BACKYARD BIODIVERSITY PROJECT

STAGE 4

This Stage 4 unit of work was developed by Moira Burns, Head Teachers, Science/Maths, Ariah Park Central School, with assistance from Jenny Green, Boorowa Central. It was trialed by a number of schools in NSW during 2001. For further information, visit the *Backyard Biodiversity Snapshot* at http://www.curriculumsupport.nsw.edu.au/learningtechnologies/snapshots/science/bio/index.htm

FRAMEWORK STATEMENT

[*This statement describes the context, processes and purpose of learning in the unit*.]

Students taking this unit will be involved in authentic Science research. They will be either initiating a base line trend of their local area biodiversity that will allow longitudinal studies to be done or they will add to and use the data to test hypotheses to compare the local area with other areas of the state. Data collected will ultimately be used in setting up a school biodiversity database.

The initial support for the survey will come from the Australian Museum. The museum scientists are "apprenticing" student scientists to assist them in building up a comprehensive picture of invertebrate biodiversity in New South Wales. The teacher's role is that of a manager and coach, guiding the team to successful completion of a project. Students involved will be building "bug traps" and identifying and counting invertebrates found within their school grounds. A comparison will be made between a lawn and a leaf-litter area.

A key aspect of this unit is the students managing their own learning; what is needed for a successful database to be established, what is the most appropriate technology to record and communicate this information both for the Australian Museum and for future year groups within their own school and between other schools.

This unit ideally suits the Prescribed Focus Area outcome 4.5 – *describes areas of current scientific research*. In setting up a system for recording archival data, students should be able to confidently explain reasons why people study present-day fauna and flora and have the skills to identify misinterpretation of data.

UNIT ORGANISATION

The unit is organised into eight distinct phases. These act as broad organisers within the unit and assist the teacher and students to focus on the collective purpose of the activities within a phase.

OUTCOMES OF THE NSW SCIENCE STAGES 4-5 SYLLABUS

Prescribed focus area

4.5 describes areas of current scientific research

Knowledge and understanding

4.8 describes features of living things
4.10 identifies the factors affecting survival of organisms in an ecosystem

Skills

4.14 follows a sequence of instructions to undertake a first-hand investigation
4.15 uses given criteria to gather first hand data
4.17 evaluates the relevance of data and information
4.18 with guidance presents information to an audience to achieve a particular outcome
4.22 undertakes a variety of team and individual tasks with guidance

Values and attitudes:

4.27 acknowledges their responsibility to conserve, protect and maintain the environment for future generations

RESOURCES

Australian Museum Backyard Biodiversity Kit
Australian Museum website: www.austmus.gov.au or www.amonline.gov.au
Backyard Biodiversity Snapshot http://www.curriculumsupport.nsw.edu.au/learningtechnologies/snapshots/science/bio/index.htm
Computer based technologies in the Science KLA (1997) NSW Department of Education and Training, Sydney NSW
Laidler, G. *Science Skills Book 2* Longman Cheshire, Melbourne, Australia
Watson, C. (1998). *Heinemann Interactive Science 1.* Heinemann
Watson, C. (1991) *Process Science in Action* Heineman Educational, Melbourne, Australia

PREPARATION *Practical advice about materials needed for the unit.*

- It is essential that you obtain the *Backyard Biodiversity Kit* available from the Australian Museum (www.amonline.net.au/biodiversity/backyard/bbps.htm)
- Slides, photos and embedded specimens of invertebrates and vertebrates
- Overhead projector (old technology, but useful in this project) and book covering plastic cut to A4 size (the cheapest overhead transparencies known)
- Binocular microscopes
- Flexi-cam, if possible. This is brilliant for focusing the class on specific aspects of specimens and students love looking at their specimen.
- Backyard Biodiversity keys (these are in the museum kits)
- Camera – digital, if possible, but students have a great time using disposable ones
- Bug trap equipment as outlined in the kit (it's cheap and easy to obtain)
- Animal Match Card Game: Sue Eamens – District Science Consultant, Queanbeyan

Organisational requirements:

- Book computer rooms for those lessons involving Australian Museum links
- Check student medical records for students with such conditions as *insect allergies* and *asthma*
- Assess areas selected for safety. Students can be taught to identify "dangerous animals" such as *red backs*, *funnel webs* and *white tails*. (highly motivating)
- If students' work is to go on a website permission notes must be completed and kept at school. Sample permission notes available at http://www.curriculumsupport.nsw.edu.au/science/index.cfm (go to **Stages 4-5 → Programming tools → Student permission notes**)

ASSESSMENT

- **Diagnostic**
  - Reading keys
  - Grouping organisms
  - Using a scale
  - Scientific drawings
  - Designing a spreadsheet.

