Assessing New Zealand high school science:

Considerations for teachers' assessment literacy

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Contents

Abstract

This paper considers the standards-based assessment system used for high school science in New Zealand and explores the required assessment literacy of teachers working within this system, using a simple focus-area model. In New Zealand, school qualifications are achieved through the assessment of student work against a set of achievement standards, which are based on curriculum objectives. These standards define a broad range of science knowledge and skills expected of students across the three levels of New Zealand senior school qualifications. The socio-scientific focus of the science achievement standards means that students are required to investigate phenomena and demonstrate their ability to make meaning of data in a range of everyday contexts. Assessing student performance against these achievement standards requires considerable assessment literacy on the part of teachers, as the teachers are responsible for choosing or designing the assessment tasks as well as making the final summative judgements. Using the New Zealand qualification NCEA Level 1 Science as an example, this paper describes ways in which all teachers can approach the task of assessing students by focussing on five important areas concurrently.

Introduction

Assessment is a complex activity and its effectiveness is dependent on the assessors' knowledge, skills, and understanding of assessment principles and practices, and their ability to apply these in the range of settings that present themselves in school classrooms (Bell & Cowie, 2001; Black & Wiliam, 2006; Harlen & Gardner, 2010; James & Pedder, 2006; Smith, 2010). The term assessment literacy is used to describe what teachers need to know about assessment matters (Abell & Siegel, 2011; Lomax, 1996; Lukin, Bandalos, Eckhout, & Mickelson, 2004; Mertler & Campbell, 2005; Popham, 2008; Siegel & Wissehr, 2011; Stiggins, 1995). Assessment literacy has been defined as an understanding of the principles of sound assessment (Stiggins, 1995, 2002). Stiggins (1995) observed that "Assessment literates know the difference between sound and unsound assessment. They are not intimidated by the sometimes mysterious and always daunting technical world of assessment" (p. 240). He went on to remark that assessment literate educators

"…come to any assessment knowing what they are assessing, why they are doing so, how best to assess the achievement of interest, how to generate examples of performance, what can go wrong, and how to prevent these problems before they occur. Most important, those who are truly sensitive to the potential negative influences of inaccurate assessment never permit students to be put in a situation where their achievement might be mismeasured" (p. 240).

As discussed by Abell and Seigel (2011), there is sufficient evidence within science education literature to show that the way a teacher assesses directly affects the way their students learn. This, then, should motivate science teachers to become more assessment literate, for the benefit of their classes.

New Zealand context

In New Zealand the Ministry of Education recognises assessment as an essential component of quality teaching and school and system improvement (Ministry of Education, 2010). Teachers' assessment capability has been defined as being "able and motivated to access interpret and use information from quality assessment in ways that affirm learning or further knowledge" (Absolum et. al, 2009, p. 6). In the New Zealand context assessment, teaching, and learning are seen as being inextricably linked, and "…to be assessment capable, teachers need assessment curriculum, and pedagogical knowledge" (Ministry of Education, 2011, p. 35). Teachers working in New Zealand secondary schools fulfil a range of roles and responsibilities common to teachers around the world. However the qualification system used in New Zealand secondary schools adds another layer of complexity on to what is already a challenging and varied job: that of classroom teachers assessing students' work against achievement standards, the results of which will contribute directly to these students' school-leaving qualifications.

New Zealand qualifications system

The National Certificate of Educational Achievement (NCEA) is the main national qualification designed for secondary school students in New Zealand. NCEA is a standards-based qualification, first introduced in 2002. It is aligned to the New Zealand Curriculum (NZC) and Te Marautanga o Aotearoa (TMoA), the two official curriculum documents for English medium and Maori medium schooling for Years 1-13 ie 5 – 18 year olds. These curriculum documents describe the compulsory learning areas that are required to be taught in New Zealand schools. Each learning

area is broken down into eight levels, with associated achievement objectives, which describe the desired progression of learning. In the final three years of schooling, NZC and TMoA curriculum levels 6, 7 and 8 are taught. Secondary school qualifications are awarded at these three levels: NCEA level 1 (gained from assessment of curriculum level 6), NCEA Level 2 (gained from assessment of curriculum level 7) and NCEA Level 3 (gained from assessment of curriculum level 8).

