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National Newsletter: All Sciences including Agricultural and Horticultural Science

Information and resources for middle leaders in secondary schools | Term 1 2015

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

Welcome to the Sciences for term 1 2015. In this issue:

- Quality teaching to support priority learners.
- Ways to support your students to successful science learning.
- Programme design for science courses.
- Continuing to develop Science Capabilities approaches in NoS.
- Information on Teachers Conferences for Sciences 2015.

Quality teaching supports priority learners

As science teachers we are all aware of the difficulties students encounter with the language of science. The important role for teachers is to identify the strategies most likely to help students progress in their science learning and achievement by supporting them to engage more readily with science language. Building literacy practices into teaching practice could begin in 2015 by getting students and teachers to try some different approaches.

One approach might be to introduce the strategy "Think it; Talk it; Draw it; Write it". For this to be successful, students need to engage in focussed "talking activities". These are a redirection of classroom chatter to productive exploratory talk to help students construct new knowledge or reassemble existing knowledge to apply the ideas to a new situation.

Much classroom talk is based on "talking for others". For example "talking for the teacher" involves regurgitating information using the correct science language in the scientist's way. Often students are simply repeating the teacher's information without any real understanding of the science.

On the other hand, "talking for self" is exploratory talk where the student explores a science idea using their own language and limited scientific language. Constructivist theory sits behind this strategy based on the idea that we learn by relating new ideas to our existing ideas and experiences. Once students have clarified the relationship between the science idea and their interpretation and experience, more scientific terms/ideas can be introduced.

To introduce effective "exploratory talk" in classrooms, the task needs clearly defined parameters with groups of 3 or 4 students considering this for a set time, with the knowledge that they need to report their ideas back. To improve the quality of "exploratory talk" the process should be modelled to the class using a discussion in a small group that includes the teacher.

Starting tasks should relate to the lesson outcomes and could be to:

- Compare and contrast two objects, investigations, photographs or diagrams, where the emphasis is on determining similarities and differences.
- Producing a concept map for science ideas in an article or page from a textbook on the current learning outcomes.
- Identifying solutions to a problem related to a practical investigation / activity on the science content.
- Identifying the three most important questions the group would like to ask about the current science topic.

Having tried one of these tasks, students can reflect on ways the "Exploratory Talk" helped them complete the task. It will important to allow time for "Exploratory Talk" to become a regular part of lessons as this will extend to more effective communication through writing.

National Co-ordinators

Mikhal Stone
Northern and Central North regions
m.stone@auckland.ac.nz
Mob: 021 1871 664

Kate Rice
Central South and Southern regions
kate.rice@otago.ac.nz
Mob: 021 793 771

Regional Facilitators The University of Auckland Northern region

Ian McHale
i.mchale@auckland.ac.nz

Natalie De Roo
n.deroo@auckland.ac.nz

Central North region
Simon Taylor
sp.taylor@auckland.ac.nz

Te Tapuae o Rehua
Central South region
Stephen Williams
stephen.williams@otago.ac.nz

Central South, Southern regions
Judith Bennetts
judith.bennetts@canterbury.ac.nz

Kate Rice
kate.rice@otago.ac.nz

Southern region
Sabina Cleary
sabina.cleary@canterbury.ac.nz

"Exploratory Talk" details

For more detail on "Exploratory Talk" go to:
http://www.corwin.com/upm-data/23512_01_Mercer_Ch_01.pdf
and
<http://www.slideshare.net/margarubiosoto/exploratory-talk-in-professor-neil-merc>

Ways to support students in successful science learning

A report titled "*What keeps students motivated to learn*" by Katrina Schwartz (<http://blogs.kqed.org/mindshift/2014/03/what-keeps-students-them-motivated-to-learn/>) uses information from students to present a summary of what they think about their education. Their ideas give insight into ways students perceive schools could better motivate students to learn. Their ideas include using learning that is integrated across learning areas that involves problem solving and has a real product as the outcome.

They agreed that learning that is relevant to them, based on their interests and hands-on is motivating, but in addition the teacher must care about them. This is shown through the teacher having high expectations and by encouraging them to learn from their mistakes through feedback from both their peers and their teachers which is framed as goals for them as learners and not based on the standards.

The following story from a teacher involved in a Level 1 Focussed Science Cluster in 2014 (as part of Secondary Student Achievement PLD) has links to some of these students ideas.

Overcoming Invisible Barriers - A reflection on achievement in a Canterbury school in 2014

In 2014, the Year 11 'Literacy supported' class was assessed using unit standards in term 1, and then chose their topics to study in term 2 to 4. For the first achievement standard the template for the assessment of Chemistry 1.1 was co-constructed with the teacher and this was used during their learning. However, when the formative assessment was to take place a lot of students would not attempt it as they thought they were "dumb and would fail....so there was no point in trying".

