21st century skills for senior education

An analysis of educational trends

November 2015

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Introduction

The Queensland Curriculum and Assessment Authority (QCAA) provides a range of educational services to Queensland school communities, including syllabuses, and teaching, learning and assessment resources to support implementation.

Senior syllabuses in Queensland are currently revised on a six-year cycle. However, this revision cycle has been modified pending decisions about the implementation of Australian Curriculum courses, which are comparable to fifteen Queensland syllabuses. Accordingly, QCAA syllabus publication dates range from 2000 to 2015.

Following the Queensland Government's announcement on 25 August 2015 of a new assessment and moderation system commencing with Year 11 in 2018, revision of senior syllabuses will occur in 2016. This revision will entail the redevelopment of syllabuses to incorporate features of the new assessment and moderation system and senior Australian Curriculum where available.

Background

Acquiring a broad set of skills during senior schooling is critical to students' success in further education and life. These skills have been widely researched and identified and over time have been refined and updated to reflect the changing world. The categorisation of these skills — sometimes referred to as general capabilities, lifelong skills, cross-curricular skills or 21st century skills — varies across educational jurisdictions and academic research.

Research suggests that to cope with the demands of the 21st century, students need more than core subject knowledge (Bruniges 2012). Students also need some different skills from those learned by students in the 20th century, and skills identified as 21st century skills are those needed to succeed in a complex, competitive, knowledge-based, information-age, technology-driven economy and society (Great Schools Partnership 2014). The Australian Council for Educational Research (ACER) *Queensland Review of Senior Assessment and Tertiary Entrance* (ACER Review) conducted by Dr Gabrielle Matters and Professor Geoff Masters, states:

> The Australian Curriculum, in common with the curricula of many other countries, is placing increased priority on the development of skills necessary for life and work in the 21st century. Senior secondary schooling will need to reflect these changes in curricular priorities (2014 p.75).

To enable the successful implementation of 21st century skills within the curriculum, it is necessary to identify a common set of skills and equip teachers with the expertise to teach them.

This paper summarises national and international research surrounding 21st century skills. It seeks to classify and group skills, identifying commonalities across educational jurisdictions and research. It lists and groups the qualities that will assist students to live and work successfully in the 21st century, and suggests an underpinning framework to use in the development of future Queensland senior syllabuses.

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The importance of 21st century skills

QCAA's vision is to develop a world-class curriculum, learning and assessment system for all Queensland students. Syllabus development must respond to the learning needs of all young people, and facilitate effective transitions to further education, training and employment.

The skills derived through senior education and needed in the 21st century are unique, and differ from those skills needed in the past. Societal shifts, including changes in employment and the way information and knowledge is accessed, used and created have influenced the changes in these skills. In some instances, they are not new skills, but a heightened importance of a particular skill, or the need to combine skill sets in different ways.

Educational jurisdictions and large multi-national companies across Australia and the world have identified a new set of skills that should be nurtured through schooling. For example, Microsoft, in their *Response to the NSW discussion paper: Great teaching, inspired learning* says:

> Employment markets have undergone seismic shifts over the last few decades, with the jobs that were once the bedrock of the global economy disappearing, replaced by a flood of new and highly adaptive roles – entrepreneurs, project managers, creative directors and more. These roles … require … an emerging skillset that's becoming as critical as literacy and numeracy — one that centres on 21st century skills such as critical thinking, collaboration and problem solving (2012 p.4)

In Queensland, the importance of these skills and capabilities has been highlighted in the recent Queensland Government (Department of Education) White Paper, *Advancing Education: An Action Plan for Education in Queensland*.

> Children and young people are preparing for a very different future from that of their parents … (2015, p.3)

Students will need to become:

- lifelong learners who are knowledge creators, technology savvy, problem solvers, innovators and effective communicators who share ideas with others and respond positively to change

- global citizens who have relationships based on fairness and tolerance, are culturally competent and able to connect locally and globally

- successful people who set goals, are resilient, able to create opportunities and are confident in pursuing their passions. (2015, p.3)

This belief has been supported by other education jurisdictions, including New South Wales, where Dr Michele Bruniges, Secretary of the NSW Department of Education and Communities stated, 'Our students compete on a global stage and they need new skills to prepare them for further study and jobs — many of which have not yet been created' (2012 n.p.).

To prepare Queensland students with the knowledge, skills and confidence to participate effectively in the community and the economy requires the development of skills that reflect the demands of the 21st century.