Most senior secondary students in New Zealand study five or six subjects in each of their final three years at high school, and each of these subjects is assessed against a number of achievement standards. Achievement standards have been developed for each subject in each of curriculum levels 6, 7 and 8. Each of these achievement standards is effectively a subset of learning outcomes with associated assessment criteria, accompanied by the standard of performance required to show proficiency in that subject. Depending on the achievement standards they choose, schools use either internal or external assessment tasks to assess whether the students meet specific achievement standards. When students meet or "achieve" an achievement standard, they gain credits. Students must gain 80 credits to gain a specific NCEA (with a minimum of 60 credits coming from one curriculum level). High achievement is recognised through the gaining of endorsements (merit or excellence) for individual subjects or the overall NCEA qualification.

Secondary schools in New Zealand independently have the authority to decide on the combinations of achievement standards they use to assess students in the science courses they teach. For example for Level 1 Science there are 16 achievement standards available, each offering 4 credits (See Table I). In general, a full year high school course in science will offer a total of 20-24 credits, so usually 5-6 standards are chosen for any one course. For each subject in each level only three standards (usually 12 credits) are available to be assessed via external examination. The New Zealand Qualifications Authority (NZQA) sets these examinations. All other achievement standards are assessed by internal assessment within individual schools, and these assessments are set and marked by classroom teachers. A sample of internally assessed work is moderated each year by NZQA for each school, to assure the public of the validity and reliability of the assessment. There are no compulsory standards.

The involvement of teachers in this high stakes summative assessment has been the subject of much discussion since the introduction of the NCEA qualifications in

2002 (Barrett, 2008; Hipkins & Neill, 2003; Mizutani, Rubie-Davies, Hattie, & Philp, 2011). Classroom teachers are fully responsible for decisions made with respect to teaching and assessment in their courses, including the design and marking of tasks for internal assessment components. In order to be able to make these assessment decisions well therefore, teachers need specific assessment literacy. With recent review and redevelopment of new achievement standards, science teachers need to further consider their assessment practice.

My personal observations, both while working as a teacher responsible for NCEA in a school, and while employed by NZQA as a moderator of teachers' assessment tasks and judgements, reveal that having to perform this internal assessment causes stress and concern for classroom teachers. Even though they have freedom to develop their own assessment tools, many teachers choose not to because of their lack of self-confidence to develop assessment tasks that meet the requirements of NZQA or because of their perceived lack of time (Alison, 2005; Kane & Fontaine, 2008). Instead, they often end up using assessment tasks that have been commercially developed, or they adapt NZQA-generated exemplar tasks for their own use. This lack of confidence is not surprising given their varied levels of specialist assessment knowledge for what is a complex, technically demanding, and time-consuming task, in a high-stakes situation. This paper takes a broad view of assessment literacy and applies five focus areas of assessment to explore what good practice can look like for science teachers assessing standards which contribute to the NCEA Level 1 qualification for 15-16 year old students.

Realignment process and the nature of the science standards

With the implementation of the revised New Zealand Curriculum in 2007 came the necessity to review and revise the science achievement standards used for NCEA, to maintain alignment between the achievement objectives in the revised curriculum, and the assessment system. The main change introduced into the science learning area of the revised New Zealand Curriculum was the introduction of the Nature of Science (NOS) strand, seen as "the overarching and unifying strand" (Ministry of Education, 2007, p. 28). This was seen as significant and pervasive but it was decided not to develop specific achievement standards to assess against the outcomes of the NOS strand (NZQA, 2008). Instead, aspects of NOS have been integrated into each of the achievement standards developed within each of the contextual strands (Living world, Planet Earth and Beyond, Physical world and Material world), thus reflecting the intent of the NZC. The significance of the NOS strand interwoven into

all science achievement standards meant that the focus of science assessment has had to change, and this has had implications for teachers of science involved in assessment.

The redeveloped standards for science were introduced for use in schools in 2011. Ministry of Education policy for this review of achievement standards has resulted in only 3 of the 16 new Level 1 science achievement standards being assessed externally by formal examination. These are: *AS90940 Demonstrate understanding of aspects of mechanics*, *AS90944 Demonstrate understanding of aspects of acids and bases*, and *AS90948 Demonstrate understanding of biological ideas relating to genetic variation*, and each of these achievement standards contributes 4 credits towards NCEA. All other aspects of NZC curriculum level 6 science are assessed through a range of internally assessed achievement standards. Table I shows the matrix for current science achievement standards available for use by teachers. I have grouped the standards by mode of assessment (internal/external) and have summarised the criteria in Table II.

