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# National Newsletter: All Sciences including Agricultural and Horticultural Science

Information and resources for middle leaders in secondary schools | Term 1 2014

Tena koe, Greetings to you all, Kia orana, Fakaalofa lahi atu, Malo e lelei, Talofa lava, Talofa ni

A new teaching year that we can begin with optimism as we prepare for new beginnings: new students to get to know; new programmes to design for the new group of learners in 2014 classes; new opportunities for level 1 to 3 students, to ensure all students experience the teaching and learning needed to achieve their best in internal assessments; new assessments to design to suit the needs of this year's learners! But most of all ensuring new programmes are being designed that are appropriate for all classes from year 7-13 for the 2014 year. Consider modifying existing programmes using new contexts to reflect the interests of these 2014 students. This alters the key content little, but does better engage students and enhance their learning.

## A 2013 success story

In 2013 the Ministry supported the National Science Co-ordinators and the Secondary Student Achievement science facilitators to trial a PLD programme for teachers of Year 11 students being assessed using science unit standards. This professional development involved three workshops with in-school support for participants. During terms 2, 3 and 4 a total of 68 teachers from 41 schools met together in 8 clusters to explore ways to enable students currently being assessed with unit standards to achieve in science achievement standard assessments tasks. The workshop content included:

- Ways to use different contexts to adapt teaching and learning programme design to better engage these learners.
- Teaching approaches that work better with these learners, many of whom were disengaged.
- Strategies to build both literacy and scientific literacy capability.
- Designing assessment tasks that better suit the interests of the learners in the class.

Participating schools worked together to develop units and tasks, sharing these, and their reflections on what worked best with their students. Schools committed to trial one Achievement Standard with their students over the time of the PLD. The table below summarises the PLD outcomes.

Region	No. of students	M	P	SLN	Time 1 data (US/AS)		Time 2 data (All AS)			
					N	A	N	A	M	E
Southern	85	24	10	10	28	57	15	56	10	4
Central South	257	80	15	2	85	172	84	146	22	5
Central North	116	57	7	25	78	38	56	44	10	6
North	224	67	56	56	109	115	63	125	31	5
<b>Total</b>	<b>682</b>	<b>228</b>	<b>88</b>	<b>93</b>	<b>300</b>	<b>382</b>	<b>218</b>	<b>371</b>	<b>73</b>	<b>20</b>

Although some schools used achievement standard data for time 1, no student achieved a grade above A, while in time 2 data, 11% achieved merit and 3% excellence. In addition the 'not achieved' lowered to 31% in time 2 from 44% in time 1. This shift could be attributed directly to the intervention when the teachers' reflections on teaching practice changes were considered.

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## What's new in science in 2014?

In December 2013, the Ministry indicated in the Gazette that new resources were available on the tki website under Science Online. These resources are a "must explore" for all science departments. They include the newly developed Science Capability Framework and support resources, the Science Community Engagement summaries and the E-in Science discussion paper.

Access this website at <http://scienceonline.tki.org.nz/>

To assist schools in developing ways to use the concepts of these resources in their programmes to continuously improve science teaching and learning a number of PLD approaches will be used by the Science Facilitators. This support will focus on the science learning area through the Nature of Science strand at the national workshops in term 1. In-depth PLD support in Ministry-allocated schools will enable leaders to explore and trial learning approaches that incorporate the resources. Regional clusters will provide the same opportunities to explore the resources with facilitator support. In some regions with no specific science clusters, workshops will be offered to schools to help them explore the resources and ways to use them in their programmes, particularly in years 7 - 10.

If your regional cluster is interested in facilitator support to explore these resources contact your local Science Facilitator. (Contact details are on the front of this newsletter.)

Exploring ways to support students to effectively use and develop knowledge, skills and understandings using a range of digital technologies, including digital citizenship and self-regulated learning has become a prime focus for teachers.

