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Designing for empowering curriculum implementation: The potential of "enduring competencies"

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International advocacy for future-focused curriculum design often centres on the idea of "competencies" or "capabilities" as potentially transformative constructs for high-level curriculum frameworks. This trend is exemplified by the addition of "key competencies" to the 2007 New Zealand Curriculum. Despite good intentions, this structural change appears to have made minimal difference to the learning that many students experience, or to the assessment practices used to evaluate that learning. With a Curriculum Refresh currently underway, now is an opportune moment to revisit the use of competencies as a lever for curriculum change and ask how the type of transformative change they are intended to stimulate might be conveyed and implemented in more empowering ways.

This paper introduces the idea of "enduring competencies" as an umbrella construct for more effective curriculum design conversations. Learning from what has proved problematic in the past, we show how this construct might refocus thinking about purposes for learning, while at the same time being more specific about how and why traditional curriculum "content" might need to change. We illustrate this potential by drawing on our recent collective endeavour to build a small set of enduring competencies for school science education. The paper briefly outlines these four enduring competencies and demonstrates how they build bridges between past (more traditional) and future-focused (more transformative) curriculum and assessment design for the science learning area.

Introduction: Curriculum and assessment as policy levers for educational change

The four authors of this paper share an interest in the dynamics of interactions between curriculum and assessment, particularly in the contexts of science, mathematics and statistics, and environmental/sustainability education, with mātauranga Māori (Māori knowledge) as an entangled curriculum and pedagogical consideration. Faced with

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increasingly rapid societal and environmental changes, and wicked problems such as the spread of disinformation, climate change, and managing a health pandemic, we share a sense of urgency around the need to pay more than lip service to the transformation of the education that students experience at school. It is imperative that they are educated for the wider societal good as well as for their own futures.

Advocacy for moving on from a 19th-20th century model of schooling is hardly new (e.g., Gilbert, 2005). As Jane Gilbert explained, the traditional Western model of schooling is underpinned by industrial metaphors such as efficiency and batching of students to achieve pre-specified universally relevant outcomes, with a predominant focus on what students should *know about* if they are to be considered educated. A curriculum that serves this model is comparatively easy to assess because the same set of metaphors applies: one-size-fits-all examinations are the time-honoured assessment approach. Transforming this model to better meet current educational needs of our young people has certainly proved easier said than done.

Given the entrenched nature of these familiar systems and the mainly tacit metaphors that underpin their organisation, how might we even begin to prompt meaningful change in curriculum and assessment systems? Before suggesting new approaches, we briefly canvass one strategy that has already been tried without apparent success. Much international advocacy for future-focused curriculum design has centred on the idea of introducing "competencies" or "capabilities" to national curricula (e.g., Organisation for Economic Co-operation and Development, 2005). Over multiple iterations of the basic concept in subsequent years, the Organisation for Economic Co-operation and Development (OECD) has continued to promote competencies as transformative elements of high-level curriculum frameworks (e.g., Organisation for Economic Co-operation and Development, 2018). In the most recent iteration of their 2030 "learner compass" they explicitly name the following as transformative competencies: taking responsibility; adding new value; and reconciling tensions and dilemmas. These are to be layered onto "core foundations" – which is presumably a reference to traditional curriculum content. However, it is not clear how the implied transformation of the learning that students experience might be practically effected.

The addition of key competencies in 2007 to the New Zealand Curriculum (NZC) (Ministry of Education, 2007) is an example of a national response to this type of advocacy for change (Hipkins, 2018). Despite good intentions, this structural change to New Zealand's national curriculum framework appears to have made minimal difference to the learning that many students experience (McDowall & Hipkins, 2018; Education Review Office, 2019), or to the high-stakes assessment practices used to evaluate that learning (e.g., Johnson et al., 2022; Moeed, 2010). With a Curriculum Refresh currently underway, now is an opportune moment to revisit this policy lever and ask how high-level indications about new directions for curriculum change might be more effectively conveyed and implemented.

