

Changing priorities? The role of general capabilities in the curriculum

Dr Paul Weldon, ACER Senior Research Fellow, February 2019

“Understanding that children need a particular set of skills to live constructively in the 21st century is not the same as an in depth understanding of what those skills are, how they develop, or how to teach them” (Care, Kim, Anderson & Gustafsson-Wright, 2017, p. 2).

Introduction

The inclusion of general capabilities as an outcome of education has been explicitly discussed globally from about the 1990s, predominately in the context of the changing skills required for employment. A selection of these skills is included as a dimension of the Australian Curriculum introduced in 2011. Their status was strengthened by ACARA in 2017 (curriculum version 8.3) to “standing ‘alongside’ and equivalent in structural terms to disciplinary subject areas” (Gilbert, 2018, p. 129).

The interest in these capabilities is growing amongst education authorities. A UNESCO rapid assessment found that “almost 90 countries... refer to generic competences in their general education curricula” (Tedesco, Operti & Amadio, 2013, p. 11). A scan of 152 countries for the Brookings Institution in 2017 showed that 117 countries (76 per cent) identify specific skills somewhere within their national policy documents, 71 (47 per cent) within the curriculum, and 58 (38 per cent) within mission and vision statements (Roth, Kim & Care, 2017; Care, Anderson & Gustafsson-Wright, 2016).

The ongoing and strengthening interest in these skills comes from the clear and profound changes in society moving into the 21st century. More and more jobs are being automated, work is becoming more complex and requires higher order skills. The economy is changing and workers are expected to need to change careers many times throughout their lives, with all the learning that entails. It is anticipated that with the constant changes in technology, our children will be working in jobs barely even conceived as yet. Our societies are more multicultural, there is greater awareness of complex and global issues, and greater need to communicate and work with the nations in our region and globally.

In this context, there has been a shift in learning goals. Core knowledge and concepts retain their importance but education systems are now being required to equip students to apply their knowledge within the socio-cultural context of their societies (Care, et al, 2019; Kim, Care & Vista, 2019). At least at the policy level, the mission has become to ensure young people can think critically and creatively, solve complex problems, make evidence-based decisions, and work collaboratively.

This movement has been developing in Australia for some time. The current New South Wales (NSW) curriculum review, the recent review chaired by David Gonski (DET, 2018a), the review

of the Australian Curriculum (Donnelly & Wiltshire, 2014) and the earlier general capabilities consultation report by ACARA (2011) acknowledge that schools and other education stakeholders have demonstrated consistently high levels of support for the inclusion of general capabilities in the curriculum. That said, while curriculum development will always and rightly be a contested process, concerns have been raised about a lack of rationale or conceptual base underpinning how the general capabilities are presented and integrated within the Australian Curriculum (see e.g. Scarino, 2018; Gilbert, 2018).

Despite the now longstanding, ongoing and global interest in and support for general capabilities, there remains a lack of agreement on such basic questions as what constitutes general capabilities, how they should be grouped, the extent to which they are discrete and generalizable, and what terms should be used to refer to them. A recent review for the NSW Department of Education raises more questions:

“But, what are the skills future generations will need? Have they found their way yet into teaching and learning in schools? How can we make sure that schools are able to teach and transmit them? [... W]hile there is a lot of discussion around the topic of key skills for the 21st century, there is little agreement yet about what the skills actually are, let alone whether they can be taught, measured or assessed” (Lamb, Maire & Doecke, 2017, p. 3).

The 2018 Review to Achieve Educational Excellence in Australian Schools chaired by David Gonski comes to much the same conclusion:

“The general capabilities need to be more effectively translated from the Australian Curriculum into the classroom, so students acquire the full set of knowledge, skills and capabilities to succeed in the rapidly changing world of work” (DET, 2018a, p. 41). “Given that the general capabilities within the curriculum were defined a decade ago, the Review Panel is of the view that ACARA should consider the adequacy of the current list in light of contemporary thinking” (Ibid, p. 27).

The discussion of general capabilities sits within a wider curriculum discussion around what it is that Australian students need, and how knowledge, skills, capabilities and standards should best be prioritised and integrated (Yates, 2017). The NSW discussion sits within a decade of national reform including, as Savage notes, “the formation of a national curriculum, standardised national assessments in literacy and numeracy, national standards for teachers and principals, and a revised national model of school funding” (Savage, 2017).

This background paper takes a brief look at the history of the development of general capabilities in Australia, including in the vocational and higher education sectors, and the current state of play. It then considers some of the issues inherent in what has been called ‘the skills movement’ (Care, Anderson & Kim, 2016) and the incorporation of skills into the curriculum internationally.

A brief history of general capabilities in Australia

In Australia in 1985, the Karmel Committee recommended that students should attain skills such as accessing information, communication, and working in groups (NCVER, 2003). In 1991, the Finn Report “concluded that there are certain essential things that all young people need to learn in their preparation for employment” (Mayer, 1992, p. vii). These key competencies came in response to perceived changes in Australia’s workplaces:

“The most obvious change in workplaces is a move away from specialised jobs and separate functions towards more broadly-defined work roles and organisational

structures that provide for devolved and shared responsibility for planning and decision making. Greater value is being placed on factors such as creativity, initiative, being entrepreneurial and being able to think critically about how to improve work practices” (Mayer, 1992, p. viii).

Key competencies were defined as competencies essential for effective participation in work and work organisation. They were to be identified in the areas of language and communication, mathematics, scientific and technological understanding, cultural understanding, problem solving, and personal and interpersonal characteristics. Their foundation was clearly related to the needs of employers, however Mayer argued that they were essential not just for work but for effective participation in further education and in adult life more generally (Mayer, 1992, p. ix).

In developing the key competencies, the committee was guided by a number of principles, including that the competencies were a part of general education, not displacing the broader purposes of developing young people as individuals and members of Australian society. The competencies did not constitute a curriculum but were cross-curricular, intended to be developed and applied across a range of subjects. They assumed a foundation of knowledge, skills and understanding which needed to be integrated and applied. In reducing the number of competencies from the Finn Report, the committee also noted that information technology had been built into several of the final competencies, notably *Using technology*. (Mayer, 1992, pp. ix-xi). Seven key competencies were identified:

Collecting, analysing and organising information	Communicating ideas and information	Planning and organising activities	Working with others and in teams
Using mathematical ideas and techniques	Solving problems	Using technology	

The Mayer report crystallized much of the thinking at that time about entry-level employment skills and provided a framework for their incorporation into training. Considerable government funding was then provided during the 1990s to embed key competencies in schools, vocational education and training (VET), higher education and the business sector, including the development of a multimedia professional development package for teachers and trainers (DECSSA, 1997).

In 1998, the West Review provided a framework of generic attributes for university graduates (Precision Consultancy, 2007). In 1999, the Australian Industry Group (AIG) commissioned a report on the training needs of Australian industry. This report noted increased globalisation and technological change, a resulting shift in demand to higher skills across all occupational levels, and an increased premium on generic skills, both ‘hard’ (notably IT skills) and ‘soft’ (e.g. problem-solving, team skills, willingness and ability to adapt), to be developed prior to recruitment (Allen Consulting Group, 1999).

In 2002 the Australian Chamber of Commerce and Industry (ACCI) and the Business Council of Australia (BCA) reported on employers’ views on generic skills, noting at the time that while there was broad agreement that all young people need a set of personal attributes and skills that will prepare them for both employment and further learning, it was less clear what these attributes and skills should be in the context of the challenges facing Australian industry (ACCI/BCA, 2002, p.1).

The ACCI/BCA project coined the term ‘employability skills’ in Australia, and expanded on the Mayer key competencies by producing the Employability Skills Framework. The report was seen

to represent industry taking a leading role in describing the “skills required not only to gain employment, but also to progress within an enterprise so as to achieve one’s potential and contribute successfully to enterprise strategic directions” (ACCI/BCA, 2002, p. 3). More recently, research has demonstrated that the definitions of employability have shifted over time from an emphasis on individual job-getting to the acquisition of attributes appealing to a range of employers. (Bennett, Richardson & MacKinnon, 2016, p. 10).

In the vocational education and training (VET) sector the term ‘foundation skills’ is currently being used to describe a combination of language, literacy and numeracy skills and employability skills. There are currently two frameworks being used as reference points for foundation skills. They are the Employability Skills Framework (ESF), and the Australian Core Skills Framework (ASCF).

