



MINISTRY OF EDUCATION

Te Tāhuhu o te Mātauranga

These national newsletters are produced by the **Secondary Student Achievement** national facilitation team, as part of supplementary PLD support for schools, from the University of Auckland and Mau ki te Ako project partners (University of Canterbury, University of Otago and Te Rūnanga o Ngāi Tahu).

# National Newsletter: All Sciences including Agricultural and Horticultural Science

Information and resources for middle leaders in secondary schools | Term 1 2016

## Introduction

Welcome to the first Sciences newsletter for 2016. As National Science Co-ordinators, we write a newsletter each term to provide information useful to Science teachers across New Zealand. Each issue contains articles to stimulate teachers' thinking on aspects of the Science learning area, as well as updates relating to assessment and subject specific information.

Most of the contract requires our facilitators to work with schools designated by the Ministry. However the science team also provides PLD in other ways:

- **Nature of Science (NoS):** This is provided in the national workshops (see below). We have also been experimenting with 'NoS unworkshops' where teachers lead discussions or share their own learning and often end in collaborative planning; and working on NoS in selected individual schools.
- **Supporting L1 students to achieve using achievement standards:** Inquiry clusters involve a workshop each term, plus some in-school support. The focus is on helping teachers of less able L1 students to shift from assessing against unit standards to achievement standards. In 2016, the success schools have experienced has led to this PLD also supporting development of L2 and L3 courses for these students.
- **In-depth clusters** may be offered by Science Facilitators in some regions involving a workshop each term, plus some in-school support. The focus will be on using a Teaching as Inquiry approach to trial and monitor student engagement and achievement through the trialling of specific teaching strategies. Invitations will be sent to schools to participate in this opportunity where it is available.

We also offer:

- **National workshops:** Each year we offer a national workshop in the main centres in our regions. Last year we looked at junior investigations in Science. The 2016 workshops will be held across the country early in term 2. Information will be in the next national newsletter and flyers will be emailed directly to schools. More information is on the back page of this newsletter.
- **Regional clusters:** Support to set up a cluster in your area may be available from the Science Facilitators, who could provide the host with ideas of discussion starters.
- **Mike's News:** Mike Stone sends out a weekly newsletter of interesting Science events, information and resource links to science teachers who request it. As she is employed to serve the North and Central North regions, events are mainly focused on that area, but the resources and information are relevant to all.

If you have had a change of HOD or moved schools, please contact the National Co-ordinators Mike Stone or Kate Rice so they can update their contact lists. This way, you can continue to be informed.

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## Science as argument

Scientific arguments allow debate of an existing idea using the evidence for or against it. For a theory or explanation to be accepted it must stand the test of debate, and provide sufficient evidence supporting the idea to become accepted. The purpose of science is to ensure theories about the world we live in are supported by sufficient evidence. Sometimes a scientific idea precedes any evidence relevant to it, and other times the evidence helps inspire the idea. Building students' understanding that science is based on argument requires the investigation and identifying of factual evidence about competing claims to understand rival hypotheses on an issue. An example of argument in Science could be introduced to students is shown in the following extract:

**Theory of evolution:** *The whole 'strengths and weaknesses' gambit rests on the belief that the business of science is testing truth claims, and this is what 'scientific method' instruction and science-as-argumentation teach. Seldom is a theory abandoned except when there is a better theory to take its place. The story of evolutionary biology in the century and a half following publication of The Origin of the Species is only in small part a story of testing and confirming or rejecting Darwin's hypotheses. It is mainly the story of improving on the original theory, incorporating new knowledge of genetics and new findings from many different fields of biology. This is an exciting story. Exposing students to it could make good educational experience in science, and it is decidedly not a story of biologists closing ranks against criticisms and alternative theories. It is a story of progress on a large scale in making sense of the world, progress to which many researchers have made contributions, large and small.* (Bereiter & Scardamalia, 2008)

The purpose of introducing argument in science is to convince students to seek evidence and reasons for the ideas held, and to take them seriously as a guide for belief and action. The success of the argument depends on making a clear distinction between hypothesis and evidence. The argument needs to investigate rival hypotheses and engage in evidence-based argument about the competing factual claims. The final argument consists of a connected series of statements that establish a position on an issue, and implying a response to 1 or more other positions.

### Ways to develop Science as argument

Science as argument links to the Participating and Contributing and also Communicating Science aspects of NoS. To build student ability to address science as argument, students need to be able to distinguish fact from opinion; bias in evidence; and inference from assumptions.

They also need to have well developed reasoning ability that does not make assumptions without considering the evidence in depth. The ability to distinguish between statements that are scientific data and those that are inferred as part of an explanation, and explain how this decision was made, will address Level 6 Participating and Contributing concepts. By Year 12-13, students need to be able to judge the quality of their own and others' arguments based on the critical evaluation of scientific evidence to address Level 7/8 Participating and contributing concepts.