> There has been a dramatic acceleration in global competition and collaboration over the past thirty years, spurred by information and communications technology… Manual labour and routine tasks have given way to interactive, non-routine tasks — even in many traditional blue-collar occupations. (Kay 2010 p.xvi)

While the importance of students attaining a broad set of skills has been well established, research has revealed some contention surrounding the label '21st century skills'. Certain of the identified skills in particular have sparked this debate as some perceive them to have long been recognised by educationalists and thus nothing new (Suto 2013). As such, the term '21st century skills' may be misleading and inaccurate.

Dede, (cited in Walser 2008 p.1) identifies this concern but clarifies, 'some of these skills have always been important but are now taking on another meaning — like collaboration. Now you have to be able to collaborate across the globe with someone you might never meet'.

Whether these skills are variations of skills needed in the past or are unique to our 21st century context, they 'have been central to education for many years and have become more prominent with the shift to advanced knowledge economies and globalisation' (Bowman 2010 p.23). 'Schools are expected to prepare students for a complex and rapidly changing world.' (Lonsdale & Anderson 2011 n.p.). It is vital that we prioritise the knowledge and skills that will equip our students with the abilities needed to thrive in the communities and economies of the future.

The need for these skills to be described and implemented in education and training contexts was highlighted in research undertaken by Bowman (2010 pp.5–6):

New demands are being placed on education. The world is changing in ways that require education to ensure that students achieve a range of generic learning outcomes as well as discipline-specific learning outcomes. For example:

- Globalisation and increased competition are intensifying the need for workers able to: engage with the organisation's goals; share information; work in teams; make appropriate decisions; and be enterprising — all with the ultimate goal of improving productivity.

- The shift to advanced knowledge economies has meant that the requirements for the information and knowledge management and communication skills integral to information and communication technology are changing.

- The complexity of economic, social and technical issues is heightening the need for critical thinking and problem-solving skills.

- The pace of change is intensifying the need for greater individual adaptive capacity and lifelong learning.

- Globalisation and international mobility are highlighting the need to nurture appreciation and respect for social, cultural and religious diversity.

It appears that both in Australia and overseas there is common agreement on what these skills should be in preparation for higher education, work and life in general.

Defining 21st century skills

There are many ways of defining and describing 21st century skills. However, all encompass the high-priority skills and attributes believed to be most significant to help students live and work successfully in the 21st century. They are conceptualised as skills required by all individuals. While most of the skills appear throughout schooling, it is often suggested that the emphasis on particular skills may change throughout schooling. This paper focuses on the skills that research shows to be particularly beneficial to students in the senior phase of schooling.

The *Melbourne Declaration on Educational Goals for Young Australians* (2008 pp 7–9) proposes that to develop successful learners for the 21st century the curriculum needs to give focus to skills such as literacy, numeracy, citizenship, ICT, problem solving, planning and organising, thinking, teamwork, communication and creativity.

The Melbourne Declaration guided the curriculum development work of the Australian Curriculum Assessment and Reporting Authority (ACARA) in developing the general capabilities. These capabilities encompass the knowledge, skills, behaviours and dispositions that, together with curriculum content in each learning area and the cross-curriculum priorities, will assist students to live and work successfully in the 21st century. ACARA outlines seven general capabilities to underpin Australian Curriculum courses: literacy, numeracy, ICT capability, critical and creative thinking, personal and social capability, ethical understanding and intercultural understanding.

Concurrently, other work was being undertaken both nationally and internationally. While most jurisdictions arrived at the same individual skills, many have unique ways to categorise them. The 4c's (critical thinking, communication, collaboration and creativity) is a common approach (e.g. Partnership for 21st Century Learning).

Between 2009 and 2012, a worldwide collaboration occurred amongst information and communications technology (ICT) industry and educational institutions through a project called Assessment and Teaching of 21st Century Skills (ATC21S). The research arm was located at the University of Melbourne and identified 21st century skills within four categories:

1. Ways of thinking: creativity and innovation, critical thinking, problem-solving, decision-making, and learning to learn/metacognition

2. Ways of working: communication, and collaboration (teamwork)

3. Tools for working: information and ICT literacy

4. Ways of living in the world: citizenship (local and global), life and career, and personal and social responsibility (including cultural awareness and competence).

Summary of research

A summary of research is presented in the following tables:

- Table 1: Scan of Academic research

- Table 2: Scan of selected Australian jurisdictions

- Table 3: Scan of selected International jurisdictions.