In 2010, the Australian Qualifications Framework (AQF) Council commissioned research to identify the use of generic skills in each education and training sector to assist with the development of a set of generic learning outcomes common to all sectors. The four broad categories of generic learning outcomes outlined in Table 1 are used in the AQF to accommodate the frameworks used in each sector.

Table 1: Key frameworks currently in use in education sectors Australia

Australian Curriculum General capabilities	Foundation skills		Graduate attributes	AQF Generic skills
	Employability Skills	Australian Core Skills Framework	<i>*8 categories that cover the variety of frameworks used by different universities</i>	
Literacy	Communication	Reading	Scholarship	Basic fundamental skills, such as language, literacy, numeracy and ICT literacy skills
Numeracy	Team work	Writing	Global citizenship	
ICT competence	Problem Solving	Oral Communication	Lifelong learning	People skills, such as being respectful to others, communication, team working skills
Critical and creative thinking	Initiative and enterprise	Numeracy	Research and inquiry	
Ethical behaviour	Planning and organising	Learning Strategies	Information literacy	Thinking skills, such as analytic, problem solving, synthesis, creativity and learning skills
Personal and social competence	Self management		Personal and intellectual autonomy	
Intercultural understanding	Learning		Communication	Personal skills, such as self management, cultural understanding, having a global perspective and acting with responsible, ethical behaviour
	Technology		Ethical, social and professional understanding	

The notion of a new, cross-sectoral framework was proposed in 2011 and stakeholders saw value in “the creation of a common language around employability skills and the establishment of clear benchmarks addressing them” (Ithaca Group, 2011, p. 3). This resulted in the Core Skills for Work (CSfW) framework (DIISRTE, 2013), however it is unclear to what extent this framework has been used in the context of school curriculum. The CSfW framework is not

included in Table 1 and its emphasis is on performance, or what an employee should be able to do, rather than naming the skills required to do them:

Cluster 1: Navigate the world of work	Cluster 2: Interact with others	Cluster 3: Get the work done
a. Manage career and work life	a. Communicate for work	a. Plan and organise
b. Work with roles, rights and protocols	b. Connect and work with others	b. Make decisions
	c. Recognise and utilise diverse perspectives	c. Identify and solve problems
		d. Create and innovate
		e. Work in a digital world

(DIISRTE, 2013)

Vocational Education and Training in Schools

It is relevant to note that the AQF is currently under review. The terms of reference ask the panel to take into account developments in school as well as vocational and higher education, and to ensure that the AQF reflects “the knowledge, skills and capabilities required by individuals for effective economic and social participation and which meet the current and anticipated skill needs of the Australian economy” (DET, 2018b).

The AQF is of interest as it defines the requirements for the nationally recognised senior secondary certificate, which is relevant to any school providing VET programs in the senior years. In NSW there were 50,200 VET in Schools students in 2017. Despite the rise in mandated school-leaving age, the number of students undertaking VET programs has fallen steadily from a high of 61,200 students in 2014. (NCVER, 2018).

Nationally, the majority of young people complete secondary education, however only about half of them will go to university (Polesel et al, 2017). This raises the question of how well school, and particularly schooling in the senior secondary years, prepares students who will not attend university for their post-school life. Arguably, there should be some level of consistency between what students should know and be able to do as a result of attention to the general capabilities in the Australian Curriculum, and the vocational and higher education paths they choose to take in the senior years of school and beyond.

What constitutes the general attributes? Terminology, frameworks and definitions

The range of terms used to describe general capabilities in the literature differs by country and organisation. Examples include:

Australia	Key competencies, employability skills, generic skills, general capabilities
Canada	Employability skills, core competencies
European Parliament	Key competences
New Zealand	Essential skills
OECD	Key competencies, Global competencies, 21 st century skills
Singapore	Critical enabling skills
UNESCO	Transversal competencies
United Kingdom	Core skills, key skills, common skills
United States	Basic skills, necessary skills, workplace know-how, 21 st century skills

(NCVER, 2003; OECD, 2005, 2018; Ananiadou & Claro, 2009)

Definitions of terms like ‘knowledge’, ‘skill’, ‘competency’ and ‘capability’ are often technical and far from universal. Knowledge is widely defined in two ways: declarative knowledge, which is factual information a person knows and can report on, and procedural knowledge, which is the connection or use of pieces of declarative knowledge. In contrast, skills are differentiated as being “interwoven with knowledge and pertain to the psychomotor domain in manipulating

and constructing” (Baartman & de Bruijn, 2011, p. 127). Skills are then “doing or acting in practice, involving motor skills as well as cognitive skills” (ibid, p. 127). The Australian Qualifications Framework (AQF) uses similar definitions, seeing knowledge as “what a graduate knows and understands” and skills as “what a graduate can do” (AQF, 2013, p. 11).

Competence is also defined differently in various studies but is commonly understood to consist of integrated pieces of knowledge, skills and attitudes (Baartman & de Bruijn, 2011, p. 126). The AQF prefers the term ‘application of knowledge and skills’ (AQF, 2013).

Lucas and Smith follow the OECD in describing capabilities as

“an interweaving of knowledge, skills, attitudes and values that form the competencies that drive actions. So, for example, developing self-discipline, an essential aspect of personal and social capability, requires an individual to make choices, follow routines, manage time, analyse factors, select strategies and so on. These sub-skills then get combined and described at a more generic level where they form part of an even larger concept – a capability. When young people are given opportunities to routinely use capabilities, they become lifelong habits and dispositions.” (2018, p. 4).

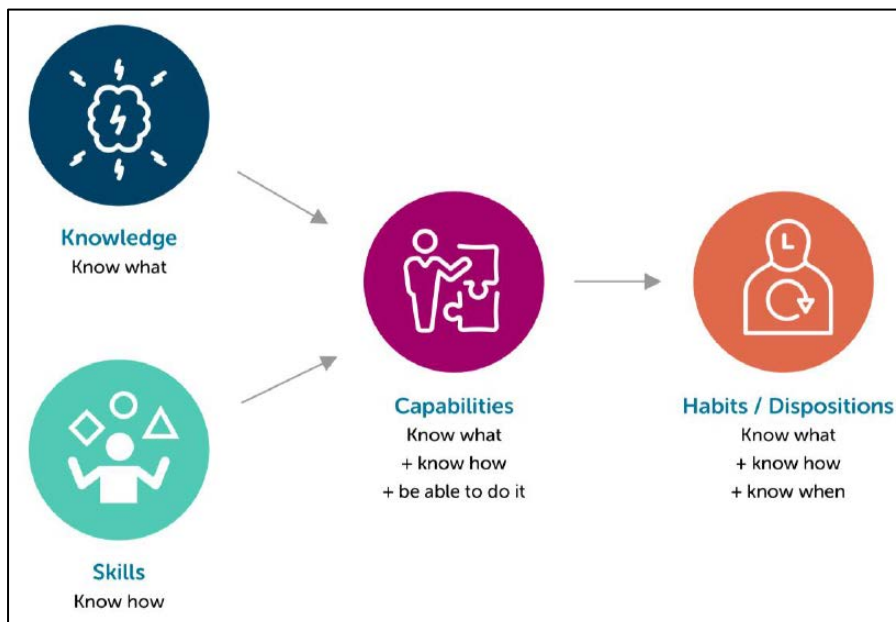


Figure 1: Building capabilities through education, taken from Lucas & Smith, 2018, p.4

While terms like skill, capability and competency are common (and conflated), the word preceding and therefore describing sets of skills or competencies provides some indication of how the skills are perceived and what their focus is intended to be. “Employability” is explicit about vocational application, while “21st century” implies new skills and tends to foreground changes in communications technologies. “General” and “generic” imply generalisability and cross-curricular skills, which “transversal” makes more explicit. “Essential” and “necessary” suggest a narrow set of skills and an initial level of competence, which “basic” makes more explicit. “Key” and “core” also suggest a narrow set of skills that are foundational, without the connotation of being basic. There is often an underlying employability aim although, since Mayer in 1992, the skills are usually argued to apply more broadly, at least in Australia, to education and to life. As Clayton and colleagues point out:

“The choice of term is telling. The difference between referring to a skill as ‘soft’ and referring to it as ‘essential’ is hugely significant in political terms. Indeed, while generic skills have suffered by definitional confusion, the most damaging label of all has been that of ‘soft skills’, with its connotations of imprecision and unimportance. Little wonder that they have not been better promoted” (Clayton et al, 2003, p. 15).

