LEARNING PROGRESSIONS AND ONLINE FORMATIVE ASSESSMENT NATIONAL INITIATIVE

FINAL REPORT – ATTACHMENT 3

CRITICAL AND CREATIVE THINKING: A REPORT ON EXISTING AND FUTURE WORK

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1 Introduction

One of ACARA's activities in the discovery phase was to identify progress to date in the development of learning progressions and any associated assessments for critical and creative thinking. Specifically, ACARA was asked to:

- Work with Victoria and any other jurisdiction where work is being done on critical and creative thinking to review existing work to date and identify what further work needs to be undertaken to continue the development of a learning progressions for critical and creative thinking linked to the Australian Curriculum
- Work with jurisdictions where work is being done on critical and creative thinking to identify existing assessments and research the development of new assessments.

Critical and creative thinking (CCT) is one of the seven general capabilities within the Australian Curriculum. The general capabilities are expressed as continua of learning to be embedded in the content of the learning areas, as appropriate. The general capabilities comprise an interconnected set of knowledge, skills, behaviours and dispositions that students develop and use in their learning across the Australian Curriculum, in co-curricular programs and in their lives outside school. The digital publication of the Australian Curriculum displays opportunities for the development of the general capabilities in the content descriptions and elaborations of the learning areas.

The question of how best to describe and measure general capabilities continues to be of significant international interest. As part of these discussions ACARA has been participating in the OECD 2030 Education and Skills Project which aims to help countries find answers to what knowledge, skills, attitudes and values are needed for today's students to thrive and shape their world, as well as how instructional systems can effectively develop them.

In discovery phase ACARA identified that the Victorian Curriculum and Assessment Authority (VCAA), the Australian Council for Educational Research (ACER) and Pairwise Pty Ltd (as Brightpath Assessment were undertaking work to define and assess CCT as part of the curriculum.

In May 2019, ACARA held a round table with the three groups to share information on current research being undertaken on CCT and to identify areas of common interest and possible collaboration.

As a result of that workshop ACER and VCAA agreed to work with ACARA to progress the work in understanding the elements required to develop an agreed learning progression in CCT. It was agreed to undertake two substantial pieces of work during discovery:

- further trialling of existing assessment instruments developed by VCAA and ACER
- mapping of assessment materials to each of the available constructs of CCT and to the existing ACARA continuum in CCT.

While the work in discovery phase has led to some insights that could inform future directions for the development of a learning progression and associated assessments for CCT, there is much more research and work needed.

2 Current activity

2.1 ACER's research project for assessing 21st century skills

ACER, through its Centre for Assessment, Reform and Innovation (CARI) is undertaking research to investigate ways of assessing so-called '21st century skills' such as collaboration, critical thinking and creative thinking. The project team have designed classroom-based activities for Year 5 and Year 8 students which have been trialled in schools. The resulting data are being analysed to investigate validity, reliability and the extent to which the tasks allow generalisations about student learning and development.

ACER's broad approach to the 'three C' skills (collaboration, critical thinking and creative thinking) is to emphasise growth. This proceeds on the basis that skills can be defined with a growth aspect, they can be improved through teaching intervention and can be measured. The approach is theory driven and evidence based. Definitions aim to provide consistent interpretation and tasks are criterion referenced.

Assessments are situated in an education context (focus on assessment and teaching) and goal oriented. They are designed to be integrated into classroom practice to enhance their sustainability and are contextualised in the broad domains of the Humanities and STEM, but do not require specific content knowledge.

Students are involved in a project-based learning module with embedded assessments, during which they explore a short humanities or STEM module delivered on computer via Google Drive. The modules developed to date consist of 10 tasks. The module is delivered by the regular classroom teacher, after having been trained by ACER researchers in the administration of the assessments. Log data of the online activities and work submitted by students in Google Drive are recorded for later analysis. In addition, students fill in occasional questionnaires about their experience with the tasks. The assessments are delivered over the course of a whole or two half school days.