A series of case studies of early uptake of the NZC documented how tentative steps towards using key competencies to change the nature of the learning that students experience was disrupted when new assessment policies cut across fledgling curriculum change. The Curriculum Implementation Exploratory Studies (CIES) were only partly completed when National Standards were introduced to primary schools (years 1-8), disrupting curriculum change journeys and creating new worries about a narrowing of the traditional curriculum (Hipkins et al., 2011). At the same time, new targets to ensure that 85% of all students in a school achieved an NCEA level 2 award entrenched (tacit) thinking

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that the senior secondary school years are largely about gaining credits/passing NCEA and hence the "curriculum" is set by the content of the achievement standards. This dilemma is captured in the following response to an open question about this policy in the NZCER National Survey of Secondary Teachers:

> The management are sceptical about the targets and foresee more dumbing down and school cheating on their results, which they already believe happens anyway. The credibility of the proposed changes is seriously doubted and therefore little energy is being spent on how to lift the achievement. In my opinion the most critical changes must take place at Years 9 and 10. The depth and quality of the foundation determines the height and quality of the building that can be erected. Some school managers need to realise that they have the capability and resources to make the changes that are necessary—what is lacking is vision. (Teacher response in Hipkins, 2013, p. 69)

It seems obvious that assessment and curriculum policy need to work together rather than cut across each other. Some teachers seem able to see past mixed messages, finding ways to design potentially transformative learning experiences for their students, but other teachers need more explicit support and guidance to realise the transformative potential in the curriculum (Wood & Sheehan, 2022). The other important message in this very brief overview is that transformative change is unlikely to be achieved in the absence of compelling, coherent narratives about why that change matters — in the above teacher's perspective, a vision cannot be lacking. These are the intertwined challenges that our recent work on enduring competencies in science education sought to address (Hipkins et al., 2022).

Why "enduring competencies"?

Given the comparative lack of success in making significant curriculum change by adding key competencies to the national curriculum framework (Ministry of Education, 2007), it is logical to ask why the modified idea of "enduring competencies" might fare any better? This section introduces their point of difference as it begins to address this challenge.

Research has demonstrated that it is a significant challenge to take an idea such as key competencies, find a purposeful way to weave them together with curriculum content, and then figure out how to assess the anticipated transformation of learning. It has taken curriculum experts some years to achieve clarity about how this might be accomplished. In New Zealand, a meta-analysis of a decade of relevant research (McDowall & Hipkins, 2018) documents this struggle. Internationally, one systematic analysis compared the treatment of broad-based competency goals in seven different national curriculum contexts, including New Zealand. This research noted the complex nature of the high-level expectations of learning and learners being signalled when terms such as competence, competency, or capability are introduced in a curriculum framework (McGuiness, 2018). Professor McGuiness commented that the same term can encompass goals that have quite different theoretical underpinnings and expectations. In the USA, the Center for Curriculum Redesign (CCR) reported that "expert" teachers from multiple states had difficulty providing clear working examples of the 12 competencies named in the CCR's curriculum model (Center for Curriculum Redesign, 2021). It is clear that translating high-level change signals to practice is both theoretically and practically challenging, with no one right way to proceed.

The translation conundrum just outlined joins conflicting policy imperatives as a piece of the puzzle that helps explain why transformative change largely evaded the

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introduction of the NZC. As a bottom line, any replacement must illuminate ways to weave disparate curriculum elements together with greater coherence and it must provide clear signals about the high-level vision that guides the overall weaving. In our view, these criteria cannot be met at the highest level of the curriculum (e.g., the overarching, generic elements of the NZC framework). Some of the detail that teachers need to understand should be specific to each learning area if they are expected to craft a coherent weaving. Our work focuses on the science learning area. While some content might be readily adapted to other learning areas, much is unique to the science disciplines and the goals of a transformative programme of science education. In what follows, we challenge readers to consider similarities and points of difference to other learning areas with which they are more familiar than us.

