NZ J Educ Stud (2016) 51:53–68
DOI 10.1007/s40841-015-0025-9

ARTICLE

Comparing Curriculum Types: 'Powerful Knowledge' and '21st Century Learning'

Graham McPhail[1] · **Elizabeth Rata**[2]

Received: 19 November 2014 / Accepted: 14 October 2015 / Published online: 17 October 2015

Abstract This paper theorises a curriculum model containing four features. We use these features as criteria to analyse and evaluate two distinctive curriculum design types: '21st Century Learning' and 'Powerful Knowledge'. The four features are: (i) the underpinning theory of knowledge in each curriculum design type; (ii) the knowledge structures used to organise the curriculum material; (iii) the organisation of the concepts and content according to the principle of conceptual progression; and (iv) the pedagogy associated with the curriculum design, such as direct instruction or personalised learning. The distinction we make between the two curriculum design types and the comparative approach taken in the paper is justified by the differences found in each of the types with respect to all of the four features. Following the analysis of each feature in the body of the paper we judge the relative merits of each design type in terms of the logical connections between the four theorised features and the ways in which they are realised in 21st Century Learning and Powerful Knowledge respectively.

Keywords 21st century learning · Powerful knowledge · Knowledge · Curriculum theory · Social realism · Curriculum design · Pedagogy

✉ Graham McPhail
graham.mcphail@auckland.ac.nz

Elizabeth Rata
e.rata@auckland.ac.nz

[1] School of Curriculum and Pedagogy, Faculty of Education, The University of Auckland, Auckland, New Zealand

[2] School of Critical Studies, Faculty of Education, The University of Auckland, Auckland, New Zealand

Introduction

The aim of this paper is to construct a theoretical curriculum model with which to distinguish between, then analyse and evaluate, two curriculum design types, 'Powerful Knowledge' (the term used by Young and Muller 2013) and '21st Century Learning' (a term originating in the lifelong learning literature (Delors 1998). The Powerful Knowledge type is generated by a very broadly based research programme which takes a Durkheimian social realist approach to understanding how knowledge is produced and reproduced (author; Maton and Moore 2010; Muller 2000; Young 2008). It puts forward an argument for the centrality of concepts and content knowledge in the curriculum in support of social and educational justice.

The 21st Century Learning curriculum design type covers another fairly recent development in curriculum theory. Referred to in the literature variously as 'future-oriented education', 'future-focused', 'future-oriented learning' and '21st Century Learning' (Bolstad and Gilbert 2008; Gilbert 2005), we use the latter term, 21st Century Learning, rather than 'futures' in order to distinguish it from other literature that uses futures terminology (e.g., Young and Muller 2010). According to this type, education is not considered sufficiently responsive to a complex, globalised world in which skills, critical thinking, adaptability, and creativity will be more important than knowledge per se. This type also claims a social justice purpose, arguing that the relevance of a skills and adaptable dispositions approach will increase opportunities, particularly for those from marginalised groups. The fundamental difference between the two types lies in *what* is meant by knowledge (the theory of knowledge), *how* this knowledge is to be organised (i.e., curriculum design), and *how* it is to be made available at school (pedagogy). The purpose of our comparative approach is to identify and examine the knowledge theories and structures that inform each design type, because we consider that how knowledge is structured and organised is foundational to curriculum design.

Theoretical Matters

The paper is a philosophically driven inquiry into curriculum design in order to provide a theoretical approach to its critique. To this end we have constructed a theoretical model which enables us to make the initial distinction between the two types and then to identify, analyse, and evaluate each type's distinguishing features. Those theorised features are: (i) the theory of knowledge underpinning each type; (ii) the knowledge structures used to organise the curriculum material (what Bernstein [2000] refers to as 'classification'); (iii) the way in which concepts are organised sequentially in order to facilitate learning, i.e., conceptual progression (author) or epistemic ascent (Winch 2013); and (iv) the pedagogy associated with the curriculum design, such as direct instruction or personalised learning. (Bernstein's 2000 concept of 'framing'). The differences found in each of the types with respect to all of the four features justify the distinction we make between the two curriculum design types and our comparative critique.