ACER has defined critical thinking and creative thinking separately. Each of them is divided into strands in which a three-level progression is described. Critical thinking is conceived as having three strands: knowledge construction, reasoning and decision-making. Within each of the three strands is three aspects. Similarly, creative thinking has three strands - generation of ideas, experimentation and quality of ideas – each of which is further elaborated by a number of aspects.

Overall ACER's project aims to develop:

- a generalisable structure across domains for assessment of general capabilities.
- the assessment of capabilities within collaborative, 'real world' problem-solving contexts.
- templates for assessing general capabilities, which teachers can adapt for their classroom.
- empirically derived achievement scales for critical thinking, creative thinking and collaboration.
- empirically supported learning progressions.

In addition to this work, ACER is soon to release a new PAT Critical Reasoning Test. This work may also inform aspects of critical thinking.

2.2 VCAA's Digital Assessment Library and support for the Victorian Curriculum

The Victorian Curriculum and Assessment Authority (VCAA) has been working for some time on assessment tasks to support schools to implement the Victorian Curriculum, which is substantially based on the Australian Curriculum but differs in its treatment of the general capabilities, including CCT. The VCAA has chosen four capabilities – critical and creative thinking, ethical understanding, intercultural understanding and personal and social capability – and described each as a set of discrete knowledge and skills that can and should be taught explicitly in and through the learning areas, but are not fully defined by any of the learning areas. A key distinction between the Australian Curriculum F–10 and the Victorian Curriculum F–10 is the provision of content descriptions and achievement standards in the four capabilities.

To support schools in implementing the Victorian Curriculum, the VCAA has developed a suite of 27 CCT assessment tasks. These tasks have been psychometrically validated and mapped to the existing scope and structure of the Victorian Curriculum.

The tasks are designed across the full range of levels from Years 1–10. They are undertaken individually. The length of time to administer a task varies between 20–60 minutes. The tasks are available online for schools to use when they wish. Teachers are provided with an administration guide. The tasks are self-contained including stimulus materials and a sequence of questions, most of which are open-ended and ask students to explain their thinking processes.

Each assessment task is scenario based. Students are given a range of stimulus material and asked questions exploring critical and creative thinking knowledge, skills and understandings as described in the curriculum continuum. These assessments do not assess the subject matter content used to provide context for the task. They are designed to assess the student's critical and creative thinking.

These CCT assessment tasks were originally developed for paper and pencil administration and empirically validated by ACER. This process showed that single scales describing progress in CCT can be developed, scaled score generated and therefore student learning and growth measured and monitored over time. To generate a valid scale score the assessment task/s need to be administered in bundles. This means a student is required to complete more than one assessment task. Single tasks can still be administered but there will not be enough information to draw conclusions about how the student is performing against all components of the curriculum achievement standards, nor provide an accurate estimate of a student's position on the scale.

These assessment tasks are now part of the VCAA Digital Assessment Library. This means the tasks are administered from a digital platform, making it easier for the students to access the broad range of stimulus materials and respond to different item types. The majority of the questions (items) are teacher marked using the supplied marking guides. The guides give details around each score point for each question and includes samples of student responses. All the information related to marking the tasks is available through the digital platform. Student results are stored in the Digital Assessment Library and this information is then able to be used to generate reports to support teachers to make decisions about what will be the next teaching and learning activities.

The VCAA conducts an annual sample assessment of CCT at Years 6 and 10 to produce state-wide data to monitor performance as part of the Education State targets.

In 2019, the VCAA is undertaking a re-calibration process for the CCT tasks and hopes to have the revised tasks available by the end of the year. This process is required as:

- The original validation process of the CCT assessment tasks was undertaken using a pen and paper version, so they need to be re-calibrated when undertaken in digital format.
- The assessment tasks were originally aligned to an early version of the Australian Curriculum CCT continuum (that only consisted of Years 2, 6 and 10). The Victorian Curriculum CCT is based on the Australian Curriculum but has been refined. A desktop alignment has been undertaken but this needs to be further validated during the re-calibration process.