Consideration of the **Digital Technologies and future-oriented science education discussion document** will be a useful tool to stimulate reflection in your science department on ways to better use the resources available to both teachers and students. This is particularly relevant with many schools moving to a 'bring your own device' mode and teachers are seeking new ways to incorporate the use of these into teaching and learning. Access this document at: <http://scienceonline.tki.org.nz/New-resources-to-support-science-education>

## Quality teaching supports priority learners

A good focus for term 1 is to identify the priority learners in your science classes – those who are Māori, Pasifika, those with special learning needs or who are below the expected curriculum level, therefore requiring additional support to enhance their learning experience in science. Then you need to do a few activities that will help identify areas they are struggling with. Having done this, the next step is to put in place the targeted support they need. Is it support in how to read a text? Is it in scientific literacy of reading tables, summarising data or is it in building their capability to write scientific explanations for their observations? Or is it in reading the question to decide what knowledge is needed in their response; or is it in building capability to write responses to questions?

Another way to support our priority learners is to identify students who are at risk of not achieving in science this year. Now is the time to start to put additional support in place to enable these students to experience some success.

The exemplars of student responses available on NZQA's website are a useful tool for supporting students. Use these to explore with students how the responses provided address the question, identifying the use of science terms as well as the gaps in the responses. Students can then plan answers to a similar question, and then spend time developing a linked response.

## Science Online

Latest Science resources on Science Online on tki.org.nz:  
<http://scienceonline.tki.org.nz/New-resources-to-support-science-education>

## Teaching and Learning Guides

### The Science Teaching and Learning Guide Part 2

This guide is now live on:  
<http://seniorsecondary.tki.org.nz/Science>

The new sections cover learning programme design, connections and pedagogy.

### The Agricultural and Horticultural Science Teaching and Learning Guide

The link for this guide:  
<http://seniorsecondary.tki.org.nz/Science/Ag-and-hort-science>

## Literacy and Numeracy

### Literacy and Numeracy page on NZQA site

There is a new Literacy and Numeracy landing page live on NZQA. It was developed in order to have all of the information from NZQA and TKI sites accessible in one place - worth bookmarking for easy access.  
<http://www.nzqa.govt.nz/qualifications-standards/qualifications/ncea/subjects/literacy-and-numeracy/>

## Science exemplars

Exemplars can be constructed using the annotated exemplars downloadable from NZQA:  
<http://www.nzqa.govt.nz/qualifications-standards/qualifications/ncea/subjects/science/annotated-exemplars/>

## More on formative assessment: Using contexts to promote student learning success

Research into what aids student learning and achievement in science has shown that an important way for teachers to help students understand what needs to be learned is through the use of new ideas within familiar and new contexts (Bell, 2005, pp. 23, 24). This is important as students bring many misconceptions to their science learning, and only through changing these concepts will learning occur. Bell further indicates that learning is supported when students have ownership of their learning; they want to find out more their world and the science in their lives.

For students to learn new things they must make links between their existing ideas or understanding and the new ideas they are being introduced to. Rote learning does not accomplish this. In addition they need to be testing out and reshaping these concepts through a process of judging and deciding the value of the ideas and opinions. When this is occurring for students, when time and opportunity is provided, students become motivated to share and discuss their ideas with others. As a result, students become more confident in themselves and willing to share and justify their ideas with their peers.

The process of conceptual change can be stressful as no-one likes to feel inadequate, unsure or frustrated because the concept being introduced is unfamiliar. The more students come to realize that learning does involve risk taking, the better teachers can aid that learning process through the use of visible models and exemplars that help clarify the concepts being covered.

Using a familiar context to locate the concepts to be learned, sharing clear learning outcomes with students, as well as outlining clear criteria for success, will support student learning in science.

Student work samples can be used as exemplars to provide support for learning, and can help students visualize or picture success for themselves when they know what the learning outcome might look like. Further ways to use exemplars were described in the 2013 term 4 newsletter. Use of contexts linked to students' lives while providing sufficient time to process new concepts together with models and exemplars is a formative assessment strategy that helps teachers support and improve student learning in science.

### Reference

*Learning in science: the Waikato research*. Bell, B. (2005). London: RoutledgeFalmer.

## Science in the New Zealand Curriculum (NZC)

As the 2014 school year begins it is a good time to remember that the NZC is the key document for all English-medium schools. The vision, principles, values and key competencies, along with the learning areas, are what informs and guides the school curriculum. For the science learning area, it is important to reiterate that the statements on page 28 are mandated, rather than the achievement objectives. Page 29 of the NZC clearly states that Nature of Science is "required learning" up to and including year 10. Further, the valid way to address the four contextual strands is through the Nature of Science, rather than as stand-alone content-focused learning.

