Kia ora, Talofa lava, Mālō e lelei, Kia orana, Talofa ni, Fakaalofa atu, Nisa bula, Kia orana, greetings.

The Science team welcomes you to our fourth newsletter for 2016. We trust that you have had a refreshing break and feel ready for the onslaught of term four.

In this issue:
- To investigate or not?
- LearnNZ term 4 field trips
- Māori and Samoan bread as a context for studying microbes
- Unpacking standards
- Term 4 dates
- Young reporters for the environment competition
- Reading in Science part 3 – extracting information
- Science Learning Hub
- Modelling resilience with Māori and Pasifika students
- Collaborative inquiry in Science
- Building on foundations laid

**IMPORTANT MESSAGE - End of SSA Centrally Funded PLD**

We have been advised by the Ministry of Education that the Secondary Student Achievement (SSA) PLD contract will end in December this year, after 5 years. The Ministry is introducing a new system for centrally funded PLD that focuses on a small number of national priority areas and provides the opportunity for schools to request their PLD and facilitators through an area allocation panel.

If you want subject-specific PLD in 2017 you will need to request it through the Ministry. We advise you to talk with your principal about this so they can contact your regional Ministry of Education office and complete the appropriate forms to request subject-specific PLD. Whilst we can offer no assurances about the outcomes of such requests, we want to make sure you are aware of the process.

More information about the future of PLD can be found at this Ministry website: [http://services.education.govt.nz/pld](http://services.education.govt.nz/pld)

This will be the last SSA national newsletter. We hope these newsletters have been valuable for you and the teachers in your department. These newsletters have been a component of the SSA PLD alongside national workshops in every learning area and literacy; inquiry clusters; regional clusters; and in-depth PLD with a number of schools.

We have been privileged to lead the SSA PLD contract for the last 5 years.

Heoi anō
National Directors – SSA PLD
Karl Mutch, University of Auckland
Lesley Brown, University of Canterbury, Mau ki te Ako

**Contact details**

**National Co-ordinators**

**Kate Rice**
Education Support Services
University of Otago
Mau ki te Ako
Regional Facilitator Central South and Southern regions
M: 021 793 771
[ke.rice@otago.ac.nz](mailto:ke.rice@otago.ac.nz)

**Mikhal Stone**
Team Solutions
University of Auckland
Regional Facilitator Northern and Central North regions
M: 027 589 9402
[ms.stone@auckland.ac.nz](mailto:ms.stone@auckland.ac.nz)

**Regional Facilitators**

**Northern region**
Ian McHale and Faye Booker
Team Solutions
University of Auckland
[i.mchale@auckland.ac.nz](mailto:i.mchale@auckland.ac.nz)
[f.booker@auckland.ac.nz](mailto:f.booker@auckland.ac.nz)

**Central North region**
Paul Lowe
Team Solutions
University of Auckland
[p.lowe@auckland.ac.nz](mailto:p.lowe@auckland.ac.nz)

**Central South region**
Stephen Williams
Education Support Services
University of Otago
Mau ki te Ako
[stephen.williams@otago.ac.nz](mailto:stephen.williams@otago.ac.nz)

**Central South/Southern region**
Judith Bennetts
UC Education Plus
University of Canterbury
Mau ki te Ako
[judith.bennetts@canterbury.ac.nz](mailto:judith.bennetts@canterbury.ac.nz)

**Southern region**
Sabina Cleary
UC Education Plus
University of Canterbury
Mau ki te Ako
[sabina.cleary@canterbury.ac.nz](mailto:sabina.cleary@canterbury.ac.nz)
To investigate or not?

What is investigation?
Different methods of investigation are used depending on the circumstances and the question being investigated. The NZC lists investigation methods as including identifying and classifying, modelling, pattern seeking, and researching, as well as fair testing.1

Research has shown that much of Science teaching emphasises fair testing. Although fair testing principles are important, they do not always help students understand science ideas or concepts, neither do they help students find answers to their questions, and nor is it the way scientists work. Fair testing does not fully satisfy the range of ideas embedded in the Nature of Science.