The adjective "enduring" signals something important about the purposes envisaged for learning. Put succinctly, enduring learning is the learning that will stay with, and be of value to, students in their lives beyond school. In this way, the term directs attention to the purposes which learning is expected to serve — what students will *know, do and be like* as a result of their learning. The 2007 national curriculum already offers a very clear view about what enduring competencies, nurtured via learning experiences in science, might be needed for:

> In science, students explore how both the natural physical world and science itself work, so that they can participate as critical, informed, and responsible citizens in a society in which science plays a significant role. (Ministry of Education, 2007, p. 17)

We knew that our set of enduring competencies would need to show how to bring this aspiration for "critical, informed, and responsible" citizenship to life. If this citizenship purpose that the NZC articulates for science learning is to be purposefully woven into curriculum thinking, everyone who might work the ideas needs access to a clear "unpacking" of the scope intended. We had initially adapted the concept of enduring competencies from the idea of "enduring understandings" which originated in the much-cited "Curriculum by Design" model developed some years ago by Wiggins and McTighe (2005), as did the concept of "big ideas." Considerable international effort has been expended on developing big ideas for science education (e.g., Harlen, 2015) and we anticipated that these would already be familiar to different design teams that the Ministry of Education wished to support, including those already working on new achievement standards for the National Certificate of Educational Achievement (NCEA) (called Subject Expert Groups or SEGs). They also included future teams such as the science curriculum team(s), yet to be formed at the time of our work, who would work on updating the 2007 version of the science learning area of the NZC. Our aim was to enhance the work of any design teams tasked with weaving together science content/big ideas and science competencies (often called "practices" in the international literature), either in curriculum or assessment design, and ideally serving to align both. The specifics of any such weaving and alignment were beyond our brief, but we anticipated that they would be easier to achieve (at least in the science learning area) when teams were equipped with the four enduring competencies and their detailed elaborations.

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Introducing four enduring competencies for the science learning area

We were clear that both current and future-focused goals for science learning inevitably involve value-judgements about the kinds of people we aspire to nurture. Accordingly, we took our cue from many respected science educators around the world, drawing on their wisdom and insights to underpin our own decision-making. The research that underpinned our thinking is extensively footnoted in our report (Hipkins et al., 2022). After considerable debate, we arrived at four enduring competencies that we felt would reflect the spirit of the NZC while responding constructively to the work of those science education researchers internationally who shared our aspiration to transform students' science learning experiences. The research-informed elaborations of the four enduring competencies are designed to provide more explicit guidance about how to design a science curriculum that aims to foster critical, informed, and responsible citizenship. The following are high-level summaries of these enduring competencies. Each is elaborated in more detail in Hipkins et al. (2022).

Drawing on different knowledge systems

"As they take their learning out into the world, young people will be able to understand and interpret events and experiences through at least two different knowledge lenses: they will understand their place and identity in the natural world through the lens of science, and through the lens of mātauranga Māori, as well as other relevant cultural-historical knowledge systems. They will know how and when to draw on the contributions and strengths of science, mātauranga Māori, and other cultural-historical ways of knowing nature, to live as ethically and responsibly as possible" (p. 4).

Enacting a range of science inquiry practices

"When asking curious and critical questions, and making judgements and choices relevant to their lives, young people can draw on their awareness and understanding that scientists use a range of disciplinary inquiry practices to produce defensible explanations of natural phenomena" (p. 9).

Working with literacy practices of science

"When communicating their ideas and accessing texts that provide, or purport to provide, scientific accounts of phenomena, young people can draw on their awareness and understanding of the ways in which scientific knowledge is constructed and communicated with the intention to be as generalizable as possible across all the contexts in which it is applicable" (p. 14).

Using science for decision-making and action

"When young people are confronted with real life events, opportunities and challenges, or issues of concern and interest to them, they know how and when to draw on their science knowledge and skills, or their mātauranga Maōri knowledge and skills, to act in the world. They are prepared to act responsibly and ethically on these issues with an awareness of the interconnectedness of things and events in both the natural and social world" (p. 18).