- **Formative**
  - Teacher observation
  - Classroom questioning
  - Quick quiz
  - Peer assessment.

- **Summative**
  - Major assignment – group work
  - Independent student project.

BACKYARD BIODIVERSITY

THE TEACHING AND LEARNING SEQUENCE

PHASE 1: INTRODUCTION – THE MUSEUM NEEDS US!		
Syllabus and ICT capability references	**Indicators** Students are able to:	**Learning activities**
Outcome: 4.5 describe areas of current scientific research **Related content:** 4/5.5 a) describe some recent scientific contributions made by male and female scientists and discusses the effects of their contributions **Computer capabilities** * uses e-mail to conduct interviews	• define *biodiversity* • confidently explain why the Australian Museum scientists are "apprenticing" scientists • outline the school's role in the project • write an e-mail to one of the Backyard Biodiversity scientists	**Activity 1:** Internet search to answer the following questions: • What is the Backyard Biodiversity project? • What are the names of some of the schools involved? • Has our school been in it before and what was achieved? • Why do Australian Museum scientists need to "apprentice" students? **Activity 2:** Write an e-mail to a scientist who works on the Backyard Biodiversity project – find out what their work involves Glue in a hard copy of the email sent and the reply Read e-mails/discussion.

PHASE 2: WE NEED TO COMMUNICATE WITH OTHER SCIENTISTS		
Syllabus and ICT capability references	**Indicators** Students are able to:	**Learning activities**
Outcome: 4.8 describes features of living things **Related content:** 4.8.2 **classification** a) classify living things according to structural features and identify that they have patterns of similarity and differences	• classify selected organisms as vertebrates and invertebrates • describe common features of a particular group	**Activity 1: Class discussion and reading activity** Why do scientists classify? (Heinemann Interactive Science 1 pg 128) *Key Concepts:* - *it enables items to be described quickly* - *it makes communication simpler.* **Activity 2: Nature walk** Students find an invertebrate from their school grounds **Activity 3: Rotation of stations** Set out a variety of preserved specimens around the room and use the live specimens (there should be both vertebrates and invertebrates) Students are to classify the organisms into two groups Discussion - compare answers Put the animals in two groups - vertebrates and invertebrates (some students may need revision) **Activity 4: Think/pair/share** Generate a list of vertebrates

PHASE 3: WE NEED TO IDENTIFY THE ORGANISMS WE FIND BY USING A KEY		
Syllabus and ICT capability references	**Indicators** Students are able to:	**Learning activities**
Outcome: 4.8 describes features of living things **Related content:** 4.8.2 **classification** b) identify a range of plants and **animals** using simple keys **Outcome:** 4.18 with guidance, presents information to an audience to achieve a particular outcome **Related content:** 4/5.18 e) use drawings, diagrams, graphs, tables and flow charts to show relationships and present information clearly and/or succinctly	• given a key, can identify an invertebrate • given the name of an invertebrate, can "work backward" and describe an invertebrate	**Activity 1: Mini-lecture** • Why scientists use keys • Some examples of keys (make overheads of 3-4 different types) **Activity 2: Group work** Which group/s can work out how to use a key (Heinemann Interactive Science Book 1, page 129, – football jumper activity OR Science Skills Book 2 pg.58-59) **Activity 3: Peer tutoring** Students from the group/s who can use key, work with others who cannot **Activity 4: Student demonstration** Modelling activity: Using *Backyard Biodiversity Invertebrate Key* and a preserved specimen, a capable student models keying out an organism **Activity 5: Student activity – Group work** Photocopy each of the invertebrates illustrated in the Backyard Biodiversity manual. Ask students to work in groups and key out three or four of them **Activity 6: Quick quiz** Make an overhead of some of the invertebrates in the Museum manual. Ask students to key out organisms OR *Animal match card game*: from Sue Eamens, Sci Consultant, Queanbeyan Dist **Activity 7: Enrichment or extension activity:** Photocopy a range of keys from simple to quite challenging OR Design your own key (develop a more detailed key of **local area** insects)