In some cases, one term refers to a subset of another. For example in Australia ‘core skills’ refers mainly to language literacy and numeracy skills, while ‘generic skills’ encompasses the current employability skills as well as a broader range of personal skills (see Table 1). The plethora of terms can be confusing. For example, Yates notes that some “systems have introduced competency frameworks as an overlay or replacement for traditional subjects. Others are still experimenting with so-called twenty-first-century skills: working in groups, problem-solving and so on” (Yates, 2017, p. 89). Arguably, competency frameworks are the overarching framework in which 21st century (21C) skills are included as a subset of the competencies students are expected to achieve. Alternatively, the notion of 21C skills itself is often intended to include areas such as citizenship, and personal and social responsibility (Griffin, McGaw & Care, 2012), making 21C skills not merely a subset, but the entirety of a competency framework (such as the Australian Curriculum’s general capabilities).

Whatever term is used, it tends to be an umbrella for a list of disparate knowledge, skills and competencies. This is problematic because statements about how generalizable, teachable or assessable general capabilities are tend to be broad brush, yet each skill or set of skills needs to be considered on its own merits. For example, perhaps collaboration and ICT literacy are more generalizable than critical thinking. There is then a further issue of the extent to which any of these skills can really be considered discrete. More on that below.

Care, Scoular and Bui (2014) mapped the general capabilities in the Australian Curriculum to the framework of 21C skills defined by the international Assessment and Teaching of 21st Century Skills (ATC21S) project (Griffin, Care & McGaw, 2012). They found strong alignment between the national curriculum and the global ATC21S project (p.185):

<p>Ways of thinking</p> <ul style="list-style-type: none"> - Creativity and innovation - Critical thinking, problem-solving, decision-making - Learning to learn/metacognition 	<p>Tools for working</p> <ul style="list-style-type: none"> - information literacy - ICT literacy
<p>Ways of working</p> <ul style="list-style-type: none"> - Communication - Collaboration (teamwork) 	<p>Ways of living in the world</p> <ul style="list-style-type: none"> - Citizenship – local and global - Life and career - Personal and social responsibility – including cultural awareness and competence

(see e.g. Griffin, Care & McGaw, 2012)

One of the issues with the many lists of skills is that there is no single, unified and universal framework for organising them (Lamb, Maire & Doecke, 2017). The ATC21S list, and the framework in which it sits, was drawn from an analysis of 12 frameworks from several countries. Another common framework separates the skills by those that are cognitive, interpersonal and intrapersonal (Pellegrino & Hilton, 2012). Yet another separates them by those that are information, media and technology skills, those that are learning and innovation skills, and those that are life and career skills (Dede 2010).

The recent review by Gonski suggests that ACARA revisit the current general capabilities (DET, 2018a, p. 27). It is not the purpose of this paper to sift through the many lists of skills currently in existence. Ongoing discussion is appropriate although the current general capabilities appear to cover the most common skills, and use terms that are broad enough to allow for new developments in areas susceptible to change (such as ICT). In their ongoing monitoring of the skills movement (as they refer to the international adoption of what in Australia is called the general capabilities), the Brookings Institution has identified the four skills most commonly cited in government documents. Of the 152 countries examined to date, 61 (40 per cent) referred to creativity, 54 (36 per cent) to communication, 49 (32 per cent) to problem solving and 45 (30 per cent) to critical thinking (Roth, Kim & Care, 2017; Care, Anderson & Kim, 2016).

Lamb and colleagues identified nine skills that they felt had “received close and concerted attention from policy makers, researchers and practitioners: critical thinking, creativity, metacognition, problem solving, collaboration, motivation, self-efficacy, conscientiousness, and grit or perseverance” (Lamb, Maire & Doecke, 2017, p. 3). These skills and qualities can be mapped into two of the Australian Curriculum capabilities: critical and creative thinking, and personal and social capability (Lucas & Smith, 2018, p. 3).

The OECD has recently released a position paper outlining a new “Learning Framework 2030” that builds on their original key competencies (the DeSeCo project: Definition and Selection of Competencies)(OECD, 2018a) and “encapsulates a complex concept: the mobilisation of knowledge, skills, attitudes and values through a process of reflection, anticipation and action, in order to develop the inter-related competencies needed to engage with the world” OECD, 2018a, p. 6). ACARA has been involved in the development of the framework and the work is likely to impact on future developments in Australia.

One of the issues facing the lists of skills is the definition ascribed to the terms themselves. As Silva notes:

“In defining “technology literacy,” for instance, various education organisations and businesses list information science skills, digital media fluency, advanced computer, and Internet communications, as well as the newborn term “technacy” – a deep knowledge of technological systems” (Silva, 2009, p. 631).

The issue of the meaning of each term in a list is closely linked to the question of how discrete individual skills really are.

How discrete are general capabilities?

Lamb and colleagues argue that the various skills that make up general competencies:

“form a dense conceptual web, that is, the constructs are related in complex ways and sometimes overlap one another. It is difficult to establish a clear distinction between knowledge, skills and dispositions based on student behaviours” (Lamb, Maire & Doecke, 2017, p. 3).

A good example of the issue with discrete terms is the set of skills listed by the Foundation for Young Australians (FYA, 2016). The list of what they call enterprise skills was not intended to be complete, but included communications, presentation skills and digital literacy as discrete terms. Digital literacy, like technological literacy above, is likely to mean different things in different sectors. Arguably, presentation skills is a subset of communication and would require aspects of digital literacy. Brookings and FYA refer to creativity. The general capabilities references critical and creative thinking. How does creative thinking differ from creativity?

And further, when it comes to teaching and assessing, it is clear that these terms themselves often hide multiple skills. Presentation skills, for example, requires subject knowledge, the ability to summarise and synthesise, the ability to tailor to time and audience, to speak confidently and clearly, to know how to create powerpoints (for example) and also what to include in slides (and what not to). With the possible exception of confidence, each of these skills could be taught and assessed, although in the case of designing powerpoints, what is acceptable or not is largely subjective and a matter of changing tastes (and technology platforms). Breaking down critical thinking and creativity into teachable and assessable components is likely to be more difficult.

Such constructs are being defined, developed and tested. For example, the OECD Programme for International Student Assessment (PISA) of 15-year-olds has, in addition to assessing reading, mathematics and science, included a variety of innovative assessments in its cycles, including creative problem solving (2012), collaborative problem solving (2015), global competence (2018) and (due in 2021) creative thinking. Such constructs are new and, as the OECD acknowledge, clear challenges and limitations remain. These, in terms of assessment, include the authenticity of tasks, time constraints and the validity of instruments and what they pertain to measure (OECD, 2018b, p. 21). Currently, 36 constructs are under review through the OECD Learning Framework 2030 project, including conflict resolution, critical-thinking skills, empathy, mindfulness, resilience, and self-efficacy (OECD, 2018a, p. 17).

How general are general capabilities?

To be *general*, it has to be assumed that general capabilities apply across multiple situations and contexts and that, therefore, the knowledge or skill concerned can be *transferred* from one setting to another. The employability skills guide for teachers and trainers said that a “generic skill learned or applied in one workplace will also be applicable in another” (Precision Consultancy 2006). The CSfW framework, however, accepts that the core skills for work are context-dependent (DIISRTE, 2013). This acknowledges that an employee moving from one workplace to another will need time to understand the culture and context of the new workplace, the internal politics and relationships, and adapt to them before being able to demonstrate the same level of ability in some core skills.

In the US, the National Research Council (NRC) committee report on defining 21st century skills argued that:

“In contrast to a view of “21st century skills” as general skills that can be applied to a range of different tasks in various academic, civic, workplace, or family contexts, the committee views 21st century skills as dimensions of expertise that are specific to – and intertwined with – knowledge within a particular domain of content and performance” (Pellegrino & Hilton, 2012, p. 3).

An earlier NRC report on the learning sciences views the issue from a different angle:

“Teaching practices congruent with a metacognitive approach to learning include those that focus on sense-making, self-assessment, and reflection on what worked and what needs improving. These practices have been shown to increase the degree to which students transfer their learning to new settings and events” (National Research Council, 2000, p. 12).