As explained earlier, externally assessed achievement standards use examinations that are set and marked by personnel contracted to the New Zealand Qualifications Authority (NZQA), and so these assessments are outside of the control of classroom teachers. The internally assessed achievement standards are the focus for this paper, as their use requires classroom teachers to have a degree of assessment literacy. A summary of the Level 1 internally assessed achievement standards for science (shown in Table II) shows that the standards cover a wide range of science content. All standards require students to either investigate the implications of a scientific phenomenon for everyday life, or investigate particular phenomena, or demonstrate understanding of particular scientific knowledge. Before the review, earlier achievement standards focussed more on scientific content without students necessarily having to make links to everyday life, but since the redevelopment of standards, the majority now focus on links made to the real world, to reflect the New Zealand Curriculum. This has posed assessment challenges to science teachers eg. the management of time is difficult, as more teaching time is now used up by internal assessment tasks, when compared to pre-NCEA days (Hipkins, 2013). The temptation to "teach to the test/task" is high when teachers feel time pressure or feel they may be judged based on the success of their students. As well as this, the task of providing engaging and authentic opportunities (assessment tasks), which enable students to provide evidence of their learning, is challenging and requires teachers to have a high level of assessment literacy.

Table I : Matrix of Level 1 science achievement standards (taken from www.nzqa.org.nz)

NCEA LEVEL 1			
Physical World	**Material World**	**Living World**	**Planet Earth & Beyond**
AS90940 **Science 1.1** Demonstrate understanding of aspects of mechanics 4 credits External	AS90944 **Science 1.5** Demonstrate understanding of aspects of acids and bases 4 credits External	AS90948 **Science 1.9** Demonstrate understanding of biological ideas relating to genetic variation 4 credits External	AS90952 **Science 1.13** Demonstrate understanding of the formation of surface features in New Zealand 4 credit Internal
AS90941 **Science 1.2** Investigate implications of electricity and magnetism for everyday life 4 credits Internal	AS90945 **Science 1.6** Investigate implications of the use of carbon compounds as fuels 4 credits Internal	AS90949 **Science 1.10** Investigate life processes and environmental factors that affect them 4 credits Internal	AS90953 **Science 1.14** Demonstrate understanding of carbon cycling 4 credits Internal
AS90942 **Science 1.3** Investigate implications of wave behaviour for everyday life 4 credits Internal	AS90946 **Science 1.7** Investigate the implications of the properties of metals for their use in society 4 credits Internal	AS90950 **Science 1.11** Investigate biological ideas relating to interactions between humans and micro-organisms 4 credits Internal	AS90954 **Science 1.15** Demonstrate understanding of the effects of astronomical cycles on planet Earth 4 credits Internal
AS90943 **Science 1.4** Investigate implications of heat for everyday life 4 credits Internal	AS90947 **Science 1.8** Investigate selected chemical reactions 4 credits Internal	AS90951 **Science 1.12** Investigate the biological impact of an event on a New Zealand ecosystem 4 credits Internal	AS90955 **Science 1.16** Investigate an astronomical or Earth science event. 4 credits Internal

Table II: Summary of Level 1 science standards with summary criteria

	NCEA Level 1 Science Achievement Standards (4 credits each)	**Meeting achievement criteria involves students:**
Externally assessed by end-of-year NZQA examinations (Most schools choose these 3 standards)	90940 Demonstrate understanding of aspects of mechanics	*Demonstrating understanding of aspects of mechanics and may include using methods when solving related problems Ability to carry out calculations, description and explanation incl. graphical interpretation.*
	90944 Demonstrate understanding of aspects of acids and bases	*Demonstrating understanding of atomic structure, particle theory and rates of reaction relating to acids and base properties, uses and reactions. Ability to use chemical language,description and explanation incl. graphical interpretation*
	90948 Demonstrate understanding of biological ideas relating to genetic variation	*Demonstrating understanding of biological ideas relating to genetic variation. Making connections between concepts*