Recent scholarship by Derry (2014), Gamble (2014), Muller (2009) and Winch (2013), extends the work of Vygotsky (1962), and Bernstein (2000) in developing ideas about curriculum knowledge structures. These theorists stress the importance of epistemic relations in knowledge structures as concepts become increasingly advanced. They explain how sophisticated patterns of inferential conceptual relations are only possible when structured by arranging concepts in a logical sequence from lower to higher levels. The concepts become increasingly interwoven and, as students advance, a foundation in lower-order concepts is required for conceptual progression (i.e., learning) to occur (Vygotsky 1962). The internal logic of conceptual arrangement (i.e., the episteme) makes it possible for students to understand how concepts are related and to move from lower to higher-order understandings. This gives rise to the key pedagogic issue: how best to sequence concepts so that their inferential relations are made explicit, thereby increasing the likelihood that they will be understood?

Of the two curriculum design types, 'Powerful Knowledge' is compatible with this theory of conceptual progression (author). The idea of epistemically structured knowledge also explains why this design type organises curriculum content based on academic subjects; subjects developed in respective disciplines then recontextualised for teaching in schools (Bernstein 2000). The knowledge may be structured either in vertical form as with subjects such as Maths and Physics that are context-independent, or more horizontally as with more context-dependent subjects such as Music and Languages (Bernstein 2000), but the organising principle is epistemic coherence for both vertical and horizontal subject structures. By contrast, in the 21st Century Learning type the structuring principle is located *outside* the concepts. We refer to this as an external organiser. Examples of external organisers are themes, topics, and projects rather than disciplinary-based subjects, hence the justification for an inter-disciplinary approach to teaching.

The fundamental difference between the ways knowledge is organised in the two curriculum types is the result of even deeper fundamental differences in the underpinning theories of knowledge. In the 21st Century Learning type, the external organisation of curriculum knowledge is justified by the understanding of knowledge found in the postmodern and post-structuralist literature that has been highly influential amongst educators from the 1990s. (Andreotti et al. 2012; Gilbert 2005; Simmons and Worth 2001). Knowledge is understood to be always tied to the knower; that is, knowledge is subjective. (Maton and Moore 2010). This idea contributes to the focus in the *New Zealand Curriculum* (Ministry of Education [MoE] 2007) on learner dispositions, responding to communities, and Learning Areas.

The Powerful Knowledge type, in contrast, draws on the opposing philosophy of knowledge; a realist position (e.g., Bhaskar 1989; Popper 1978) which regards concepts as real objects in that they have causal effects. In other words, although disciplinary knowledge is created by people, it is objective, not subjective, because it uses universalised concepts created in the disciplinary communities, and this provisional knowledge is subject to rules and procedures which continually test the truth claims. Bourdieu's (1984) reference to the 20-year-old mathematics student with 20 centuries of mathematical knowledge captures this idea of the universalised

nature of disciplinary knowledge. It is not tied to a specific social group but is available to all (Rata 2012).

The subjective–objective distinction produces another major difference between the two curriculum types concerning the authority for knowledge (Rata 2012). The Powerful Knowledge type addresses this issue by arguing that the knowledge taught to students is justified by the procedures used to maintain a discipline's integrity (Maton and Moore 2010). In contrast, the 21st Century Learning type's understanding of knowledge as subjective means that it is always tied to some group's interests. However, if a discipline's scientific authority is removed, then any opinions and beliefs, such as creationism or beliefs supporting gender inequality or sexual orientation prejudice, may be justified as worthwhile curriculum content because they are the knowledge of the school's community. The 21st Century Learning literature is silent on the difference between authority located in a discipline and authority located in the 'knowers'. It assumes a progressive intent for community knowledge but does not address what happens when reactionary, non-scientific beliefs are included in the curriculum.

The New Zealand Context

We have chosen New Zealand to illustrate our curriculum design comparison because there is interest in that country in both types. The ideas of the 21st Century Learning approach have become a major influence and are included in the national curriculum and in the Ministry of Education's strategic plan (MoE 2014). Currently, at least three 21st Century Learning schools have been built in the Auckland area, with more proposed. The Powerful Knowledge curriculum design type is still at the theoretical stage of development amongst international researchers, however the ideas are gaining influence amongst New Zealand researchers (Barrett and Rata 2014). We consider that both types warrant ongoing critique, the 21st Century Learning type more so because it has already been put into practice in New Zealand without scholarly criticism. A purpose of this paper is to undertake that critique.

