Unlocking the Formative Potential of NCEA

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ABSTRACT

This article examines the formative potential of New Zealand's exit qualification from secondary school, the National Certificate of Educational Achievement (NCEA). Drawing on findings of a study conducted in a senior mathematics classroom it asks the question: To what extent can high-stakes assessment be used to formatively direct and influence students' learning? The article argues that, when a distinction between the gathering and the interpretation and use of assessment evidence is established, the formative function of assessment tasks need not be incompatible with high-stakes summative assessment.

BACKGROUND

In 2002, the New Zealand Qualifications Authority (NZQA) commenced the implementation of a new Standards-Based Assessment (SBA) system—the National Certificate of Educational Achievement (NCEA)—as the principal summative exit qualification from secondary school. Integrated into the last three years of secondary school, NCEA is comprised of a combination of internally assessed standards completed during the course of the year, and externally assessed standards completed at the end of the year.[1] Despite lengthy calls for changes to the existing assessment systems (Lennox, 2001; Strachan, 2001) the introduction of NCEA has arguably been the most contested educational reform in the senior secondary school in recent times. Certainly the negative commentary associated with NCEA has far outweighed the positive commentary in the media.

The discourse surrounding NCEA emphasises its role as a summative assessment system. Research has identified, however, that formative assessment rather than summative assessment has the greatest potential to direct and enhance learning (e.g., Black & Wiliam, 1998; Carr, McGee, Jones, McKinley, Bell, Barr, & Simpson, 2000; Crooks, 1988; Natriello, 1987; Sadler, 1989). Moreover, summative and formative assessment practices are often in tension and an emphasis on the summative role can marginalise the use of formative assessment strategies by teachers and students. Formative assessment is not well understood by many teachers and successful implementation of formative assessment

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[1] There are two types of assessment Standards; Unit Standards and Achievement Standards. Unit Standards are awarded either a 'Not Achieve' or 'Achieve' grade. Achievement Standards are awarded either a 'Not Achieved', 'Achieved', 'Achieved with Merit' or 'Achieved with Excellence' grade. For further information refer to www.nzqa.govt.nz.

practices is not widespread in secondary school classrooms (Black & Wiliam, 1998; Crooks, 2006; Wiliam, Lee, Harrison, & Black, 2004). Large class sizes and heavy workloads can lead teachers to believe that while formative assessment is a nice idea in theory it risks being "somewhat impractical, too time-consuming and hence incompatible with the demands of schooling" (Carless, 2007, p. 173).

Although summative and formative assessment are often thought of as mutually exclusive, Black and Wiliam (1998) suggest that they might be more usefully thought of as ends of a continuum along which all assessment lie. This raises the question of what structural and philosophical characteristics are necessary for an assessment system to satisfy both the formative and the summative roles of assessment, and does the NCEA satisfy these characteristics? What potential exists for New Zealand's high-stakes summative assessment system to be used to formatively direct and influence students' learning?

The interaction between assessment and learning has been heavily debated over the last 20 years. Whilst in the past, assessment was viewed as the endpoint to learning it is now regarded as integral to learning. This is reflected in New Zealand's educational policy. For example, the New Zealand Curriculum states that "[t]he primary purpose of assessment is to improve students' learning and teachers' teaching as both student and teacher respond to the information that it provides" (Ministry of Education (MoE), 2007, p. 39). Similarly, when the NCEA was officially launched in 2001 both the Minister of Education and NZQA officials argued that it was strongly underpinned by a philosophical position of enhancing students' learning. "All of this is about learning first. NCEA results are a consequence of enhanced learning opportunities" (Meek, 2001, p. 4). The NCEA provides schools with an "enhanced flexibility…to offer broader and deeper learning for all students" (Mallard, 2001, p. 5). Despite this political rhetoric, for many teachers, assessment remains an addition to, rather than an integral part of, learning, with few formative assessment opportunities for students (Crooks, 2006; Wiliam, Lee, Harrison, & Black, 2004).