The re-calibration of these tasks will enable the development of finer grain progressions to be embedded within the CCT curriculum. In addition, VCAA intends to tender for the development of a further 27 assessment tasks this year.

2.3 Brightpath exploratory work

Brightpath is a software program delivering assessment tasks designed to allow students to demonstrate their learning in designated curriculum areas in ways which will assist teachers to identify the learning required to enable students to progress and demonstrate improvement. It uses a pair-wise comparison methodology to develop a scale using a variant of the Rasch model. Teachers compare their students' work to calibrated exemplars to arrive at a scaled score. The process of comparing students' work to the calibrated exemplars promotes reliable teacher judgements.

The resource provides information regarding student performance and their position on the scale in relation to calibrated exemplars and descriptors, plus a profile indicating students on the scale in relation to the teaching points. At present, Brightpath provides assessments for oral narrative (F–2), recount writing (F–2), information report writing (F–7), narrative writing (F–9), persuasive writing (F–9) and book reviews (Yrs 2–8). It is available to all schools in Western Australia through the School Curriculum and Standards Authority, is being introduced to all South Australian schools, and is also used by a range of other schools across Australia.

Brightpath is doing some early thinking about the area of creativity. An initial task for Years 4–6 is being trialled using cartooning where students are given a stimulus and asked to create a story. Brightpath is also trialling an assessment for reasoned argument in SA schools, and looking to research whether this can be used as an assessment of an aspect of critical thinking.

3 Agreed scope of work for discovery phase

All three groups agreed that there is promising work occurring with the potential to inform the work on learning progressions and assessment for critical and creative thinking. However, it is complex work and the research is in its early days.

There are a number of approaches to the conceptualisation of critical and creative thinking, particularly on the relationship between the two and the extent to which it is both possible and desirable to integrate them. There is also a considerable body of research on the constructs of both critical thinking and creative thinking, but not much empirical evidence upon which to base a learning progression (or two).

For the discovery phase, it was agreed that it would be most productive to analyse the relationships between the existing work and look to enhance the empirical basis for the development of learning progressions. There was general agreement that the most productive next steps would be to explore opportunities to share existing data and align immediate research activities between VCAA and ACER, noting that the research activity by Brightpath is less developed at this stage.

The following two activities were agreed for the discovery phase because of their capacity to provide further empirical evidence to inform the development of a CCT learning progression.

3.1.1 Common student equating across assessments – taking advantage of work underway

Both ACER and VCAA have assessment tools available in relation to CCT. The assessments by ACER and VCAA have or will involve data collection in multiple states. Each agency was also planning for further data collection in the coming months.

It was proposed that schools be approached to undertake both the ACER and VCAA assessments. These trials will yield significant further empirical evidence on the measurement properties of the instruments and, by generating common student data, will enable comparison between the two constructs which will help identify commonalties and differences. Schools would be offered support to implement the tasks, professional learning and reports on student performance and asked to administer both the VCAA and ACER tasks to the same cohorts of students.

3.1.2 Mapping of assessment materials to each of the available constructs of CCT

To facilitate a better understanding of the definition and/or aspects of CCT assessed by the assessment resources from each agency, it was proposed to undertake a mapping exercise in which available assessment material is mapped to other available constructs. Since Brightpath is assessing only a small subset of CCT, and is in early days of development, it doesn't have a construct as such at this stage. Therefore, in practice, this will involve mapping of the ACER CCT tasks to the VCAA learning continuum, mapping of the VCAA tasks to the ACER CCT constructs, and mapping of all assessment material to the ACARA learning continuum for CCT.

4 Common student equating across assessment tasks

4.1 Methodology

The VCAA and ACER assessment tasks will be administered to a set of common students in Year 5 and Year 8.