One of the first publications in New Zealand to focus on the idea of 21st Century Learning was Jane Gilbert's 2005 book, *Catching the Knowledge Wave*. It is something of a seminal work cited by most subsequent local writers in the field (for example, Abbiss 2013; Andreotti et al. 2012; Bolstad 2011, 2012; Gilbert and Bull 2014; Hipkins 2005; Morgan 2013). Its influence on education policy was immediate with the 2007 NZ *Curriculum* (MoE 2007) showing the full commitment of the Ministry to the 21st Century Learning inter-disciplinary curriculum design type.

The Ministry's rapid commitment to transformative 21st century ideas as New Zealand's curriculum blueprint did not occur in isolation but can be traced to interdependent, although sometimes opposing, social, political, and intellectual movements which have shaped educational discourse in New Zealand since the 1980s (Openshaw 2009). Postmodern ideas about knowledge contributed to, and were in turn supported by, other substantial changes, themselves the result of fundamental changes to the global economy and the rise of neoliberalism as the political ideology of financial capitalism (Piketty 2014). Communitarian movements,

such as biculturalism, contributed to the emphasis in the national curriculum on responding to an ethnically diverse society (Rata 2012). Likewise, the dominance of constructivist pedagogy (McPhail 2015) with its learner-centred approach, is within, and contributes to, these broader trends.

In contrast to the rapid spread of 21st Century Learning ideas in New Zealand education, the Powerful Knowledge type is currently confined to international researchers, with some involvement from New Zealand based theorists. Seminal writers, Michael Young, Johan Muller, and Rob Moore have led the development of a research programme [sometimes referred to as 'social realism' [Rata and Barrett 2014] to theorise powerful knowledge (Young and Muller 2013)] as a curriculum principle and to argue for its importance to all social groups. 'Bringing knowledge back in' (the title of Young's 2008 book) draws on Durkheimian and Bernsteinian theories about knowledge structures to locate curriculum knowledge in the differentiation and specialisation of knowledge in modern society (author; Maton and Moore 2010). It is simultaneously a conservative understanding of knowledge and a politically progressive one. Disciplinary knowledge is 'conserved' from the past and continually developed and specialised. However, the literature employs a Marxist critique to acknowledge the source of socio-economic inequality in this disciplinary differentiation and specialisation.

In a marked departure from the New Sociology of Education's Marxist reproduction theorists (Rata 2012), the Durkheimian-influenced approach argues that education can ameliorate inequalities, including those actually created in the social relations of specialised knowledge, if more equal access is provided to this type of knowledge. It does not claim to address the source of inequality itself, acknowledging that this is created in the unequal relations of the capitalist economy. Rather, the Powerful Knowledge approach limits its aims to seeking explanations of what it is about objective knowledge that makes it 'powerful' and how the education system might distribute this knowledge resource more fairly.

How Knowledge is Theorised in the 21st Century Learning Curriculum Design Type

The following two sections extend the comparison between the first two features (knowledge theories and structures) of the two curriculum design types before turning to features three and four (knowledge progression and pedagogy) in subsequent sections. In order to understand the ideas upon which the 21st Century Learning approach is built, we use the literature referred to above, given its influence and location in official reports. Central to this literature is the criticism of the idea that knowledge is "a finished set of known, accepted, fixed facts" (Gilbert 2005, p. 175). However, we claim that this idea is not, in fact, compatible with the 'traditional' scientific view of disciplinary knowledge and the critique is misguided. Randall Collins, opens his opus magnum, *A Global Theory of Intellectual Change* by describing "intellectual life [as] first of all conflict and disagreement" (1998, p. 1). With reference to intellectual communities in many civilisations, Collins says

that "it is conflict-lines of differences between positions—which are implicitly the most prized possessions of intellectuals" (p. 6).