Internally assessed during the year by teachers using teacher made tasks or modified NZQA assessment resources (Most schools choose 1- 4 of these standards)	90941 Investigate implications of electricity and magnetism for everyday life 90942 Investigate implications of wave behaviour for everyday life 90943 Investigate implications of heat for everyday life 90945 Investigate implications of the use of carbon compounds as fuels 90946 Investigate the implications of the properties of metals for their use in society 90947 Investigate selected chemical reactions* 90949 Investigate life processes and environmental factors that affect them 90950 Investigate biological ideas relating to interactions between humans and micro-organisms 90951 Investigate the biological impact of an event on a New Zealand ecosystem 90955 Investigate an astronomical or Earth science event	*Investigating a phenomenon by the generation/gathering/use of data from primary and/or secondary sources, and communicating the findings and results of their investigations. No restrictions exist on how communication occurs.* *Links between concepts, and analysis is required for higher levels of achievement. An emphasis on the practical outworking of scientific phenomena in everyday life is required to be communicated.* **Only 90947 insists on experimental work as a compulsory component, although other standards suggest primary sources of data be used.*
	90952 Demonstrate understanding of the formation of surface features in New Zealand 90953 Demonstrate understanding of carbon cycling 90954 Demonstrate understanding of the effects of astronomical cycles on planet Earth	*Demonstrating understanding by communicating key scientific ideas evident in the phenomenon under study. Scientific knowledge can be gathered by a number of means. Links between key ideas, phenomena are required for higher levels of achievement.*

Research conducted to investigate the standards-based assessment of scientific inquiry through an earlier science achievement standard 90186 Carry out a practical science investigation with direction showed that the teaching leading up the assessment was affected (Hume, 2006; Moeed & Hall, 2011). In both of these studies, it was shown that teachers ended up focussing on a very narrow skillset with their students, and basically "practising" for the assessment, rather than helping students understand that science is predicated upon investigation, by allowing them to be involved in a wide range of investigations. The current internal achievement standards are different from 90186 in that they encourage practical work in the context of a real life scenario. Teachers who design tasks and make judgements about students' work for these new standards, must employ their assessment literacy in order to enhance quality assessment.

Focus area model

The second section of this paper focusses on the approaches taken by teachers that are more likely to result in high quality assessment. The example of assessing Level 1 NCEA science achievement standards has been chosen to illustrate these approaches, as NCEA Level 1 science is compulsory for most for 15-year-old students. However, the issues raised are applicable to the assessment of other levels of science. As has been discussed, New Zealand secondary science teachers have the responsibility for both teaching and assessing the majority of the science curriculum science at NCEA Level 1. There are advantages in teachers directly assessing students' work. Teachers who do this are able to assess processes of learning as well as outcomes; they can allow students to play some part in the assessment of their learning; and they can use evidence collected and used formatively for summative purposes (Harlen, 2010). However this is also a high stakes exercise and teachers can find themselves narrowing their students' experiences to align with assessment tasks, especially if they feel they are being judged by their students' performances (Hume, 2006; Moeed & Hall, 2011).

A focus area model for quality assessment in science was developed through the synthesis of assessment literature with consideration of the list of competencies developed by Brookhart (2011), together with views of assessment from the perspective of socio-cultural theory (Edwards, 2013). The quality assessment focus area model used here, helps teachers focus on broad key aspects of quality assessment whilst teaching science. Using this model keeps the focus on teaching and learning, and prioritises teachers' assessment literacy, rather than focussing on "teaching to tests". The five focus areas of: teaching, students, evidence of learning, future decision making, and impact, are linked to the internal NCEA science standards, to illustrate how concurrent consideration of these focus areas could improve the quality of a teacher's teaching and assessment practice.

Focus on teaching

The importance of a focus on teaching is based on the premise that good planning is a pre-requisite for good teaching and good assessment. The use and communication of clear learning intentions and achievement criteria for each topic, and direct links between the focus of the learning and what is assessed are critical (Brookhart, 2011; Kennedy, 2008). For quality assessment in NCEA, New Zealand science teachers must clearly communicate the purposes of various assessment activities, and in

particular show students how these link to learning objectives, and to the achievement standards. Clarity will allow for improved student achievement and engagement (Absolum, 2006).

A number of the internal achievement standards for NCEA centre on investigating what the implications of science concepts are for everyday life or society (AS90941, AS90942, AS90943, AS90945, AS90946). This means that as part of their focus on teaching, teachers need to consider how students best learn about topics such as electricity, wave behaviour, metals, etc, and they need to plan their teaching in order to help students make clear links between the scientific concepts they learn in the classroom, and what they experience in everyday life. Implicit in this planning is the need for methods of investigation and the nature of scientific investigation (as part of NOS) to be taught and experienced. In three of the achievement standards (AS90952, AS90953, AS90954) students have to be able to demonstrate understandings of particular phenomena, so teachers need to communicate that this is an aim of the teaching programme, and need to explicitly teach the ways that students could demonstrate their understanding.