The teacher realised she needed to change the students' mindsets from fixed to growth so she showed them the Joseph Iosefo *Brown Brothers* YouTube video (<http://youtube.com/watch?v=S-SKYOwjIGU>). There was complete attention and silence, not even fidgeting. The teacher shared some of her invisible barriers, some put up for herself as well as those other people had put up for her. She talked with the class how she had kicked her barriers down. Some students offered to share some of their invisible barriers.

The teacher set for homework: Discuss these ideas (invisible barriers) with your whānau and brainstorm some ways to kick these barriers down". They all did this homework, one student even did it with his boxing coach as there was no-one at home that night to do it with! The class then discussed ways to kick down their barriers. They also talked about ways the school could help them, and other places they could get help if not from school.

The class eventually did the assessment for Chemistry 1.1 and 7 of 20 students didn't buy in. During the next topic (Science 1.15) the teacher revisited the idea of fixed versus growth mindsets. There was more buy in during this topic but five students were not keen to be assessed. Critically one very fixed-mindset student shouted out in the middle of the summative, "This isn't that hard after all, I can do this!" resulting in two of the five non-participating students giving it a go.

By the last assessment all students were keen to give science learning a go and attempt the assessment, with 6 aiming for Merit. In summary the class of 20 achieved the following results:

- | | | |
|----------|------------------|--------------------------------|
| • Term 1 | 2xUnit Standards | 13A+A; 7A+N |
| • Term 2 | Chemistry 1.1 | 11A; 9N |
| • Term 3 | Science 1.15 | 1M; 11A; 8N (attitude changed) |
| • Term 4 | Science 1.11 | 1M; 15A; 4N |

Professional development opportunity and links to resources/professional reading about **Growth Mindset** (*referred to in the Invisible barriers story*) include one day workshops **Teaching for Intelligent Mindsets**. These are being held in Auckland, Wellington and Christchurch in March, and will be presented by Stanford University psychologist Carol Dweck, Professor Guy Claxton (Learning Sciences at the University of Bristol Graduate School of Education) and Jamie Fitzgerald/Billy Graham. Further details at: <http://www.learningnetwork.ac.nz/shared/calendars/conferences.aspx>

Important links and resources for science teachers

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>

Science online

The Science Specific site on tki contains links to new resources, Science Capabilities activities and Nature of science activities <http://scienceonline.tki.org.nz/New-resources-to-support-science-education>

Useful links and resources

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/>

A blog with some links to great articles and a Ted talk about growth mindset: <https://evidenceintopractice.wordpress.com/tag/dweck/> and http://teacherstoolbox.co.uk/T_Dweck.html

Another blog with an article on Big ideas of 2013 refers to Carol Dweck's work around positive conditions for learning and growth mindset: <http://blogs.kqed.org/mindshift/2013/12/mindshifts-big-ideas-of-2013-focus-on-learning/>

This article reviews Carol Dweck's book "Mindset – the new psychology of success": <http://www.brainpickings.org/2014/01/29/carol-dweck-mindset/>

The Science Teaching and Learning Guidelines provide ideas on other approaches to quality teaching and learning in the Effective Pedagogy section. To explore go to <http://seniorsecondary.tki.org.nz/Science/Pedagogy>

2015 National Science Learning Area Workshops Programme Design in Science: Re-thinking Investigations in Year 9-11

This 1-day workshop is intended for Science Middle Leaders, Teachers in charge of Junior Science and those aspiring to be. Work with Level 1 Science Focused Clusters in 2013 and 2014 has highlighted the need to back-map teaching and learning approaches to build student capability in the Investigating in Science strand of Nature of Science.

In 2015, Science teaching and learning programmes need to develop students' ability to investigate in science and must address a range of needs. These include:

- Meeting needs of priority learners through quality teaching approaches.
- Using digital technologies to support science investigations).
- Incorporating teaching shifts in science investigation to build greater student capability in pattern seeking and modelling.
- Addressing the New Zealand Curriculum focus on teaching through the Nature of Science.

During this workshop participants will engage with some strategies to address these needs, and support the development of the Science Capabilities using a focus on teaching and learning using scientific investigations. Workshops dates and locations are:

Auckland	3 March	Dunedin	4 March
Whangarei	5 March	Cromwell	10 March
Rotorua	5 May	Christchurch	12 March
Hamilton	26 May	Wanganui	19 March
Napier	3 June	Lower Hutt	20 March
Gisborne	11 June	Nelson	20 April

Enrolment enquiries
m.stone@auckland.ac.nz

Enrolment enquiries
kate.rice@otago.ac.nz

Continuing to develop Science Capabilities approaches in Nature of Science

Last year the Science national workshops focused on the Science Capabilities. These capabilities focus on five specific skills that exemplify Nature of Science and could be developed in year 7 to 10 teaching programs.

The online resources <http://scienceonline.tki.org.nz/Science-Capabilities-for-citizenship> unpack each capability and then take MoE resources already available for teaching science and show how they can be adapted to include a NoS focus.