What does ‘investigate’ mean in NCEA assessments?
In the Science achievement standards, the aim is for students to locate and select primary and/or secondary information to use in their report on “implications” by using an investigation or research approach. The clarifications from NZQA Moderators in 2013 stated, “The aim of investigation here is to sift and sieve information” and, “The definition of investigate is any method used to gather scientific data.”

For example, in working towards assessing AS90942 – Investigate the implications of waves in everyday situations, “Investigate could involve using the modelling of waves in a sloping wave tank to explain why tsunami act the way they do. Students can collect evidence to include on amplitude, waves etc. which would be presented in annotated diagrams, tables etc. Scientific formats include annotated diagrams, graphs and tables that are used to clarify the implications of the scientific information for an everyday situation.2

…When using secondary data students must put it into their own words to address the question used to explain the implication.”

The above extract is from Clarifications documents, 2013 (no longer accessible on the NZQA website).

NB: When assessing understanding with Science achievement standards, students can collect primary data but do not need to plan and carry out their own individual investigation. That is only required in Biology, Chemistry and Physics investigations – AS 90935, 90930, 90925. For Science investigations, the method can be provided and the students may collect the data in groups, but the data gathered in this way will still need to be processed and used in addressing the requirements of the individual standard. A full write-up of the investigation may not be needed. This means data from the investigation, including observations and results, is used to discuss the implications or issue required by the standard. For example, students may investigate the implications of heat relating to conduction, convection and radiation within an everyday context such as the best jacket for protecting you from cold weather. Students will need to use collated data from their investigations to discuss the Science ideas behind each type of heat transfer as they relate to jackets.

Processing data or information involves organising the data collected to make an inference or to make scientific sense. It could involve listing, sorting, tabulating, collating, highlighting, reformatting, summarising, graphing, calculating etc. Processing data or information could involve calculations, such as finding the average of data from 3 temperature loss trials or graphing the data, or identifying and describing a pattern or trend.

Often in Science, the terms ‘data’ and ‘information’ are used to mean the same. Information is a collection of facts or data. Taken literally, data is factual information used for analysis or reasoning. Data on its own has no meaning, but becomes information when it is interpreted in a specific context. It might be timely to revisit the following alert from NZQA:

Some teachers may be considering new approaches to assessment that include combining assessment of skills and knowledge that are common to more than one subject. This may facilitate cross-curriculum courses and/or reduce student assessment loads.

An example for Science might include combining assessment of Science 90955 (Investigate an astronomical or earth science event) with English

LearNZ field trips, term 4

LearNZ offers virtual field trips for NZ schools. Their resources include video clips, background information, experts answering questions, images with focus questions, reinforcing activities. As a sideline the trips always give an insight into one or more science careers too.

In term 4 there will be two big virtual field trips.

What`s the plan, Stan?
Getting ready for an emergency
11-13 October.

During this virtual field trip students find out about New Zealand’s history of emergencies caused by natural hazards and explore the latest and best practice recommended for them and their school during an emergency. This field trip coincides with the release of the updated What’s the Plan, Stan? education resources.

Antarctica - cool science in action
14-18 November.

During this trip students will land on sea ice at -120°C. After a survival course they travel to remote, historic huts to find out about the science that was and is done there by Antarctic scientists, historians and preservation experts. Find out more at:

http://www2.learnz.org.nz/core-fieldtrips.php

The Secondary Student Achievement Professional Learning and Development initiative is funded by the Ministry of Education.

An electronic copy of this newsletter can be downloaded from the TKI website:

Māori and Samoan bread as a context for microbes

A teacher had been using making yoghurt as the focus for her microbes unit but wanted something more relevant and engaging for her students. With some support from her SSA Facilitator she decided to change to a context of bread. She explored different kinds of bread – sourdough, Māori bread (rewena) and Samoan bread (fa'apapa). These breads use bacteria from the air or yeast as sources of CO₂; Rewena uses potato flour and fa’apapa uses coconut (or pumpkin, taro or banana) as the microbes’ food source.

