

# SCIENCE



**Aggregation:** Term 1, 2015

**Strand:** Living World.

The Living World Strand is about living things and how they interact with each other and the environment.

Students develop an understanding of the diversity of life and life processes, of where and how life has evolved, of evolution as the link between life processes and ecology and of the impact of humans on all forms of life.

As a result they are able to make more informed decisions about significant biological issues.

The emphasis is on the biology of New Zealand, including the sustainability of New Zealand's unique fauna and flora and distinctive ecosystems.

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

**In their study of the Living World students used their developing scientific knowledge, skills and attitudes to:**

1. Gain an understanding of order and pattern in the diversity of living organisms, including the special characteristics of New Zealand plants
2. Investigate and understand relationships between structure and function in living organisms
3. Investigate how organisms grow, reproduce and change over generations
4. Investigate local ecosystems and understand the interdependence of living organisms, including humans and their relationship with the physical environment.

## Main Ideas Contained At Each Level Within The Strands:

|   |   |
|---|---|
| <b>Level 1 Context studied: “Growing Plants”</b><br>(Generally Years 1 & 2 students)  | <b>Level 2 Context: “Is this a Plant”</b><br>(Generally Years 2, 3 & 4 students)  |
| <p><i>The ‘Big Ideas’ in the unit:</i></p> <p><b><u>Early Level 1</u></b></p> <ul style="list-style-type: none"> <li>- Plants grow</li> <li>- Plants need water and light to stay healthy</li> <li>- There are lots of different plants</li> <li>- Plants are one group of living things.</li> </ul> <p><b><u>Secure Level 1</u></b></p> <ul style="list-style-type: none"> <li>- All the individuals within any one group of living things share a number of features in common             <ul style="list-style-type: none"> <li>- Some features used for classification are readily observed.</li> </ul> </li> <li>- Plants have features that help them stay alive and grow.</li> <li>- All plants share a similar life cycle.</li> <li>- Plants need air, soil, water, light, and space to grow.</li> </ul> | <p><i>All the preceding ideas, plus:</i></p> <ul style="list-style-type: none"> <li>- We can group plants in lots of different ways, scientists have agreed on one scientific way of grouping plants</li> <li>- The plants within each group share certain easily observed key features</li> <li>-Plants grow and change over time and in different environments</li> <li>-Plants make their own food, respond to things around them and produce new plants</li> <li>- Flowers of some plants turn into fruit, and the seeds are in the fruit</li> <li>- We can use plants for a variety of reasons.</li> </ul> |
| <b>Level 3 Context: “Our Growing World”</b><br>(Generally Years 4, 5 & 6 students)  | <b>Extension areas (Level 4/5) concepts</b><br><b>“Our Growing World”</b>   |
| <p><i>All the preceding ideas, plus:</i></p> <ul style="list-style-type: none"> <li>- Plants grow from seeds</li> <li>- Flowers produce seeds before they die</li> <li>- Seeds and pollen are spread in a variety of ways.</li> <li>- When seeds reach the ground, new plants have a chance to grow</li> <li>- Flowers of some plants turn into fruit and the seeds are in the fruit</li> <li>- The plant that grows from a seed will have the same type of flower and fruit as the plant that produced the seed</li> <li>- Plants live in conditions to which they are suited</li> </ul>   | <p><i>All the preceding ideas, plus:</i></p> <ul style="list-style-type: none"> <li>- Plants live in a variety of physical conditions and habitats</li> <li>- Plants need to be able to respond to changes in their environments in order to survive</li> <li>- Some plants have certain features or structures that enable them to survive and to reproduce</li> <li>- Green plants need light and make their own food, this process is called photosynthesis</li> </ul>   |

|  |  |                             |
|--|--|-----------------------------|
| <b>Values being encouraged:</b>          | Ecological Sustainability<br>Innovation, Inquiry and Curiosity | Community and Participation |
| <b>Key Competencies being developed:</b> | Relating to Others<br>Self Managing<br>Trying our Best         | Always Learning             |