The same report, summarised in a recent update, notes:

“Learning transfer – the capacity to apply learning in a new context – most likely occurs when the learner knows and understands the underlying general principles

that can be applied to problems in different contexts” (National Academies of Sciences, Engineering, and Medicine, 2018, p. 14).

An argument is then made that “Deeper learning is needed for complex problem solving, reasoning, inferential thinking, and transfer of knowledge to new situations” (National Academies of Sciences, Engineering, and Medicine, 2018, p. 167; Hattie & Donoghue, 2016). Along with reflection, there may be specific skills related to transfer, and these should be made explicit. This may be facilitated by teachers articulating the usefulness and transferability of the skills they are teaching, rather than leaving students to infer such things for themselves (Misko, 1995). That is, thoughtful and critical teaching can help learners to see the generic nature of their skills and knowledge and make the transfer possible (Waterhouse & Virgana, 2004; Gibb, 2004).

Integrating general capabilities into curriculum and classroom

Binkley and colleagues, from the Assessment and Teaching of Twenty-First Century Skills (ATC21S) project (Griffin, McGaw & Care, 2012), comment that:

“Where the aims and goals of twenty-first century learning are described in the frameworks we examined, they are generally specified as being taught through, within and across the subjects without the detail of how this is to be achieved or what the responsibilities of each subject might be in achieving them. Without this depth of detail, these national statements of twenty-first century aims and goals are unlikely to be reflected in the actual learning experience of students or in the assessments that are administered” (Binkley, Erstad, Herman et al. 2012, p. 35-36).

More recently, Lamb and colleagues find that while “Most systems recognise that the key skills need to be developed through teaching disciplines and subject content, as well as potentially across subject areas; no school system can yet demonstrate a generalised and consistent focus on key skills across schools, subjects and year levels” (Lamb, Maire & Doecke 2017, p. 4).

Tan and colleagues see two challenges: “how school systems and educators can more effectively assess and scaffold the development of these “new knowledge economy” competencies” and “the cultural and pedagogical complexities of implementing 21st century core competencies-oriented educational innovations within long-established conventions of mainstream schooling that tend to privilege the acquisition of canonical disciplinary knowledge and academic achievement” (Tan et al, 2017, p. 427).

Researchers at the Brookings Institute note the “absence of well-established, evidence-based approaches that demonstrate how to teach the skills and show how students have benefited from the process” and cite Australia as one of a few countries providing resources to guide teachers across year levels and subject areas (Care, Kim & Vista, 2017).

Magee and Jensen (2018) have written about British Columbia (BC) for this review. The BC school system is one of the highest performing in the world. Magee and Jensen note that the curriculum includes competency learning standards that are subject-specific articulations of the core competencies that include skills, strategies and processes and set out in each case what students should be able to do. Both the Australian Curriculum and the NSW syllabus documents also set out what students should know and be able to do, by subject and year level, with reference to the general capabilities.

Other systems have developed similar requirements within the curriculum. For example, Alberta has identified eight competencies. There are accompanying documents that describe how these competencies may be expressed in each learning area.¹

In BC, a developmental continuum has been constructed for each core competency. So for example, there are eight levels in the ‘Communication’ developmental continuum which describe what a student at each level should know and be able to do. ACARA has done the same for each of the Australian general capabilities. For example, the Critical and Creative Thinking learning continuum has four sub-sections, each of which contains three sub-elements (see Figure 2). For each of these, there are six levels along a continuum. Moving from Level 1 (typically describing what a Foundation level students can do) to Level 6 (typically describing what Year 10 students can do)(ACARA, n.d.).



 						
Critical and Creative Thinking learning continuum						
Sub-element	Level 1 Typically, by the end of Foundation Year, students:	Level 2 Typically, by the end of Year 2, students:	Level 3 Typically, by the end of Year 4, students:	Level 4 Typically, by the end of Year 6, students:	Level 5 Typically, by the end of Year 8, students:	Level 6 Typically, by the end of Year 10, students:
Reflecting on thinking and processes element						
Think about thinking (metacognition)	describe what they are thinking and give reasons why	describe the thinking strategies used in given situations and tasks	reflect on, explain and check the processes used to come to conclusions	reflect on assumptions made, consider reasonable criticism and adjust their thinking if necessary	assess assumptions in their thinking and invite alternative opinions	give reasons to support their thinking, and address opposing viewpoints and possible weaknesses in their own positions
Reflect on processes	identify the main elements of the steps in a thinking process	outline the details and sequence in a whole task and separate it into workable parts	identify pertinent information in an investigation and separate into smaller parts or ideas	identify and justify the thinking behind choices they have made	evaluate and justify the reasons behind choosing a particular problem-solving strategy	balance rational and irrational components of a complex or ambiguous problem to evaluate evidence
Transfer knowledge into new contexts	connect information from one setting to another	use information from a previous experience to inform a new idea	transfer and apply information in one setting to enrich another	apply knowledge gained from one context to another unrelated context and identify new meaning	justify reasons for decisions when transferring information to similar and different contexts	identify, plan and justify transference of knowledge to new contexts
Analysing, synthesising and evaluating reasoning and procedures element						
Apply logic and reasoning	identify the thinking used to solve problems in given situations	identify reasoning used in choices or actions in specific situations	identify and apply appropriate reasoning and thinking strategies for particular outcomes	assess whether there is adequate reasoning and evidence to justify a claim, conclusion or outcome	identify gaps in reasoning and missing elements in information	analyse reasoning used in finding and applying solutions, and in choice of resources
Draw conclusions and design a course of action	share their thinking about possible courses of action	identify alternative courses of action or possible conclusions when presented with new information	draw on prior knowledge and use evidence when choosing a course of action or drawing a conclusion	scrutinise ideas or concepts, test conclusions and modify actions when designing a course of action	differentiate the components of a designed course of action and tolerate ambiguities when drawing conclusions	use logical and abstract thinking to analyse and synthesise complex information to inform a course of action
Evaluate procedures and outcomes	check whether they are satisfied with the outcome of tasks or actions	evaluate whether they have accomplished what they set out to achieve	explain and justify ideas and outcomes	evaluate the effectiveness of ideas, products, performances, methods and courses of action against given criteria	explain intentions and justify ideas, methods and courses of action, and account for expected and unexpected outcomes against criteria they have identified	evaluate the effectiveness of ideas, products and performances and implement courses of action to achieve desired outcomes against criteria they have identified

Figure 2: Page one of the Critical and Creative Thinking learning continuum

Arguably, then, there is a framework in place in the Australian Curriculum for integrating general capabilities into the classroom. Australia’s integration of the general capabilities currently mirrors that of Alberta, where “Educators are not required to formally evaluate and report on competencies separately from students’ progress in achieving learning outcomes” (Alberta Government, 2017).

British Columbia, however, has raised the profile of their general capabilities using assessment. For years F-9, students are required to self-assess where they are on the developmental

¹ Alberta Education documents that “make clear connections between the eight competencies and subject learning outcomes in current programs of study (e.g. Arts Education, Science, Math, Social Studies). See <https://education.alberta.ca/competencies/competencies-in-subjects/everyone/documents/>

continuum for each core competency, and these self-assessments are summarised in reports to parents. This is intended to raise awareness of the importance of the core competencies to the students' futures (Magee & Jensen, 2018). Such student self-assessment and reflection supported by teachers is also recognised to be an aspect of a metacognitive approach to learning that can facilitate awareness of and transfer of learning to new situations (discussed further below).

The 2016 review of BOSTES recommended that the current NSW syllabus development process should be significantly streamlined, overcrowding reduced and teacher professional judgement supported. (Louden, Paul & Lambert, 2016, p. 4). The review further recommended increasing capacity for the organisation to focus on areas identified as needing greater attention, such as resources to enhance support for teachers in the use of formative assessment in the classroom. These areas are relevant if a greater focus on general skills and their teaching and assessment at the classroom level are to be realised.

There is literature on teaching strategies that support the development of competencies in students, however, there is little research about whether teaching and learning has changed with the introduction of competency-based education (Burns & Gereluk, 2017). A small study of teachers in Alberta, where a competency framework has been in place since 2011, found that teachers tended to privilege one competency (e.g. technology) to the neglect of others. They “each implemented only those aspects they deemed critical, noting that time and curricular expectations didn’t allow for a more integrated approach. This also showed a tendency to view the competencies put forth in government policy as additional to the curriculum, not as a means to delivering curriculum. (Burns & Gereluk, 2017, p. 88).

