Lark Quarry
DINOSAUR TRACKWAYS

Classroom Activity Kit

Classroom Activity Kit
Contents

Introduction

Activities

Life & Living

Earth & Beyond

Energy & Change

Science & Society

Appendices & References

Appendices

References

Introduction

The Lark Quarry education kit provides a unique opportunity for students to explore the Science curriculum's key learning areas: Earth and Beyond, Energy and Change, Life and Living, and Science and Society.

The kit includes on-site activities, and activities designed for the classroom. Classroom activities are particularly useful **for teachers who are unable to take students on a visit to Lark Quarry**. Display panels, fact sheets, and a site tour are available on this website.

While the focus of the kit is in the Science area, it is designed to **link with other syllabus**, including English, Studies of Society and Environment, Technology, Mathematics, and The Arts. Lark Quarry also presents a project opportunity for students studying the Tourism syllabus in Years 11 and 12.

The activities in the kit are **designed for Levels 3 - 6**, covering upper primary and lower secondary students. However, some of the activities can be adapted for Levels 1 - 2.

This education kit also outlines the core learning outcomes, as well as aspects of working scientifically and their components related to each activity.

Activity helpers

Some activities benefit from resources available on the Lark Quarry Dinosaur Trackways website. This resources will be listed as **Actvity helpers** at the top of the activity.

You can download these resources in PDF format from:
http://www.dinosaurtracks.com.au/resources.html

Activities — Life & Living

Activity 1 *What's on your mind?*

Students develop a mind map to find out what they know about dinosaurs. The word "dinosaur" is placed in the centre of the page, and students link this to other words or phrases they associate with dinosaurs. The activity should be free flowing.

Students may come up with some questions or areas of interest during the exercise. If appropriate, activities can be chosen to help answer these questions.

Students do a second mind map following their visit to Lark Quarry or at the completion of the unit of work. The two mind maps are compared to see what students have learnt about dinosaurs and to test the accuracy of their prior knowledge.

Activities — Earth & beyond

Activity 2 *Trails tell tales*

Activity helper — Fact sheet 2

1. Students investigate and interpret footprints. Students make their own tracks across strips of aluminium foil over carpet, or a damp sandy/soft soil area. They analyse the tracks to see how scientists would be able to determine the size and weight of the animal, speed of movement, and other features.

Students walk, run, and jump across the area. They repeat the exercises carrying various weights. Each group could create tracks and other groups could analyse the tracks.

The following table is an example of creating different tracks:

Track No.	Track-makers	Analysis
1	Tall/heavy sytudent	
2	Short/light student	
3	Student 1 carries student 2	(compare to track 1)
4	Walking slowly (stalking)	
5	Walking quickly	
6	Running	
7	Changing direction erratically (panic)	

2. Students model dinosaur footprints in clay or plasticine.

3. Create scenarios and develop the evidence: Students use "casts" of dinosaur footprints to create their own stampede scenario. Students interpret each other's scenarios by "reading" the evidence of the trackways. For example, analyse type of footprints, direction and apparent speed of footprints, etc.

This activity can be carried out at two levels of difficulty:

Level 1 = 3D
Level 2 = 1D (paper/potato printing etc).

Teacher offers prompts for variations on the scene at LQ. For example, a second Theropod comes around from the front, causing stampeding dinosaurs to change direction and end up in the lake.

Activity 3 *Lines of time*

Activity helper — *The epilogue* Display

Using the poem on *The epligoue* (gallery of displays), students create a Lark Quarry timeline. Timeline can be presented as a storyboard, cartoon, or mural. Research: Students will need to find out which era/time is represented in each section of the poem.

Activity 4 *Extinction is forever*

Students develop their own theory on how dinosaurs became extinct, and the evidence that supports their theory. Can be delivered as a Powerpoint presentation, skit, poetry, creative writing, essay/project.

Activity 5 *On the dinosaur trail*

Outback Queensland is rich with fossil sites. Students research Queensland's dinosaur trail. This includes:

1. Lark Quarry, near Winton
2. Richmond
3. Hughenden
4. Riversley, near Mt Isa
5. Muttaburra, near Longreach

Students form five groups, each investigating one of the above sites. Students explore discoveries unique to their site and the different eras fossils in that area represent.

Students develop a tourist map of the trail, including illustrations, information snippets, and promotional material.

Activity 6 *Rain, forest... desert*

Students explore climate change over time at Lark Quarry. Students investigate climatic conditions 95 million years ago and compare this with current day climate. Students look at current rainfall patterns at Lark Quarry. How is it similar to their local area? How is it different? For example, rainfall may be the same but the pattern is quite different. This is reflected in the environment, where erosion occurs from heavy downpours etc. Students present their findings in a poster.

