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The 'everywhere and nowhere' nature of thinking as a subject-specific competency

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ABSTRACT

Thinking is one of five key competencies that are supposed to be woven into every learning area of the New Zealand Curriculum (NZC). The paper argues that achieving this weaving in the science learning area requires an understanding of the nature and importance of *epistemic* thinking. Epistemic thinking is pivotal to interpreting the Nature of Science (NOS) strand of the science learning area in ways that support learning outcomes related to informed participation in society (i.e. citizenship competencies). Such current and future participation is signalled as important by NZC. However creating a learning programme congruent with this intent requires schools and teachers to undertake a sophisticated weaving of the various high-level NZC components with the strands and sub-strands of the science learning area. Since many classroom teachers are unlikely to possess the knowledge *about* science that is needed, or even to be aware that there is 'something more' to thinking competencies that they should be addressing, the provision of appropriate forms of professional learning support is vital. Without such support thinking in general, and epistemic thinking in particular, is likely to remain 'everywhere and nowhere' as a specific outcome of science learning.

1. Introduction

> I am struggling to get my head around the way the key competency 'thinking' is articulated in the draft [curriculum document]. Thinking in itself means little and is something we all do (some well some not so well - remember when your teacher told you to think harder and you were already thinking as hard as you could - he/she should have said think differently or what is another strategy we could use). It should be the management of our thinking processes or strategies that is the desired competency. [Teacher comment posted in 2006 to an on-line forum set up to give feedback about the initial draft of the New Zealand Curriculum]

This comment succinctly captures the 'everywhere and nowhere' nature of thinking when it is identified as a competency in its own right *and* an important *means* by which other curriculum goals are attained. Thinking is usually taken for granted as a necessary activity during learning, i.e. it is 'everywhere'. Yet, when it is identified as a specific type of curriculum *outcome*, what exactly should be the focus for deliberate teaching? Should thinking-related outcomes be the same in every learning area – are they generic, as the quote above might imply? If certain aspects of thinking are not generic, how will they differ in different parts of the curriculum and why? In any case, why should teachers care about such matters, beyond the obvious desire to see their students make learning gains because they have become more competent thinkers? Confronted with such questions, thinking can seem to be 'nowhere' in *readily accessible* curriculum guidance.

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In this paper I make the case that thinking is indeed likely to be everywhere and nowhere for teachers implementing the New Zealand Curriculum (NZC) (Ministry of Education, 2007). In part, this challenge arises from NZC's framework structure, with its generic guidance concerning students' competency development. Another contributing factor is that, by and large, our teachers do not have access to freely available curriculum support materials that demonstrate how to skillfully weave thinking into learning programmes in ways that achieve the high-level outcomes indicated for the various learning areas. However provision of such support materials is not a simple matter that could be easily addressed by developing a few resources.

The paper begins by briefly discussing what a weaving of thinking into the *science* curriculum might be expected to achieve. What types of thinking might be important for teachers to bear in mind when developing their science learning programmes and why these specifically? The context for teachers' curriculum thinking and planning is outlined next. I briefly describe the dual nature of NZC as a document of two halves. As a national curriculum *framework*, the 'front-end' provides high-level direction for learning but not a great deal of content-specific direction. This section of the paper also outlines the nature and origins of key competencies and scopes their intended role within the NZC framework. The nature of the 'back-end' of the curriculum, which provides the content specifications for eight "learning areas",[1] is briefly outlined

The paper then outlines in some detail the structure of the science-specific learning area in the back-half of the NZC framework. The practical and policy-related accommodations from which this structure evolved are noted. In this section I explain why a forward-looking interpretation of this curriculum structure (as signalled by the front half of the NZC framework) demands that careful attention is paid to one specific type of higher order thinking – epistemic thinking. In the final section of the paper I scope the nature of the challenges curriculum developers and professional learning providers must confront in order to provide more explicit support for teachers.

Research of NZC's early implementation points to initial rapid acceptance of NZC's high-level intent, followed by uncertainties about how best to integrate the front and back halves to achieve that vision (Cowie, Hipkins, Keown, & Boyd, 2011). The paper concludes by addressing the nature of professional learning support that might now be needed to help teachers get past the current implementation plateau, in order that science can live up to its potential part in realizing NZC's future-focused vision for all New Zealand's young people to be and become "confident, connected, actively involved lifelong learners" (Ministry of Education, 2007, p. 8).

My overall aim is to demonstrate why it is important that thinking competencies, as outcomes of learning, are richly exemplified in subject-specific contexts. Although my chosen context is science, and I predominantly focus on one specific type of thinking, I am confident that there will be equivalent challenges in other discipline areas that I do not know as well, and for other types of thinking. A specific account of one teacher's practice, included near the end of the paper, has a focus on *complex systems thinking*. The relationship between this type of thinking and epistemic thinking is briefly outlined but actually warrants a full paper in its own right. This comment points to the difficulties that confront researchers and teachers when developing curricula with a focus on competency development. We should not underestimate the challenges posed by this shift in thinking about the sorts of learning outcomes we should now value. The challenge is nothing less than to ensure that our young people are adequately and appropriately educated for the uncertain future they face (Barnett, 2004).

2. Thinking in science: what matters and why?

> 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, emphasis added)

This quote is the so-called *Essence Statement* for science in NZC. All other seven learning areas have an equivalent one-sentence summary that provides an overarching rationale for the inclusion of that disciplinary context/content in the national curriculum. Note the semantic structure of the statement as highlighted by my use of italics: learning in this discipline area is first and foremost intended to equip students for their future roles as citizens. This claim is contested because a range of purposes for learning science can be described. In New Zealand, as elsewhere, the acquisition of science content knowledge is the most familiar and commonly enacted purpose (Bull, Gilbert, Barwick, Hipkins, & Baker, 2010). An expanded two-page NZC elaboration of overarching purposes for inclusion of science includes four types of outcomes, the first of which refers to the need for students to develop an understanding of current scientific theories (i.e. a content focus). The other three types of outcomes can be broadly paraphrased as: understanding science to be a specific type of knowledge system (an epistemic focus); being able to use current scientific knowledge for problem solving and inquiry (a skills/process focus); and making informed decisions about the applications and implications of science as these relate to students' lives and cultures, and to environmental sustainability (a participatory/citizenship focus) (Ministry of Education, 2007, p. 28).

How is *thinking*, and its relationship to science content, implicated in these diverse but potentially interrelated signals about what matters in science? Clearly learning abstract science content is effortful and cannot be achieved in the absence of thinking for building greater understanding (see Harpaz, 2007). But this avenue of thinking about embedding thinking in the curriculum leaves us squarely with the everywhere-and-nowhere challenge. Later in the paper I will demonstrate that

[1] English, languages, mathematics, sciences, social sciences, arts, technology, health and physical education.