PHASE 4: WE NEED TO IDENTIFY THE STRUCTURAL FEATURES OF THE ORGANISMS WE FIND		
Syllabus and ICT capability references	**Indicators** Students are able to:	**Learning activities**
Outcome: 4.8 describes features of living things **Related content:** 4.8.2 **classification** a) classify living things according to structural features and identify that they have patterns of similarities and differences **Outcome:** 4.18 with guidance, presents information to an audience to achieve a particular outcome **Related content:** **4**/5.18 d) use symbols to express relationships, including mathematical ones, and appropriate units for physical quantities 4/5.18 e) use drawings, diagrams, graphs, tables and flow charts to show relationships and present information clearly and/or succinctly	• accurately draw an invertebrate • include an appropriate scale • calculate the actual size of an organism from a scale drawing	**Activity 1: Group work – Binoculars/microscopes** Students are given a preserved specimen. They are each asked to make a very accurate lead pencil diagram of their specimen **Activity 2: Teacher-led discussion/Modelling** How can we let people know the actual size of our specimen? Demonstration of use of scales in invertebrate drawings **Activity 3: Student activity** Students accurately measure their specimen and then include a scale **Activity 4: Revision activity** Scale drawings (Process Science in Action Activity 2.11)

PHASE 5: WE NEED TO FORM GROUPS AND FOLLOW A PROCEDURE TO COLLECT DATA		
Syllabus and ICT capability references	**Indicators** Students are able to:	**Learning activities**
Outcome: 4.14 follows a sequence of instructions to undertake a first-hand investigation **Related content:** 4/5.14 a) follow the planned procedure when performing an investigation **Outcome:** 4.22 complete a variety of team and individual tasks with guidance **Related content:** 4/5.22.2 b) match the tasks to the team members according to the requirements of the task and the skills of the individual 4/5.22.2 c) negotiate and allocate individual roles to members of the team	• Identify the tasks needed to complete the invertebrate trapping investigation and negotiate and allocate individual roles to members of the team • build an invertebrate trap	**Activity 1: Discussion** Presentation of the Australian Museum Kit to the class Ask individual students to lift one item out and suggest why it might have been included in the kit **Activity 2: Brainstorming** *Aim: To compare the biodiversity of a lawn area to a leaf-litter area* • Which habitat might have the greater biodiversity? • What readings do we need to take? • What sites will we select? • Is it important to do it the same way as the other schools? **Activity 3: Mapping** Identifying survey sites on a map of the school grounds. On a map of NSW, identify the location of the school and other participating schools. **Activity 4: Group work/reading activity** *Hand out Backyard Biodiversity booklets* Form groups (teacher directed if necessary) and allocate jobs (student negotiated is ideal) **Activity 5: Oral quick quiz** • How is the trap made? • What data is collected? • How are the tables completed? **Activity 6: OPTIONAL Group work activity – *Constructing trial traps*** Students go outside to the two selected sites and set up traps according to the manual. What problems emerged during the trial? **Activity 7: Student activity** Building the real traps

PHASE 6: WE NEED TO COLLECT OUR DATA AND TRANSFER IT ELECTRONICALLY		
Syllabus and ICT capability references	**Indicators** Students are able to:	**Learning activities**
Outcome: 4.15 uses given criteria to gather first hand data **Related Content:** 4/5.15 b) uses a range of data collection technologies and strategies independently **Outcome:** 4.5 describe areas of current scientific research **Related content:** 4/5.5 c) identify scientific skills that can be useful in a broad range of careers **Computer capabilities** * publish material on a prepared site on the Internet	• use and read tally marks • calculate averages • work in groups • identify a science career and outline when a scientist in the career would need to apply the research skills learned in *Backyard Biodiversity*	**Activity 1: Group work** Students return to their sites 24 hours later and record results on activity sheet 2 **Activity 2: Teacher-led discussion** Focus Questions: • What data is needed by the Museum? Why? • What other areas of science use the same skills as in *Backyard Biodiversity* • How can this data be electronically recorded? • Can averages be calculated? • How can this data be transferred to the Australian Museum? **Activity 3: Peer tutoring - Computer activity** Designing and using a spreadsheet to input survey results (some students should be quite proficient and will be quite willing to share their expertise) **Activity 4: Student activity: e-mailing data** Have the class choose one that they feel is suitable to send to the Museum (teacher guidance will be necessary at this stage)