Activity 7 *It's all relative...*

Activity helper — Fact sheet 2

Students develop scale models or diagrams of dinosaurs using information on Fact Sheet 2. Levels 4-5 can work out a way to demonstrate speed. Groups scale down speeds (how fast over 100m – one dinosaur per group) and demonstrate, i.e. recreate the event in time, can make design dinosaur costumes including paper machete heads. This could also be enacted on stage with one group developing light and sound show as a backdrop – using images of Lark Quarry and/or dinosaurs.

Activity 8 *Art-dino / Wild-life*

Activity helpers — Fact sheet 1, 3 & 5

Art-dino

Students create two murals – then and now.

Wild Life

Australia is one of the driest continents on earth, so our native vegetation is used to a life with very little water. Students can:

1. Investigate kinds of plants found at Lark Quarry. Find out how they have adapted to very little water. How has vegetation changed since that morning 95 million years ago?

2. Compare native Australian plants to "European" style vegetation. Find and compare drought resistant or water efficient plants (preferably native) with other plants in their community, garden or school. Plan a visit to their local nursery.

Option 1: Students develop a presentation for parents and community to show the important features of water efficiency in our native plants and to encourage community to use more native plants in their gardens. Use plant samples, a Powerpoint presentation, interview with local nursery person or ranger etc. Develop a fact sheet "Go native: how to develop your own water efficient garden" to hand out on the evening.

Option 2: Students develop a feature article for the local paper as above, including submitting this to local paper. Students can each have tasks – photography, research, plant collection, writing, editing etc.

Activity 9 *Another dimension*

Activity helper — Fact sheet 3

3D – past and present: Students use a stream tray to make a 3D reconstruction of Lark Quarry as it would have been, and how it is now (one group works on the past, the other on the present). Research types of plants and wildlife, past and present. Present these in terms of the similarities and differences.

Activities — Energy & Change

Activity 10 *How big is your footprint?*

Activity helpers — Fact sheet 4, ESD displays

Students explore the concept of Ecofootprinting[1]. Students look at how much space we use on the planet to sustain our way of life. Students investigate the principles used in the design of Lark Quarry to minimise impact. Students ask, how can these principles fit into my lifestyle?

To explore ecofootprinting, students can:

1. Place their name/photograph (and family) in centre of page. Make connections with the real source of all the things they use, including food, energy, water, waste, physical space, clothing and so on. For example, their clothing may come from Thailand, car from Japan, fish from aquaculture in Queensland, fuel from Singapore! When these products are grown or developed in these places, they have an impact on the environment. This forms part of our personal ecofootprint.

2. Measure their ecological footprint at

3. Explore ways of reducing their own ecofootprint. Check out sustainable housing websites below.

4. Examine their local school: If you were a member of your local council, with a big budget and the responsibility of planning for sustainability, how would you apply ESD principles to make your school sustainable?

5. Look at how sustainability has been achieved at LQ – explore various features and possible application to urban living (sustainable housing etc)

6. Investigate incentives and strategies used by their local council to deal with these issues (e.g. Brisbane City Council: 2001/02 rebate for retrofitting a rainwater tank).

Websites:
www.yourhome.gov.au
www.gu.edu.au/centre/ecocentre
www.eco-web.com
www.sustainableenergy.qld.edu.au
www.ecosustainable.com.au/links
www.sustainability.uts.edu.au/teaching/teaching

[1]**Ecological footprinting** is a measurement tool that allows communities, countries and individuals to assess their imoact on the planet. Professor Bill Rees developed the concept of ecological footprinting to answer a basic but often overlooked question of human ecology: "how much of the Earth's surface is needed to support you in the style to which you are accustomed?" The concept of ecofootprinting personalises environmental sustainability. It makes us aware of how our lifestyle in this consumer age can affect the environment far from where we live. Most importantly, it shows us that we can all make a difference.

Activities — Science & Society

Activity 11 *The great (dino) debate*

Students choose a topic to explore the importance of science, such as "The study of fossils is vital to our future" (i.e. studying the past for our future)

Activity 12 *So you want to be a...?*

Activity helpers — Displays: Entry, Behind the scenes & ESD - the brief

Students investigate the people involved in the discovery of the Trackways and the development of Lark Quarry visitor centre: scientists; architects; engineers; Queensland Museum; consultants (interps, communication); station manager/farmers; educators; rangers; council. Students explore how people work together on a project like this. They examine individual careers and find out how they contribute to society.