Four facets are identified for each competency, each elaborated via a set of criteria intended to support and stretch the design thinking of the curriculum and assessment teams. To illustrate, the competency that focuses on the literacy practices of science has facets that address: communication practices outlined in literature about science (a more

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traditional Nature of Science focus that aligns with the NZC); the comparatively recent challenge posed by deliberate mis- and dis-information (see Osborne et al., 2022); the nature of communication practices used to convey mātauranga Māori accounts of the natural world; and the need to build awareness of our personal sense-making in response to this wide range of communication practices. Some of the criteria elaborated for each facet will be familiar territory but we have also aimed to prompt new design thinking, and to support the more contested aspects of design thinking already being asked of the science curriculum and assessment teams by new policy inclusions such as the mana ōrite initiative. We conclude our paper by briefly discussing this contested aspect of current curriculum and assessment design work in New Zealand.

Supporting the design journey towards mana ōrite

In this final section we take one complex dilemma to illustrate how the enduring competencies we have designed might help build bridges between past (more traditional) and future-focused (more transformative) curriculum and assessment design for the science learning area. The mana ōrite initiative falls with a broad suite of policies designed to right past wrongs by honouring New Zealand's commitments to Ti Tiriti o Waitangi (The Treaty of Waitangi), while also fostering greater inclusion and equality of learning opportunities for our increasingly diverse student population.

In early 2020 the government signed off on a change package for the review of the NCEA assessment system. Among seven specific types of change was this one:

> ***Equal status for mātauranga Māori in NCEA*** *– develop new ways to recognise mātauranga Māori, build teacher capability, and improve resourcing and support for Māori learners and te ao Māori pathways.* (What is the NCEA Change Programme | NCEA (education.govt.nz))

In 2022, a document that provides an overview of the Curriculum Refresh process was published (MoE, n.d.). Figure 1 is snipped from a larger change graphic, set out on p. 4:

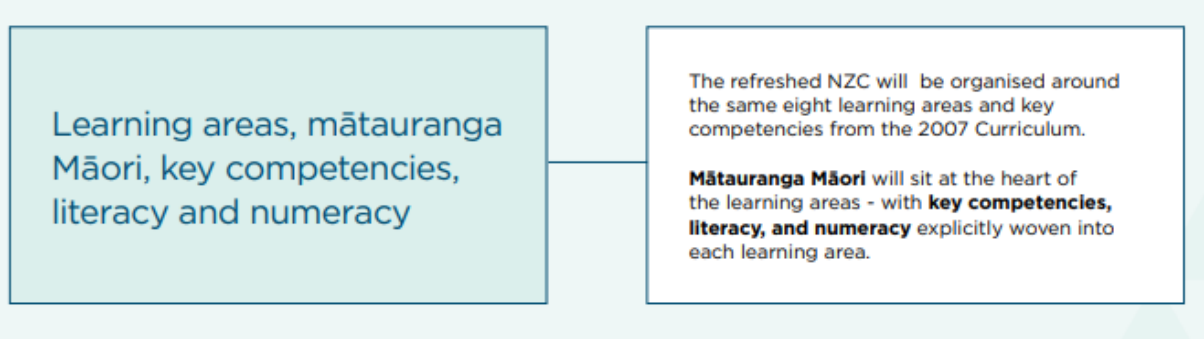

Figure 1. Overview of the Curriculum Refresh process

There is a clear signal in this graphic that key competencies are expected to continue in their role in fostering "capabilities for living and lifelong learning" (Ministry of Education, 2007, p. 12). However, the specific intention to give equal status (mana ōrite) to mātauranga Māori knowledge in both the curriculum and assessment change packages is new. This change creates interesting design challenges for the science learning area. The collective endeavours of scientists have built up an extensive body of knowledge that we mostly simply refer to as "science." The body of knowledge called "mātauranga Māori"

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has been built on quite different premises, and shared and communicated via quite different processes and conventions. How should these two bodies of knowledge be brought together in science education, and for what purpose? The mere possibility has attracted controversy. Lillis & Schwerdtfeger (2021) provide an overview of public debate. There is also evidence that science teachers are worried and confused about what this change might mean for their practice (Alansari et al., 2022).