## Achievement Objectives At Each Level

### (Science in the NZ Curriculum)

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**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:

| <b><u>Level One and Two Programme</u></b> | <b>Science<br/>The New Zealand Curriculum<br/>( 2007)</b>  | <b><u>Level Three Programme</u></b>  |
|---|--|--|
| <b>Strands</b>                            | Students will:   | <b>Science<br/>The New Zealand Curriculum<br/>( 2007)</b>  |
| Living World                              | <b>Life Processes</b> <ul style="list-style-type: none"><li>• Recognise that all living things have certain requirements so that they can stay alive</li></ul> <b>Ecology</b> <ul style="list-style-type: none"><li>• Recognise that living things are suited to their particular habitat</li></ul> <b>Evolution</b> <ul style="list-style-type: none"><li>• Recognise that there are lots of living things in the world</li></ul> | <b>Life Processes</b> <ul style="list-style-type: none"><li>• Recognise that there are life processes common to all living things and that these occur in different ways</li></ul> <b>Ecology</b> <ul style="list-style-type: none"><li>• Explain how living things are suited to their particular habitat and how they respond to environmental changes both natural and human induced</li></ul> <b>Evolution</b> <ul style="list-style-type: none"><li>• Begin to group plants, animals &amp; other living things into science-based classifications</li><li>• Explore how the groups of living things we have in the world have changed over long periods of time and appreciate that some living things in N.Z. are quite different from living things in other areas of the world</li></ul> |

**TABLE OF STUDENT PROGRESS WITHIN THIS STRAND**

| <b>Achievement Level:</b> | <b>Early Level 1</b> | <b>Secure Level 1</b> | <b>Level 2</b> | <b>Level 3</b> | <b>Level 4</b> |
|---------------------------|----------------------|-----------------------|----------------|----------------|----------------|
|---------------------------|----------------------|-----------------------|----------------|----------------|----------------|

***Class Level - Numbers of Students working at each level.***

|                                 |           |            |            |           |          |
|---------------------------------|-----------|------------|------------|-----------|----------|
| <b>Year 1</b><br>(119 students) | <b>57</b> | <b>62</b>  |            |           |          |
| <b>Year 2</b><br>(134 students) | <b>2</b>  | <b>132</b> |            |           |          |
| <b>Year 3</b><br>(131 students) |           | <b>25</b>  | <b>106</b> |           |          |
| <b>Year 4</b><br>(113 students) |           |            | <b>113</b> |           |          |
| <b>Year 5</b><br>(119 students) |           | <b>4</b>   | <b>52</b>  | <b>63</b> |          |
| <b>Year 6</b><br>(100 students) |           | <b>1</b>   | <b>22</b>  | <b>76</b> | <b>1</b> |

**ANALYSIS AND RECOMMENDATIONS**

**All Students:**

Number of students assessed across Year 1 - 6 **716 students.**

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

Overall throughout the school we have **95.9 %** of the students working **at** the Achievement band expectation. ***This is an excellent result.***

**Male Students (Total: 347 )**

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

Overall throughout the school we have **95.6 %** of the students working **at** the Achievement band expectation.

**Female Students (Total: 369 )**

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

Overall throughout the school we have **96.2 %** of the students working **at** the Achievement band expectation.

**Maori Students :**

Number of Maori students assessed across Year 1-6 **84 students**

Of these students 81 are **at** the Achievement Band Expectation.  
For our Maori students this is a result of **96.4 %** working **at** the Achievement band expectation.

**Pasifika Students: 7 students** at the time of this unit. All 7 are at expectation level.  
**100%** at the Achievement band expectation.

### **Students not achieving at expectation levels – 29 students**

Of these 29 students, 8 are 'English as a Second Language' students, so are often at a lower stage of development with literacy oral/written language development. A further 2 students were formally on the ESOL roll so still come from homes with a non-English speaking background where concept development may be impaired or delayed. Of these students who are achieving at one level below expectation levels, 18 of them feature in our Learning Support roll, with learning delays. Of the students who have been at Te Totara longer than this year, they have all shown a rate of progress consistent with the general cohort, from the last Science data reported on in 2013.