The teacher discovered the unit did engage her Māori and Pasifika students. One Samoan boy sat down and showed her websites about different types of Samoan bread - ako in action. This student also arranged for his mother to bring some fa’apapa into school (their family called it pan pan).

When discussed at her cluster, the teacher found that unleavened communion bread would also provide a good connection for Catholic schools wishing to link units to their faith. Using bread as a context for the microbes unit gave lots of scope for relevant and engaging learning.

Unpacking standards

In several schools it has been very useful to revisit standards and check that our teaching and learning and assessment have not drifted away from the original intent of the standard. Key points have included:

- Start by looking at updated standards, clarifications and conditions of assessment. In many cases departments have found it useful to collect all of this information on one sheet.¹
- Then, before teaching a unit unpack the achievement standard to determine the skills and knowledge required. This is a very useful process to help a department develop a clear, shared understanding of the teaching and learning, and assessment.²
- The teaching and learning resources may then need to be adapted and the assessment task decided upon. The choice of task may affect the teaching and learning that needs to take place. For example if assessing with Physics 1.1 the main intent is to carry out an investigation that leads to a straight-line relationship and the Physics context could be electricity (Ohm’s Law) or forces (Hooke’s Law).
- For internally assessed standards there is generally no sufficiency statement - once a student has demonstrated understanding they probably shouldn’t need to repeat it to meet the criteria for a grade.
- This unpacking process often identifies that teachers are focusing on content rather than the literacy skills required to achieve in a standard. For example a student who can write equations for the reactions of metals but cannot explain the implications of their properties for their uses could not achieve in AS90946, Investigate the implications of the properties of metals for their use in society. Students need to be explicitly taught the skills required to pass the standard.

References

1. For more information about these methods of investigation explore http://scienceonline.tki.org.nz/Teaching-science/Teaching-Strategies/Types-of-investigation
2. Note if students focus on the Canterbury earthquakes to meet the requirements of 90955 (Geological Event) they generally also meet the criteria for 90942 (Waves)

Term 4 dates

- 8-16 October: Earth Sciences Week, US
- 10-14 October: Get Ready Week
- 11 October: Ada Lovelace Day, women in STEM
- 13 October: World Sight Day
- 16-22 October: Niue Language Week
- 14-15 October: Breast Cancer Awareness (Pink Ribbon)
- 16 October: World Food Day
- 23 October: Mole Day
- 24 October: World Polio Day
- 23-29 October: Tokelau Language Week
- 30 October: NZ Teachers Day
- 9 November - 2 December: NZQA exams
- 14 November: World Diabetes Day
- 14-21 November: Antibiotic Resistance Awareness Week
- 15 November: Leonid meteor shower peak visible from NZ
- 1 December: World AIDS Day (Red Ribbon)
- 5 December: World Soil Day
- 11 December: International Mountains Day
- 12 December: Geminid meteor shower peak visible from NZ
- 21 December: Summer Solstice NZ

The Secondary Student Achievement Professional Learning and Development initiative is funded by the Ministry of Education.

An electronic copy of this newsletter can be downloaded from the TKI website: http://nzcurriculum.tki.org.nz/Secondary-middle-leaders/Professional-learning-and-development/E-newsletters
This year’s conditions of assessment also included the following information for all standards:

Internal assessment provides considerable flexibility in the collection of evidence. Evidence can be collected in different ways to suit a range of teaching and learning styles and a range of contexts of teaching and learning. Care needs to be taken to allow students opportunities to present their best evidence against the standard(s) that are free from unnecessary constraints. It is recommended that the design of assessment reflects and reinforces the ways students have been learning. Collection of evidence for the internally assessed standards could include, but is not restricted to, an extended task, an investigation, digital evidence (such as recorded interviews, blogs, photographs or film) or a portfolio of evidence.

