

The assessments included sixteen tasks related to the *Planet Earth and Beyond* strand of the science curriculum.

Eight tasks were identical or had many common components for year 4 and year 8 students. Two of these are trend tasks (fully described with data for both 1995 and 1999), three are released tasks (fully described with data for 1999 only), and three are link tasks (to be used again in 2003 so only partially described here). Four other tasks, including one link task, were attempted only by year 4 students. The remaining four tasks, one of which was a link task, were attempted only by year 8 students.

The task details and results for trend tasks are presented in the first section, followed by the task details and results for released tasks. The third section contains a little task information and the results for the link tasks. Within each of the three sections, tasks used with both year 4 and year 8 students are presented first, followed by tasks used only with year 4 students and then by tasks used only with year 8 students.

### **Comparing results for year 4 and year 8 students**

Averaged across 34 task components used with both year 4 and year 8 students, nine percent more year 8 than year 4 students produced correct responses. This indicates that, on average, students have made modest progress between year 4 and year 8 in the skills assessed by the tasks. Hidden within this picture of modest progress, however, were very small differences on task components requiring careful observation and description, but much larger differences on task components requiring explanation of mechanisms or issues.

### **Trend results: Comparing 1995 and 1999 results**

Although the assessments included two trend tasks, one of these focussed predominantly on attitudes to pollution and the other included just three brief objective items. Accordingly, it is inappropriate to try to summarise trends in performance for this curriculum stand. In four year's time, there will be sufficient trend tasks to allow a comparison between performance on this strand in 1999 and 2003.

**Environmental Issues**

**Approach:** One to one

**Level:** Year 4 and year 8

**Focus:** Judge the relative importance of seven environmental threats and justify these decisions.

**Resources:** 7 pictures showing environmental disasters.

**Questions/instructions:**

I am going to give you 7 pictures of things happening on the earth that may be of concern to people. You are to put these pictures in 3 rows on the table.

In the **top row** put the picture or pictures which you think people should be most concerned about; the things that you think have the worst effect on the environment of the world.

In the **middle row**, put the picture or pictures that show problems that are not quite so bad.

In the **bottom row** put the picture or pictures that you feel are not as important as the rest.

**Give the student the pictures.**

Here are the pictures. Put them into the 3 rows I have described.

**Read instructions again if the student needs it.**

1. Let's look at the top row. You have put [read titles of pictures] in the top row. I want you to tell me why you think these are the most important concerns.

**Encourage use of picture titles in spoken explanations.**

2. Let's look at your bottom row of pictures. You have put [read titles of pictures] in the bottom row. I want you to tell me why you think these are not as important as the other concerns.



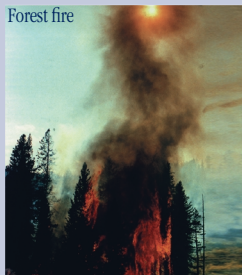
Plastic rubbish on sea animals



Factory smoke



Oil spilled from big boat



Forest fire

**Plastic rubbish on sea animals**

	% responses	
	1999 ('95)	1999 ('95)
	year 4	year 8
top row	54 (55)	41 (46)
middle row	34 (30)	40 (37)
bottom row	12 (15)	19 (17)



Atomic bomb exploding

	% responses	
	1999 ('95)	1999 ('95)
	year 4	year 8
top row	65 (71)	69 (79)
middle row	25 (19)	19 (14)
bottom row	10 (10)	12 (7)

**Atomic bomb exploding**

**Factory smoke**

	% responses	
	1999 ('95)	1999 ('95)
	year 4	year 8
top row	40 (44)	43 (44)
middle row	33 (34)	33 (35)
bottom row	27 (22)	24 (21)



Clearing the rainforest

	% responses	
	1999 ('95)	1999 ('95)
	year 4	year 8
top row	29 (38)	34 (46)
middle row	36 (32)	35 (28)
bottom row	35 (30)	31 (26)

**Clearing the rainforest**

**Oil spill**

	% responses	
	1999 ('95)	1999 ('95)
	year 4	year 8
top row	47 (45)	56 (56)
middle row	37 (36)	37 (37)
bottom row	16 (19)	7 (7)

**Dumping rubbish at sea**



Dumping rubbish at sea

	% responses	
	1999 ('95)	1999 ('95)
	year 4	year 8
top row	52 (49)	54 (49)
middle row	36 (37)	40 (40)
bottom row	12 (14)	6 (11)