The central argument in this article is that in addition to providing summative information on students' progress, the NCEA has the potential to provide a wealth of formative information that can be used to direct and enhance students' learning. The use of the term 'summative' and 'formative' assessment can give the impression that these are different types of assessment events. Rather, these terms more correctly apply, not to the assessments themselves, but to the functions they serve. As such we can make a distinction between the gathering of assessment evidence and the interpretation of that evidence. Assessment gathers information about current levels of achievement for a student. It is the interpretation of the information gathered, and the subsequent action taken, that determines whether it serves a formative or a summative purpose, or potentially both. When we administer a test or mock exam we intend to interpret the information summatively to judge whether the student has reached the desired standard, as well as formatively to help the student in future learning opportunities. In this regard, many of the NCEA based assessments that students sit during the course of the year potentially serve a duality of purpose. This duality is best achieved by designing assessment systems primarily using formative assessment principles. A

summative grade can always be ascribed to an assessment task that is designed primarily as a formative tool, but not necessarily visa-versa.

The following section discusses the methodology of a larger study undertaken to examine the formative potential of the NCEA (Rawlins, 2007). This section also introduces a theoretical framework for formative assessment developed by Sadler (1989). This framework is then used in the subsequent sections to examine the formative potential of the NCEA: illustrating the discussion with findings from the author's doctoral research. The article concludes by discussing a number of potentially undesirable outcomes of high-stakes assessment systems that should be mitigated against if we are to remain focused on students' learning.

THE STUDY

In order to investigate perceptions of the formative potential of the NCEA, a case study research project was conducted. Three Y12 mathematics classes from a medium to large (1300 students) decile 7[2] urban secondary school formed the case study singularity. Contemporary literature argues that assessment practices designed to be formative can only be considered so if the student actively engages with the process. As such, this research primarily focused on the students' perceptions of the formative assessment strategies they were exposed to. Classroom observations and focus group interviews with the nine case study students were conducted throughout the year. Additionally a quantitative questionnaire was administered to the three mathematics classes to gather further evidence and to gauge the focus groups representativeness of the wider cohort of students. To contextualise the students' perceptions, and to provide the teachers' perspectives, a focus group interview and ongoing dialogue with the teachers also formed part of the data gathering phase of the project. This research project specifically focused on the interactions resulting from structured formal assessment events that form part of the students' progress towards the NCEA. This includes topic assignments, end of topic assessments, and the written and oral feedback offered to students subsequent to these assessment tasks.

This research project used a framework developed by Sadler (1989) to explore the potential for the NCEA to provide effective formative assessment in mathematics classrooms. Sadler's framework consists of three key characteristics necessary for assessment systems to be considered formative. Notably, he stated these characteristics from the students' perspective. Sadler's three key components require that the student has to:

> (a) possess a concept of the *standard* (or goal, or reference level) being aimed for, (b) compare the *actual* (or current) *level of performance* with the standard, and (c) engage in appropriate *action* which leads to some closure of the gap. (p.121, emphasis in original)

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[2] The Ministry of Education uses a decile rating system for school funding purposes. Each decile contains approximately 10% of schools. Schools in decile 1 have the highest proportion of students from low socio-economic backgrounds. Schools in decile 10 have the lowest proportions of students from low socio-economic backgrounds.

This framework provides an organisational structure for the discussion that follows. Findings from the author's doctoral project are discussed and some suggestions for improving formative assessment practices are made.

ASSESSMENT CRITERIA

The provision of assessment criteria in the Achievement and Unit Standards is consistent with Sadler's (1989) first characteristic for effective formative assessment. Effective knowledge of assessment criteria focuses students' and teachers' attentions on important learning objectives and helps students to monitor and regulate their progress towards the assessment standard. The main findings from this project, however, identified that students often had a limited and underdeveloped knowledge of the assessment criteria for the assessment standards they were working towards. This limited understanding restricted students' independent use of self-assessment strategies to monitor and regulate their learning. Furthermore, an underdeveloped knowledge of the assessment criteria potentially reduced students' ability to understand and engage with feedback provided to them.