Equating is generally performed in order to place the results from two different assessments, or test forms within an assessment on a common scale so they can be directly compared. A series of psychometric analyses are performed to ensure that any claims of comparability are valid. In the case of the present, exploratory equating, the aim is not principally to place these results of the two assessments on a common scale (though this may be a by-product). Rather the aim of the process is to interrogate the results of the analyses performed during the process to explore whether, how, and to what extent the two assessments appear to be measuring a common construct.

Since there are some differences in the way the assessments are administered (VCAA tasks to individual students, and the ACER tasks to groups, for example) the interrogation of the exploratory equating results will necessarily be combined with a high level of professional judgement. Having established a broad-level of construct agreement in the framework mapping, the exploratory analysis will reveal whether there are areas of particularly strong (or weak) alignment. These results will help establish a shared common understanding of the construct of CCT, which is an imperative underpinning of any future work on learning progressions for CCT.

ACARA worked with the Association of Independent Schools in South Australia (AISSA), the South Australian Department for Education and a group of government schools in New South Wales, with the great support of Christine Cawsey, Principal of Rooty Hill High School, to organise a common group of students to undertake the assessments of CCT developed by VCAA and ACER.

Identifying and communicating with schools to engage with the assessment trials required an extensive round of communication, which led to training days taking place in Adelaide on 7 August at AISSA and in Sydney on 26 August at Rooty Hill HS.

The students who are undertaking both sets of tasks are at Years 5 and 8. VCAA also offered schools the opportunity to undertake their CCT tasks at other levels.

Tables 1 and 2 below list the 17 schools from SA and NSW showing the number of classes that undertook the VCAA assessments. ACER had 922 students from 16 schools complete their assessments, as shown in Table 3. .

Table 1: Participating South Australian schools in VCAA tasks

School	Number of classes Year 5 bundles		Number of classes Year 8 bundles		Number of classes Year 1–2 bundle	
	Bundle 5.1	**Bundle 5.2**	**Bundle 8.1**	**Bundle 8.2**	**Bundle 2.1**	**Bundle 2.2**
Yorketown Area School	1 class		1 class			
Victor Harbour High School			2 classes			
Woodville High School				2 classes		
King's Baptist Grammar School			1 class			3 classes
St Peter's Girls' School				5 classes		

School	Number of classes Year 5 bundles		Number of classes Year 8 bundles		Number of classes Year 1–2 bundle	
	Bundle 5.1	Bundle 5.2	Bundle 8.1	Bundle 8.2	Bundle 2.1	Bundle 2.2
Hills Christian Community College		2 classes		2 classes		
Westminster School		2 classes	1 class		2 classes	

Table 2: Participating New South Wales schools in VCAA tasks

*Note: Rooty Hill HS undertook the VCAA assessments across Years 7–10.

Schools and contact	Year 5 Bundle	Year 8 Bundle	Year 10 Bundle	Year 1-2 Bundle
Rooty Hill HS (John Meng)		217 students 8 classes Bundle 8.2		
Hurlstone Agricultural HS (Paul Pittas)		180 students 6 classes Bundle 8.1		
Rouse Hill HS (Simon Kelly)		150 students 6 classes Bundle 8.1		
Erskine Park HS		Students classes Bundle		
Doonside Technology HS		Students classes Bundle 8.	Students Bundle 10.1	
Plumpton High School		Students classes Bundle 8.2		
Bondi PS	.			30 students 1 class Bundle 2.2.
Anzac Park PS	Students classes Bundle 5.			
Manly West PS (Jenni Milburn)	110 students 4 classes Bundle 5.2			
Lindfield Learning Village	60 students (approx.) 2 classes Bundle 5.2			30 students (approx.) 1 class Bundle 2.