**Forest fires**

	% responses	
	1999 ('95)	1999 ('95)
	year 4	year 8
top row	73 (66)	48 (41)
middle row	19 (23)	35 (31)
bottom row	8 (11)	17 (28)

**TOP CONCERNS 1999**

YEAR 4	YEAR 8
Forest fires 73%	Atomic bombs 69%
Atomic bombs 65%	Oil spill 56%
Plastic on sea animals 54%	Dumping at sea 54%
Dumping at sea 52%	Forest fires 48%
Oil spill 47%	Factory smoke 43%
Factory smoke 40%	Plastic on sea animals 41%
Clearing rainforest 29%	Clearing rainforest 34%

**Commentary:**

The environmental concerns of year 4 and year 8 students were quite similar, except that year 8 students placed substantially less importance on forest fires (the top concern in 1999 of year 4 students, but only fourth concern of year 8 students). Year 8 students showed greater change from 1995 to 1999, with reduced concern about atomic explosions and clearing the rainforest, but more concern about forest fires. In their reasons both year 4 and year 8 students gave greatest weight to the danger to animal life, then to the danger to human life. Year 8 students gave much greater weight than year 4 students to global (as opposed to local) effects.

## Planet Earth and Beyond Questions

## Trend task

*Approach:* Independent

*Level:* Year 4 and year 8

*Focus:* Knowledge and understanding about ecological, geological and astronomical phenomena.

*Resources:* None

*Questions/instructions:*

1. If you throw these things away outside, which will decay fastest?

- |    |                  | % responses |            |
|----|------------------|-------------|------------|
|    |                  | 1999 ('95)  | 1999 ('95) |
|    |                  | year 4      | year 8     |
| a. | a paper bag ✓    | 49 (53)     | 78 (81)    |
| b. | a glass bottle   | 15 (16)     | 7 (5)      |
| c. | a metal can      | 21 (12)     | 8 (7)      |
| d. | a plastic bottle | 24 (19)     | 7(7)       |

2. Stars are bigger than the moon, but they appear to be smaller when you look at them.

Explain why.

mentions distance  
( eg., stars are further away) 82 (78) 86 (87)

3. The picture shows two different mountains.



The mountains in Picture A are rough and jagged.

The mountains in Picture B are smooth and rounded.

Which statement about the age of these mountains is probably true?

- |    |   | % responses |            |
|----|---|-------------|------------|
|    |   | 1999 ('95)  | 1999 ('95) |
|    |   | year 4      | year 8     |
| a. | the mountains in picture A are older                                | -           | 29 (28)    |
| b. | the mountains in picture B are older ✓                              | -           | 29 (27)    |
| c. | the mountains are about the same age                                | -           | 4 (3)      |
| d. | the pictures don't give any information about the age of mountains. | -           | 38 (42)    |

## Natural Disasters

**Approach:** One to one

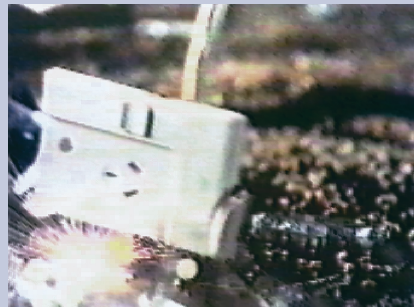
**Level:** Year 4 and year 8

**Focus:** Recognising earthquakes and volcanic eruptions and explaining the likely causes.

**Resources:** Video showing earthquake and volcanic eruption.

**Questions/instructions:**

The news on TV often shows natural disasters that have happened around the world. We're going to watch a video that shows some natural disasters then I will ask you some questions.



**Show video part 1.**

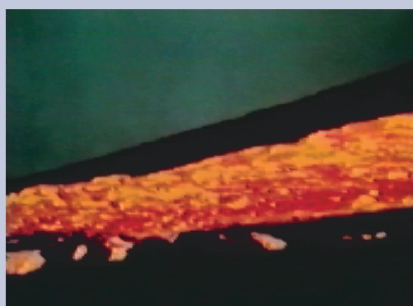
1. What name do we give to an event like this?  
**earthquake**
- If student doesn't know, tell them it is an earthquake.**
2. Try to tell me what might have caused this to happen.