Lark Quarry goes to air

Students develop a TV talk show, featuring people involved in Lark Quarry. Students research a particular career/occupation, and develop character/role for that career. Student host/interviewer talks to these people "in studio". Two students take on the role of journalists to interview people "on site" – can have a separate "sets" off to one side (e.g. palaeontologist either in lab with bones etc, or at "a dig"). Talk show host "crosses live" to the onsite teams for interviews during show.

Appendices

Appendix 1 *Core learning outcomes from science syllabus*

Earth and Beyond

3.2 Students discuss regular and irregular events in time and space that occur on the Earth and in the sky.

4.1 Students recognise and analyse some interactions (including the weather) between systems of Earth and beyond.

4.2 Students collect information which illustrates that changes on Earth and in the solar system occur on different scales of time and space.

5.1 Students explain how present-day features and events can be used to make inferences about past events and changes in Earth and beyond.

6.1 Students use scientific ideas and theories about interactions within and between systems of the Earth and beyond to explain past and present features and events.

Life and living

5.1 Students collect information about the structure (including cell structure) and function of living things and relate structure and function to survival.

6.1 Students seek reasons for and can explain why functioning and behaviour change in response to variations in internal and external conditions (including disease, temperature, water and light).

Science and Society

3.1 Students relate some of the ways that people of various historical and cultural backgrounds construct and communicate their understandings of the same natural phenomena.

Energy and change

5.3 Students discuss the consequences of different ways of obtaining and using energy (including nuclear energy).

Appendix 2 *Working scientifically*

Aspects of working scientifically and their components pertaining to **Activity 1**

Investigating	**Understanding**	**Communicating**
clarifying and challenging formulating questions seeking reasons	analysing drawing conclusions examining and evaluating making and judging deductions making comparisons making links reflecting and considering	clarifying ideas and concepts creating diagrams summarising and reporting

Aspects of working scientifically and their components pertaining to **Activity 2**

Investigating	**Understanding**	**Communicating**
collecting information designing and performing investigations hypothesising identifying and controlling variables looking for patterns and meanings making and judging observations measuring	analysing applying ideas and concepts constructing meaning drawing conclusions examining and evaluating inferring from data interpreting data making and judging deductions making comparisons making links suggesting	exploring and elaborating ideas expressing points of view summarising and reporting

Aspects of working scientifically and their components pertaining to **Activity 3**

Investigating	**Understanding**	**Communicating**
accessing resources collecting information identifying looking for patterns and meanings making plans measuring	analysing applying ideas and concepts constructing meaning drawing conclusions inferring from data making links synthesising	creating presentations expressing points of view illustrating negotiating retelling and restating

Aspects of working scientifically and their components pertaining to **Activity 4**

Investigating	**Understanding**	**Communicating**
collecting information hypothesising seeking reasons	applying ideas and concepts formulating and elaborating ideas preparing scenarios selecting and justifying suggesting	arguing a position clarifying ideas and concepts creating presentations discussing thinking explaining ideas and decisions supporting decisions

Aspects of working scientifically and their components pertaining to **Activity 5**

Investigating	**Understanding**	**Communicating**
collecting information identifying looking for patterns and meanings	analysing applying ideas and concepts assessing and reassessing constructing meaning drawing conclusions examining and evaluating inferring from data making comparisons making links reflecting and considering	clarifying ideas and concepts creating presentations expressing points of view illustrating

Aspects of working scientifically and their components pertaining to **Activity 6**

Investigating	**Understanding**	**Communicating**
collecting information identifying looking for patterns and meanings	analysing constructing meaning creating analogies drawing conclusions making comparisons reflecting and considering synthesising	clarifying ideas and concepts creating presentations summarising and reporting

Aspects of working scientifically and their components pertaining to **Activity 7**

Investigating	**Understanding**	**Communicating**
accessing resources designing and performing experiments identifying and controlling variables looking for patterns and meanings making and judging observations making plans measuring	analysing applying ideas and concepts constructing meaning creating analogies dealing in an orderly manner with the parts of a complex whole examining and evaluating formulating and elaborating ideas inferring from data interpreting data judging credibility making and judging deductions making comparisons making links preparing scenarios reflecting and considering suggesting	creating presentations discussing thinking exploring and elaborating ideas improvising and performing negotiating retelling and restating

Aspects of working scientifically and their components pertaining to **Activity 8**

Investigating	**Understanding**	**Communicating**
accessing resources collecting information identifying making and judging observations seeking reasons	applying ideas and concepts drawing conclusions interpreting data making and judging deductions making comparisons making links reflecting and considering selecting and justifying using ideas, theories and principles	arguing a position creating presentations describing explaining ideas and summarising and reporting supporting decisions