Webcasts of five 20 minute PLD sessions on these capabilities may be found at <http://tinyurl.com/ScienceTeamSolutions>

Links to NZQA moderator newsletters

Remember to keep up with these for latest information on the assessment tasks and achievement standards.

Agriculture/Horticulture

<http://www.nzqa.govt.nz/qualifications-standards/qualifications/ncea/subjects/ag-and-hort-science/moderator-s-newsletter/may-2014/>

Biology

<http://www.nzqa.govt.nz/qualifications-standards/qualifications/ncea/subjects/biology/moderator-s-newsletter/may-2014/>

Chemistry

<http://www.nzqa.govt.nz/qualifications-standards/qualifications/ncea/subjects/chemistry/moderator-s-newsletter/february-2014/>

Earth and Space Science

<http://www.nzqa.govt.nz/qualifications-standards/qualifications/ncea/subjects/earth-and-space-science/moderator-s-newsletters/may-2014/>

Physics

<http://www.nzqa.govt.nz/qualifications-standards/qualifications/ncea/subjects/physics/moderator-s-newsletter/february-2014/>

Science

<http://www.nzqa.govt.nz/qualifications-standards/qualifications/ncea/subjects/science/moderators-newsletter/february-2014/>

Clarifications

Also refer to the clarifications for science: <http://www.nzqa.govt.nz/qualifications-standards/qualifications/ncea/subjects/science/science-clarifications/>

Science subject area alerts

NZQA now runs 3 different types of Best Practice Workshops (BPW):

- **Making Judgements** – subject specific, moderators focus on internally assessed standards
- **Connecting with Contexts** – generic, focus on modifying existing assessment resources to better meet the needs of learners.
- **Collecting Evidence** – generic, focuses on diverse and valid methods of collecting assessment evidence to meet the varied needs of learners.

Each workshop costs \$120 pp. Sort out the ones appropriate for your department. Schedules will be up soon on the NZQA website.

Terminology

There can be an issue with mixing up the terms "standards" and "assessments". The standard is written by the MoE and defines what is being assessed; it cannot be changed. The assessment task modelled on TKI is one way the standard may be assessed. These TKI tasks are intended to be adapted by teachers for their students and their context. The Assessment task can also be very different from the TKI task, but must address the requirements of the standard, taking into consideration information in the Explanatory Notes, Clarification documents and Conditions of Assessment. Teachers need to be aware that the standard is the ultimate arbiter, against which the moderator checks assessment tasks and student work.

Assessment tasks

Vocational Pathway tasks are available for most internally assessed standards. They give teachers a wide range of alternatives tasks and contexts to use with their students. If you have not already, have a look at them. Many of them are very good.

NZASE

Subscriptions to NZASE are due this term, the form can be downloaded at <http://nzase.org.nz/membership/register/>. Payment can be on-line or by cheque. Please make sure the most appropriate email address is entered; usually this will be the HOD.

Teaching and Learning Guides

At some of the NZQA Best Practice Workshops it has been noted that many science teachers are not aware of or using the Teaching and Learning Guides. The Science Teaching and Learning Guide was written by teachers for teachers to provide comprehensive elaboration of the New Zealand Curriculum Science learning area statement and range of Sciences achievement objectives. It shows what good science pedagogy looks like, provides guidance for program planning and examples of programs that include Nature of Science. <http://seniorsecondary.tki.org.nz/Science>

Teachers of Agriculture and Horticulture

HATA Conference 2015 – Innovate and Invigorate, St Andrews College, Christchurch, 12- 15 April or 16 April if BPW offered (tbc).

Teachers of Physics

NZIP Conference: 6-8 July, Waikato University, Hamilton <http://confer.co.nz/nzip2015/> . Conference theme relates to International Year of Light.

Teachers of Biology

BioLive Teachers Conference: 5-8 July, Victoria University, Wellington – combined with ChemEd.

Teachers of Chemistry

ChemEd Teachers Conference: 5-8 July, Victoria University, Wellington combined with BioLive.

Teachers of Earth and Space Science

Meeting to be advised.

Science online

Remember to explore the materials on the Science Capabilities and Use of Digital Learning Technologies in Science:

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

Ideas on approaches to use in science can be found on Literacy on line 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>

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

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

Secondary Student Achievement professional development

This newsletter is developed by the Science National Co-ordinators of the Secondary Student Achievement professional learning and development. Secondary Student Achievement professional development is funded by the Ministry of Education and covers every learning area.

The Government goal is that 85% of all 18-year-olds will have achieved NCEA Level 2 or an equivalent qualification by 2017.

Support is available to all middle leaders in the form of workshops, clusters and e-newsletters in every learning area and in a range of subjects.

Intensive, in-depth support is also being provided for schools that have been successful in their application to the regional Ministry offices.