*Prompt: What causes an earthquake to happen?*

*Tectonic plate movement, pressure build up, eventual sudden movement to release pressure.*

	% responses	
	y4	y8
good understanding: using technical terms	8	26
no technical terms	10	19
vague notion of earth movement	20	20
technical terms, but weak understanding	3	7

% responses	
y4	y8
89	100



4. Try to explain to me what might have caused this to happen?

*Prompt: What causes a volcano to happen?*

*Magma pressure build-up, plus earth/plate movement creating pathway for escape.*

	% responses	
	y4	y8
good understanding of both aspects	1	6
good understanding of one aspect or vague understanding of both	15	32
vague understanding of one aspect	42	33

% responses	
y4	y8
46	61
49	47

**Show video part 2.**

3. What name do we give to something like this? **volcanic eruption or eruption**  
**volcano**

**If student doesn't know, tell them it is a volcano erupting.**

**Commentary:**

Most year 4 and year 8 students identified the phenomena successfully. Year 8 students were more successful than year 4 students in explaining the phenomena, but less than half had a reasonably good understanding.

## Vege Peelings

**Approach:** One to one

**Level:** Year 4 and year 8

**Focus:** Evaluate and justify different approaches to organic waste disposal.

**Resources:** Video showing four ways to dispose of vegetable peelings, 4 photos.

**Questions/instructions:**

In this activity I want you to think about different ways of getting rid of vegetable waste. We'll start by watching a video.

**Show video.**

The video showed four different ways of getting rid of some vegetable peelings — put them in a rubbish bag, throw them on a compost heap, put them in a waste disposal unit or feeding them to the animals.

**Show pictures.**



% responses  
y4 y8

1. Which of these ways do you think is a very good way to get rid of the vegetable peelings?

**Record number of picture chosen.**

rubbish bag	14	5
compost heap	28	43
waste disposal	9	9
feeding to animals	49	43

2. What happens to the vegetable peelings when you get rid of them in that way?

3. Why is that a very good way to get rid of the peelings?

good understanding of process	12	31
some useful idea/s	47	42

4. Which of these ways do you think is not a very good way for getting rid of vegetable peelings?

**Record number of picture chosen.**

rubbish bag	25	47
compost heap	19	19
waste disposal unit	44	28
feeding to animals	12	6

5. Why is that not a very good way for getting rid of vegetable peelings?

6. What happens to the vegetable peelings when you get rid of them in that way?

*Considerations of immediate and long-term consequences, hygiene, pollution, conservation, convenience, cost.*

good awareness of waste issues	4	13
some awareness	41	52

**Commentary:**

About 20 percent more year 8 than year 4 students were able to justify their choices to some useful extent, but few were able to give good clear justifications

## Rocks

**Approach:** One to one

**Level:** Year 4 and year 8

**Focus:** Describe, differentiate and suggest human uses for different rocks.

**Resources:** Hand lens, 3 rocks —sandstone, greenstone, pumice.

**Questions/instructions:**

**Put 3 rocks in front of student.**

In this activity we will be looking at some rocks found in New Zealand. You can pick them up. Use the hand lens to have a really good look at them.

**Give the student the hand lens. Allow time for student to examine all 3 rocks.**

1. Now we'll talk about each rock, starting with rock 1 [sandstone]. Try to tell me all of the things that you have noticed about this rock?

*% responses*

	y4	y8
<b>Sandstone:</b>		
layered	56	60
light brown/yellow	31	39
gritty/sandy	47	22

3. Some rocks are used by people. What might this rock be used for?

abrasive	10	12
decorative use	19	22

**Show rock 2: greenstone.**

4. Now look at the rock labelled 2. Tell me all the things that you noticed about this rock?

5. How is this rock different from other rocks?

	y4	y8
<b>Greenstone:</b>		
very hard	9	7
green, smooth	86	84
beautiful when polished	55	
great cultural significance to Māori	8	10

6. Some rocks are used by people. What might this rock be used for?

jewellery, ornaments	72	89
weapons (mainly ceremonial now)	6	17
cutting tool	4	6
status, 'mana'	1	1

**Show rock 3: pumice.**

7. Now look at the rock labelled 3. Try to tell me all the things that you noticed about this rock?

8. How is this rock different from other rocks?

<b>Pumice:</b>		
very light, full of air holes	86	86
very rough, gritty	30	29
abrasive	34	46

9. Some rocks are used by people. What might this rock be used for?

gardening/ gardening materials	6	5
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**Commentary:**

Year 4 and year 8 students performed quite similarly on this task.

## Sand Dunes

**Approach:** Independent

**Level:** Year 4

**Focus:** Explain erosion of sand dunes, ways to reduce erosion and reasons for conservation of dunes.

**Resources:** Picture of sand dunes.

**Questions/instructions:**

The sand dune in the photo is getting smaller. It is being worn away. Soon there might be no sand dune.