The report chaired by David Gonski notes that “Despite the attention and importance given to the general capabilities, teachers and schools are insufficiently supported to teach and assess them. [...O]nly around one-third of Australian lower-secondary teachers recently participated in professional development aimed at teaching cross-disciplinary capabilities like problem solving” (DET 2018a, p. 39). In addition, many Australian teachers report that professional development does not have a positive impact on their teaching, and many are also unaware of the resources for developing capabilities available to them, and how they might be used in conjunction with learning area materials (Ibid, p. 40).

The need for alignment

Kim and colleagues argue that the incorporation of general attributes into an education system requires the alignment of curriculum, assessment and pedagogy, as shown in Figure 3. They provide an example:

“The learning objective is for students to learn to think critically and compare and analyze statements made by various authors, but the pedagogical strategies focus entirely on requests for summaries of the authors’ statements, and the assessment only captures information about which author made which statements. As a result, the task does not provide the opportunity for students to engage in the learning goal, and the assessment therefore cannot measure critical thinking or comparing and analyzing.

As evidenced by this example, when the components in the system are misaligned, changes in one component (e.g., curriculum reform) may yield few improvements in student learning if the other parts of the system, such as assessment and pedagogy, are not similarly adjusted. What you’re left with are outcomes that fall substantially short of what was intended” (Kim, Care & Vista, 2019).

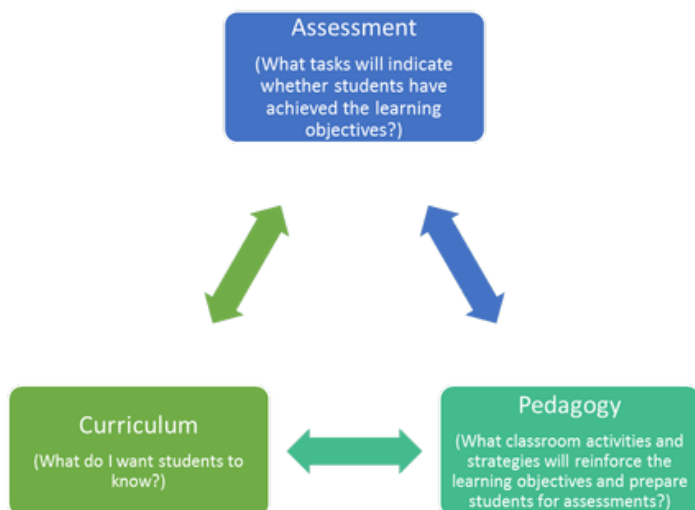


Figure 3: Alignment of the components of the education system (Kim, Care & Vista, 2019)

Care and colleagues argue that this alignment has not yet occurred because we do not yet have a deep understanding of these skills. Research argues that we have not yet answered questions such as: what does thinking critically mean? What does the developmental trajectory of critical thinking look like? What should grade level expectations be for critical thinking?

ACARA’s learning continuum demonstrates that attempts to answer these questions are being made. Kim and colleagues recommend that once there is “understanding of the developmental nature of these skills, the focus needs to be on differentiating between levels of skills. One possible approach is to use learning progressions—pathways that describe how students typically achieve mastery of a particular learning domain or skills.” Then “in order to capture and report on what students are able to do, assessments of 21st century skills should be authentic—that is, reflect what students will be asked to do in real-life situations beyond school” (Kim, Care & Vista, 2019). This focus is recommended in the recent report chaired by David Gonski:

“Recommendation 7: Strengthen the development of the general capabilities, and raise their status within curriculum delivery, by using learning progressions to support clear and structured approaches to their teaching, assessment, reporting and integration with learning areas” (DET 2018b, p. 41).

The learning of general capabilities in Australia is likely then to focus on those capabilities within key learning areas, and on student ability to use their knowledge in situations beyond the classroom. Recent work by Dinham and colleagues notes that “There is also mounting concern that school mathematics and science are failing to help students develop the problem-solving and critical reasoning skills that will prepare them to tackle the challenges entailed in generating productive futures for themselves and, more generally, enhancing national wealth” (Tytler et al 2018, p. 2).

Literacy and numeracy are general capabilities with a long history and considerable development in learning progressions. Nonetheless, numeracy in particular faces a particular issue in primary school where teachers “report a lack of competence and confidence in teaching mathematics and science, not having taken the higher levels of these subjects in senior secondary school...or at this level at all” (Dinham & Tytler, 2018, p.19). At the secondary level “Some students will not encounter a trained mathematics or science teacher until the latter years of

secondary schooling, if at all” (Ibid, p.20; Prince & O’Connor, 2018), and this is more likely to occur in government schools, in low socioeconomic, regional and rural areas (Weldon, 2016).

Dinham and Tytler argue that change needs to go beyond simply providing additional “teacher proof” resources, and that additional content and pedagogical knowledge is not enough. They look to the underlying causes of the current situation and suggest that both teachers and students need to better engage with real world mathematics and science, “in the sense that mathematicians and scientists are engaged with solving current environmental, technological and societal problems through particular ways of thinking and working” (Dinham & Tytler, 2018, p.22).

The recent report of Australia’s Chief Scientist, Alan Finkel (Education Council, 2018), also argues for a deeper engagement with industry and other partners, although most of the recommendations concern producing learning materials and implementing high quality teaching practices. It will be important to pay attention to recent research and ensure that such materials are not simply more of the same, and that industry partnerships include the kind of outreach that has mathematicians and scientists engaging directly with schools.

The experience of reform in East Asia

A recent series of case studies by the Asia Society Center for Global Education (Cheng, 2017) looked at how East Asian education systems are integrating what is referred to as 21st century competencies (21CC). The research project considered Hong Kong, Japan, Singapore, South Korea and Taiwan, all of which have performed well in international comparisons through PISA, TIMSS and PIRLS. The project found that the education reforms had several components in common, and comprehensive plans for implementation, particularly in terms of curriculum reform and changes in the role of the teacher. Common components are listed below:

- Rationale of reform shifted from economic benefits to aspirations for the future of society (moving beyond the expectations of the workplace)
- Identify the characteristics of a successful young person in the 21st century, including development of self, interpersonal relations, thinking skills, good citizenship and social participation, contribution to the global world, basic knowledge and new knowledge
- Emphasis on values, and social and emotional learning, attained through experiential learning
- Emphasis on science of learning findings and changing pedagogy: active learning, experiential learning, diverse learning paths and outcomes
- Reduced curriculum: compressing disciplinary learning to make room for experiential learning

The emphasis on personal attributes and formation of personal values was seen to be a move away from the notion of skills and competencies, as they refer to performance (reflected in work) rather than dispositions (reflected in one’s mind). As such, there is a movement away from a focus on employability and skillsets per se. Interestingly:

“In Taiwan, the traditional vocational schools have all been transformed into alternative types of higher education. There is also a dilution of vocation-specific education in Japan and South Korea. All these reflect the workplace reality – the rapid obsolescence of vocational skills, the frequent change of jobs and occupations, the instability of jobs, and the growth of the tertiary sector of the economy – which demands higher educational qualifications” (Cheng, 2017, p. 7).

Both Singapore and Japan reduced their formal curriculum by about 30 per cent, and Hong Kong reduced its formal curriculum to four key learning areas. In Hong Kong, experiential learning opportunities are provided through school partnerships with the business sector, NGOs and other non-education bodies.

There is an emphasis on project-based learning, which requires students to define their own objectives, plan their own activities, sometimes in groups, and present their results to a larger audience. Singapore has now included “project learning” as a compulsory dimension of its university entrance examinations. South Korea has introduced an exam-free semester, in which students are required to design and plan their own study. In both Japan and Hong Kong, new areas of learning have been introduced that try to blur the disciplinary boundaries and allow students to learn how to tackle issues or problems with integrated knowledge.

The two major challenges to implementation identified by the project were modes of assessment (and the focus of current assessment regimes), which is discussed further below, and the role of teachers. The trend is towards decentralisation and greater autonomy for schools and teachers to develop and implement school-based curriculum according to their local needs. The role of students as active learners “is accompanied by the changing role of teachers as facilitators of self-directed learning, coordinators of experiential learning, and mentors of youth development in the affective domain” (Cheng, 2017, p. 11).