Table 3: School participants for ACER tasks

School	Year 5 student numbers	Year 8 student numbers
Hills Christian Community School (SA)	65	
Anzac Park Public School (NSW)	70	
Lindfield Learning Village (NSW)	26	
Westminster (SA)	46	
Bondi Public School	27	
Yorketown Area School (SA)	15	
Woodville High School (SA)		17
Victor Harbour High School (SA)		51
King's Baptist Grammar School (SA)		29
Hurlstone Agricultural High School (NSW)		180
St Peter's Girls' School (SA)		80
Doonside Technology High School (NSW)		155
Hills Christian Community School (SA)		35
Erskine Park High School (NSW)		30
Rouse Hill High School (NSW)		54
Plumpton High School (NSW)		27
Total	249	673

4.2 Key findings

The schools had until the end of Term 3 to complete the tasks. All assessments were completed in time to allow marking and psychometric analysis to proceed in November. VCAA worked with schools to support the teachers to mark their students' work. It will then be marked independently by VCAA markers. ACER tasks are marked by ACER markers. Analysis is due to be completed by the end of the year.

5 Mapping the constructs for critical and creative thinking

5.1 Methodology

The collaboration between ACARA, VCAA and ACER was based on the knowledge that each had unique materials available, the comparison of which would allow substantial and deep investigation of the different conceptualisations of the domain/s of CCT. In particular:

- ACARA has developed a continuum describing CCT
- VCAA has developed a continuum describing CCT, as well as a bank of assessment items for use in their annual assessment of the Education State Target for CCT, which is administered to Year 6 and Year 10 students in Victoria
- ACER has developed detailed construct definitions and hypothetical learning progressions for each of critical and creative thinking, as well as accompanying assessment materials designed for students in Year 5 and Year 8.

In order to better understand the similarities and differences in the way that critical and creative thinking are understood by the three organisations, a mapping exercise, in which samples of the available assessment material were mapped to all available constructs, was undertaken.

In practice, since a mapping of VCAA and ACER assessment material to their own constructs was part of task development, the mapping exercise focussed on mapping:

- a subset of the VCAA assessment items to both the ACARA CCT continuum, and the ACER definitions of Critical thinking and Creative thinking; and
- the ACER pool of assessment items to the ACARA and VCAA learning continua.

5.1.1 The CCT general capability in the Australian Curriculum

Critical and creative thinking (CCT) is one of the seven general capabilities within the Australian Curriculum. The general capabilities are expressed as continua of learning to be addressed through the content of the learning areas, as appropriate.

Learning continua have been developed for each capability to describe the relevant knowledge, skills, behaviours and dispositions at particular points of schooling. Within each of the capabilities, specific behaviours and dispositions are identified and incorporated into each learning continuum as appropriate. Each continuum is organised into six levels that describe typical behaviours by the end of Foundation, Year 2, Year 4, Year 6, Year 8 and Year 10.

The learning continua are based on the belief that students need opportunities to develop capabilities over time and across learning areas. What is learned in the early years supports all subsequent learning. The learning continua assume it is possible to map common paths for general capability development, while recognising that each student's pace of development may be influenced by factors such as their prior experience, sense of self in the world and cognitive capacity.

ACARA states that the CCT general capability combines two types of thinking – critical thinking and creative thinking.

- Critical thinking is at the core of most intellectual activity that involves students in learning to recognise or develop an argument, use evidence in support of that argument, draw reasoned conclusions, and use information to solve problems. Examples of thinking skills are interpreting, analysing, evaluating, explaining, sequencing, reasoning, comparing, questioning, inferring, hypothesising, appraising, testing and generalising.
- Creative thinking involves students in learning to generate and apply new ideas in specific contexts, seeing existing situations in a new way, identifying alternative explanations, and seeing or making new links that generate a positive outcome. This includes combining parts to form something original, sifting and refining ideas to discover possibilities, constructing theories and objects, and acting on intuition. The products of creative

endeavour can involve complex representations and images, investigations and performances, digital and computer-generated output, or occur as virtual reality.

5.1.2 ACER definitions of critical and creative thinking

In comparing VCAA and ACER constructs, it is important to note key differences in the approaches.