The 21st Century Learning approach does not recognise that scientific or disciplinary knowledge is never 'fixed' for the reason that its creation occurs within intellectual communities and according to processes of scrutiny, doubt, criticism, and refutation. As knowledge is separated from the conditions of its creation through disciplinary processes that put "procedural reason on trial" (Habermas 2001, p. 30), it is subjected to those processes of continual criticism and change. Gilbert (2005) does refer to both of these knowledge features: its objective character and its social conditions of production, but draws the opposite conclusion—arguing that the knowledge informing academic subjects is "accepted" and therefore "fixed" (p. 175). This allows for a counter-view to be positioned in opposition to the idea of fixed knowledge: the view that knowledge is a process not a product. Shifting to the concept of knowledge as process establishes several ideas that become foundational to the 21st Century Learning model. Although the following quotation is lengthy we include it because these core ideas are found here:

> It probably does mean abandoning the idea of knowledge as a finished set of known accepted, fixed facts… Accepting all this helps us rethink how we might approach knowledge in schools…. Thus knowledge will continue to matter, but not necessarily in the same way it might have in the past. Given this, we should be presenting knowledge to students not as something monolithic, fixed and finished, but as something organic, something that is always developing and always in process. Instead of viewing it as a set of discrete disciplines, we should be presenting it as a series of systems that have particular ways of doing things. (Gilbert 2005, p. 175)

These central ideas are picked up in the Ministry of Education report from 2012:

> Knowledge is rapidly created every day. Knowledge is the *process* of creating new knowledge. It is a product of "networks and flows" coming into being through interactions and intersections on a "just-in-time" basis to solve specific problems as they emerge. (Bolstad et al. 2012, p. 13)

While we sense a note of hesitation in Gilbert's words, the shift away from the realist view of knowledge as "products of the mind" (Popper 1978) to 'process' justifies the 21st Century Learning pedagogical focus on skills and generic competencies, and the interdisciplinary thematic curriculum focus. Rather than the hypothesised, but inaccurate, view of knowledge as static objects and theories from the past, this counter-view considers knowledge to be dynamic. Knowledge becomes a verb and students *create* it rather than reproduce it. The compatibility of this view with the prevailing constructivist pedagogy contributed to its acceptance (McPhail 2015). Gilbert's terms, 'a series of systems' and 'systems-level understandings' appears to replace discrete disciplines as organising knowledge structures. Therefore it is necessary to ask: What are these "series of systems that have particular ways of doing things" (2005, p. 175) and what is the source of such systems of organic knowledge? Can the series of systems be epistemic systems

given that they are "ways of doing things", a term which suggests the *application* of knowledge rather than an epistemic structure of knowledge?

How Knowledge is Theorised in the Powerful Knowledge Curriculum Design Type

The Powerful Knowledge curriculum design type theorises knowledge as an epistemic structure constituted by abstract objectified ideas used to explain and predict experience (though not corresponding to experience). This is the realist model described by Bhaskar (1989) and Collins (1998). The term 'episteme' refers to the constituent principles and concepts which are structured as systems of meaning. These systems are disciplined (as in 'contained' or 'bounded') in that they serve a particular field of enquiry or 'discipline'.

Some disciplines are characterised by a hierarchical structural integrity with knowledge built cumulatively. Other disciplines, usually in the arts, humanities, and social sciences, tend to be influenced more by the social context. However, whether it is more context dependent or independent, the discipline exists because it *is* an epistemic structure. In other words, it is a complex and integrated arrangement of *systems of meaning* built cumulatively over time by intellectual communities and subject to the testing procedures of those communities. In contrast, the 21st Century writers do not identify an epistemic structure for the 'series of systems'. This does not mean that such a system may not exist; it does mean however, that it is not identified and theorised in the literature and so is not available for critique.

Powerful Knowledge theorists locate the development of epistemic objective knowledge in the disciplines which themselves develop from philosophical and empirical enquiry into all areas of existence and have become the arts, physical and natural sciences, social sciences, and the humanities (Muller 2000). Drawing on Durkheim's (2001) distinction between the sacred and the profane, disciplinary knowledge is distinguished from knowledge acquired from experience (Moore 2013; author). Accordingly, the latter is the profane knowledge that enables us to live in the world. It is common-sense intuitive knowledge of our experiences—our 'culture'; what we accept as the truth of our lives. In contrast, disciplinary knowledge disturbs our common-sense understanding of the world by providing counter-intuitive understandings and the intellectual means for doubt, criticism, and judgement. What is conceptualised is provisional truth only because abstract ideas are truth claims, not the fixed truth of belief. Therefore the source of criticism and change exists within the process of both creating and testing these objective products of the mind.