Assessment and levels of assessment

“a real assessment of the students’ ability to use their knowledge, as in the science of learning, should be the students’ ability to apply what they have learned to real-life situations and in collaborative groups. Hence, the ideal assessment should be creative, integrative, practical, and collaborative. This is rare” (Cheng, 2017, p. 13).

In the Australian education space there has been considerable work to define skills or concepts and to describe what individuals may be expected to achieve at different levels of competence. As noted above, the Australian Curriculum documents include six levels of competence, with level six equating approximately to the ability of a Year 10 student (although in intent, the levels are not age-related). In the vocational education space, the Core Skills for Work (CSfW) developmental framework has five levels: Novice, Advanced Beginner, Capable, Proficient, and Expert (DIISRTE, 2013). The AQF describes knowledge, skills and the application of knowledge and skills for 10 levels, equating to Australian qualifications from certificates I-IV to diplomas, bachelor, masters and doctoral degrees (AQF, 2013). The original Mayer report had three levels of achievement for its skills.

Reviews of skills in vocational education, from those of Mayer on, have found significant issues with their integration and assessment in training programs. Clayton and colleagues found that generic skills were included as discrete units of competency, as elements of competency, or as performance criteria, and also embedded in vocational units of competency. They were explicit in some cases and implicit in others, and this variation was found to have “a direct and sometimes negative bearing on practitioners’ understandings of generic skills, and the approaches they take to assessing them” Clayton et al, 2003, p. 7). They went on to argue that trainers found the delivery and assessment of generic skills to be difficult due to the lack of clear definition of what they were (Clayton et al, 2003).

Following the Mayer competencies, the Employability Skills Framework was approved in 2004-5. Research in 2009 found that there had been little information or professional development for trainers associated with the interpretation, teaching and assessment of skills in the new

framework (Cushnahan, 2009). There was a great deal of conflicting commentary and advice on the content and implementation of generic employability skills. TAFE teachers had difficulty understanding and teaching the skills supposedly embedded in training packages. There is an argument that it is neither reasonable nor appropriate for the interpretation of generic skills to be left to trainers (Cushnahan, 2009). While classroom teaching in school (and teacher training) differs from the vocational sector, such research suggests that teachers will need support to operationalise what is encoded at the policy level in the curriculum, including the learning continua (per the example in Figure 2).

A review of the impact of transferable skills programs in low and middle income countries found 90 completed impact evaluations. In almost all cases where an indicator was included to measure transferable skills (about half of the studies), the measurements came from self-reported information (Brown et al, 2015). While the reflection necessary for such self-assessment is likely to be a learning in itself, such measures are highly subjective, particularly so if the skills themselves are not clearly defined.

In Australia, the assessment of general competencies is not outlined in the policy framework or guidelines but is considered to be embedded in the assessment of subject knowledge and skills in each of the key learning areas. It assumes that the implementation and assessment of the general competencies occurs through the teaching of content and assessment of achievement standards (Care & Luo 2016, p. 15).

The evidence suggests that it does not follow that the current articulations of the skills and what students should be able to do at various levels translates well if at all to teaching, learning and assessment in practice. In both schools and vocational training, educators first and foremost are subject specialists and many may not see the general capabilities sitting comfortably within their current practice.

Care et al comment:

“Educational assessment is both ubiquitous and unpopular. Despite increasing visibility of concepts such as “assessment for learning” or “formative assessment,” which describes the constructive use of assessment to inform teaching, the primary use of assessment by national education systems remains summative—for use in certification, identification of eligibility for education progress, and system accountability. The assessment of 21CS, still in its infancy, does not lend itself easily to the modes of assessment that typically populate summative assessment approaches” (Care et al, 2019, p. 3).

Summative assessments, while they remain high stakes, are likely to cause a lack of uptake of reform that takes students beyond the simple retention of knowledge. In Hong Kong, Taiwan and Japan, university entrance exams are a fundamental obstacle to reform. They occupy all of students’ time, and shape pedagogical practices into knowledge acquisition and memorisation. “While all reforms intend to give students diverse paths of learning, the high stakes examinations have a unifying function, where all students have to follow the same curriculum, undergo the same learning process, and prepare for the same tests” (Cheng et al, 2017, p.13).

In response, British Columbia has moved away from subject-based examinations for university entrance at the end of school. In Hong Kong there are proposals to widen the scope of university admissions criteria and reduce the pressure of examinations. Japan is also implementing changes to its exams in 2019 (Cheng et al, 2017). As Lucas and Smith note, “Given the increased role of non-ATAR pathways in university admissions, and the call from employers to ensure young

people start work with well-developed capabilities, it may be timely to reconsider how and why our system ranks and reports student achievement” (2018, p. 6).

Work to define constructs and frameworks and develop appropriate assessments of general capabilities is nascent and ongoing. As noted above, the OECD has already attempted some general international assessments. The greater need is for formative, school-level assessments, tied to learning progressions that can be used by teachers across subject areas and year or ability levels.

Conclusion

“General capabilities do not exist as separate (and additional) curriculum entities. The seven general capabilities [...] are knowledge, skills and dispositions that are central to living, working and being a community member. They go far beyond having a solely work-related focus, being fundamental capacities for being active and productive individuals, citizens and community members living in a diverse and rapidly changing society.

Not only do they not exist independently of the learning areas and subjects (disciplines), they cannot exist without them. They are developed THROUGH the subjects. They work in partnership with them. The reason they are identified separately in the current Australian curriculum is to encourage educators to recognise that developing these general capabilities in all students is a task for all teachers, no matter what subject they teach. [...]

Of course there may be other general capabilities that are more important, but that is a community and professional discussion that should be ongoing, and the discussion is related always to time and place.” (Reid, 2015, p. 27).

Care and colleagues, following a scan of 152 countries, argue that;

“the skills movement has been underway for some time, at least in national rhetoric. There is less evidence of its articulation in curriculum and pedagogy policies, which may mean it is less evident in classrooms as well” (Care, Anderson & Kim, 2016, p. 4).

The Australian curriculum does articulate the general capabilities and ACARA provides learning continua that set out what students should know and be able to do as they progress through school, with the assumption that these general capabilities will be taught within the context of the key learning areas. For each learning area, ACARA and the NSW syllabuses provide subject-specific links with all seven general capabilities. There is little clarity on how the various current, primarily vocational skills frameworks (AQF, ESF, CSfW), relate to the Australian Curriculum and the senior years of schooling.

What is also less clear is the extent to which the general capabilities are actually implemented in the classroom. Can teachers undertake formative assessment to establish where on the learning continuum their students sit, and can they then design activities through which students will improve? How do students demonstrate that they have achieved a given level of ability in these kinds of skills? And a related issue: how do schools demonstrate the impact that they have on their students in developing the skills that are increasingly seen to be a requirement to live and work successfully in the 21st century?

Given the close relationship between these skills and the context within which they are practiced, whether that is within a subject discipline or a workplace environment, there may be a greater requirement that assessments within disciplines better demonstrate these kinds of skills. Lamb and colleagues argue that there is a gap between policy and practice, between what is in the curriculum and what happens in the classroom:

“[T]he expectation is that all teachers play a role in the development of key skills using a school-wide cross-curricular approach. Without research tracking reform in a concurrent manner, it is not possible to know how teachers operationalise new curricular frameworks that emphasise key skills alongside traditional subject areas. Do teachers feel supported in being able to meet the policy objectives set out within their curriculum objectives? Do teachers regard key skills as an equal or lesser-order priority to the delivery of subject-specific content? What learning approaches or pedagogies do teachers feel work best to develop such skills?” (Lamb, Maire & Doeke 2017, p. 45).

The evidence from East Asian education and other systems suggests that teachers need time and professional development to effectively introduce general capabilities and relevant experiential pedagogies into their classrooms. Many systems have reduced syllabus content to achieve the space required in the curriculum and timetables. Some systems are also partnering closely with industry and other organisations to provide students with relevant, practical, real-world experience and problems to solve.

Introducing the general capabilities into the curriculum documents, including with descriptions of levels of achievement, appears unlikely on its own to lead to change in most classrooms. There are likely to be teachers and schools with early uptake, and (if such work can be captured) their experiences may assist transition elsewhere. Retaining the current assessment status quo, however, where schools are not required to demonstrate teaching or learning of general capabilities in any form, and have to concentrate on preparing students for high-stakes exams, largely of content, at the end of schooling, are limiting factors that may prevent any real change or reform in this area.

