

Report On Student Achievement



Science

Aggregation: Term 2, 2018

Strand: Planet Earth and Beyond

The Planet Earth and Beyond Strand is about the interconnecting systems and processes of the Earth, the other parts of the solar system, and the universe beyond. Students learn that Earth's subsystems of geosphere (land), hydrosphere (water), atmosphere (air), and biosphere (life) are interdependent and that all are important. They come to appreciate that humans can affect this interdependence in both positive and negative ways.

Students also learn that Earth provides all the resources required to sustain life except energy from the Sun, and that, as humans, we act as guardians of these finite resources. This means knowing and understanding the numerous interactions of Earth's four systems with the solar system. Students can then confront the issues facing our planet and make informed decisions about the protection and wise use of Earth's resources.

Achievement Aim – the classes worked with a range of contexts across these aims.

In their study of the Solar System students used their developing scientific knowledge, skills and attitudes to:

1. Earth systems

Investigate and understand the spheres of the Earth system: geosphere (land), hydrosphere (water), atmosphere (air), and biosphere (life).

2. Interacting systems

Investigate and understand that the geosphere, hydrosphere, atmosphere, and biosphere are connected via a complex web of processes.

3. Astronomical systems

Investigate and understand relationships between the Earth, Moon, Sun, solar system, and other systems in the universe.

Achievement Objectives At Each Level

Main Ideas Contained At Each Level Within The Strands:

Level 1 Context studied: 'Our Star, our Sun' (Generally Years 1 & 2 students)	Level 2 Context 'Out of this World' (Generally Years 3 & 4 students)
<p><i>The Big Ideas' in the unit:</i></p> <ul style="list-style-type: none"> The Sun is the ultimate source of energy for life on earth Earth's system is a small part of a solar system within the vast system of the universe. <p>Science Concepts:</p> <p>Level 1 What is a Star The Sun is a Star in our solar system The Sun provides energy that we need for life The Sun is the star closest to Earth and is the centre of our Solar system We see the Sun in the daytime and other stars at night The Earth rotates around the Sun The Earth spins</p> <p>LEARNING OUTCOMES: Can make a comparison about what is in the sky at night and during the day (that we can see) Identify and name some planets in our Solar system Express how we get night and day Explain how the sun is important to our everyday lives Draw a realistic star and name the features of it Show their understanding of the Sun being the centre of our solar system and the how the Earth and other planets fit within it.</p>	<p><i>All the preceding ideas, plus:</i></p> <p>BIG IDEAS:</p> <ul style="list-style-type: none"> The Sun is the ultimate source of energy for life on earth Earth's system is a small part of a solar system within the vast system of the universe. <p>Science Concepts:</p> <p>Level 1 - The Sun gives out light and heat We see the Sun in the daytime We see other stars at night Life on Earth depends on the light and heat given out by the sun Large space objects that emit their own light and heat are called stars The Sun is a star The Sun is the star closest to the Earth Other stars are much further away from us than the Sun.</p> <p>Level 2 The Earth spins on its axis once every 24 hours giving day to the parts that face the sun and night to the parts that face away from it The Sun is so close to us that during daytime its brightness outshines the light of other stars If we were able to get closer to other stars we would sense a great amount of their heat and light The Earth takes one year to orbit around the Sun On clear nights we can see star patterns in the sky - (link to Matariki)</p>
<p><u>Level 3 and 4 (Years 5&6) Context 'The Moon / The Night Sky '</u></p>	
<p><i>All the preceding ideas, plus:</i></p> <p>BIG IDEAS The way the Moon's gravity pulls on the spinning Earth causes the environmental pattern of tides. The change in relative positions of the Moon, Earth and sun determines the apparent change in the shape of the Moon. The Earth's system is a small part of a solar system within the vast system of the universe. We order the visible stars in the night sky in the patterns that our cultures have taught us. Our position in space governs what celestial objects we can see. Relationships between planet Earth and its solar system, galaxy and the universe. Our theories about the universe and Earth's place in it have changed and developed over time Our theories about the universe and Earth's place is limited by what we are able to observe and think about The development of the new kinds of technology has expanded the ways in which people can make observations of space.</p>	

LEARNING OUTCOMES: Level 3 and 4

Explain how the Moon influences the Earth tides

Demonstrate why the moon seems to 'change shape'

Identify the planets in our Solar System in order from the Sun.