Table 4 provides a synthesis of the scans, identifying similarities and differences.

Table 1: Scan of Academic research identifying broader educational skills

Assessment and Teaching of 21st Century Skills (2012)	The Melbourne Declaration (MCEETYA 2008)	P21 Partnership for 21st Century Learning (n.d.)	Center for Curriculum Redesign (Fadel & CCR 2015)
Ways of thinking • creativity and innovation • critical thinking, problem-solving, decision-making • learning to learn/metacognition **Ways of working** • communication • collaboration (teamwork) **Tools for working** • information literacy • ICT literacy **Ways of living in the world** • citizenship — local and global • life and career • personal and social responsibility	• literacy • numeracy • citizenship • ICT • problem-solving • planning and organising • thinking • teamwork • communication • creativity	**Learning and Innovation skills (4Cs)** • creativity and innovation • critical thinking and problem-solving • communication • collaboration **Information, media and technology skills** • information literacy, media literacy, ICT literacy **Life and career skills** • flexibility and adaptability • initiative and self-direction • social and cross-cultural skills • productivity and accountability • leadership and responsibility	• skills (creativity, critical thinking, communication, collaboration) • character (mindfulness, curiosity, courage, resilience, ethics, leadership) • metacognition (self-reflection and learning how to learn)
Global Digital Citizen Foundation (n.d.)	**Deep Learning, ICT and 21st Century Skills (Keane & Keane 2013)**	**ACER's Preparing 21st Century Learners (Lonsdale & Anderson 2011)**	**The Global Achievement Gap (Wagner 2008)**
21st century fluencies • solution • information • creativity • media • collaboration	• creativity • communication • collaboration • critical thinking • productive users of technology	• critical thinking and problem solving skills • communication • teamwork • information and media literacy	• critical thinking and problem-solving • collaboration and leadership • agility and adaptability • initiative and entrepreneurship • effective oral and written communication • accessing and analysing information • curiosity and imagination

Table 2: Scan of broader educational skills identified in selected Australian jurisdictions

Qld	NSW	Vic	WA
SAS — Core Skills for work Authority — General capabilities	**4C's**	**Key competencies and Employability skills**	**General capabilities**
SAS • Manage career and work life • Work with roles, rights and protocols • Communicate for work • Connect and work with others • Recognise and utilise diverse perspectives • Plan and organise • Make decisions • Identify and solve problems • Create and innovate • Work in a digital world <u>Authority</u> Varies across subject areas. Syllabuses (pre-2010) have broad skills embedded within the global aims and the attitudes and values dimension. Post-2010 syllabuses refer to the <u>Australian curriculum</u> general capabilities, and provide resources to support implementation of these skills.	• creativity • critical thinking • communication • collaboration Currently, broader skills are addressed in the "Domain" section of the syllabus. **Ways of thinking** — inference, deductive reasoning and creativity **Skills** — planning, investigating, communicating, problem-solving techniques, creative solutions to problems, working individually and in teams. **Values** — positive values and informed critical attitudes; ethical behaviour; develop attitudes such as curiosity, honesty, flexibility, persistence, critical thinking, willingness to suspend judgement, tolerance and acceptance.	• initiative and enterprise • problem-solving • planning and organising • learning • communication • team work • technology • self-management.	• literacy • numeracy • information and communication technology competence • critical and creative thinking • ethical behaviour • personal and social competence • intercultural understanding.

Table 3: Scan of broader educational skills identified in selected International jurisdictions