Work to better define elements of knowledge, skill and competency is ongoing, however the lack of valid, cross-subject, multi-skill-level measures of most competencies makes system-wide uptake of new forms of assessment problematic. In addition, the apparent lack of a wide understanding amongst the teacher workforce of the what and how of teaching many elements of general competencies, suggests that change may need to be slow and incremental.

Acknowledgements

My thanks to Kathryn Moyle and Louise Wignall for useful discussions and helpful unpublished material. Thanks also to Geoff Masters, Claire Scoular and Sam Rothman for context-setting conversations.

References

- Alberta Government. (2017). *Competencies and current programs of study: Science*. Alberta Government. Retrieved from: https://education.alberta.ca/media/3576124/comp-in-science_20mar_17_final.pdf
- Allen Consulting Group. (1999). *Training to compete: The training needs of industry*. Sydney: Australian Industry Group. Retrieved from: <https://www.voced.edu.au/content/ngv%3A15682>
- Ananiadou, K., & Claro, M. (2009). 21st Century Skills and Competences for new millennium learners in OECD countries. *OECD Education Working Papers No. 41*. Paris: Organisation for Economic Co-operation and Development. Retrieved from: <http://dx.doi.org/10.1787/218525261154>
- ACCI/BCA. (2002). *Employability skills for the future*. Canberra: Department of Education, Science and Training. Retrieved from: <https://www.voced.edu.au/content/ngv%3A12484>
- ACARA. (no date). *Critical and Creative Thinking learning continuum*. Sydney: Australian Curriculum, Assessment and Reporting Authority. Retrieved from: <https://www.australiancurriculum.edu.au/f-10-curriculum/general-capabilities/>
- ACARA. (2011). *General capabilities consultation report*. Sydney: Australian Curriculum, Assessment and Reporting Authority. Retrieved from: http://docs.acara.edu.au/resources/General_Capabilities_-_Consultation_Report_-_December_2011.pdf
- AQF Council. (2013). *Australian Qualifications Framework: Second Edition January 2013*. South Australia: Australian Qualifications Framework Council. Retrieved from: <https://www.aqf.edu.au/>
- Baartman, L. K. J., & de Bruijn, E. (2011). Integrating knowledge, skills and attitudes: Conceptualising learning processes towards vocational competence. *Educational Research Review*, 6, 125-134.
- Bennett, D., Richardson, S., & MacKinnon, P. (2016). *Enacting strategies for graduate employability: How universities can best support students to develop generic skills*. Canberra: Australian Government, Office for Learning and Teaching, Department of Education and Training. Retrieved from: https://melbourne-cshe.unimelb.edu.au/data/assets/pdf_file/0011/1874774/SP13-3258_Curtin_Bennett_Graduate-Employability_Final-Report_Part-A_20163.pdf
- Binkley, M., Erstad, O., Herman, J., Raizen, S., Ripley, M., Miller-Ricci, M., & Rumble, M. (2012). Defining twenty-first century skills. In P. Griffin, B. McGaw, & E. Care (Eds.), *Assessment and teaching of 21st century skills*. Dordrecht: Springer.

- Brown, A. M., Rankin, K., Picon, M., & Cameron, D. B. (2015). *The state of evidence on the impact of transferable skills programming on youth in low- and middle-income countries*. New Delhi: International Initiative for Impact Evaluation. Retrieved from: <http://www.3ieimpact.org/evidence-hub/publications/scoping-reports/state-evidence-impact-transferable-skills-programming>
- Burns, A., & Gereluk, D. (2017). *Interpreting 21st century educational reform in Alberta: A pilot*. Paper presented at the IDEAS Conference. Retrieved from: <http://dx.doi.org/10.11575/PRISM/5336>
- Care, E., Anderson, K., & Kim, H. (2016). *Visualising the breadth of skills movement across education systems*. Retrieved from: <https://www.brookings.edu/research/visualizing-the-breadth-of-skills-movement-across-education-systems/>
- Care, E., Kim, H., Anderson, K., & Gustafsson-Wright, E. (2017). *Skills for a Changing World: National Perspectives and the Global Movement*. Center for Universal Education at Brookings. Retrieved from: <https://www.brookings.edu/wp-content/uploads/2017/03/global-20170324-skills-for-a-changing-world.pdf>
- Care, E., Kim, H., Vista, A., & Anderson, K. (2019). *Education system alignment for 21st century skills: Focus on assessment*. Center for Universal Education at Brookings. Retrieved from <https://www.brookings.edu/research/education-system-alignment-for-21st-century-skills/>
- Care, E., & Luo, R. (2016). *Assessment of transversal competencies: Policy and practice in the Asia-Pacific region*. Paris: UNESCO. Retrieved from: <https://unesdoc.unesco.org/ark:/48223/pf0000246590>
- Care, E., Scoular, C., & Bui, M. (2014). Australia in the context of the ATC21S project. In E. Care & P. Griffin (Eds.), *Assessment and teaching of 21st century skills: Methods and approach*. Dordrecht: Springer.
- Cheng, K. (2017). *Advancing 21st century competencies in East Asian education systems*. Retrieved from: <https://asiasociety.org/files/21st-century-competencies-east-asian-education-systems.pdf>
- Clayton, B., Blom, K., Meyers, D., & Bateman, A. (2003). *Assessing and certifying generic skills: What is happening in vocational education and training?* Adelaide: National Centre for Vocational Education Research, Australian National Training Authority. Retrieved from: <https://core.ac.uk/download/pdf/10827379.pdf>
- Cushnahan, M. (2009). *Beyond Mayer: Learning from delivering and assessing generic employability competencies*. Adelaide: National Centre for Vocational Education Research. Retrieved from: <https://www.ncver.edu.au/research-and-statistics/publications/all-publications/beyond-mayer-learning-from-delivering-and-assessing-generic-employability-competencies>
- Dede, C. (2010). Comparing frameworks for 21st century skills. In J. Bellanca & R. Brandt (Eds.), *21st century skills: Rethinking how students learn*. Bloomington: Solution Tree Press.
- DECSSA. (1997). *Key competencies professional development kit*. Adelaide: Department for Education and Children's Services of South Australia.

- DET. (2018a). *Through growth to achievement: The report of the review to achieve educational excellence in Australian schools*. Canberra: Department of Education and Training.
- DET. (2018b). *AQF Review – Terms of Reference*. Canberra: Department of Education and Training. Retrieved from: https://docs.education.gov.au/system/files/doc/other/terms_of_reference_1.pdf
- DIISRTE. (2013). *Core skills for work developmental framework*. Canberra: Department of Industry, Innovation, Climate Change, Science, Research and Tertiary Education.
- Dinham, S., & Tytler, R. (2018). Key innovations and methodology of ReMSTEP. In S. Dinham, R. Tytler, D. Corrigan, & D. Hoxley (Eds.), *Reconceptualising maths and science teaching and learning*. Melbourne: ACER Press.
- Donnelly, K., & Wiltshire, K. (2014). *Review of the Australian Curriculum: Final Report*. Canberra: Department of Education and Training. Retrieved from: <https://docs.education.gov.au/documents/review-australian-curriculum-final-report>
- Education Council. (2018). *Optimising STEM industry-school partnerships: Inspiring Australia's next generation, Final Report April 2018*. Melbourne: Education Services Australia. Retrieved from: <https://www.education.gov.au/review-achieve-educational-excellence-australian-schools>
- FYA. (2016). *The new basics: Big data reveals the skills young people need for the new work order*. The Foundation for Young Australians. Retrieved from: www.fya.org.au/wp-content/uploads/2016/04/The-New-Basics_Web_Final.pdf
- Gibb, J. (Ed.) (2004). *Generic skills in vocational education and training: Research readings*. Adelaide: National Centre for Vocational Education Research. Retrieved from: <https://www.ncver.edu.au/research-and-statistics/publications/all-publications/generic-skills-in-vocational-education-and-training-research-readings>
- Gilbert, R. (2018). General capabilities in the Australian Curriculum: Promise, problems and prospects. In A. Reid & D. Price (Eds.), *The Australian Curriculum: Promises, problems and possibilities*. Canberra: Australian Curriculum Studies Association.
- Griffin, P., McGaw, B., & Care, E. (Eds.). (2012). *Assessment and teaching of 21st century skills*. Dordrecht: Springer.
- Hattie, J. A. C., & Donoghue, G. M. (2016). Learning strategies: A synthesis and conceptual model. *NPJ Science of Learning*, 1(16013).
- Ithaca Group. (2011). *Employability skills and attributes framework project - Background paper*. Canberra: Department of Education, Employment and Workplace Relations. Retrieved from: <http://www.acal.edu.au/downloads/employabilityskillsconsultationbackgroundpaper.pdf>
- Jacobsen, M., Lock, J., & Friesen, S. (2013). Strategies for engagement: Knowledge building and intellectual engagement in participatory learning environments. *Education Canada*, 53(1). Retrieved from: <http://www.ceq-ace.ca/education-canada/article/strategies-engagement>
- Jones, A. L. (2006). *Re-disciplining generic skills: An examination of the relationship between the disciplinary context and generic skills in higher education*. (Doctor of Philosophy),