To be able to begin to build understanding about Science as argument, students need to be able to tell *fact* from *opinion*. Opinions are often *personal* and based on *feelings* or *beliefs*, or that an event could possibly happen in the *future*; quite a few people would *disagree* with the idea.

Fact and opinions are usually verified from 2 sources: (1) Social validation – meaning is socially constructed and agreed e.g. it actually happened or existed in the past, or is based on the experience of many people, so very few people will disagree with it (agreement). (2) Empirical validation – meaning is confirmed by measuring and testing.

Students need to have opportunities to discuss and identify faulty reasoning approaches that are commonly made:

- Assuming events which follow others are caused by them.
- Drawing conclusions based on insufficient number of incidents.
- Drawing conclusions based on non-representative instances.
- Assuming something true in specific circumstances is true in general.
- Imputing causal significance to correlations.

## NZQA Best Practice Workshops

These provide good information on what is required for internal assessments so it is worth someone from the school attending.

<http://www.nzqa.govt.nz/about-us/events/best-practice-workshops/auckland/#Making%20judgements>

## Have you considered marking external exams?

This is very good PLD – you really learn what students need to know and do to pass these exams. NZQA calls for marking panels around June each year. Keep an eye out at <http://www.nzqa.govt.nz/about-us/working-at-nzqa/contract-vacancies/>

## Nature of Science (NoS)

### The Science Capabilities

These break Nature of Science down into discrete skills. The pages on Science Online give more information on each capability and show how these can be incorporated into science lessons. More info at:

<http://scienceonline.tki.org.nz/Introducing-five-science-capabilities>

### Webcasts

Mike Stone from Team Solutions has developed 5 webcasts on the Science Capabilities useful for departmental PLD. Each of these explores a different Science Capability, putting it in the context of Nature of Science. The webcast explains its purpose and applies the focusing questions to one or two examples.

Ian McHale from Team Solutions has developed a webcast about auditing a junior Science program with respect to NoS, using a tool he has developed. HoDs could use this for department PLD.

Both of these can be found at: <http://mediasite.temanuauate.org.nz/Mediasite/Catalog/Full/7b15892d9d4b4858803c9b42ca52f57d21>

## Subject associations

Subject association conferences provide great subject professional development and are the way to keep up with trends in your teaching area. These provide a forum for teachers to share ideas and gain updates on the direction teaching and learning is proceeding. For most conferences there is a limited number of scholarships available from subject associations. The New Zealand Association of Science Educators (NZASE) holds conferences each year. In 2016 **SCICON** will be at Wellington, 10-13 July. This conference is for all Science teachers, and has generic speakers as well as sessions specific to each Science strand.

**Subjects:** In alternate years, next in 2017, there are individual subject conferences – BioLive, ChemEd, Physikos. NZASE Members get discounted registrations. SCICON 2016 website:

<https://innovators.eventsair.com/QuickEventWebsitePortal/scicon-2016/scicon2016/ExtraContent/ContentPage2>

**Membership** of NZASE is for all science teachers. Annual membership is now due. See <http://nzase.org.nz/membership/>

**Journal:** The *NZ Science Teacher* is NZASE's journal for NZ Science teachers, providing articles of interest in a wide range of science contexts, including teaching ideas and recent Science research. The articles are published online during the year and selected articles are published in hard copy at the end of the year for members:

<http://nzase.org.nz/publications/>

**Local association branches** often provide regular professional development and visiting speakers for their region.

## Subject alerts

In many subject areas there are experienced teachers able to answer teacher queries. Contact a Facilitator to access these email addresses. All the subject associations below are part of NZASE.

### AgHort

The AgHort Teachers Association is HATA. To access the many useful resources on the website, you need to become a member. Membership forms are available from <http://hatan.com/>

### Biology

BEANZ is the association for Biology teachers. Regional BEANZ workshops are run in term 3 or 4. Resources from these can be accessed through Dropbox. Members can contact [biology@gmail.com](mailto:biology@gmail.com) for an invite. BEANZ also runs a Dropbox for BEANZ members that supports the L3 Biology Homeostasis topic. Email for access [biology@gmail.com](mailto:biology@gmail.com) Members of BEANZ executive will answer Biology related questions at [biology@gmail.com](mailto:biology@gmail.com)

### Chemistry

NZIC is the subject association for chemistry teachers: <http://nzic.org.nz/> and <http://www.chemteach.ac.nz/>

### Earth and Space Science

The subject association has some info at <http://esse.nzase.org.nz/> Some teachers have online resources available for teachers to access. e.g. Robin Eyre has a Google group for L3 ESS. To request access, go to <https://groups.google.com/forum/m/#!forum/l3ess>