Students in this project primarily developed their knowledge of the assessment criteria from two sources: The structure of the units of mathematics work and the provision of the 'I can do' sheets[3]. Within the research classrooms the teaching and learning of the units of mathematical content were structured around the assessment criteria for the assessment standards, starting with material consistent with the 'achieve' level criteria and progressing through to 'merit'[4] and 'excellence' level material. In many instances, however, excellence material was not actively taught: the responsibility to master excellence material often being left up to the individual student. The assessment of students' readiness to progress was informally conducted by the teacher across the whole class rather than on an individual level. Teachers gained a sense of the whole class's understandings based on the social interactions that occurred within the classroom: for example, the number of questions asked by students either in whole-class teaching or when students were doing set work out of the text book or worksheet.

The practice of structuring the unit of work around the levels of the assessment standard was questioned by one of the teachers in the study. "You are allowed to do that aren't you? That's good? Or is that bad?" Conversely, another teacher, Ms Brown, defended the practice arguing that:

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[3] 'I can do' sheets list the assessment criteria for Achievement Standards in student language and are incorporated into the course booklet (the 'Blue Book') given to the students at the start of the year. The 'I can do' sheets were developed nationally by the New Zealand Association of Mathematics Teachers, with schools being encouraged to adapt them to best suit their students.
[4] Comments relating to progressing to merit and excellence material are only relevant for Unit Standards

> [I] trust that the test assesses what they need to know. So it is not a test that is about something that is completely random. Somebody decided prior to me teaching it that this was important, so they put it in the test so I will teach what is in the test.

This notion of 'alignment' between curriculum and assessment, implicit in Ms Brown's comments, concurs with research suggesting that such alignment is both feasible and beneficial to teaching and learning (Biggs, 1998; Clune, 2001; Linn & Herman, 1997; Porter & Smithson, 2001).

Students in this study could also potentially develop knowledge of the assessment criteria through the use of 'I can do' sheets. Significantly, even though these sheets were written in a language designed to be easily interpreted by students, the majority of the research students found it difficult to judge their competence against the given assessment criteria. These students appeared not to gain sufficient understanding of the assessment criteria from their normal classroom work to be able to recognise the criteria from the 'I can do' sheets. This apparent lack of understanding effectively limits the independent use of the sheets for self-assessment purposes. Self-assessment is an important component in the development of increased students' autonomy in learning. Increasing students' autonomy, and the resulting decrease in the reliance on the teacher to address learning needs, has the potential to free up teachers' time to provide targeted assistance when required (OECD, 2005).

During the research project it was noted that some teachers' pedagogical practices may have limited students' development of assessment criteria. In many classes teachers typically identified the achievement level of a mathematical problem, but often did not
make explicit links between the assessment criteria and individual mathematical question or content. For example, a teacher identified a complex quadratic ($x^2+8x=400$) as being a merit question in level 2 algebra. However, students mistakenly believed that this is a merit question because it is a multi-step problem requiring it to be equated to zero before it can be factorised and then solved (actually an achieve level skill). In fact, this is a merit level problem because it requires the use of the quadratic formula, which is not immediately obvious in this example, and was not explicitly pointed out to students. In these instances, students may come to believe that 'harder' questions are at the higher achievement levels of the standard, but may not develop links between specific aspects of the questions and the relative assessment criteria from the standard.

A number of strategies can be suggested to help students understand the assessment criteria they are working towards. Firstly, teachers could initially specify the assessment criteria (e.g., the use of the quadratic formula to solve quadratic expression) and then give a mathematical problem, making explicit links back to the criteria. Secondly, developing the links between specific assessment criteria and mathematical problems could be done as a structured class activity. Students could be given specific assessment criteria and asked to write

mathematical problems consistent with these criteria. These problems could then be given to their peers to see if they can identify the assessment criteria they are designed to exemplify. Thirdly, more proactive in-class use of 'I can do' sheets with links to exemplars could improve students' independent use of these sheets as self-assessment guides.

FEEDBACK

The provision of quality feedback has been widely identified in the literature as an important feature that facilitates students' formative use of assessment information (Black & Wiliam, 1998; Crooks, 1988; Hattie & Timperley, 2007; Kluger & DeNisi, 1996, Sadler, 1989). Students must initially receive and understand this feedback before they will be in a position to engage in appropriate action to positively influence their learning. The findings of this research project highlight a disparity between the teachers' perceptions and the students' perceptions of effectiveness feedback practices. In particular, students expressed a clear preference for written scaffolded feedback while teachers preferred to give whole-class oral feedback of common problems. Students' perceptions of the effectiveness of oral feedback, and engagement with written feedback, will be discussed more in the next section. This section specifically looks at the characteristics of written feedback students found helpful.