It is also recommended that the collection of evidence for internally assessed standards should not use the same method that is used for any external standards in a programme/course, particularly if that method is using a time bound written examination. This could unfairly disadvantage students who do not perform well under these conditions.

References
1. Examples of a standard, with its clarifications and conditions of assessment all on 1 sheet can be found at: https://drive.google.com/drive/folders/0B1eJy6TjOkrLbGnTUD
2. A possible sheet to help unpack a standard can be found at: https://drive.google.com/open?id=0B1eJy6TjOkrLbGnTUD

Reading in Science part 3 – extracting information
In term 2 we explored engaging struggling readers with reading. Last term we looked at preparing students for reading. This term we investigate reading for understanding – what we do during reading to extract meaning.

Students can understand texts at a literal level; or they can delve more deeply to interpret an author’s implied meanings; or they can go deeper still, evaluating the content, responding to the author’s ideas and integrating them into their own existing knowledge (ELS p. 73). To become critical readers at this deeper level students need repeated exposure to text that takes more than a minute to read (Wray & Lewis, 1995) – extended text.

“Reading and writing are reciprocal processes,” (ELS, p. 73) and so helping students understand reading (both its content and its structure) is fundamental to helping them to learn to write.

We saw in term 2 that good readers predict, ask questions, clarify and summarise. These are skills we need to help students develop as they are key to comprehending what they read.

If we want students to engage with texts at a deeper level then the extended readings teachers select or design need to encourage students to “use information; monitor and reflect on their understanding and think critically as they read.” (ELS p 77).

Many students struggle to make their own notes from what they read. We need to help them develop this skill (Neate, 1992; Wray 1985). Some strategies that may help:
- Start to teach summarising by asking questions as you go through a reading with students. What are the main ideas? What crucial information is needed to support these ideas? What information is irrelevant or unnecessary?
- Find key words or the topic sentence in each paragraph.
- Once they have identified key words and/or main ideas, use graphic organisers to summarise it e.g. concept star, table, flowchart, Venn diagram, mind map, diagrams (drawn and annotated).
- Give students a limit to start with, e.g. ask them to explain the text verbally in less than 1 minute or in writing in fewer than 20 words.
• Jot ’n dot strategy - students write key ideas in 1 or 2 bullet points per paragraph.
• Information transfer – students put information into a different form e.g. convert graph to text, text to grid or diagram etc. Ensure students transform the information and not just copy chunks of it.
• Freeze frame or skit – students demonstrate in still poses or action the process they are learning about.
• Reach a consensus – after 3 mins thinking and writing down the key terms and ideas, groups of 3 students first share their ideas in turn, then express their preference from all the shared ideas, then discuss for a set time to reach a consensus on the key ideas.
• Give students a section of text on photocopied paper then ask them to:
  o Underline or highlight key words and main ideas.
  o Write a title for each paragraph or section of text.
  o Annotate with questions and links (see our term 2 newsletter).

Make sure you model these strategies for students first so they are clear on what they’re to do. I used to find students gained confidence if first we summarised as a class, and then, when they seemed to have mastered the skill, summarised in pairs, before I asked them to attempt this individually.

Being too brief risks not recording crucial material while being too full risks taking too long and having too many notes to sort easily. We need to teach students to manage these risks by being selective about:

• Which parts to read – look for what is most recent, relevant sections in the index or table of contents and also in the introduction and summary of potentially promising text.
• Which information to record – ask whether they really need the information, whether they already have it, and what questions they want to answer with the information.

This means it is important to make sure students have a clear purpose so they know what they are looking for. “Make notes about photosynthesis” is not as helpful as, “Describe where each reactant comes from and the fate of each product of photosynthesis then try to write a word equation.”