ACER has defined each skill of critical thinking and creative thinking as a unidimensional construct or singular skill. This has been done, in part, for ease of conceptualisation. However, ACER acknowledges that these skills do not necessarily work in isolation and that skills, as well as other entities such as domain knowledge, attitudes and values will also play an important role in how these skills are manifested. The second point to note is that ACER's conceptualisation of the skill is intended to be generalisable. That is, the core skills are described in a generalised way. However, ACER acknowledges that the skills need context and are best taught and assessed within domain contexts. It is also possible that these core aspects will play out differently in different domains.

ACER defines critical thinking as follows:

- Critical thinking is the capacity to objectively analyse and evaluate information (including existing knowledge, data, truth claims and situations) for the purpose of constructing sound and insightful new knowledge and applying it judiciously to tasks and for informed decision making. Critical thinking encompasses the subject's ability to process and synthesise information in such a way that it enables them to logically and effectively solve problems.

ACER defines creative thinking as follows:

- Creative thinking is the capacity to generate many different kinds of ideas, manipulate ideas in unusual ways and make unconventional connections in order to outline novel possibilities that have the potential to elegantly meet a given purpose.

5.1.3 Critical and creative thinking in the Victorian Curriculum

The Critical and Creative Thinking curriculum is one of four capabilities within the Victorian Curriculum: F–10. These capabilities sit alongside the eight learning areas. The Victorian Curriculum: F–10 recognises that all learning areas and capabilities make a distinct contribution to the development of a critical and creative thinker. The Critical and Creative Thinking curriculum identifies transferable knowledge and skills that can be brought to bear on a range of different contexts and that are linked to, but not repeated or explicit in, content descriptions of the learning areas.

In constructing CCT into one capability, VCAA has accounted for typical conceptualisations of creative thinking that often includes a critical element, for example, in evaluating ideas, and for typical conceptualisations of critical thinking that often include a creative element, such as in speculative reasoning. A unified, high-level construct also allows teachers maximum scope for how they might bring together different learning areas and CCT to create a learning program.

The CCT capability is not a full description of the full development of creativity. It is concerned with the development of one element of creativity, that of creative thinking. Other vital elements of creativity, for example, creative expression and creative collaboration, are included in other learning areas and capabilities.

5.2 Findings from the construct mapping

The different approaches taken by ACER and VCAA to defining and assessing CCT provide the basis for analysis and discussion of possible links and points of difference. In addition, the structure of the ACER constructs provides the potential for comparisons and links to the ACARA continuum and the VCAA progression for CCT as a single construct.

Mapping of the existing constructs has been completed. The mapping exercise found that:

- Every VCAA item could be mapped to the ACER constructs. This suggests a high level of construct agreement across the two conceptions of CCT
- The ACER tasks could be mapped to, and were well spread across, the sub-elements of the ACARA CCT continuum
- The VCAA items could be mapped to the sub-elements of the ACARA CCT continuum, with a concentration of items within the 'reasoning' strand.

Undertaking the mapping process at a detailed, item level allows generalisation of the results to a construct level. Tables 3 and 4 represent what the results of the mapping suggest as to how the different constructs relate to each other. In Tables 3 and 4:

- the first column lists the ACER strands and aspects
- the second column represents the relationship between VCAA and ACER constructs
- the third column represents the relationship between ACER and ACARA constructs.

The mapping found high levels of correspondence among the key components of the three different constructs, although they are put together from differing organisational ideas; for example, ACER does not use metacognition as an organiser, but the mapping identified at least five examples of elements of what VCAA includes in metacognition being present in the ACER construct.

With the opportunity for further analysis, the points of both commonality and difference, including gaps, will become clearer.