PHASE 7: WE NEED TO ESTABLISH A SCHOOL ARCHIVE FOR THIS PROJECT		
Syllabus and ICT capability references	**Indicators** Students are able to:	**Learning activities**
Outcome: 4.17 evaluates the relevance of data **Related content:** 4/5: 17 b) distinguish between relevant and irrelevant information 4/5:17 d) organises data using a variety of methods including diagrams, tables, spreadsheets and databases **Outcome:** 4.18 with guidance, presents information to an audience to achieve a particular outcome **Related content:** 4/5: 18 b) select and use an appropriate medium to present data and information **Computer capabilities** * prepare a factual Newsletter to inform a target audience * use computer based technologies to support the presentation of a short oral report	• organise data using tables, spreadsheets etc • identify trends, patterns, relationships	**Activity 1: Guest speaker – School lbrarian/Local historian** "What is an archive?" **Activity 2: Class discussion** • Who might use our Backyard Biodiversity archival material? • How might they use our data? • How can we ensure that the data is accurate? • Who do we contact if we think some of our data is unreliable • What is the best method for presenting our data? • Should we involve other schools? • Student questions **Activity 3: Identifying individual talents – Peer assessment** *Forming the team – who is good at:* • building traps? • identifying invertebrates? • doing accurate scale diagrams? • doing background research? • inputting data into a computer? • videoconferencing with the Australian Museum? • collecting and assembling all the information for the archive? • writing a media report? *(Teacher to work this allocation in whatever way is appropriate for the particular group)* **Activity 4: Group work – Building the archive** This will vary according to individual school needs

PHASE 8: LET'S RETURN TO THE BOARDER PICTURE		
Syllabus and ICT capability references	**Indicators** Students are able to:	**Learning activities**
Outcome: 4.17 evaluates the relevance of data and information related content **Related Content:** 4/5 17 c) check the reliability of gathered data and information by comparing them with observations or information from other sources **Outcome:** 4.27 acknowledges their responsibility to conserve, protect and maintain the environment for future generations **Related Content:** 4/5.27 b) demonstrate a commitment to conserving and improving the quality of society and the environment **Outcome:** 4.5 describe areas of current scientific research **Related content:** 4/5.5 d) identify possible career paths in science	• draw inferences from data re relationships between habitat and biodiversity • identify trends in invertebrate biodiversity in NSW • predict trends from given data • critically evaluate data • outline the career path (school→ work/TAFE/Uni → research) taken by one Australian scientist	**Activity 1: Student activity – computer work** Compare this year's results with last year's (you may need to find a school near you if your school did not participate last year) • Were your results similar? • If not, can you think of possible reasons? • What trend can you identify with reference to invertebrate biodiversity throughout the state? • What factors do you think might reduce biodiversity in an area? • Which areas of the state would you expect to have limited biodiversity? • Does the data on this website support your ideas? **Enrichment 1: Practical activity/homework** Compare the biodiversity of your school with your own backyard **Enrichment 2: Videoconferencing with Australian Museum** **Enrichment 3: Report to Stage 6 students in your school on the Backyard Biodiversity Project and the need to monitor biodiversity** **Enrichment 4: Design a poster to alert people to the importance of monitoring invertebrate biodiversity**

PILOT SCHOOLS, 2001 and schools/teachers using *Backyard Biodiversity* in 2002-03

2001	Ardlethan Central School	Kerrilee Logan (Head Teacher) Stacie Luppi	6978 2046
2001	Ariah Park Central School	Moira Burns (Head Teacher)	6974 1105
2001	Boorowa Central School	Jenny Green (Head Teacher)	6385 3009
2002	Coolamon Central	Margaret Myles	6927 3209
2001, 2002	Cootamundra High School	Rhonda Pitson (Head Teacher) Brian Huntington	6942 2711
2001	Lucas Heights Community High School	Craig Brown (Head Teacher) Mike Redding	9543 8317
2001, 2002	Mount Austin High	Ken Landsdown (Head Teacher) Sue Lonregan, Sue Lockwood	6925 2801
2002	Narrendarah HS	Penny Sheppard (Head Teacher)	69591744
2001	Southern Cross	Sue Benson (Head Teacher)	6686 0503
2002	Temora High	Bob Brabin (Head Teacher)	6977 1988
2002	Ungarie Central	Rachel Duncan	6975 9030
2001	West Wyalong High School	Meg Milton (Deputy Principal) Chris Lee, Steve Carey, Denise Howorth	69 72 2700