### Physics

NZIP is physics teachers' subject association: <http://nzip.org.nz/> The Physics-Teacher-Talk list serve is also a good place to go for answers to physics queries. Join this at: [http://nzip.org.nz/mailman/listinfo/phys-teach-talk\\_nzip.org.nz](http://nzip.org.nz/mailman/listinfo/phys-teach-talk_nzip.org.nz)

## Online teaching and learning resources for the Sciences

### National newsletters

These include info about relevant issues in professional development, curriculum and assessment. You can access these from: <http://nzcurriculum.tki.org.nz/Ministry-curriculum-guides/Secondary-middle-leaders/Professional-learning-and-development>

### The Science Teaching and Learning Guide

This is a comprehensive elaboration of the NZC's science learning area statement and achievement objectives.

It shows what good Science pedagogy looks like, provides guidance for programme planning and gives examples of programs that include Nature of Science (NoS).

The *Science Teaching and Learning Guide* is good to use when planning programmes <http://seniorsecondary.tki.org.nz/science>

### The Science and Biotech learning hubs

Connect the work of NZ scientists to resources for use in the classroom:

<http://sciencelearn.org.nz/>

<http://biotechlearn.org.nz/>

### Secondary Literacy Online

At Secondary Literacy Online you will find good resources to support development of literacy (vocab, speaking, reading, writing).

There are plenty of Science examples.

For more information, visit:

<http://literacyonline.tki.org.nz/Literacy-Online/Secondary-Literacy>

## National workshops 2016

The broad focus for this year's national workshops are to identify and share curriculum, learning and assessment practices that will improve the retention, engagement and achievement for students, and particularly for those students at risk of not achieving NCEA level 2 in 2017.

We may also try to include some Nature of Science/Scientific Literacy as part of the content. However, the final content is still to be decided.

Team Solutions national workshops are being offered for teachers in these cities:

Date	Location
10 May	Auckland
12 May	Napier
17 May	Gisborne
19 May	Whangarei
31 May	Hamilton
2 Jun	Rotorua

Mau ki te Ako workshops are being offered for teachers in these places:

Date	Location	Date	Location
6 April	Dunedin	7 April	Timaru
5 May	Christchurch	13 April	Palmerston North
14 April	Wellington Central	12 May	Invercargill
17 May	Lower Hutt	18 May	Nelson
19 May	New Plymouth		

Details of the programme and the venues will be sent to schools shortly.

## Middle leader calendar

Middle leaders will no doubt have their own lists of things internal to the school that they have on their calendar. You may also need to be cognisant of these things:

### Term 1

- Achievement specifications for external standards are published.
- Any changes to achievement standards are signalled through the NZQA Facebook page and a change to the version number on the standard.
- NZASE (and regional subject association) annual membership renewal.
- School 2015 NCEA data is available for analysis.
- Look for professional learning opportunities for staff (NZQA Best Practice Workshops; conferences, courses, clusters in the local area etc).
- Checkpoint for achievement: is each student in each class/course on track to achieve?

### Term 2

- SSA national workshops for Science are on offer across the country.
- National achievement data is published.
- Examiners' reports for external standards are published.
- Checkpoint for achievement: is each student in each class/ course on track to achieve?
- NZASE national SCICON conference week 1 of the holidays.

### Term 3

- Finalising entries for NCEA externally assessed standards.
- Checkpoint for achievement: is each student in each class/course on track to achieve?

### Term 4

- End of Year PLD on offer from local science teacher associations.

## More online teaching and learning resources

### #Scichatnz

Every 2 weeks during term time, on a Thursday at 8:30 pm, Science educators meet online. This is a chance to discuss a topic voted for by the teachers involved to share ideas, resources and inspiration by tweets. More info at: <https://scichatnz.wordpress.com/>

### Facebook

Most science subject areas have a Facebook page.

### Physics

<https://www.facebook.com/groups/NewZealandPhysicsTeachers/>

### Biology

<https://www.facebook.com/groups/577352309058780/>

### Chemistry

<https://www.facebook.com/groups/NZChemistryteachers/>

### Science

<https://www.facebook.com/groups/346737702172016/>

### Wikis

These are often useful collections of resources. Accessible to members. You can request access to each.

### L1 Science

<http://l1scipd.wikispaces.com/>

Resources for L2 -Biology, Chemistry, ESS, Physics

<http://l2scipd.wikispaces.com/>

### ARBS

Assessment Resource Bank, developed by NZCER, is a collection of items for formative or summative assessment. Questions are classified by NoS strand, content strand and level.

Useful to assess/report by level.

[arbs.nzcer.org.nz](http://arbs.nzcer.org.nz).