Recall the shape of the Southern Cross and one other constellation.

LEARNING OUTCOMES – KNOWLEDGE: Level 3 and 4

Students can find information obtained from space exploration

They can use this information to suggest explanations for the characteristics of and environmental patterns associated with the Earth, the Sun, the Moon, and the planets in our solar system

Locate and use information obtained from space exploration to clarify, challenge, and extend their ideas about the general nature and behaviour of the Earth, its moon, and the other planets in our solar system

LEARNING OUTCOMES – SKILLS: Level 3 and 4

Use a variety of thinking processes to make sense of information, experiences, and ideas

Frame questions to ask self and others to find out more information

Use active listening skills

Reflect on learning

Researching skills

Values- Throughout the unit the following values from The New Zealand Curriculum will be modelled, encouraged and explored.

- **Innovation, Inquiry and Curiosity** by thinking critically, creatively and reflectively to evaluate a scientific process and outcome
- **Excellence**
- **Diversity**
- **Community and Participation**

Key Competencies- Throughout the activities in this unit, there are many opportunities to develop the key competencies identified in The New Zealand Curriculum. In particular, this focus of learning develops the key competencies of:

- **Managing Self** (Managing oneself when doing Scientific observations and research)
- **Using Language, Symbols and Text**
- **Thinking** (Predicting, Observing, reflecting, questioning and discussing process/outcomes)
- **Participating and Contributing** (as an individual and as a group member – active involvement)

Our 'Reach for the Stars' –

- **Smart Decisions**
- **Always Learning**
- **Self Managing**
- **Trying our Best**
- **Respectful**

Achievement Objectives At Each Level

(Science in the NZ Curriculum)

Level One and Two (generally Years 0 – 2, and Years 3 - 4 students)

Level Three (generally Years 5 and 6 students)

The students will be able to:

<p>Science The New Zealand Curriculum (2007)</p> <p>Strand</p>	<p><u>Level One and</u> <u>Two Programme</u></p> <p>Students will:</p>	<p><u>Level Three Programme</u></p> <p>Students will:</p>
<p>Planet Earth and Beyond</p>	<p>Earth Systems</p> <ul style="list-style-type: none"> • Explore & describe natural features & resources <p>Interacting systems</p> <ul style="list-style-type: none"> • Describe how natural features are changed & resources affected by natural events and human actions • <p>Astronomical systems</p> <ul style="list-style-type: none"> • Share ideas & observations about the Sun & the Moon & their physical effects on the heat and light available to the Earth 	<p>Earth Systems</p> <ul style="list-style-type: none"> • Appreciate that water, air, rocks and soil, and life forms make up our planet and recognise that these are also Earth's resources. <p>Interacting systems</p> <ul style="list-style-type: none"> • Investigate the water cycle and its effect on climate, landforms, and life. <p>Astronomical systems</p> <ul style="list-style-type: none"> • Investigate the components of the solar system, developing an appreciation of the distances between them.

TABLE OF STUDENT PROGRESS WITHIN THIS STRAND

Achievement Level:	Early Level 1	Secure Level 1	Level 2	Level 3	Level 4
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Class Level - Numbers of Students working at each level.

Year 1 (121 students)	51	70			
Year 2 (124 students)		124			
Year 3 (134 students)		14	120		
Year 4 (116 students)		2	113	1	
Year 5 (127 students)			13	114	
Year 6 (131 students)		1	7	123	

ANALYSIS AND RECOMMENDATIONS

All Students:

Number of students assessed across Year 1 - 6 **753 students.**

From the data above the majority of all year levels is either **at** or **above** the Achievement Band Expectation. (743 students at or above expectation Curriculum levels)

Overall throughout the school we have **98.7 %** of the students working **at** or **above** the Achievement band expectation. **This is an excellent result.**

Maori Students:

Number of Maori students assessed across Year 1-6: **94 students**

Of these students **93 are** either **at** or **above** the Achievement Band Expectation.