We explicitly addressed this design challenge by ensuring that each of the four enduring competencies sheds light on the relationship between science and mātauranga Māori, and that they do so in a way that points to fresh possibilities for developing the "critical, informed and responsible citizens" envisaged in the NZC. For example, the first competency supports the understanding that science and mātauranga Māori are different knowledge systems that should not be conflated. Both have their strengths. Being able to draw on both when addressing complex issues is a particular taonga (treasure) available to New Zealand's citizens. This potential is exemplified in a recent interview with scientist Ocean Mercier (Muru-Lanning, 2022). Understanding that these are separate knowledge systems has the potential to constructively address recent controversies about how they should be related to each other (e.g., Lillis & Schwerdtfeger, 2021) while also ensuring that the well-intentioned mana ōrite initiative does not become a vehicle for recolonisation of Māori knowledge from Western perspectives. As Dr. Mercier notes elsewhere, "a revitalised, decolonised education system might seek to recover plurality, or different ways of knowing" (Mercier, 2020, p. 59).

A number of interesting challenges arose as we debated and shaped the detailed bullet points under each facet of each competency. As one example, quite late in the work, we realised that we had sometimes elaborated a specific point about "dominant science" (Liboiron, 2021) by using mātauranga Māori as a contrast. But we had never done this the other way around (i.e., elaborated a point about mātauranga Māori by drawing on science as a contrast). Our discussions on these and related points led us to consider how these comparisons reinforce colonial binaries, and as a result, we worked systematically to eliminate any potential for making such comparisons. We shifted toward allowing the space for both knowledge systems to stand on their own strengths. Even now, however, we see things we did not get quite right. For example, one sentence in the fourth definition above could be tweaked to read: "When young people are confronted with real life events, opportunities and challenges, or issues of concern and interest to them, they know how and when to draw on their science knowledge and skills, **and/or** their mātauranga Maōri knowledge and skills, to act in the world." This small tweak exemplifies the shift of focus from either/or (binary) to the type of both/and thinking that we hope to foster.

Handing the baton on

As we prepared to hand the baton on to the design teams who would be the first audience for our work, we reflected on the critical importance of co-designing new curriculum and assessment materials, bringing different perspectives and insights to the work. Three of us are not Māori, and so we could not have done the depth of thinking necessary, or so clearly illuminated the limitations of our own worldviews and experiences, without expert guidance from our fourth team member, who is Māori. Nor could we have done this work without mutual trust across the whole team.

We think that the imperative for co-design applies at all levels of the system. As we have noted several times, the immediate audience for our work is the curriculum and

assessment design teams working at the national level. However, we are also aware that some creative individual teachers and school teams have already embraced the enduring competencies, and can see how they align with their school's existing local curriculum. We acknowledge the creativity and energy of these teachers but our past experience with key competencies, as outlined above, suggests that it is not realistic to ask the sort of deep design work we have presented here of all teachers and school teams, working in isolation. However, our framework is just that – a framework or skeleton. Now it needs to be supported by the next stages of design, by specific exemplars, and by professional learning opportunities. A different type of deep practice-based expertise now needs to be combined with our thinking to arrive at an enabling curriculum design that can more explicitly support the purposes envisaged for science learning at school.

The Curriculum Refresh and SEG teams that pick up our ideas need enabling conditions for their own work. It takes time to build mutual trust and understanding of different perspectives. It will also take time and skilled support to debate the deep ideas that underpin the enduring competencies we have shaped. Only once this groundwork has been carefully laid will members of the design teams be empowered to build crossable bridges between our aspirational thinking and the on-the-ground reality of the existing systems, practices and beliefs within which teachers' work is embedded.

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