The idea that knowledge is differentiated into disciplinary knowledge and social knowledge has profound implications for the curriculum. By having access to disciplinary knowledge, with its counter-intuitive character (i.e., it doesn't correspond to the everyday world of appearances), students can think about the world in abstract or context-independent ways. This takes students beyond the common-sense understandings acquired from their socio-cultural location, enabling them to develop a critical awareness of the forces structuring their lives and to imagine alternatives beyond their everyday experiences (Moore 2013). It is this

liberating potential of disciplinary knowledge that makes it a political, as well as an epistemological, resource, one that all students should have access to. (Rata 2014).

Conceptual Progression

This section is about the third feature of our curriculum design model, the acquisition of knowledge as conceptual progression (Rata 2015) following Vygotsky (1962) or epistemic ascent (Winch 2013). In the Powerful Knowledge type's concept of how knowledge is acquired, learning is understood to "come primarily from systematic work with an organised body of knowledge at different levels of abstractions, at different degrees of complexity, in and outside of specific contexts" (Shalem and Slonimsky 2014, p. 211). Concepts that students already understand are brought into *new relations* of inferential abstraction and generality as further concepts are acquired. This means that the episteme should be ordered in a systematic way so that students can progress in their understanding. We consider that the theorisation of knowledge acquisition as conceptual progression is a strength of the Powerful Knowledge type.

The 21st Century Learning curriculum design follows different principles of concept organisation, with knowledge organised according to a "series of systems that have particular ways of doing things" (Gilbert 2005, p. 175). It is the relevance to the 'real world' that serves as the organising principle, not a discipline's epistemic requirements. This is why the 21st Century Learning type is structured by an 'external organiser' with ideas organised in an inter-disciplinary way according to 'topics' or 'themes' and not an internal epistemic structure. The use of thematic topics which replace the 'old' discipline boundaries is argued for as a more relevant and meaningful approach. According to Boyd and Hipkins (2012), "curriculum integration is essentially a way of thinking about how the curriculum is best structured to support learning" (p. 17). Topic and inquiry method approaches are justified by their relevance to the 'real world', providing problem-solving skills and competencies that are relevant not just to present conditions but to a predicted future.

However, there is growing criticism about whether inter-disciplinary approaches can provide conceptual coherence. Oates (2011), Counsell (2011), and Lambert (2011) all suggest that weakening the classification of academic subjects may have unintended and serious consequences. The concepts and content of subjects, divorced from their structuring systems of meaning in the discipline's episteme, become 'packages' of facts and details. 'Freed' from the integrating structure of a disciplinary episteme, information may become mere 'noise'. This is the term used by Tim Oates (2011) to describe the accumulation of information which lacks the integrating concepts and principles that give the information meaning—in other words, that turn information or 'facts' into knowledge. (See also the Fisher et al. 2015 reference to the internet as a problematic source of meaning in Sect. 7 below).

An external organiser may be the *method* of study rather than the *object* of study. This is the case with 'inquiry learning' or a project approach. How the student goes about acquiring information is considered to be the purpose of the work rather than what is being inquired into. In this approach the information may be organised on

the basis of student or teacher interest. A criticism of this is that information selected to be taught for contextual reasons rather than its epistemic value may "compromise entitlement as schools and individual teachers make idiosyncratic choices about what to teach" (Sinnema and Aitken 2013, p. 158). The challenge in thematic and project-based approaches is for teachers to be sure that underlying generative concepts relevant to the inquiry or the theme are included that allow for conceptual progression. Taylor et al. (2012) note that "while inquiry learning has many potential benefits, the integrity of contributing disciplines should be maintained" (p. 29). Replacing the integrating epistemic structure with information that is justified by its contextual significance and organised according to an external organiser may lead to a fragmented cognitive architecture where the internal relations between concepts are absent.

The issue unanswered, then, in the 21st Century Learning literature is how does an external method of knowledge organisation provide the link from one concept to a higher-order concept so that students can progress in their understanding. In other words, how are concepts organised in a systematic way so that they refer one to another in increasing degrees of complexity? Are students moving up an epistemic ladder from lower-order to higher-order thinking or are they just accumulating information? The absence of a discussion about these matters in the 21st Century Learning literature leads us to conclude that this design type does not deal adequately with the matter of conceptual progression. In contrast, the Powerful Knowledge type is built on the idea of conceptual progression as a central component of curriculum design.