For our Maori students this is a result of **98.9%** working **at** or **above** the Achievement band expectation. **This is also an excellent result.**

Pasifika Students:

Number of Pasifika students assessed across Year 1-6: **7 students**

Of these students **6 are at** the Achievement Band Expectation. For our Pasifika students this is a result of **85.7 %** working **at** or **above** the Achievement band expectation.

Male Students (Total: 378)

From the data above the majority of all year levels is **at** or **above** the Achievement Band expectation. (372 male students at expectation Curriculum levels)

Overall throughout the school we have **98.4 %** of the male students working **at** the Achievement band expectation.

Female Students (Total: 375)

From the data above the majority of all year levels is **at** or **above** the Achievement Band Expectation. (371 female students at expectation Curriculum levels)

Overall throughout the school we have **98.9 %** of the female students working **at** the Achievement band expectation.

Students not achieving at expectation levels – 10 students

Of these 10 students, 3 are 'English as a Second Language' students, at a lower stage of development with literacy oral/written language development 9 of the 10 students feature in our Learning Support roll and all of them have been identified within their teaching team with appropriate remediation processes in place.

What went well with this unit of learning

It has been a few years since we had worked on a unit in the Science strand of Planet Earth and Beyond, the last one was in 2016 when the unit focus was hydrosphere and atmosphere contexts about Weather.

The Solar System was only explored through other contexts and not as the sole focus for a unit so I decided to make this a major Curriculum focus area this year. It linked very well to our first topic of the year – 'Te Totara, our Place' as so much of our school's cultural report and ongoing story is through celestial links showcased in our buildings and our 'Reach for the Stars' programme. I felt that the deep knowledge we could foster would be maintained through the ongoing connections to our school and its journey. This was certainly achieved school wide through this unit, with high levels of student and teacher engagement and the excellent achievement results.

The teaching staff shared that these units of work on aspects of our Solar System were particularly motivating and successful for the students because of the practical and familiar study contexts, which were easily accessible to all students. The interest of the students was easy to ignite, many teachers commented in their unit evaluations that our boys were particularly engaged with and extended their learning. The use of an 'inquiry learning' focus with the Te Totara Learning Model was a great framework to develop the learning. Several teachers said that the students didn't want the learning to stop; they wanted to learn more about the solar system and the planets. It provided lots of opportunities for independent research studies and presentations.

Parents commented on their children's interest in this topic and thirst for more knowledge at home. Learning was shared with our families through the Seesaw app where students were provided a platform to record and showcase their learning journey. The iPad COWs were also used widely to maximise the number of devices in the research and presentation phase of this unit. Relevant apps which are excellent such as the 'Night Sky' were put onto all our iPads for the duration of the unit. Research also continued through relevant Home Learning tasks to further growth in oral language, vocabulary and questioning skills. Fabulous to get the families learning too! As one teacher's said... 'Teach a child, teach a community.'

A number of 'Education Outside the Classroom' (E.O.T.C.) experiences enriched the students' knowledge as they were able to observe the night sky and explore other aspects of space and space travel. The Year 5 and 6 classes went with their teachers and families on evening visits to the Hamilton Observatory. A presenter spoke to them, answered their questions and they had an opportunity to look through their large telescopes at the stars and the surface of the Moon.

One of our Year 3-4 teams went to a facility in Te Awamutu called 'The Space Place.' This housed an amazing collection of space exploration memorabilia including a space suit, photos, videos etc. The host of the museum had wonderful knowledge that was skillfully shared with the students – this was a great culmination to their unit. This resource person also came to Te Totara and spoke to our Year 5-6 classes about aspects of space exploration – past, present and in the future as well.

Great support resources were used e.g. our school readers, internet, NASA website, YouTube, apps, school library books (fiction and non-fiction), iMovie, videos and resource personnel. Students created, acted and filmed their own videos in relation to 'how the Earth orbits the Sun' and 'how the Moon orbits the Earth.' Curriculum budgets were used to purchase and enhance our resource collection in this area, also to subsidize our trips and costs of resource personnel so these were affordable for all our families.

In all areas of the school new scientific vocabulary was encountered and unpackaged into sound understanding for the students e.g. terms like; 'Earth's axis, the moon phase patterns, solar and lunar eclipses, constellations, and the moon's link to the tides'.