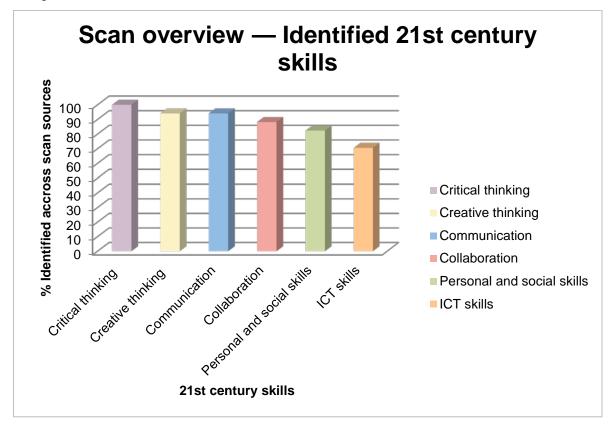| International Baccalaureate (IB)	Hong Kong	Singapore	Ontario (Canada)	New Zealand
ATL skills (Approaches to learning skills) IB learner profile	Generic skills	21st century competencies	21st century skills are also mentioned but not explicitly outlined The Ontario Skills Passport (OSP) is implemented	Key competencies for living and lifelong learning (TRUMP)
ATL skills • thinking skills • communication skills • social skills • self-management skills • research skills **IB learner profile** • inquirers • knowledgeable • thinkers • communicators • principled • open-minded • caring • risk-takers • balanced • reflective (ATL skills should be seen as linking closely with the attitudes and dispositions identified in the IB learner profile)	**Generic skills** • collaboration • communication • creativity • critical thinking • information technology • numeracy • problem-solving • self-management • study.	**21st century competencies** *Values* *Social and emotional competencies* ***Emerging global competencies*** • civic literacy, global awareness and cross-cultural skills; • critical and inventive thinking; • communication, collaboration and information skills	**21st century skills general statement** Compassionate, actively engaged citizens, critical thinking skills, imagination, resilience **Work habits** • teamwork • reliability • organization • working independently • initiative • self-advocacy • customer service • entrepreneurship **Essential skills** • reading text • writing • document use • computer use • oral communication • numeracy • thinking skills Digital citizenship is also embedded within the curriculum	• thinking • relating to others • using language, symbols, and text • managing self • participating and contributing

Table 4: Synthesis of scans

Assessment and Teaching of 21st Century Skills	The Melbourne Declaration	P21 Partnership for 21st Century Skills	Center for Curriculum Redesign	Global Digital Citizen Foundation	Deep Learning, ICT and 21st Century Skills	ACER's Preparing 21st Century Learners	The Global Achievement Gap
creativity and innovation	literacy	creativity and innovation	creativity	solution	creativity	critical thinkers and problem solvers	critical thinking and problem-solving
critical thinking, problem-solving, decision-making	numeracy	critical thinking, problem solving, decision-making	critical thinking	information	critical thinking	communicators	collaboration and leadership
learning to learn/metacognition	citizenship	communication	metacognition	creativity	communication	team players	agility and adaptability
communication	ICT	collaboration	communication	media	collaboration	information and media literate	initiative and entrepreneurship
collaboration (teamwork)	problem solving	information literacy, media literacy,	collaboration	collaboration	productive users of technology		effective oral and written communication
ICT	planning and organising	ICT operations and concepts	character				accessing and analysing information
information literacy	thinking	initiative and self-direction					curiosity and imagination
citizenship — local and global	teamwork	flexibility and adaptability					
life and career	communication	social and cross-cultural skills					
personal and social responsibility	creativity	productivity and accountability					
		leadership and responsibility					

Qld (SAS)	NSW	Vic	WA	IB	Hong Kong	Singapore	Ontario (Ca)	New Zealand
manage career and work life	creativity	initiative and enterprise	literacy	thinking	collaboration	civic literacy, global awareness and cross-cultural skills	critical thinking skills	thinking
work with roles, rights and protocols	critical thinking	problem-solving	numeracy	communication skills	communication	critical and inventive thinking	imagination	relating to others
communicate for work	communication	planning and organising	ICT competence	social skills	creativity	communication	resilience	using language, symbols and text
connect and work with others	collaboration	learning	critical and creative thinking	self-management skills	critical thinking	collaboration	computer use and digital citizenship	managing self
recognise and utilise diverse perspectives	values	communication	ethical behaviour	research skills	information technology	information skills	teamwork	participating and contributing
plan and organise		team work	personal and social competence		numeracy		reliability, organisation	
make decisions		technology	intercultural understanding		problem-solving		working independently initiative	
identify and solve problems		self-management			self-management		literacy and numeracy	
create and innovate					study		actively engaged citizens	
work in a digital world							oral communication	

Scan overview: Identified 21st century skills

The majority of 21st century skills identified across the scans are represented within the six categories outlined below.

It should be noted that although ICT is not explicitly identified as a 21st century skill across the entire scan, it has been entrenched in the approach to achieving 21st century skills. In addition, personal and social skills do not represent a distinct skill but a number of skills identified across the scan, positioned within this category.

	The following skills identified across the scan are represented by personal and social skills:
	character
	citizenship — local and global
	civic literacy, global awareness and cross-cultural skills
	ethical behaviour
	flexibility and adaptability
	leadership and responsibility
	manage career and work life
	personal and social competence
	planning and organising
	productivity and accountability
	self-management skills
	social and cross-cultural skills

Proposed 21st century skills for senior syllabuses

There is significant commonality among skills recognised across the scans. A set of 21st century skills and associated skills emphasised across the scans are listed below. QCAA proposes to include these skills when developing future Authority syllabuses.