The summary on page 44 indicates the curriculum for all students must be underpinned by the principles, while supporting students to develop the values and key competencies outlined in NZC. Thus, when reviewing science teaching and learning programmes this year it will be important to reflect on the extent to which this is underpinned by the principles and how the learning experiences provided enable students to develop both the values and key competencies in meaningful ways.

## Free national workshops for science middle leaders and teachers in charge

### Progressing junior science

#### Exploring Nature of Science; Science Capabilities; Literacy in Science; Scientific Literacy

This workshop focuses on developing junior science programmes that engage students leading to improved success for all.

You will be introduced to the new resources available on Science Online and ways to use these effectively. These workshops are designed to support teachers of years 9-10 (and years 7-8 in secondary schools that have those year levels.)

#### Proposed Dates

Dunedin	17 March
Christchurch	19 March
Wellington	26 March
Palmerston North	27 March
Whangarei	TBC
Auckland	TBC
Hamilton	TBC
Tauranga	TBC

#### How to register

Registration details will be sent to all schools soon, so please watch for email information. Alternatively, to indicate an interest in these workshops contact your Region's National Coordinator:

#### Northern and Central North regions

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## Leadership in science classrooms

A key reminder here is that the quality of the relationship between the teacher and the student is key to the success of the teaching. All teachers are leaders of learning in their own classroom, so establishing a learning-focused relationship at the start of a year is vital. To do this it is important for every leader and teacher to identify, facilitate, monitor and evaluate the key actions and strategies that result in enhanced outcomes for students.

To be sustainable it is likely these will include both pedagogical and systems changes that are shared across the department and school. Much research exists on ways to nurture and build learning-focused relationships and exploring this as a science department to develop strategies that work for you will provide a professional learning focus for 2014.

A useful resource to base reading and reflection around is Michael Absolum's book *Clarity in the classroom: Using formative assessment*. Absolum, M. (2006). Hodder Education, Hachette Livre NZ Ltd.

## NZQA workshops

There are two different NZQA workshops being offered in 2014, the **Best Practice** workshops and the **Connecting with Contexts** workshop. The latter generic workshop is aimed at providing teachers with the skills to modify existing assessment resources to better meet the needs of students. The subject-specific Best Practice Workshops, Making Judgments, continue to be offered and are aimed at increasing teachers' confidence to make assessment judgments in their subject area. Just a reminder from NZQA that these workshops are dependent on sufficient registrations being received early, so register now for these, even if they are not on in your area until later in the year.

For more information refer to the NZQA Best Practice Workshops page. <http://www.nzqa.govt.nz/about-us/events/best-practice-workshops/>

## Subject area alerts

As 2014 begins the initial focus for all teachers of senior classes should be on analyzing achievement data to identify strengths and weaknesses, and identify areas where more teaching and learning support could be provided. In addition, check out the Assessment Specifications and the clarifications provided by moderators in the links on the sidebar.

## Agriculture and horticulture alert

When planning for 2014, remember to explore the achievement standard options available and also consider the ideas for programme design presented in the Primary Industry Guidance document.

In looking at the contextualized learning programme, it is possible to identify a range of assessment pathways within the contexts and the possibility of tailoring these to suit a range of learners using both achievement standards and industry standards. These ideas can be downloaded at:

<http://youthguarantee.net.nz/assets/Uploads/Regional-Workshops-programme-docs/MOE-VP-Guidance-Ag-Farming-d5b-12Aug-FINAL.pdf>

Teachers of level 3 – note the topic for AS 91532 has the specified environmental issue for 2014 as the management of nutrients in intensive agriculture or horticulture, with students being expected to have an understanding of the role of technology within courses of action.

## Links to moderator newsletters

Keep up with the latest information on assessment tasks and achievement standards.