### **What went well with this unit of learning**

The staff all felt these units of work within the Living World strand of the Science curriculum were particularly motivating and successful for the students because of the direct observation, investigative and interactive nature of the activities. This led to lots of enthusiasm and engagement for our learners. Many teachers commented that block periods of scientific investigations where Science and Technology outcomes were closely linked via authentic scenarios (particularly in the Year 3-4 and 5-6 levels) really gave the students the opportunity to 'feel like and communicate as real scientists.' Conceptual understanding was grown through practical experiences.

The school environment provided areas of rich learning for the students as the variety of planting and garden types allowed them to identify and discuss the plants, also taste the plants e.g. the peas and beans, the sunflowers and the swan plants. The swan plants were particularly interesting as they allowed the students to build an understanding of the interrelated nature of the living world; plant and animal life with the Monarch caterpillars living on the swan plants and the students being able to view all aspects of their life cycle. We also used photographs of our planting to bring the outside into the classroom. The students were immersed in science-rich language which they were expected to use in specific instances, both oral and written forms.

This unit was linked with the ongoing development of our Teaching and Learning Model throughout the school. Teachers focused specifically on developing effective questioning within their students. How this was achieved varied depending on the level of the students; some of the methods included modelling effective questions, deliberate acts of teaching around the types of questions, exploring open and closed, relevant and irrelevant questions. A number of information gathering methods were explored in our learning areas.

Extensive use of E-learning occurred in all classes as students researched answers to their 'rich questions' and looked closely at aspects of many types of plants, both familiar and unfamiliar. The iPads were used to capture plant growth over time, different types of plants in the school environment, google slides were taught as a presentation tool in one class and in others iMovie was used to create a video diary presentation.

Many students did experiments and investigated aspects of these with a link into the Home Learning as an extension of their class work.

A number of experiments were conducted at all levels of the curriculum, which meant the students gained an understanding of the key concepts based on their direct observation of germination, growth and change. Staff discussions prior to the start of the unit focused on establishing a clear understanding of the student's prior knowledge as a beginning point and then teaching from that point. In all areas of the school the start point was classification and establishing a clear understanding of the category of 'living vs non-living.' This gave us the opportunity to explore some of the students' 'misconceptions' in their thinking. In one teacher's evaluation of the unit it was commented that many of her students commented with some excitement that 'grass is also a plant !'

The teachers all set up colourful, interactive display areas with different types of plants and experimented with them growing in different conditions. This required planning across the early weeks of the term with the planting occurring early so that students had time to watch the different stages of germination and plant growth. Students planted seeds of their own in cotton wool, individual containers and also in team gardens so they could watch them germinate and grow below and above the ground. Different types of growing conditions were tried.

The students kept diaries of their seed and plant, they enjoyed drawing weekly observational diagrams and measuring their plant's growth. The use of a number of observational drawings over a series of weeks lead to positive developments in the accuracy of the visual detail and also the specific oral language connected with a scientific concept. The students were curious about the results of the experiments, especially with the variable conditions for growth, particularly evident in one of our teams where lots of discussions and questions occurred after one seed sprouted even though it had no light !

These great discussions were evident in our learning areas and at home. Our younger students were eager to show their parents their plant when arriving to school and many parents said they were more interested in plants at home. A technology link was provided in our younger classes with the students researching and creating a 'plant holder out of recycled materials.' It was lovely to see the excited children at the end of Term 1 carefully carrying their own plants that they had grown home in their designed, created and decorated containers !

