

Science Education SIG activity 2022- 2023

Members of the Science Education SIG collaborated to write a collection of papers for a special edition of the *Assessment Matters* journal. The collection had its genesis in developments and dilemmas that arise in the highly liminal space between curriculum and assessment. While assessment challenges were the focus, the science curriculum provided the context.

This note following is a brief overview of the collection. The whole edition can be found here: <https://doi.org/10.18296/am.SI.2022>

Exploring tangled interrelationships between assessment and curriculum

Bronwen Cowie and Rosemary Hipkins

<https://doi.org/10.18296/am.0054>

This paper provides an overview, linking the points made to the papers in the collection. It begins with a discussion of intertwined relationships between curriculum and assessment and the different ways these relationships play out in assessment for learning and high-stakes summative assessments. This is followed by a discussion of the ongoing impact of the Learning in Science Project (LISP) with its emphasis on students as active meaning-makers, and the National Education Monitoring Programme (NEMP) that similarly sought to more actively involve students in assessment. The challenges of aligning stated curriculum purposes and assessments are then discussed, followed by a brief discussion of what might be missing from the collection as a whole.

Assessing Science Capabilities in New Zealand Secondary Schools: Thinking Required for Planning to Enacting

Jared Carpendale and Mairi Borthwick

<https://doi.org/10.18296/am.0055>

This paper discusses a small set of 'science capabilities', introduced in the New Zealand curriculum context as things that weave the nature of science with content strands. The capabilities reflect what students could do with their science learning where citizenship is a high-level curriculum goal. The paper draws on pedagogical content knowledge (PCK) to explore how a New Zealand secondary school embraced science capabilities and how they are assessing them. The paper outlines how a concerted and targeted effort over the last decade saw significant shifts in teacher thinking. The school now utilizes science capabilities for significant portions of the curriculum design and assessment in Years 9-11, and reports on student progression with respect to what they can do.

Towards science assessment with an orientation to science for societal good

Bronwen Cowie and Suzanne Trask

<https://doi.org/10.18296/am.0056>

This paper draws the idea of ‘*sustainable assessment*’, which encompasses the capacities students need to learn lifelong across formal and informal settings, and alerts students to the use of their learning for societal good. The paper focuses on perspective-taking as an important dimension of socio-scientific reasoning that has the potential to act as a bridge to the appreciation of other reasoning domains such as complexity, inquiry, skepticism, and if and how scientific evidence might contribute to the negotiation and resolution of a socio-scientific issue (SSI). Concept mapping and concept cartoons are discussed as promising assessment strategies to use in these curriculum contexts.

Stop tinkering around the edges: a call for the deterritorialisation of assessment praxis in the age of Anthropocene predicaments

Thomas Everth

<https://doi.org/10.18296/am.0057>

This paper argues that education, which is traditionally engineered as an instrument of cultural reproduction, urgently needs to adopt a leadership role for cultural transformation to generate a sustainable future in an age of Anthropocene predicaments. To fulfil this role, the aims, objectives and practices of education must be strategically revisited. The overbearing role of the NCEA assessment culture in secondary schools is critiqued for its territorialising impact on educational content and praxis and the stifling of teacher-led innovation. The paper calls for the deterritorialisation of assessment culture with the aim of liberating student and teacher agency to promote humanity’s search for new ways to live.

Could the design of assessment standards be adapted to better reflect curriculum intentions?

Rosemary Hipkins and Charles Darr

<https://doi.org/10.18296/am.0058>

This paper draws on New Zealand’s standards-based senior secondary qualifications system (NCEA) to illustrate how adaptations of existing structures might better reflect future-focused curriculum intentions in high-stakes, summative assessments. Using one of the new NCEA science achievement assessment standards as an example, we show how several comparatively minor structural changes could provide clear and explicit links between curriculum intentions and demonstrations of complex learning. These changes would provide a more robust foundation for teachers’ assessment decision-making, which is of utmost importance when achievement standards are internally assessed by teachers themselves.

Challenges for assessing curriculum learning in Initial Teaching Education programmes

Carolyn Swanson, Pamela Perger, Jayne Jackson

<https://doi.org/10.18296/am.0060>

Designing an assessment that is fit for purpose in the Initial Teacher Education (ITE) setting is complex. The assessment must meet the University and New Zealand Teaching Council regulations, mirror educational best practice, support ITE students to learn curricular and pedagogical content, as well as be practicable to teach and assess. This article outlines a novel integrated assignment for first year primary ITE students in Science, English and Mathematics. The lecturers used role-play to model a team meeting where junior team teachers designed an integrated unit, which was a required task within the students' assignment. Student feedback and lecturer reflections suggested that the format emulated classroom practice, deepened curriculum understanding, and helped ITE students understand teachers' work.

Enhancing talk with visual representations to understand children's ideas about celestial phenomena

Simon Taylor and Barbara Whyte

<https://doi.org/10.18296/am.0061>

This paper provides a snapshot of assessment for learning in action. It introduces the drawings made by children who had been studying *Planet Earth and Beyond/Matariki* as a context in science in a New Zealand primary school. The visual data is drawn from the Te Ao Hurihuri project (The Changing World) in which students were offered structured opportunities to represent their thinking with visual constructions. The wide range of constructions created by the students, as well as their associated talk, provided teachers with an effective way of checking on developing conceptual knowledge and understanding. Students became partners with their teachers, sharing power and responsibility for their learning and assessment.

21st Century Learning A-Buzz: Integrating and Assessing an Arts-Centred STEAM approach to Learning With Apsicopes (Beehives) in 2 Aotearoa Intermediate Classrooms

Carrie Vander Zwaag

<https://doi.org/10.18296/am.0062>

Facilitating quality STEAM teaching and learning can be challenging for teachers when value is placed on traditional single-subject forms of monitoring, measuring and reporting on student knowledge. This paper explores an authentic, integrated STEAM teaching and learning approach via a case study where an apiscope – a living beehive – was installed in a classroom as part of an innovative arts-centred STEAM teaching and learning approach to learning about bees. The paper documents the unfolding of a collaborative journey that involved students, teachers, researchers, and experts (scientist, beekeepers, artists) in grappling with how best to integrate and assess STEAM teaching and learning that responds to students' strengths and interests.

One further paper was completed but at the time of publication of the paper journal was still awaiting permissions from the owners of the assessment times discussed. This paper is published 'on-line first' now that the permissions have been granted.

Making sense of TIMSS 2019 New Zealand Year 9 Science study:
item analysis of students' performance

Maurice Cheng

Much of the focus of international comparative studies of students' achievement has been on New Zealand students' falling standards. Using the most recent findings from the Trends in International Mathematics and Science Study (TIMSS), and in particular, Year 9 New Zealand students' performance in specific items, this paper suggests that there is much more we can learn from this large-scale assessment. For example, in what ways are students' achievements changing over the years? How has students' higher-order thinking in science changed? What have we done well and not so well? Highlighting the values of TIMSS Science Study, could encourage teachers and schools to consider and use the findings to plan curriculum and to design assessment.

<https://www.nzcer.org.nz/nzcerpress/assessment-matters/assessment-matters-online-first>