Students in this research distinguished between written comments, which they considered feedback, and other indications of achievement, such as ticks, crosses and grades, which they considered of limited formative potential. As one student put it: "Ticks and crosses are not very helpful at all, and neither is just an 'M' on the front". In addition to identifying errors in their work, students expressed the view that feedback should provide scaffolded comments indicating corrective strategies. "I like to know where I went wrong and what I have to do to fix it, rather than just being given the answer". Such task-oriented feedback, indicating the 'next steps' in learning, recognises that students' mathematical knowledge is partial and developing and encourages students to make connections between their existing knowledge and the feedback provided.

The following extract highlights the value students place on scaffolded comments over the practice of providing just the correct answer.

Sally: She gave us just the answers for each of the questions. I found that hopeless. I could not figure out how they got to that answer and I was just sitting there and ...

James: There were a couple of the questions, the really crazy ones, where she did the first bit for us and then told us what to do next, like you need to factorise, expand solve and then ...

Sally: That was good. That was helpful but she didn't do that for all of them.

James: It's like, pointing you in the right direction, you are learning more, whereas, when you just get the answer you are just like, "oh so what". You see where to go, and all of a sudden it kinda clicks into place, and you are like, "oh I see it is just that simple process".

Despite the research students identifying particular characteristics of written feedback that they felt helpful, the teachers reported that they provided limited written feedback. Although marking workload and the desire to return work quickly were consistently identified by the teachers as factors affecting the amount of written feedback given, these factors appeared overshadowed by the teachers' belief that students don't read written feedback. As Ms Clarke put it: "Yeah I'd write more if I really thought the kids would read it."

The teachers in the study were interested to learn about feedback practices that would increase effective learning, and decrease management issues. One of the teachers who indicated that she was uncomfortable with her existing feedback expressed a wish to find out more about effective feedback practices.

> It would be nice to know if they read it, that's true, and especially whether they find written, or personal, or group, or board work as the best delivery of the feedback. I'd be very interested in what would be most effective in terms of our delivery. (Ms Brown)

Interestingly, none of the teachers involved in the research had asked the students directly about their preferences for written or oral feedback.

ENGAGEMENT

Sadler's (1989) third condition for effective formative assessment is that students must engage with the feedback to direct and enhance their learning. Engagement with feedback is a complex and multi-facetted issue. Providing students with valid and reliable feedback about the quality of their work, does not necessarily lead to improvement in learning and achievement. Research has identified that although most mathematics students realise that they should learn from their assessments, the majority "only look at their mark" (Tanner & Jones, 2003, p. 280). In such circumstances students desire to "work out how to do better next time is likely to be restricted to unfocussed targets like 'try harder' or 'be more careful" (ibid, p. 280). The literature claims that students often fail to recognise formative feedback as a helpful signal and guide, and remind us that it cannot be assumed that when students are given feedback they will know what to do with it. Hence, active student engagement with feedback is a critical component of effective formative assessment practices.

As noted earlier, the teachers in this research preferred to give oral rather than written feedback on assessed work. They viewed this as an efficient way of communicating feedback to students. This common feedback practice was usually provided in a whole-class setting concentrating on common mistakes made by the cohort of students. Since students often have limited future access to their marked scripts[5] these oral feedback sessions formed the primary opportunity for students to engage with the oral and written feedback given to them.

Students expressed mixed views when asked about the teachers' practice of providing whole-class oral feedback. Although a small number saw it as valuable

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[5] Students assessed work is often stored by the teacher in individual student folders with limited access by students.

the majority saw the practice of the teacher orally going over large portions of the test to be an inefficient use of time. In some instances this was because: "Going through the entire test is a bit boring if you get the majority of it right", while in other instances: "If you got too many questions wrong it can be a bit overwhelming".