Pedagogy and Curriculum Design

The fourth feature we identify in our curriculum design model is the coherence of the relationship between the type of curriculum knowledge structure and the associated pedagogy. This section examines how each of the curriculum types, 21st Century Learning and Powerful Knowledge deals with pedagogical issues. Powerful Knowledge faces a major pedagogical problem in that the cumulative abstract concepts which comprise the basis of academic subjects are difficult for students to understand. Acquiring this knowledge takes years of disciplined study and instruction from knowledgeable teachers. It requires the development of a pedagogy that is not only epistemically structured but is also motivating and engaging. Powerful Knowledge writers do acknowledge the importance of creating such a pedagogy with Young and Muller (2010) referring specifically in their 'Futures 3' scenario to the need for a pedagogy of engagement, not compliance.

The pedagogical issue is not the only difficulty faced by a curriculum design which emphasises the importance of disciplinary knowledge. Students must be taught this abstract knowledge because it is not available in their experience. The difficulty in acquiring counter-intuitive knowledge was understood by Vygotsky (1962) whose writings discuss the relationship between abstract ideas and a student's lived experience. Vygotsky considered that abstract concepts come first and "*are then transferred to everyday concepts, changing their psychological structure from*

the top down" (p. 93, emphasis added). The 21st Century Learning approach takes the opposite position. Teachers are encouraged to start with students' experiences and select knowledge (or have students select material) that is relevant to those experiences. This is justified by the belief that relevant knowledge is more likely to be motivating than abstract ideas. However it does not answer the question: where do students acquire abstract knowledge? Vygotsky's (1962) insight of a pedagogic relationship between abstract and everyday concepts (the student's contribution to learning) may point to a possible accommodation between the two opposing curriculum design types with respect to pedagogy if not to the curriculum (Rata 2015). The idea that teachers start with scientific or abstract concepts and then draw on everyday knowledge, which itself is transformed in the process, moves academic knowledge and the knowledgeable teacher to the central position at school (the Powerful Knowledge approach), but "does not exclude the student's contribution to learning" (Vygotsky 1962, p. 93)—the contribution emphasised by the 21st Century Learning approach.

Both curriculum design types reject rote-learning pedagogies. Powerful Knowledge writers consider that the teaching academic subjects in this way historically was a pedagogical fault, not a function of the subjects themselves. Young and Muller's (2010) curriculum of engagement in which academic subjects are taught in motivational ways while retaining cumulative knowledge building is a key focus of the Powerful Knowledge research programme. This is the case because it is in the fourth feature of our curriculum design model—the association of pedagogy to the curriculum type—that Powerful Knowledge is less developed than in its knowledge theorisation. However, a number of researchers are drawing on the work of Bernstein (2000) to address this lacuna. Their aim is to extend the research programme into developing a pedagogy suitable for an epistemic knowledge curriculum but without the restrictive teaching styles that are associated, rightly or wrongly, with this type of curriculum (Howard and Maton 2011; Maton 2013; McLean and Abbas 2009; McPhail 2013a, b).

There is a significant difference between the two curriculum design types regarding teachers' roles. The process of learning is described by 21st Century Learning writers as "a teacher-supported process" in which students "learn through the process of inquiring into questions they develop themselves about a topic or concept" (Boyd and Hipkins 2012, p. 16). Although it is assumed that a 'facilitating', rather than an 'instructional', teacher will promote learning (Gilbert and Bull 2014), this ignores the primary matter of *who* must establish the conceptual foundation required in order to build cumulative knowledge. Winch (2013) refers to the:

> minimal conceptual grasp… necessary for acquaintance with a subject [as] condition for further progression in understanding and expertise. It follows then that systematic knowledge of the basic conceptual structure of the subject needs to be secured and that this cannot be by pupil-initiated procedures alone. It also needs teachers with a clear conceptual map. (p. 138)

The teacher as instructor does not mean that ideas are presented in a rote-learning fashion. Vygotsky (1962) was aware that scientific concepts are not simply acquired by rote. He regarded their acquisition as involving "the aid of strenuous mental

activity on the part of the child himself" (p. 86). But that activity does require direct instruction, in contrast to the constructivist "emphasis on the meaning-making of the individual learner" (Derry 2014, p. 4). A successful Powerful Knowledge pedagogy would need to include the direct instruction by the teacher but in ways that are motivating for students. Vygotsky insisted on the importance of direct instruction, referring to "instruction [as] one of the principal sources of the school child's concepts… [it] is also a powerful force in directing their evolution; it determines the fate of this total mental development" (p. 85)—the cognitive architecture to which we referred in the previous section about conceptual progression.