*% responses*

1. What is eroding the sand away? Why is the sand dune getting smaller?

	y4
<b>Wave action:</b>	
identified and explained	9
identified only	43
<b>Wind action:</b>	
identified and explained	3
identified only	22
<b>People removing sand</b>	10

2. What can be done to help protect the sand dune so that it doesn't keep on getting smaller?

*% responses*

<b>Identifies use of a barrier:</b>	
with explanation	4
without explanation	45

**Identifies ways of holding together:**  
(eg planting)

with explanation	0
without explanation	8

3. Why is it important to look after our sand dunes?

plant or animal ecology	12
protection of land behind dunes	9
recreational value	25
visual landscape	6
other good reason (eg. heritage)	22

**Commentary:**

More than half of the students identified at least one erosion process, but few could explain the processes clearly. About half suggested barriers to reduce erosion with only eight percent suggesting planting.

## Underground

**Approach:** Station

**Level:** Year 4

**Focus:** Demonstrate knowledge of properties of top soil and clay.

**Resources:** Picture of soil and clay, 9 stickers listing soil properties.

**Questions/instructions:**

Sometimes when you dig in the ground you find topsoil. Under the topsoil you could find clay.

Some of the words on the stickers are to do with topsoil. Some of the words are to do with clay.

Stick the words where you think they belong — on the soil, or on the clay.



**Topsoil**

- lots of tiny pieces
- worms in it
- dead leaves
- dark brown in colour
- lots of air in it
- drains easily

**Clay**

- light brown in colour
- only a little air in it
- doesn't drain easily

% responses	
y4	
lots of tiny pieces	71
worms in it	83
dead leaves	82
dark brown in colour	80
lots of air in it	80
drains easily	78
light brown in colour	83
only a little air in it	80
doesn't drain easily	80

**Commentary:**

About 30 percent of the year 4 students placed all nine stickers correctly. A further 40 percent only placed one or two stickers correctly.

## Space Address

**Approach:** Station

**Level:** Year 4

**Focus:** Matching a hierarchy of locations within the universe with their pictures.

**Resources:** set of 7 pictures

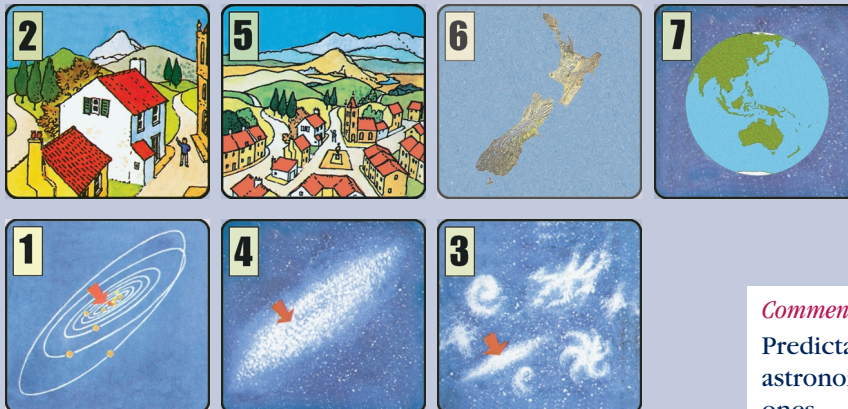
**Questions/instructions:**

Sam was having a lot of fun writing his address on an envelope. This is what he wrote:

Sam Williams  
14 Smith Street  
Greytown  
New Zealand  
The Earth  
The Solar System  
The Milky Way  
The Universe



Look at the 7 pictures. See if you can work out which part of Sam's address they are. Write the number of the picture that matches each part of the address.



14 Smith Street	2	91
Greytown	5	89
New Zealand	6	96
The Earth	7	95
The Solar System	1	75
The Milky Way	4	53
The Universe	3	49

% responses	
y4	
14 Smith Street	91
Greytown	89
New Zealand	96
The Earth	95
The Solar System	75
The Milky Way	53
The Universe	49

**Commentary:**

Predictably, students struggled more with the astronomical pictures than with the terrestrial ones.

## Night Sky

**Approach:** One to one

**Level:** Year 8

**Focus:** Identifying ways in which the moon and stars have and do help people, and affect animal and plant life.

**Resources:** Picture of night sky.

### Questions/instructions:

Show student picture of night sky.

This is a picture of the night sky. The night sky is important to life on earth. People through time have looked at the moon and stars. Often they have used the moon and stars to help them in their lives.