Notes and bibliography
Reading and writing strategies from ESOL Online, 2009
Reading Rockets research-based reading strategies, 2015
http://www.readingrockets.org/strategies/summarizing
Note-making study guide, Student Learning & Development, University of Leicester, 2010 http://www2.le.ac.uk/offices/ld/resources/study/notes

Modelling resilience with Māori and Pasifika students
Several schools have had success working with year 12/13 Māori and Pasifika students to role model the resilience and effort needed for NCEA assessment. The senior students are given a set of questions to consider, e.g.

How did you feel when you got your NCEA Science internal assessment results? Were they what you expected?

How would you feel and what would you do if you got Not Achieved in a practice assessment?

Science PLD in 2016
We have interacted with many teachers over the past five years, facilitating PLD in several different ways:

• National workshops in each region annually.
• Regular in-school PLD with individual schools, helping to raise student achievement (our in-depth work).
• Workshops and school visits for teachers wanting to help their priority students to achieve with achievement standards at levels 1 to 3.
• Workshops, unworkshops, and individual school visits with those wanting to imbed Nature of Science and Science Capabilities into their teaching programmes.
• Mike’s News sent to many teachers weekly.
• These SSA Sciences national newsletters sent to all schools each term.

These opportunities have been offered free to schools under the SSA contract. However, there will be a new system for allocating Ministry-funded PLD for 2017 and beyond.

Science PLD in 2017 and beyond
The ministry is changing how schools access professional learning and development in 2017.

However, we are fortunate that Science has been named as one of the priority areas for PLD. If your school would like to apply for PLD next year, your principal will need to complete a Ministry PLD journal template that can be downloaded from:

http://services.education.govt.nz/pld/news/making-a-pld-proposal/

Note that the closing date is 20 October and that you can contact us for support in preparing your Journal application.
How do you cope with failure? Are there any strategies you can recommend?

With their teacher they co-construct a set of questions to answer with their junior class, choosing the questions and their wording. They may even ask their teacher how she or he learns from failure. Then they go into a year 10 or 11 class, a selection of whom have been given those questions to ask.

Tikanga is followed when introducing and thanking the student role models. Follow up visits by the role model students are arranged to address issues such as career pathways and study skills, with the emphasis on how to make the most out of failure.


Collaborative inquiry in Science

Collaborative inquiry is a very student-centred practice and once you take those few bold steps you will never go back; your students won’t let you. Key aspects include:

- Students working in self-selected teams of 2 or 3, which tends to lead to homogeneous groups, at different levels of ability, allowing for team-based differentiation. At the senior level students in teams can be doing different achievement standards.

- Focus on a big question – open-ended (lots of possible solutions), wide-ranging and relevant for your students (local or topical).

- Work being posted online – the inquiry topic, resources, team profiles, daily work plans, as well as student work.

- The teacher facilitating, becoming a guide on the side, (rather than a sage on the stage) answering no questions that students can reasonably be expected to answer themselves.

- Thinking skills improving as students have to generate knowledge for themselves: http://pamhook.com/solo-taxonomy/

- Assessments becoming a team effort where possible, even mock NCEA tests can be handed back for review. This helps develop self-efficacy as students learn from each other. This way of assessing is more fun and encourages life-long learning.

- Find out more at https://pogil.org, a good solid research based site.

For more information contact your Science Facilitator.

Building on foundations laid...

As part of the Secondary Student Achievement (SSA) PLD contract we have worked alongside many of you over the past five years in a range of ways and would like to take the opportunity to thank you for your valuable knowledge, enthusiasm and professionalism.

We have seen a growing understanding and enactment of science in the NZC, and in particular programs that foster the development of critically informed, responsible citizens - through the development of Science Capabilities.

At senior levels, we have seen huge shifts in achievement of students who have struggled with Science in the past, through units that have engaged these students and been responsive to their individual needs.

Finally, we have been pleased to see ongoing progression in understanding (yours and ours) of how to continually move our teaching and learning forward through inquiring into the impact of our practice.

Despite the SSA PLD contract coming to an end in December this year, we trust that these foundations will support the continual development of the Science learning area. We hope we have the opportunity to work alongside many of you in the future, in some capacity.