One of our Year 3-4 teams presented a similar Biotechnology scenario

*'The weather is beginning to cool and I have harvested a lot of vegetables from my garden. I'd like to protect my plants for a little longer so that they will produce fruits and vegetables for a longer time. How can I do that ?'*

In their plants unit the students had researched and discovered that plants grew well in greenhouses as moisture was more likely to be kept in the soil and the environment was warmer. These environmental factors encouraged plant growth. The students were challenged to design a greenhouse system and co-construct a greenhouse prototype as individuals or in groups. This was also linked to their Home Learning. They had to think about 'fit for purpose factors', design, modify and remake their designs based on need factors and outcomes. This was excellent Technology learning in action.

The Biotechnology component of the unit for our Year 5-6 teams was to develop an awareness and appreciation of how dye can be extracted from plants using a variety of techniques, some of which have been used for thousands of years. This unit also had strong understandings from the Material Word strand of the Curriculum with the practical colour change process causing either permanent (chemical change) or temporary (physical) colour change. This was challenging learning for our students with some sophisticated concepts, skills and language involved. Many of the expectations and inquiry skills such as 'fair testing, analyzing, explaining, synthesizing' were taking the students well into Level 4 of the New Zealand curriculum. Some big learning links were being made, which some students struggled with, as the extension of scientific learnings moved through to Biotechnological outcomes. Making the investigation meaningful for the students was created by the use of the dyes they extracted to make a piece of artwork.

Our E.S.O.L. students benefited from some prior knowledge and specific vocabulary teaching by our E.S.O.L. teacher before the unit began. This helped to prepare them and support them with the learning. They needed constant support and scaffolding particularly through the more challenging and sophisticated concepts.

The link to our school planting gave the unit an authentic context to present as a scenario to the children for rich integrated learning across the Curriculum.

Our school Eco group of teachers, 30 students (at least 2 per learning area) led by Mrs Goile participated in the planting process in the school grounds which will strengthen their sense of understanding and concern for the ecological environment at Te Totara School. A further 50 students (2 per learning area) are now involved in recycling and other initiatives. 50 Enviro students are attending the Waikato community Arbor Day planting on Friday 29 May 2015.

Curriculum integration occurred with the essential learning areas of:

**Science** - as detailed on Pages 1-3 of this report.

**Technology** - linked with a Bio Technology and an artificial environment scenario for the Year 3/4 teams – Greenhouses, Biotechnology and plant dye extraction process in our Year 5/6 teams.

- Materials Technology in our Year 2 classes with the construction of a Plant holder.

**English** - Procedural and Report writing, Poetic explanation, Poetry, Drama - role play to develop some concepts.

**Mathematics** - Measurement of growth and time, simple mapping of position and orientation, Statistics.

**The Arts** - Observational Drawing of plants, seeds and Sketching day by day growth and change.

- The use of Plant dyes to create an Artwork in Years 5-6

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

- \* Tap into resources and personnel that can enrich the programme and assist in developing confidence and skills in staff.  
Continue to strengthen the link with our own Te Totara garden with high levels of student participation in our Enviro groups. Undertake projects which continue to develop different types of plants, gardens and ecological environments have very positive learning implications for all our students. An example of this is the initiative to plant daffodil bulbs around the water tank where the sunflowers and swan plants were. This fosters a different understanding to the plant life cycle of bulbs and dormancy rather than that of seeds. Another possible idea is to harvest and use our own garden plants with Food Technology units e.g. soup or salad. This allows for on-going learning about the 'big concepts' of sustainability of our environment and how we can meet the basic needs of life which is life- long learning for the students.  
With Food Technology and Healthy Eating to be a focus point for Term 2 we will be creating strong Curriculum links with this first term unit. In Term 3 we will also create further links with our major topic for the term being based on Ecological Sustainability of our Plant ; Global Warming – Endangered Plants and Animals – Going Green – Reduce, Reuse and Recycle as all themes that the teaching teams will choose to explore.
- \* Continue specific professional development in inquiry learning with our Te Totara Learning Model. Scientific and subject specific knowledge is to be fostered for teachers. Curriculum knowledge of concepts and units is shared to ensure that we have a common understanding of the levels of the curriculum and the inquiry process. This helps us to identify where our expectations for student learning are and where the students are currently achieving at.  
The rich discussions we have with our staff at all levels help to ensure that no assumptions are made about student prior knowledge, we establish shared understandings first, then build on from there in a clear and deliberate fashion in order to foster learning that is rich. This continues to be a priority area with a staff meeting each term devoted to sharing curriculum concepts, levels across the school and the 'big ideas' to ensure all staff are fluent in their understanding of the learning outcomes required at each school level. Continue to focus on Jay McTigue's research on 'Backwards by Design' which encourages us to be very clear on the enduring understandings that the students need to get from a unit of work and used deliberate planned interactive steps to get them to those understandings. The Curriculum teaching resources often have a two level band in them e.g. Is this a Plant is a Level 1-2 teaching resource, Making New Plants is a Level 3-4 teaching resource. We also need to exercise a deliberate decision around the content to gain Curriculum depth, not be cluttered by attempting to do too much and risk shallow learning. We also need to be very clear over where the content is pitched in terms of curriculum levels and assess student learning according to this pitch.
- \* 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 student's learning is consolidation, at the appropriate level, to