The teachers' observation that many students appeared to be not listening during the oral feedback sessions was interpreted by them as students having limited interested in feedback per se. Conversely, students preferred to engage with the feedback in a different way. However, despite recognising their teachers' openness to answering individual queries, the majority of students indicated a clear preference for working with their peers to develop corrective strategies in the first instance. Students reported that after a brief initial discussion of the grades received by their peers their conversations quickly turned to discussions of particular questions on the assessment task. They would discuss questions with their peers in an attempt to understand how the written feedback related to their work, and also see if anyone knew how to answer the question and could help them understand it.

The finding that students prefer to initially work with their peers to engage with written feedback does not preclude the use of oral feedback. It does, however, require an examination of the timing of the delivery of such feedback. Students in the current study preferred to use teacher help only when they could not identify errors and how to correct them from the written feedback. It could be conjectured that students' reluctance to ask their teacher for help is, in part, because they have had insufficient time to examine the feedback, discuss it with their peers, and identify whether they need to ask any questions of the teacher. In an analogous way to the value of 'wait time' following teachers' questions, a delay in teachers asking for questions could encourage students to critically analyse the written feedback, and help them to be in a better position to ask more focussed questions of the teacher. This might, in turn, help teachers develop awareness of particular characteristics of their written feedback that are clearly understood or, perhaps more importantly, not understood by students.

In the previous section it was noted that the research teachers tended not to give written feedback, in part because they believed that students did not read it. In contrast, the students argued that they did read and engage with the written feedback provided. Responses from the quantitative survey reveal that the students claimed that they read the feedback and tried to relate it to their assessed work. This was confirmed in the focus group interviews where most students reported that they were interested in looking at the questions they found difficult, and the associated feedback. Interestingly, students often talked about particular pieces of feedback they had received despite not having their assessed work in front of them. A subsequent check of the assessed work revealed a high degree of correlations between students' recollections of the feedback and the actual feedback provided by the teacher. This was seen as clear evidence that the students did indeed actively read the feedback.

Of particular note in this project was that student engagement with feedback was independent of whether the assessment carried any credit value, or whether the students would be assessed on that work again during the year. Most students

appeared to have an inherent interest in knowing 'what they did wrong' and 'what they should have done to get it right': "I am interested to see where I went wrong because I get frustrated when I can't do something in a test and spend ages thinking about it".

From these findings two strategies to improve students' engagement with formative feedback are suggested. Firstly, students could be exposed to structured in-class activities where students are taught how to interpret and use the feedback offered. For example, students could be tasked to find out which of their classmates knows how to answer the questions they got wrong, correct their answers, and then hand them back in. These scripts could then be peer marked against the marking schedule with help from the teacher. Finding enough people who know how to do the excellence questions may be a problem, and this is where whole-class oral feedback, given by either the teacher or a student, could work well.

Secondly, initially providing students with formative comments without grades has been shown to encourage students' engagement with feedback (Butler, 1988). Formative comments, well written, can convey sufficient information to the student about the quality of their work and how to improve it. Students can then be given their grades at a later time.

A CAVEAT

The previous three sections have argued that the NCEA is consistent with the Sadler's (1989) three characteristics necessary for as assessment system to be used to formatively direct and enhance students' learning. However, the provision of an assessment system consistent with formative principles will not guarantee improvement in formative assessment practices. The underlying philosophical principles need to be incorporated in teachers' everyday pedagogy. This research has identified a number of teachers' and students' practices that could be modified to more fully realise the formative potential of the assessment system.

There are also a number of potentially undesirable outcomes that could result from the introduction of NCEA that should be acknowledged. As teachers we should be aware of these outcomes so that we may mitigate against them if we are to remain focused on students' learning. Firstly, the identification and division of a set of assessment criteria split into achievement levels has the potential to negatively impact on learning and teaching in a number of ways. Critics of SBA have highlighted the potential for atomisation of the curriculum. This atomisation potentially restricts teachers' and students' opportunities to make connections between related mathematical content and strategies. NZQA is currently in the process of realigning some of the mathematics standards to assess students' ability to solve 'types' of mathematical problems by a range of techniques, rather than assessing particular content based areas. While it remains to be seen whether this realignment will reduce the perceived atomisation of the curriculum it should be noted that Achievement and Unit Standards are units of assessment, not units of learning. While organising learning plans around individual standards may be appropriate for some topics (e.g., level 1 Trigonometry), it may be more

beneficial to integrate the content of several standards into the teaching of other topics (e.g., geometric techniques and geometric reasoning), even though they may ultimately be assessed at different times.