One way of becoming more explicit in this focus area of teaching, is by the use of Content Representations (CoRes) and Pedagogical and Professional-experience Repertoires (PaP-eRs), which have been shown to be help teachers specifically identify and depict components of their pedagogical content knowledge (Hume, 2010; Hume & Berry, 2010; Loughran, Berry, & Mulhall, 2006). CoRes represent the special knowledge held by expert teachers around a specific science topic and include " the key content ideas, known alternative conceptions, insightful ways of testing for understanding, known areas of confusion, and ways of framing ideas to support student learning" (Loughran, Mulhall, & Berry, 2008, p. 1305), whereas PaP-ers are the narrative accounts of this knowledge in action. In the initial planning stages these strategies may be particularly helpful when there is an added focus on the skills requirement for the assessment of the topic under consideration. The effectiveness of "plotting a course between the domain of learning and the assessments selected to embody it" (Brookhart, 2011, p. 6) depends on the way students learn as well as teachers' deep understanding of NOS within the content area. With a focus on teaching, careful and thorough planning, and the communication of clear learning intentions, the teacher is better able to help students learn science as the curriculum intended, rather than just teaching to a test. This will lead to broader and deeper learning, which will in turn lead to the students being

more able to demonstrate their knowledge and skills in the assessment tasks they are presented with.

Focus on students

Focussing directly on students, and their particular aptitudes, prior learning, interests, and needs, means that teachers are able to build a learning relationship with their students. New Zealand science teachers do have considerable freedom in the design of assessment activities for the gathering of evidence of learning from their students. This means that they can incorporate their own students' interests and strengths into their teaching, and plan assessments that are responsive to their students' beliefs, values and experiences. At the same time they can be gathering reliable evidence that can be assessed against the relevant achievement standards. For example students living at a beach, who enjoy surfing, may well be given tasks that focus on ocean waves when teachers are assessing against the standard: 90942 *Investigate implications of wave behaviour for everyday life*. This context is more likely to engage the students. Or students living near the Tiwai smelter (an Aluminium smelter in New Zealand) may be able to use the knowledge of family members working in the industry, and a site visit as part of an investigation of the uses of aluminium for 90946 *Investigate the implications of the properties of metals for their use in society*. This personalisation and focus on individual classes or even students, as opposed to using run-of-the-mill tasks aimed at the "average New Zealand student", improves the quality of the assessment, as students are more likely to be fully engaged in the assessment activity.

By focussing on their students, science teachers can share power in the classroom through the co-construction of assessment tasks (within the constraints of the achievement standards), thus giving them a part to play in the assessment process. This means assessment tasks that take account of students' strengths, interests, culture and language can be developed within the NCEA system. The moderation system that operates for NCEA for quality control means the accuracy of assessment judgements will not be compromised by doing this. The evidence of learning is compared to the criteria in the achievement standards when judgements about competency are made. It is the student-generated evidence that is important, rather than the means by which it was generated, as will be discussed in the next section.

Focus on evidence of learning

Part of a teacher's assessment literacy is their ability to work out the mechanism to best assess the learning of their particular students. For this to be done to best effect there are very specific principles of assessment that need to be applied. NCEA summative assessment is high stakes assessment and as such the internal assessment components need to be carried out in ways that maximise reliability and validity. During the teaching of any science topic a range of assessment is used for a range of purposes. For example a teacher preparing to teach a unit on chemical change, who will eventually assess students against standard AS90947 *Investigate selected chemical reactions may use a pre-test for diagnostic purposes* so that she can plan the unit based on prior knowledge of the students. She may then use a range of practical, on-line and paper-based tasks during the course of teaching/exploring the unit, from which further information will be gathered to help her refine her planning to provide feedback to students about their learning and to better meet the needs of the students. This formative assessment is central to her teaching but will include gathering evidence of student learning and progress, some of which may be used for summative purposes. In some cases, if appropriate authentic evidence is gathered and documented, the teacher can use it for assessment against the achievement standard. She will use summative assessment tasks at the end of the unit on chemical reactions in order to give students final chances to show evidence of their knowledge and skills. The final outcomes of the judgements she makes will be reported to students and NZQA, as summative outcomes, but may also be used in a department review to further inform the effectiveness of the teaching for next year (thus using summative assessment formatively). Throughout the whole process of preparing for and teaching the unit, the better the teacher's understanding and use of assessment, the better the outcomes for her students (Harlen & Gardner, 2010).