One teacher commented that "as a teacher I felt really successful when student's prior concepts were challenged and progressed from statements like:

...the day is when the sun is up and the night is when the moon is up in the sky to the following ...

...the Earth spins around and when New Zealand faces the sun we have day time and when we don't face the sun it is night time. The moon is always there; you just can't see it in the day because the sun is so bright... (Year 3 student)." The students began to 'think and interpret like scientists.'

The timing of this unit was excellent as the autumn night sky this year yielded some spectacular images. We had very large full moons ('harvest moons', as one of our lovely picture books put it) and very big tides. There was also a 'blood moon'. During May and early June, we had some very calm, cool, cloudless nights which made for wonderful night sky viewing. The timing of the unit to coincide with Matariki (Maori New Year) was also fantastic for integrating the unit and using a familiar star constellation, to help the students to learn about planting and harvesting with the natural world, also how early explorers navigated by the stars.

Our E.S.O.L. students benefited from some prior knowledge and specific vocabulary teaching by our E.S.O.L. teachers before the unit began. This helped to prepare them for the learning and meant that a very high percentage of them were achieving a curriculum level comparable to their cohort.

Curriculum integration occurred with the essential learning areas of Social Sciences (with the sharing of different historical and cultural beliefs around the Sun, Moon and Space), English; Oral discussions and conclusions, Reading, Research, Presenting, Writing; Explanation and Report writing, Narrative myths and legends and poetry. Mathematics (distance to the Sun with a ratio scale), STAR's learning, The Arts; Visual (observational drawing by sketching and modelling) and Drama and Movement programmes.

Many teachers used role play to help the students gain real understanding of Night and Day and distance from the sun that determines length of a planet's 'year.' Some fantastic interactive learning was presented to our school community through our Term 2 assemblies.

I believe this unit ignited some lifelong learning in our students which will continue to be enhanced through our fascination of our place in this vast universe. The continual development in technology allows us to explore and learn more and more e.g. the discovery of water on Mars and the recent launch of the Space probe into the sun.

Ideas for Future Action of this or a similar unit (Linked to our Strategic Plan)

- * Continue to tap into resources, personnel and E.O.T.C. experiences that can enrich the programme and assist in developing confidence and skills in staff and students. An interchange of teachers with scientific skills can be considered as well as the bringing in of 'experts' and E.T.O.C. experiences where we take the students to the 'expert knowledge and their environment.'
- * Specific professional development in scientific areas for teachers. Curriculum knowledge of concepts and units need to be shared across the staff ensuring that we have a common understanding of the levels of the curriculum, where our expectations for student learning are and where the students are currently achieving at. This is very important as there can be many areas of incorrect prior knowledge with adults as well as the students.

- * We need to ensure the concepts taught are relevant to the students in terms of their learning needs and abilities. Extension activities should be offered to the group that they are targeted for whilst the other students learning is consolidated, at the appropriate level, to ensure success for all.
- * Targeted purchases of equipment, resources, experiences and time need to be made in relation to specific teaching intentions. With this unit we used the Science and Literacy budgets to subsidize the costs of the trips and the 'experts' for our families, so that this valuable learning was accessible to all our students.
- * Teaching focus is to be "hands on" learning as much as possible. This was very much the case during this unit. The learning was very interactive and contributed to the high levels of student engagement and success.
- * Continue our valuable home/school partnership by including home activities and informing the parents of the specific science focus, this occurred throughout the unit and beyond into our learning plans for each student. This is a powerful model of interactive education between home and school which leads to rich learning. This link was also enhanced through parent support in accompanying us on our trips and then home learning research and discussions.
- * Continue to support E.S.O.L. students through support programming with our E.S.O.L. teachers. Use a variety of assessment procedures and "hands on" learning to gauge/enhance their understandings of scientific processes. Prior vocabulary learnings helped to increase the understanding of our E.S.O.L. students.

This document on student achievement in Science - Term 2, 2018 was reported to the Board of Trustees Meeting on 30 August, 2018.
The valuable input of all staff is acknowledged in the preparation of this report.

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