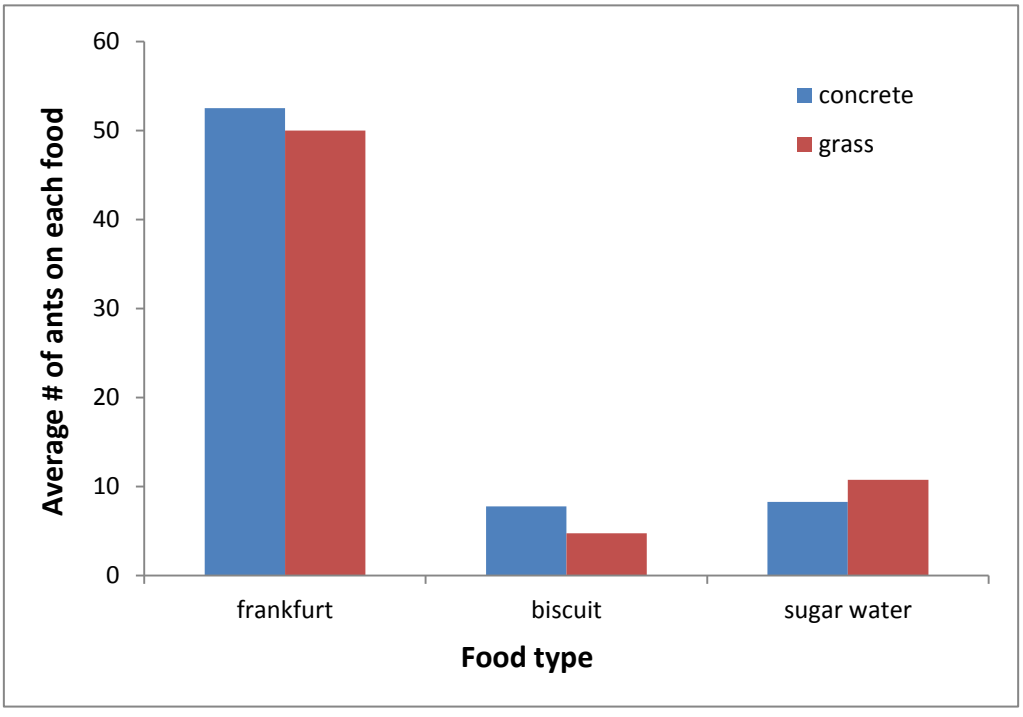
Graphing and TOTAL and AVERAGE number of ants will change how your graph looks. Discuss with the students why they think this is the case.

Your table and graph will likely look like the one below.

Table 1 – The number of ants on each food type in different habitats around our school

	Food type			
Habitat	**Frankfurt**	**Biscuit**	**Sugar water**	**TOTAL**
P1				
P2				
P3				
P4				
P5				
TOTAL				
AVERAGE				
G1				
G2				
G3				
G4				
G5				
TOTAL				
AVERAGE				

Figure 1 – The average number of ants at each food type in two different habitats around our school.



Results: 15-30 minutes

Discuss the results as a class & write them as a mini-report

First, simply describe the results in simple sentences, for example:

"There were more ants on frankfurts in both green and paved areas", and
"Ants preferred the biscuit least in both habitats".

Elaborate

Just like people, ants prefer different foods for different reasons and at different times of the year. Interpreting your results is a chance to do some on-line research or see the document called "Ant diet info & interpreting results" to prompt discussion.

Evaluate

Have students write *one paragraph describing the results*, and *one paragraph that states TWO reasons why they may have got the results* they did. For example:

"There were more than an average of 50 ants on the frankfurt in both habitats, and less than 20 ants on average on the other food baits. Therefore, the order of food preference for ants in XXX public school is frankfurts, sugar cotton ball and then scotch finger biscuit."

Their food preference could be a result of the colony not having sufficient protein in order for the queen to lay eggs effectively. It could also be because there is enough sugar in the environment that they do not need to collect any more that they find. We know that ants store both sugar and protein in their nest for when they need it later, so they may be stocking up on a nutrient they are short on."

What have you learned? 5 minutes

Have students write 5 dot points about what they have learned about ants.

FINISH and if you haven't already, send all the ants and data sheet to:

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