Table 3: The relationship between the ACARA, VCAA and ACER constructs:Critical Thinking

ACER Critical Thinking Framework	VCAA Continuum	ACARA Continuum
Strand 1: Knowledge Construction		
Aspect 1.1: Identifies gaps in knowledge	Questions and possibilities (best fit)	Apply logic and reasoning Pose Questions
Aspect 1.2: Discriminates information	Reasoning Within domains	Organise and process information
Aspect 1.3: Identifies patterns and makes connections	Questions and possibilities Reasoning	Organise and process information
Strand 2: Reasoning		
Aspect 2.1 Applies logic	Reasoning Metacognition	Apply logic and reasoning
Aspect 2.2 Identifies assumptions and motivations	Reasoning Metacognition	Think about thinking (metacognition) Reflect on processes
Aspect 2.3: Justifies arguments	Reasoning Metacognition	Think about thinking (metacognition) Reflect on processes Evaluate procedures and outcomes
Strand 3: Decision Making		
Aspect: 3.1: Identifies criteria for decision making	Reasoning Metacognition	Evaluate procedures and outcomes
Aspect 3.2: Evaluates options	Metacognition	Evaluate procedures and outcomes
Aspect 3.3 Tests and monitors implementation	Expressed within learning domains	Seek solutions and put ideas into action

Table 4: The relationship between the ACARA, VCAA and ACER constructs: Creative Thinking

ACER Creative Thinking Framework	VCAA Continuum	ACARA Continuum
Strand 1: Generation of Ideas		
Aspect 1.1: Number of ideas	Questions and possibilities	Imagine possibilities and connect ideas
Aspect 1.2: Range of ideas	Questions and possibilities	Imagine possibilities and connect ideas
Strand 2: Experimentation		
Aspect 2.1 Shifting perspective	Questions and possibilities	Consider alternatives
Aspect 2.2 Manipulating ideas	Questions and possibilities	Imagine possibilities and connect ideas
Strand 3: Quality of Ideas		
Aspect: 3.1: Fitness for purpose	Within learning domains Metacognition	Imagine possibilities and connect ideas
Aspect 3.2: Novelty	Questions and possibilities Expressed within learning domains	Imagine possibilities and connect ideas
Aspect 3.3 Elaboration	Expressed within learning domains	Not expressed in ACARA continuum

6 Next steps

VCAA and ACER have existing products that each is strengthening through participation in this work and all parties are committed to using the results to contribute to a shared view which will inform next steps in the exploration of how learning progressions might be used in relation to CCT. There is nothing like the theoretical and empirical data available in literacy and numeracy to date on which to base a learning progression for CCT. Much of the research literature available is rich in philosophical discussion together with useful material to enhance pedagogy, but it is relatively rare to find validated assessment instruments linked to an agreed assessment framework.

The question of whether national learning progressions are developed for other aspects of the Australian Curriculum beyond literacy and numeracy is dependent on empirical evidence and policy intent. The national online formative assessment system will be designed in ways which will make it possible to incorporate other national learning progressions and aligned assessments if it is subsequently decided that this is both a policy goal and is empirically able to be done. Continuing research into critical and creative thinking will allow that proposition to be tested.

A national approach to validation and use of learning progressions is an admirable one. Australia is among only a few countries who have attempted development of skills learning progressions that are linked to the national agenda. However, to be fully integrative there needs to be full alignment of the skills within assessment, curriculum and pedagogy. Formative assessments need to be linked to the learning progressions so that growth can be identified and monitored. The learning progressions also need to link to level appropriate teaching actions and interventions. From an assessment point of view, this might mean showing how sample student responses and items relate to the progression. From a classroom perspective, it might mean thinking about how teachers use the progression for reporting, and what might be some interventions linked to each level.

There are numerous possibilities for future work moving toward learning progressions for CCT. Existing definitions and continua should be refined in light of the evidence from the collaboration to date. Not yet fully understood is the role that domain-based knowledge plays in CCT. Empirical research could be conducted in an alpha phase, administering assessments allowing for different levels of CCT proficiency to be displayed, while controlling the level of domain-based skill required. Such work would help explore the impact of domain-based knowledge on the general capabilities and inform the extent to which these capabilities are general.

It is recommended that research into assessing CCT continue in alpha phase building on the work commenced with ACER and VCAA in discovery phase. This work will be important in deepening an understanding of CCT and in exploring options for the design of a learning progression and aligned assessments for this general capability.