### Agriculture/Horticulture

<http://www.nzqa.govt.nz/qualifications-standards/qualifications/ncea/subjects/ag-and-hort-science/moderator-s-newsletter/june-2013/>

### Biology

<http://www.nzqa.govt.nz/qualifications-standards/qualifications/ncea/subjects/biology/moderator-s-newsletter/july-2013/>

### Chemistry

<http://www.nzqa.govt.nz/qualifications-standards/qualifications/ncea/subjects/chemistry/moderator-s-newsletter/may-2013/#L3>

### Earth and Space Science

<http://www.nzqa.govt.nz/qualifications-standards/qualifications/ncea/subjects/earth-and-space-science/moderator-s-newsletters/june-2013/>

### Physics

<http://www.nzqa.govt.nz/qualifications-standards/qualifications/ncea/subjects/physics/moderator-s-newsletter/may-2013/>

### Science

<http://www.nzqa.govt.nz/qualifications-standards/qualifications/ncea/subjects/science/moderators-newsletter/february-2013/>

### Clarifications

Also refer to the clarifications for science:

<http://www.nzqa.govt.nz/qualifications-standards/qualifications/ncea/subjects/science/science-clarifications/>



## Biology alert

In considering possible approaches to learning for 2014, it's useful to refer to the resources on pathways to health sciences included in the Vocational Pathways guidance materials for course design. These can be found at:

<http://youthguarantee.net.nz/assets/Uploads/Regional-Workshops-programme-docs/MOE-VP-guidance-Hauora-d13b-12Aug13-FINAL.pdf>

Consider some of your local contexts to better engage your learners with local biology issues – could these could be marine, land based industry, medicine based, forest based, tourism based such as whales, endangered local wildlife, pest or disease control in humans or animals?

## Chemistry/Physics alert

Check out the assessment specifications and clarifications to update your planning for this year. Remember that students perform better where an assessment focus relates to their interests, so consider using assessments you have adapted for your learners. Attending the NZQA workshops on Connecting with Contexts may help you with this.

## Earth and Space Science alert

Separate Earth and Space Science Best Practice Workshops are being offered for level 2 and 3 this year. Register early to make sure there are enough participants for them to run.

What local resources could you focus on to provide a real life context for this and similar learning? Limeworks, oil refinery, Maui gas, coal mining, fossil finds?

## Science and Literacy heads up

Many schools have recognized the need for students to develop their writing capability to achieve in science assessments. Through the use of a range of reading and writing strategies, students can become confident in their ability to write reports and responses necessary at level 1 NCEA. Accepting that writing for science requires different learning has resulted in many schools realizing the development of reading and writing skills and strategies needs to be included in year 9 and 10 programmes. Science teachers have always been good at using a range of vocabulary activities, but developing the reading and writing strategies with students requires a different set of teaching approaches. As a consequence the free National Science Workshops will provide ideas on ways to build both literacy in science and scientific literacy. See sidebar on page 2 of this newsletter.

## More resources to support students' literacy needs in science

Ideas for literacy approaches to use in science can be found on Literacy Online on TKI:

<http://literacyonline.tki.org.nz/Literacy-Online/Secondary-Literacy/Teacher-needs/Literacy-in-the-learning-areas2/Literacy-in-Science/Teaching-Inquiry-Planning-to-meet-student-needs>

## Sample unit

A sample unit plan for Material World can be found at:

<http://esolonline.tki.org.nz/ESOL-Online/Teacher-needs/Teaching-and-learning-sequences/Units/Secondary-mainstream>

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## Secondary Student Achievement professional development

### One school's story: A focus on subject specific literacy lifts achievement in science

Following an analysis of student achievement data as part of in-depth professional development in a school, the science facilitator worked with science middle leaders to address the literacy needs of students in year 10, to better prepare students for the demands of science at NCEA, with a particular focus on report writing in science.

Initial scoping found that there were two major issues:

- Some science teachers of year 10 believed that students should have already acquired all their literacy skills and that the teachers' focus should be on science content.
- It was rare for scaffolding and other support to be put in place to develop cognitive and metacognitive strategies in science.

The professional development focused on supporting more explicit teaching and learning of literacy strategies in science with differentiated instruction. A survey showed students became more positive in their attitude towards report writing in science. Seventeen priority year 10 students were identified as needing extra support and their progress was tracked:

- Each one of these students improved from their year 9 investigation grade.
- Most students moved up at least 4 aSTTle sub levels.
- 11/17 completed written science reports at NZC level 5 or above.
- 6/17 completed reports that would have achieved NCEA Level 1 standard 90930.