'Personalised learning' is another significant difference between the two curriculum types. This pedagogy has an important place in the 21st Century Learning literature and is seen to "revers(e) the *logic* of education systems so that the system is built around the learner, rather than the learner being required to fit with the system" (Bolstad 2012, p. 82, emphasis in original). It is in this language that we see the conflation between pedagogy and the moral commitment to universal access. "Personalising learning … is a genuine attempt to develop a renewed, 21st century version of the traditional social democratic goal of equal opportunity for all" (Bolstad et al. 2012, p. 18, f.n. 46). Accordingly, students are expected to maintain a genuine involvement in decision making about their learning. This is to be achieved through a synthesis of their input (such as identifying interests) with "what teachers know to be important knowledge" (Bolstad 2012, p. 84).

The 21st Century Learning type argues that higher levels of student engagement and autonomy will result from personalised learning. However, there is a danger that personalised learning may focus on the students' dispositions as learners at the expense of what they are actually learning. Drawing on impressions from NZCER projects, Bolstad (2012) suggests learners "are better able to describe in their own words what they have come to learn about their strengths, weaknesses, motivations and interests as learners, and how these relate to other contexts of their lives" (p. 84). There is development of awareness of dispositions [key competencies (Ministry of Education 2007)] but potentially these dispositions may be empty of any actual knowledge content which is the source of conceptual development (Rata 2012). While the goal of success for all is characterised as "a new form of equity" (Bolstad 2012, p. 18), it runs the risk of reducing success to credit hunting rather than deep engagement with the potentially empowering nature of conceptual knowledge. And what is to be done where students' ideas concerning what they want to study conflicts with "what teachers know to be important knowledge"? (p. 19). In such instances, if the teacher has deemed it essential to overrule the students, do we then have instances of what Bolstad (2012) describes as "shallow expressions of practice"? (p. 19)—a reference to teacher-determined content choice.

The question of whether digital technologies are a valuable motivating pedagogical resource which may lead to improved learning is an important one in the search by both curriculum design types for enhancing pedagogy. There is some literature supporting the 21st Century Learning emphasis on the use of these technologies. For example, Hepplestone et al. (2011) have shown that the appropriate use of technology can enhance opportunities for learner engagement. The Powerful Knowledge writers are more cautious about claiming benefits, concerned that digital

technologies' use may encourage the information 'noise' referred to above by Oates (2011) and reduce students' ability to discriminate between sources of information. This caution is supported by Fisher et al. (2015) who found that people "mistake access to information for their own personal understanding of the information" (p. 674) leading to an overconfidence which can undermine the effort required to become knowledgeable. Fisher et al. (2015) point out that, "with the internet, the lines become blurry between what you know and what you think you know". Without the internet, we know that we do not know something, and recognise that "it takes time and effort to find the answer" (p. 675).

Curriculum Design and Political Ideals

Both curriculum design types are committed to the ideal of social justice and claim a role for education in promoting greater opportunities, particularly for the working-class and marginalised groups that have been disadvantaged historically. However, only Powerful Knowledge writers provide a sociological theorisation of the role that knowledge plays in structuring unequal social relations by contributing to the division of mental and manual labour (Bernstein 2000; Durkheim 2001; Muller 2000). This approach takes seriously the question: Does education reproduce (Bourdieu 1984) or interrupt (Bernstein 2000; Moore 2013) the inequalities created outside the school and what role does knowledge play in creating or ameliorating those inequalities? Writers who take a Powerful Knowledge approach agree with the Marxist analysis that specialist and differentiated knowledge is a productive force in capitalism and does structure social relations unequally (Bernstein 2000). However, this approach argues that while schools are limited in what they can do to address such inequalities what they can do is distribute access to this valuable knowledge resource more fairly.