Aspects of working scientifically and their components pertaining to **Activity 9**

Investigating	**Understanding**	**Communicating**
accessing resources collecting information handling materials identifying	applying ideas and concepts constructing meaning dealing in an orderly manner with the parts of a complex whole drawing conclusions examining and evaluating inferring from data making comparisons making links	constructing and using models creating presentations retelling and restating

Aspects of working scientifically and their components pertaining to **Activity 10**

Investigating	**Understanding**	**Communicating**
accessing resources collecting information engaging with problems making plans predicting	developing possible, probable and preferred options examining and evaluating formulating and elaborating ideas inferring from data looking for alternatives making links recognising and analysing options reflecting and considering selecting and justifying	arguing a position envisioning alternative futures explaining ideas and decisions expressing points of view supporting decisions

Aspects of working scientifically and their components pertaining to **Activity 11**

Investigating	**Understanding**	**Communicating**
clarifying and challenging collecting information	constructing meaning formulating and elaborating ideas preparing scenarios reflecting and considering suggesting synthesising	arguing a position explaining ideas and decisions exploring and elaborating ideas

Aspects of working scientifically and their components pertaining to **Activity 12**

Investigating	**Understanding**	**Communicating**
collecting information identifying looking for patterns and meanings	drawing conclusions formulating and elaborating ideas making comparisons making links preparing scenarios reflecting and considering selecting and justifying suggesting	arguing a position expressing points of view improvising and performing relating responding and debating supporting decisions

References

Useful teaching websites

Education Queensland Curriculum Exchange:
education.qld.gov.au/tal/curriculum_exchange/
Eductaion Queensland Access Ed:
education.qld.gov.au/accessed/

Useful dinosaur websites

South Australia Museum:
www.samuseum.sa.gov.au/pdf/dinosaurs
Questacon:
www.questacon.edu.au/html/terrorsaurus
ABC:
www.abc.net.au/dinosaurs/meet_the_dinos
Dinosaur database:
www.arts-letters.com/dino2/ency
Victorian Museum:
www.sci.monash.edu.au/msc/lessons
Dinosaur encyclopedia:
www.isgs.uiuc.edu/dinos/de_4
www.search4dinosaurs.com/pictures

Useful ESD websites

Sustainable future:
www.sustainableenergy.qld.edu.au
Griffith ecocentre:
www.gu.edu.au/centre/ecocentre/

Useful dinosaur books

Encyclopedia of dinosaurs San Diego: Academic Press, 1997.

Long, John A.; *Dinosaurs of Australia and New Zealand and other animals of the Mesozoic era* Sydney: UNSW Press, 1998.

Vickers-Rich, Patricia & Rich, Thomas H. *Wildlife of Gondwana: dinosaurs and other vertebrates from the ancient supercontinent* Bloomington: Indiana University Press, 1999.

Rich, Thomas H.V. & Vickers-Rich, Patricia. *Dinosaurs of darkness* Bloomington: Indiana University Press, 2000.

Vickers-Rich, Patricia *Australia's lost world: a history of Australia's backboned animals* Kenthurst, N.S.W.: Kangaroo Press, 1996.

White, M. E. *Reading the rocks* East Roseville N.S.W.: Kangaroo Press, 1999.

Rolls, Eric C. *Australia: a biography, the beginnings from the cosmos to the genesis of Gondwana, and its rivers, forests, flora, fauna, and fecundity.* St Lucia, Qld.: University of Queensland Press, 2000.

Lilydale, Vic.: *Vertebrate palaeontology of Australasia* Pioneer Design Studio in cooperation with the Monash University Publications Committee, Melbourne, 1991.

Fenton, Carroll L. & Mildred A. *The fossil book : a record of prehistoric life* Rev. by Patricia Vickers-Rich, Thomas H. Rich, & Mildred A. Fenton. New York: Doubleday, c1989.

Vickers-Rich, Patricia & Van Tets, Gerard, eds. *Kadimakara: extinct vertebrates of Australia* Lilydale, Vic.: Pioneer Design Studio, 1985.

Morrissey, David. *The age of dinosaurs* South Melbourne: Macmillan Education Australia, 1995.

Yeend, Norman. *Muttaburrasaurus: life in Gondwana*. Sydney: ABC Books, 1995.

Higgins, Geoff. *Australia, the land time forgot: the origins of our land, plants and animals* Frenchs Forest, N.S.W.: Child & Associates, 1988.

Mackness, Brian. *Prehistoric Australia: 4000 million years of evolution in Australia* Sydney : Golden Press, 1987.

Schouten, Peter. *The antipodean ark* North Ryde, N.S.W.: Angus & Robertson, 1987.