The New Zealand NCEA assessment system allows for teachers within individual schools to design assessment activities, so teachers can quite freely decide on item types (eg short answer tests, posters, seminars, websites, essays, reports, on-line quizzes etc) which allow their students to communicate their learning. As part of a focus on evidence the selection of item types needs to be made following thoughtful consideration of the ways in which items will allow students to best provide evidence of their learning. This may mean for some groups in a class an oral report is made, rather than a written report, because of the strengths of the students being assessed. Group assessments can be carefully crafted so that individual students' learning can be assessed through group processes, particularly if group work is the way students operate best. As long as authenticity of students' individual work is assured, this flexibility can allow students to demonstrate their learning more naturally.

When assessing a standard like 90949 *Investigate life processes and environmental factors that affect them*, teachers must consider whether their students are more likely to show their learning by completing a practical investigation generating primary sources of data, or by using secondary sources, and which contexts might be most engaging for the students. As well as this they need to consider how best to scaffold the recording and communication of their investigation (is a report best or would the production of a short documentary or webpage better suit the purpose?) The item types need careful consideration to ensure students are best able to provide evidence of their learning. For example, is a series of short answer questions more helpful than an open assignment where students have to prepare an essay? The expertise of the teacher is very important here, as assessment task design now needs to include elements of NOS. To allow for excellence grades, teachers need to know how best to prepare tasks that allow for comprehensive investigations, so there is a need for the types of questions which require a higher cognitive demand to be included in the task design.

Focus on future decision making

The summative results that students generate through being assessed against NCEA achievement standards could well have an impact on decisions they themselves, or others around them, make about their future. This means there is an onus on teachers to make their summative judgements fairly and accurately, and to communicate these to students and other stakeholders. For example, in the final two years of senior high school science, students will be placed in specialist science classes (eg biology, chemistry, physics), and entry to these classes is often based on students' results in Level 1 NCEA science. This example highlights the importance of teachers choosing appropriate achievement standards to assess students for Level 1 NCEA.

Care needs to be taken to ensure that decision making about the future is done with due diligence, and with students' best interests at heart. For example, decisions about which science achievement standards to use in a particular year by a may be influenced by the past results and the interests of students but also by the teachers' knowledge of what makes a well-balanced curriculum. The balance of internal to externally assessed standards may also make a difference to student outcomes and hence to decisions that are made for those students. Another consideration is that students need to be able to interpret their own NCEA results and use their assessment information to make sound judgements. This is part of the students' assessment capability.

Focus on impact

Quality assessment in science involves consideration of the impact that the assessment will have both on individuals and on school programmes. Teachers need to think carefully about the views students have about themselves as scientists/investigators, so they can set up activities that encourage and interest their students. In this way students will not feel that science is of no interest or use to them. In the internal achievement standards AS90450-AS90455 this will mean the careful teaching of investigation skills and techniques, data gathering and synthesis of ideas so that students are fully engaged equipped to investigate phenomena as required, as well as understanding the NOS. Given the breadth of the achievement standards, some negotiation of focus topics may help students engage in their assessment, and may result in a positive impact on their grades. The impact of successful investigations may well be that the students carry on studying the sciences in senior secondary school and at tertiary level.

Because New Zealand is a multi-cultural and multi-ethnic country, teachers need sensitivity and awareness to ensure that the beliefs of students are honoured and acknowledged, so as to lessen any negative impact that might occur when introducing scientific concepts.

Summary

Quality assessment is an integral part of good teaching practice and teachers need to know what to focus on in order to ensure their assessment of student learning is accurate and useful for the student's ongoing learning and development. The identification of five focus areas for teachers to use when considering their assessment practice enables both technical and sociocultural aspects of assessment to be acknowledged and valued.

By focussing on teaching, science teachers in New Zealand are able to consider the content carefully, decide on how best to integrate this with the nature of science and with engaging contexts, so as to inspire and motivate students to learn. A focus on the students themselves allows teachers to tailor their programmes more appropriately and to plan assessment tasks that are more likely to intersect with the interests of their students. The evidence of learning needs to be a focus for science

teachers in New Zealand, as this evidence is generated by their students in response to tasks they design. Matching students' strengths to the design of tasks allows students to better show their learning. Consideration by teachers of the future decision-making made by teachers and students motivates a careful approach to assessment. Similarly a focus on the potential impacts that assessment can have on students helps teachers be more aware of the diversity in their classes and to be responsive to this.

When considering the complexity of teaching science to a wide range of students and then assessing their learning in meaningful and authentic ways, particularly in a system such as the one in New Zealand, having a framework to direct teachers' focus is useful. The focus area approach helps teachers maintain a balance between formative and summative purposes for assessment, and it is hoped that their reflection on these areas will encourage the ongoing building of assessment literacy.

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