ensure success for all. This is a general goal however in some circumstances curriculum decisions are made in relation to a number of other factors.

Whilst many Level 4 concepts were developed and successfully achieved, in this unit of work only one student was assessed by the teachers as achieving at Level 4. This was due to a number of factors including professional decisions about the need to ensure depth of certain content learning and progressions at particular curriculum levels, the emphasis on developing the Inquiry questioning skills (the 'How We Learn') and also to the inevitable time pressures in relation to a short first term (just under 9 weeks) of the school year.

Curriculum timing is an important ongoing focus for our staff. Many staff in the Year 3-6 area of the school commented in their unit evaluations that they felt they needed more time. Teachers need to look at 'creative timetabling' by using blocks of time like half days or full days for some of the outcomes, also 'a little bit every day' for other concepts such as the facilitation of tracking of change and growth. Teachers also benefit from using a week by week tracker to plan their unit so that they keep moving through the teaching concepts in a timely manner.

- \* Targeted purchases of equipment and resources needs to continue to be made in relation to enhancing specific teaching intentions.
- \* Teaching focus is to be "hands on" and as relevant 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 success. Teachers are making links to the 'broader nature' of Science understandings and suggesting contexts such as life cycles to make comparisons with plants, insects and other animals. Our swan plants were very helpful in encouraging the Monarch butterfly caterpillars through their life cycle, learning which was very visible and accessible to the students
- \* Simple Science investigations, which include home activities and informing the parents of the specific science focus, through team newsletters and displays in the shared areas, occurred throughout the unit and beyond into our learning plans for each student. This is a powerful model of interactive learning between home and school which leads to rich learning.
- \* Te Totara Learning Model skills to be further developed throughout 2015;
  - Co-constructing with the students the 'Big Question' that is going to lead the inquiry to the enduring understandings. (Teachers need to have a clear sense of the end outcomes of the inquiry and be able to articulate this.)
  - Information gathering skills such as finding information and putting it into the students own words, sourcing and filtering of reputable, credible or relevant information.
  - Exploring ways of publishing their inquiry process and outcomes
  - The use of E Learning in the above process, building the teacher's confidence and competency in this area linked to the goal that each of them have in their 2015-2016 Professional Learning Goals.
- \* Continue to support E.S.O.L. students through support programming with our E.S.O.L. teacher. Use a variety of assessment procedures and "hands on" learning to enhance/gauge their understandings of scientific processes. Prior vocabulary learning helped to increase the understanding of our E.S.O.L. students.

**This document on student achievement in Science - Term 1 2015 was reported to the Board of Trustees Meeting on 28 May 2015.**

**The valuable input of all staff is acknowledged in the preparation of this report.**

**Anne Fraser  
(Deputy Principal)**