Table 5: 21st century skills proposed for QCAA Authority syllabuses

21st century skills	Associated skills
Critical thinking	- analytical thinking - problem-solving - decision-making - reasoning - reflecting and evaluating - intellectual flexibility
Creative thinking	- innovation - initiative and enterprise - curiosity and imagination - creativity - generating and applying new ideas - identifying alternatives - seeing or making new links
Communication	- effective oral and written communication - using language, symbols and texts - communicating ideas effectively with diverse audiences
Collaboration and teamwork	- relating to others (interacting with others) - recognising and using diverse perspectives - participating and contributing - community connections
Personal and social skills	- adaptability/flexibility - management (self, career, time, planning and organising) - character (resilience, mindfulness, open- and fair-mindedness, self-awareness) - leadership - citizenship - cultural awareness - ethical (and moral) understanding
ICT skills	- operations and concepts - accessing and analysing information - being productive users of technology - digital citizenship (being safe, positive and responsible online)

Proposed implementation of 21st century skills for senior syllabuses

It is proposed that 21st century skills form one aspect of the QCAA underpinning factors for Authority subject syllabuses.

Recently developed QCAA Authority-registered Subject Area Syllabuses (SAS) embed a number of underpinning factors, derived from current education, industry and community expectations.

1. Literacy

2. Numeracy

3. Applied learning

4. Community connections

5. Core Skills for Work.

Literacy and numeracy skills have an important place in senior secondary subjects regardless of the pathways undertaken by students beyond Year 12. In 2012, Australia's Industry Skills Council published *No More Excuses: An industry response to the language, literacy and numeracy challenge*, a report identifying challenges for improving Australians' literacy and numeracy skills. The report called for industry and education sectors to share responsibility for building young people's literacy skills and numeracy skills. Initiatives such as this influenced the redevelopment of QCAA SAS and were supported by consultation undertaken by QCAA in 2013. The consultation — involving government and professional committees, an online survey and numerous meetings with practising teachers — established that both industry and the community expect students to demonstrate competency in literacy and numeracy. It also revealed that teachers identified the need for curriculum to explicitly teach literacy and numeracy knowledge and skills that align with applied practical learning for the subject and that reflect learner needs and pathways.

The importance placed on the development of literacy and numeracy skills for students entering a tertiary pathway is supported by the Federal Government's recent decision that from 2016 student teachers will need to pass a national literacy and numeracy test before being allowed to graduate. This is one of a number of recommendations of the *Action Now: Classroom Ready Teachers* report, adopted by the government for implementation in 2016 (TEMAG 2015). The Melbourne Declaration also highlighted the need for students to have the essential skills in literacy and numeracy, as a foundation for success in all learning areas. For this reason, it is proposed that literacy and numeracy will form two of the underpinning factors for both SAS and Authority subjects.

The distinctive nature of SAS delivers a broader skill set through applied learning, community connection and Core Skills for Work. Many of the 21st century skills identified in this paper overlap with the skill sets included in SAS (Table 4). For this reason, 21st century skills need not be included as additional learning when developing future SAS.

Current Authority syllabuses however, do not explicitly address a broader skill set. As such, it is proposed that 21st century skills form one of three underpinning factors that shape the development of Authority subject syllabuses (Table 6).

Table 6: Proposed inclusion of 21st century skills as an underpinning factor for Authority syllabuses

QCAA senior syllabuses	Authority syllabuses	Underpinning factors • literacy • numeracy • 21st century skills
	Study Area Syllabuses (SAS)	Underpinning factors • literacy • numeracy • applied learning • community connections • Core Skills for Work

Students should be provided with a variety of opportunities to learn through and about the underpinning factors across the four-semester course of study. Though coverage of each may vary from syllabus to syllabus, QCAA proposes to require the Expert Writing Teams to embed the underpinning factors when writing content as part of syllabus redevelopment proposed for 2016.

Further considerations

In recent years, education systems worldwide have developed frameworks with an increased emphasis on developing the skills necessary for success in the 21st century. This paper establishes the importance of 21st century skills and identifies a common skill set. Successfully implementing 21st century skills may require further analysis of the following matters:

- resources and support for teachers to develop core competencies needed to teach 21st century skills

- assessing 21st century skills.

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