- University of Melbourne, Melbourne. Retrieved from: https://minerva-access.unimelb.edu.au/bitstream/handle/11343/39290/67465_00003740_01_absolutely_final_April07.pdf?sequence=1
- Kim, H., Care, E., & Vista, A. (2019, 30 January). Education systems need alignment for teaching and learning 21st century skills. Retrieved from: <https://www.brookings.edu/blog/education-plus-development/2019/01/30/education-systems-need-alignment-for-teaching-and-learning-21st-century-skills/>
- Lamb, S., Maire, Q., & Doecke, E. (2017). *Key skills for the 21st Century: an evidence-based review*. Sydney: NSW Department of Education. Retrieved from: <https://education.nsw.gov.au/our-priorities/innovate-for-the-future/education-for-a-changing-world/research-findings/future-frontiers-analytical-report-key-skills-for-the-21st-century/Key-Skills-for-the-21st-Century-Analytical-Report.pdf>
- Louden, W., Paul, L., & Lambert, P. (2016). *Review of the Board of Studies, Teaching and Educational Standards*. Sydney: State of New South Wales. Retrieved from: <https://educationstandards.nsw.edu.au>
- Lucas, B., & Smith, C. (2018). *The capable country: Cultivating capabilities in Australian education*. Mitchell Institute policy report No. 03/2018. Melbourne: Mitchell Institute. Retrieved from: <http://www.mitchellinstitute.org.au/wp-content/uploads/2018/10/The-capable-country.pdf>
- Magee, J., & Jensen, B. (2018). *Overcoming challenges facing contemporary curriculum: Lessons from British Columbia*. Collingwood: Learning First. Retrieved from: <https://learningfirst.com/reports/lessons-from-british-columbia/>
- Mayer, E. (1992). *Key competencies*. Canberra: Australian Education Council and Ministers of Vocational Education, Employment and Training. Retrieved from: <http://vital.voced.edu.au/vital/access/services/Download/ngv:28045/SOURCE2>
- Misko, J. (1995). *Transfer: Using learning in new contexts*. Adelaide: National Centre for Vocational Education Research. Retrieved from: <https://www.ncver.edu.au/research-and-statistics/publications/all-publications/transfer-using-learning-in-new-contexts>
- National Academies of Sciences, Engineering, and Medicine. (2018). *How people learn II: Learners, contexts and cultures*. Washington, DC: National Academies Press. Retrieved from: <https://www.nap.edu/download/24783>
- NCVER. (2018). *VET in Schools 2017*. Adelaide: National Centre for Vocational Education Research. Retrieved from: <https://www.ncver.edu.au/research-and-statistics/publications/all-publications/vet-in-schools-2017>
- NCVER. (2003). *Defining generic skills*. Adelaide: Australian National Training Authority. Retrieved from: https://www.ncver.edu.au/__data/assets/file/0020/4457/nr2102b.pdf
- National Research Council. (2000). *How people learn: Brain, mind, experience and school: Expanded edition*. Washington, DC: National Academies Press. Retrieved from: <https://www.nap.edu/download/9853>

- OECD. (2018a). *The future of education and skills: Education 2030*. Paris: Organisation for Economic Co-operation and Development. Retrieved from: <http://www.oecd.org/education/2030/learning-framework-2030.htm>
- OECD. (2018b). *Preparing our youth for an inclusive and sustainable world: The OECD PISA global competence framework*. Paris: Organisation for Economic Co-operation and Development. Retrieved from: <https://www.oecd.org/education/Global-competency-for-an-inclusive-world.pdf>
- OECD. (2005). *The definition and selection of key competencies: Executive summary*. Paris: Organisation for Economic Co-operation and Development. Retrieved from: <http://www.oecd.org/pisa/35070367.pdf>
- Pellegrino, J. W., & Hilton, M. L. (2012). *Education for life and work: Developing transferable knowledge and skills in the 21st century*. Washington, DC: The National Academies Press. Retrieved from: <https://doi.org/10.17226/13398>
- Polesel, J., Leahy, M., Rice, S., Gillis, S., & Clarke, K. (2017). What if you're not going to university? Improving senior secondary education for young Australians. In T. Bentley & G. C. Savage (Eds.), *Educating Australia: Challenges for the decade ahead*. Melbourne: Melbourne University Publishing.
- Precision Consultancy. (2007). *Graduate employability skills: Prepared for the Business, Industry and Higher Education Collaboration Council*. Canberra: Department of Education, Science and Training. Retrieved from: <https://core.ac.uk/download/pdf/30688676.pdf>
- Prince, G., & O'Connor, M. (2018). *Crunching the numbers on out-of-field teaching. AMSI Occasional Paper 1*. Melbourne: Australian Mathematical Sciences Institute. Retrieved from: <https://amsi.org.au/media/AMSI-Occasional-Paper-Out-of-Field-Maths-Teaching.pdf>
- Reid, A. (2015). Review of the Australian Curriculum: A view from the academy. *Curriculum Perspectives*, 35(1), 20-28.
- Roth, A., Kim, H., & Care, E. (2017, 31 August). New data on the breadth of skills movement: Over 150 countries identified. Retrieved from: <https://www.brookings.edu/blog/education-plus-development/2017/08/31/new-data-on-the-breadth-of-skills-movement-over-150-countries-included/>
- Savage, G. C. (2017). Improving national policy processes in Australian schooling. In T. Bentley & G. C. Savage (Eds.), *Educating Australia: Challenges for the decade ahead*. Melbourne: Melbourne University Publishing.
- Scarino, A. (2018). The Australian Curriculum and its conceptual bases: A critical analysis. In A. Reid & D. Price (Eds.), *The Australian Curriculum: Promises, problems and possibilities*. Canberra: Australian Curriculum Studies Association.
- Silva, E. (2009). Measuring skills for 21st-century learning. *Phi Delta Kappan*, 90(9), 630-634.
- Tan, J. P-L., Choo, S. S., Kang, T., & Liem, G. A. D. (2017). Educating for twenty-first century competencies and future-ready learners: research perspectives from Singapore. *Asia Pacific Journal of Education*, 37(4), 425-436.

- Tedesco, J. C., Opertti, R., & Amadio, M. (2013). *The curriculum debate: why it is important today*. Geneva: UNESCO International Bureau of Education. Retrieved from: www.ibe.unesco.org/sites/default/files/resources/wpci-10-curr_debate_eng.pdf
- Tytler, R., Dinham, S., Corrigan, D., & Hoxley, D. (2018). Responding to concerns about mathematics and science education. In S. Dinham, R. Tytler, D. Corrigan, & D. Hoxley (Eds.), *Reconceptualising maths and science teaching and learning*. Melbourne: ACER Press.
- Waterhouse, P., & Virgona, C. (2004). *Workplace literacy in the aged care and call centre industries: Two-dimensional work*. Adelaide: National Centre for Vocational Education Research. Retrieved from: <https://www.ncver.edu.au/research-and-statistics/publications/all-publications/two-dimensional-work-workplace-literacy-in-the-aged-care-and-call-centre-industries>
- Weldon, P. R. (2016). Out-of-field teaching in Australian secondary schools. *Policy Insights 6*. Melbourne: ACER. Retrieved from: <http://research.acer.edu.au/policyinsights/6/>
- Yates, L. (2017). Curriculum: The challenges and the devil in the details. In T. Bentley & G. C. Savage (Eds.), *Educating Australia: Challenges for the decade ahead*. Melbourne: Melbourne University Publishing.