1. How might the moon and stars help people on earth? *Prompt: Why was and is the night sky important to people on earth?*



% responses

	y8
provide light/visibility	53
navigation	46
phases/movements used to define time/seasons/etc	15
aesthetic value (beauty)	10
cultural significance (religious, myths, beliefs, astrology)	27
spur to scientific exploration	15
tides	6
2. Over time people have noticed that the moon and stars affect animal and plant life on earth. Try to tell me some ways that the moon and stars might affect animal and plant life on earth.	
cyclic phenomena, such as animals behaving differently in different phases of the moon	14
plants or animal health benefiting from light of moon	24
navigational use by animals	3
animals use light of moon/stars to see, move about	15
darkness at night suits some animals and plants	15

## Changing Faces of the Moon

**Approach:** Station

**Level:** Year 8

**Focus:** Identify the sequence of phases of the moon.

**Resources:** Computer, mouse, headphones, mousepad.

### Questions/instructions:



% responses

	y8
This activity is done on the computer. The computer should show the home page. If it doesn't tell the teacher. Click on the button that says "Moon". The computer will tell you what to do	
<b>Placement of 7 phases</b>	
<b>All correct:</b>	
for southern hemisphere	20
for northern hemisphere	12
<b>One pair inverted:</b>	
for southern hemisphere	8
for northern hemisphere	6
<b>Other</b>	54

### Commentary:

Twenty percent of the year 8 students produced a completely correct response, with a further 12 percent putting the phases in a logical sequence but opposite to that applying in the Southern Hemisphere.

## Daytime — Night-Time

**Approach:** One to one

**Level:** Year 8

**Focus:** Understanding the relationship between the rotation of the earth relative to the sun and the time of day or night for different locations on the earth.

**Resources:** globe, torch, recording book

**Questions/instructions:**

Here is a globe of the earth and here is a torch.



**Give students the globe and point to New Zealand.**

% responses  
y8

- Imagine that it is 4 o'clock in the afternoon in New Zealand.  
Where might the sun be? Hold the torch and shine it from where you think the sun might be.

**Record student response.**

shining on NZ from the west 38

- It is daylight in New Zealand at the moment. Using the globe and the torch show me what happens from 4 o'clock in the afternoon until midnight.

% responses  
y8

globe rotated so sun moves further west 42  
rotated quarter to half a turn 30

**Put torch aside. Point to New Zealand.**

Imagine that it is the middle of the day in New Zealand.

**Point to, and say FRANCE.**

- Will it be daytime or night-time here?

**Record student response.**

night time 90

**Point to, and say AUSTRALIA**

- Will it be daytime or night-time here?

**Record student response.**

day time 50

**Point to, and say JAPAN.**

- Will it be daytime or night-time here?

**Record student response.**

day time 38

**Commentary:**

Year 8 students demonstrated quite limited understanding of how the rotation of the earth relative to the sun leads to patterns of night and day in different locations on the earth.

**Link Tasks 22-26**

**LINK TASK 22**

*Approach:* One to one  
*Level:* Year 4 and year 8  
*Focus:* Phenomena on earth  
*Resource:* Video

	% responses	
	y4	y8
explanation	4	20
information	38	53
explanation	1	4

**LINK TASK 23**

*Approach:* One to one  
*Level:* Year 4 and year 8  
*Focus:* Solar System  
*Resource:* 4 pictures

	% responses	
	y4	y8
<b>Total score: 20-24</b>	1	7
17-19	8	16
14-16	13	21
11-13	20	22
8-10	21	18
5-7	23	9
2-4	11	6
0-1	3	1

**LINK TASK 24**

*Approach:* One to one  
*Level:* Year 4 and year 8  
*Focus:* Geology  
*Resource:* Lens, 3 samples.

	% responses	
	y4	y8
<b>Information: 1</b>	96	98
2	30	45
3	3	7
<b>Explanation: 1</b>	39	62
2	18	29
3	18	31

**LINK TASK 25**

*Approach:* One to one  
*Level:* Year 4  
*Focus:* Solar system  
*Resource:* Diagram

	% responses
	y4
<b>Total score: 6-15</b>	4
4-5	35
2-3	43
0-1	18

**LINK TASK 26**

*Approach:* Station  
*Level:* Year 8  
*Focus:* Phenomena on earth  
*Resource:* Picture

	% responses
	y8
<b>Total score: 9-22</b>	3
6-8	52
3-5	42
0-2	3