In contrast the 21st Century Learning proposition is that the world needs new ways of knowing with the use of information and communication technologies with the skills and competency approach (Bolstad 2012; MoE 2014) seen as a way out of the inter-generational inequalities of educational reproduction. However, this ignores the persistence of inequality in today's technological society (Brown et al. 2012). Low-level technology jobs have the same class-determining features that characterise manual work in the industrial era. These jobs in technology may well be cleaner and less physical, but they share the central features of working-class employment: low autonomy, limited or no decision-making, repetitive operation, low wages, and casualised or uncertain employment conditions. In contrast, the 'mental' jobs of the technological era are like those of the industrial economies: marked by creativity, considerable employee autonomy and decision-making, and high salaries with relative security.

The 21st Century Learning approach runs the risk of a digital romanticism which tends to see technological solutions to political problems. This means that globalisation is understood a historically in terms of applied knowledge or technology. In contrast, Powerful Knowledge's sociologically informed explanation regards globalisation as the neoliberal regulation of the global economy, as a

political process of class reconfiguration and increasing inequality (Brown et al. 2012; Friedman 2000; Rata 2012; Turner 2003; Vidal 2013). The technological skills and dispositions acquired at school are distributed on class lines with working-class students continuing to take vocational subjects while middle-class students continue with academic subjects that provide the epistemic ascent to more complex specialist knowledge (Wheelahan 2010). The 21st Century Learning's ahistorical understanding of technological skills as the means by which students can improve their life circumstance also overlooks a key feature of class reconfiguration: the low wages of the higher-skilled (Brown et al. 2012; Vidal 2013).

Conclusion

We have theorised a model to distinguish between two distinctive design types: Powerful Knowledge and 21st Century Learning. Four distinguishing features have been identified to use as comparative tools. They are: the theory of knowledge underpinning the curriculum design type, the knowledge structure, the method of conceptual progression, and the pedagogy associated with the knowledge type. We conclude by evaluating the justifying logic for each type against the model's conceptualised features.

The stronger claim of the Powerful Knowledge approach rests on the logical connections drawn from a theory of knowledge which establishes the case for an objectified episteme, to a curriculum structure which contains the episteme as its ordering principle. That curriculum structure enables conceptual progression leading to student learning. Finally, the fourth feature, the least developed feature in the Powerful Knowledge design, is linked to the three preceding features in the argument for an engaging pedagogy which teaches the theorised epistemic knowledge.

We consider that the 21st Century Learning curriculum design type has a weaker claim to a coherence between each of the four features. The problem lies in the type's foundational theory of knowledge and affects the other three features as a consequence. That theory's rejection of objective knowledge which exists independently of the creator of the knowledge means that there is no internal structuring principle, that is, an episteme, which organises the concepts into coherent systems of meaning. A case is made for systems of meaning that exist outside the knowledge structure but these are not identified. Therefore we consider this to be an unconvincing argument. Without an identified knowledge structure with an integrating internal mechanism (the episteme), it is not possible to theorise knowledge structures in the curriculum in terms of the internal organisation of concepts. While the approach argues that conceptual coherence in the curriculum is provided by external organisers such as topics and themes, we do not see how these organisers provide the means by which concepts can be related sequentially so that conceptual progression is possible. It is more likely that concepts are arranged in a fragmented, even random way, according to teacher or student interests. If this is the case, then it is also likely that this type of curriculum design disrupts the means by which students can progress from lower- to higher-order concepts, especially as

those concepts become increasingly organised into complex and interdependent systems of meaning.

The fourth feature, the pedagogy associated with the 21st Century Learning type, is recognised as an attempt to engage students by choosing curriculum knowledge that is relevant to their lives. However, the problem with this pedagogy is that it is associated with what we have argued is externally organised knowledge, a 'weak' form of knowledge sequencing. We conclude by saying that the Powerful Knowledge recognition of the school's role in providing knowledge that has an epistemic structure is logically valid. The next task in this research programme is to develop the engaging pedagogy which will help students from all social groups move into the counter-intuitive understandings which are needed to make sense of a complex 21st century. The task for the 21st Century Learning approach is to identify the means by which conceptual progression occurs in an externally organised curriculum.

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