Secondly, the identification of achievement levels within achievement standards may encourage some students to limit their learning to material based on the Achieve level of the standard. Recent research into the impact of NCEA on student motivation (Meyer et al., 2006), identified two main student motivations identified as 'doing my best' and 'doing just enough'. While acknowledging that the structure of the NCEA encouraged some students to adopt a minimalist approach, with little incentive to do more than the minimum 80 credits or to aim for the higher grades of merit and excellence when these carried no extra credits, their research suggests a negative relationship between the motive to 'do just enough' and the number of credits achieved:

> This may mean that many of them will not obtain enough credits to actually get by, because people do not always achieve exactly what they aim for. So students aiming to do just enough may actually fail to achieve their goal, not because they lack the required ability but because their motivation orientation leads them to achieve less than they are capable of. If these same students are motivated to do their best, they are more likely to pass the required number of credits, and also obtain merit and excellence grades. (p. 2)

In essence, if we encourage our students to maximize their learning opportunities, then they are more likely to be acknowledged for that learning through higher grades and more credits.

Lastly, the flexibility offered under NCEA to design courses with any number or combination of assessment standards can be considered both a strength and a weakness of the assessment system. Its strength lies in the ability of schools to offer broader and deeper learning for all students. However, many schools have chosen to provide for able students' learning needs by increasing the number of standards that students sit in order to maximise the number of credits students receive, rather than maximising students' achievement levels in a smaller number of standards (Hipkins et al., 2007). It could be argued that these schools are offering 'broader', but not 'deeper' learning opportunities for students. Offering a larger number of standards increases the number of assessments students must sit, and reduces the time to teach any given standard. This over-assessment has been identified as a major factor negatively influencing students' approach to learning (Hipkins et al., 2007). The recent introduction of 'merit' and 'excellence' endorsements on NCEA level certificates will hopefully encourage schools to reduce the number of credits offered in a given course and increase their motivation to master the content to a high level.

While a number of potentially undesirable outcomes for learning and teaching are acknowledged, it should be noted that these are not inevitable consequences of the introduction of the NCEA. NCEA is an assessment system designed to support teaching and learning. The decisions of *what* and *how* to teach are

essentially school decisions—with guidance from the New Zealand Curriculum (MoE, 2007). Accordingly, schools and teachers have a high degree of freedom to utilise the formative potential of NCEA to direct and enhance students' learning.

CONCLUSIONS AND IMPLICATIONS

This article has examined the philosophical and structural design of the NCEA and identified that a strong potential exists for it to satisfy both the summative and formative purposes of assessment. The explicit nature of assessment criteria inherent in SBA focuses students' and teachers' attention on important learning objectives. This focus potentially enhances the effectiveness of task-oriented feedback, identifying gaps between students' current and desired achievement levels, with clear indications of the 'next steps' in learning. Students must then engage with the feedback to strengthen their understanding, with the nature of the feedback and the culture of the classroom, being critical to effective engagement. Teachers play a major part in establishing and maintaining an appropriate assessment culture, however they should be cognisant of students' preferences. Task-oriented written feedback that scaffolds students' future learning and a clear preference for working with their peers in the first instance were consistently identified by the students in this study as preferred feedback practices.

It should be noted, however, that a move towards using models of assessment that promote learning will not in itself bring about changes in teaching and learning. It is not enough that we have an assessment tool that potentially allows for a formative model of assessment to become the norm in New Zealand classrooms. Teachers must be supported with appropriate professional development and research. As Harlen (2005) notes, "it takes a good deal of support—and courage—for teachers to turn round their practices from being test-oriented to being learning-oriented (p. 210). However, if we can achieve this then the perception of the role of the teacher can change from being the "judger of student competence' to the 'guider of students' learning" (Crooks, 2006).

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