

NSW Department of Education

FUTURE

EDGE

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Thinking ahead: Why critical and creative thinking is needed in a complex world

Featuring Yasodai Selvakumaran, Mary Roche, Ronald Beghetto and Mark Scott





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Contents

About the Authors.....	4
Foreword	
Leslie Loble	6
Critical Thinking and Book Talk: An approach to developing critical thinking abilities in the early years	
Mary Roche	14
Cultivating critical and creative thinking: A teacher's journey	
Yasodai Selvakumaran	34
On creative thinking in education: Eight questions, eight answers	
Ronald A. Beghetto	48
Giving students an edge: Educating for a rapidly changing world	
Mark Scott	72



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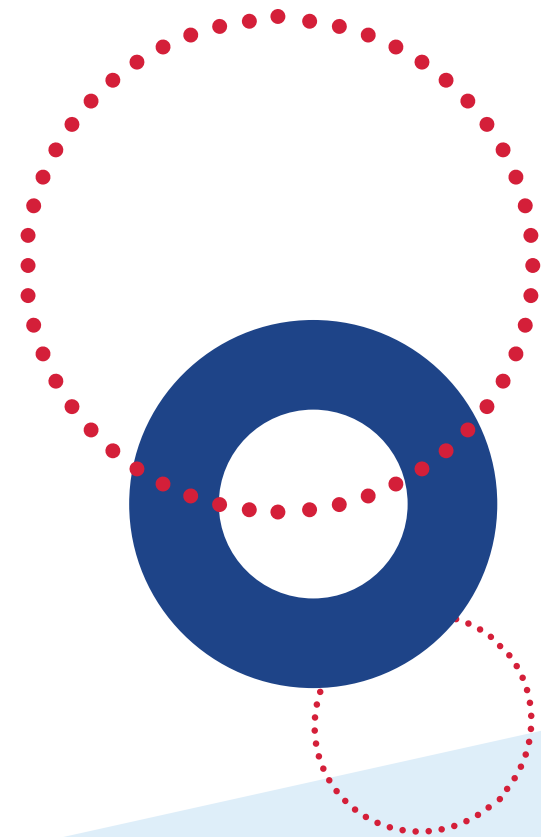
Mark Scott

Mark Scott AO is the Secretary of the NSW Department of Education and has a distinguished record in public service, education and the media. Mark's career began as a teacher in Sydney. Mark held a number of senior editorial roles at Fairfax. From 2006 to 2016, Mark was Managing Director of the ABC and led the organisation's transformation to be a public broadcaster in the digital era.



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Yasodai Selvakumaran is a humanities teacher at Rooty Hill High School and was a Top 10 finalist in the 2019 Global Teacher Prize. In a career of just eight years, she has directly influenced the careers of over 200 teachers, winning the 2014 Australian Council of Educational Leadership Mary Armstrong Award for Outstanding Young Educational Leader, and the Australian Teaching Fellowship for 2018.



Foreword

Leslie Loble

As educators, we have rarely faced circumstances as difficult as those confronting us in 2020.

Still reeling from the most catastrophic bushfire season ever recorded, schools in NSW have found themselves faced with unprecedented disruption caused by the COVID-19 pandemic. All across the state, teachers have risen to the challenge of delivering frontline services in a time of uncertainty – sharing resources, adapting lesson plans, and harnessing technology to develop innovative new approaches to deliver class content remotely while simultaneously ensuring that every child requiring access is welcome and learning at school.

Never has it been clearer that schools are an essential core of Australian life – for learning, of course, but we also have seen how central schools are to the dynamic communities they form.

Indeed, a notable (and reassuring) aspect of this pandemic is how our forced isolation has sharpened our need for human relationships and interconnection.

Natural disasters and pandemics also remind us just how big some challenges can be – and that no single act of human genius will overcome them. It will take the sustained collaboration of thousands of people applying their professional knowledge, skills and judgement to address each of the many serious challenges posed by the pandemic: caring for the sick, testing treatments, developing vaccines, managing public health resources, delivering essential services, supporting unemployed workers,



keeping businesses viable and fostering social and political stability.

In times like these the true value of human ingenuity, creativity and collaboration becomes starkly illuminated. It emphasises just how important it is to educate for these skills so that people can draw on deep subject and technical expertise to generate new knowledge and solve complex problems.

Professor David Baker, of the University of Washington's Institute of Protein Design, has developed an online game to crowd-source the design of a protein that could block receptors of the coronavirus. When asked why the task couldn't be completed by machine learning, Professor Baker replied that the total number of possible shapes for a protein were 'more than atoms in the universe'. To find a treatment fast, the

human ability to create, adapt and draw connections is more efficient than algorithms.

Harnessing a different set of creative skills, MIT engineering Professor Markus Buehler developed a musical translation of the SARS-CoV-2 virus spike protein in order to analyse structural details of the virus that may otherwise go unnoticed. Our brains have a very sophisticated ability to process sound and, by considering the virus in musical translation, the identification of a similar melody could help map a protein that could limit the ability of the virus to infect its host.

These examples are a great illustration of the importance of creativity, but also of how deeply creativity is linked to subject knowledge in practice and to critical thinking. True innovation requires analytical thinking, precision,

openness to different perspectives and collaboration.

Today, all across NSW, students are learning to solve their own big problems.

At Rosemeadow Public School, Year 4 students track their progress against colourful data walls, setting personal learning intentions and identifying the exact skills they need to demonstrate in order to reach their next education milestone.

Students in Yasodai Selvakumaran's classroom at Rooty Hill High School consciously work to develop their creative thinking skills, mapping the intellectual, technical and deliberative components of each new and challenging task.

Hours north, on the edge of the Northern Tablelands near the Queensland state border, the Wee Waa High School Bush Bots robotics team works with industry sponsors to learn to code and discover how technology has been applied to increase the competitiveness of the local cotton industry.

The thing that unites all these students? They're learning to think ahead. They are being educated to thrive whatever the future may bring. They are learning and honing the capacity to think more deeply and creatively.

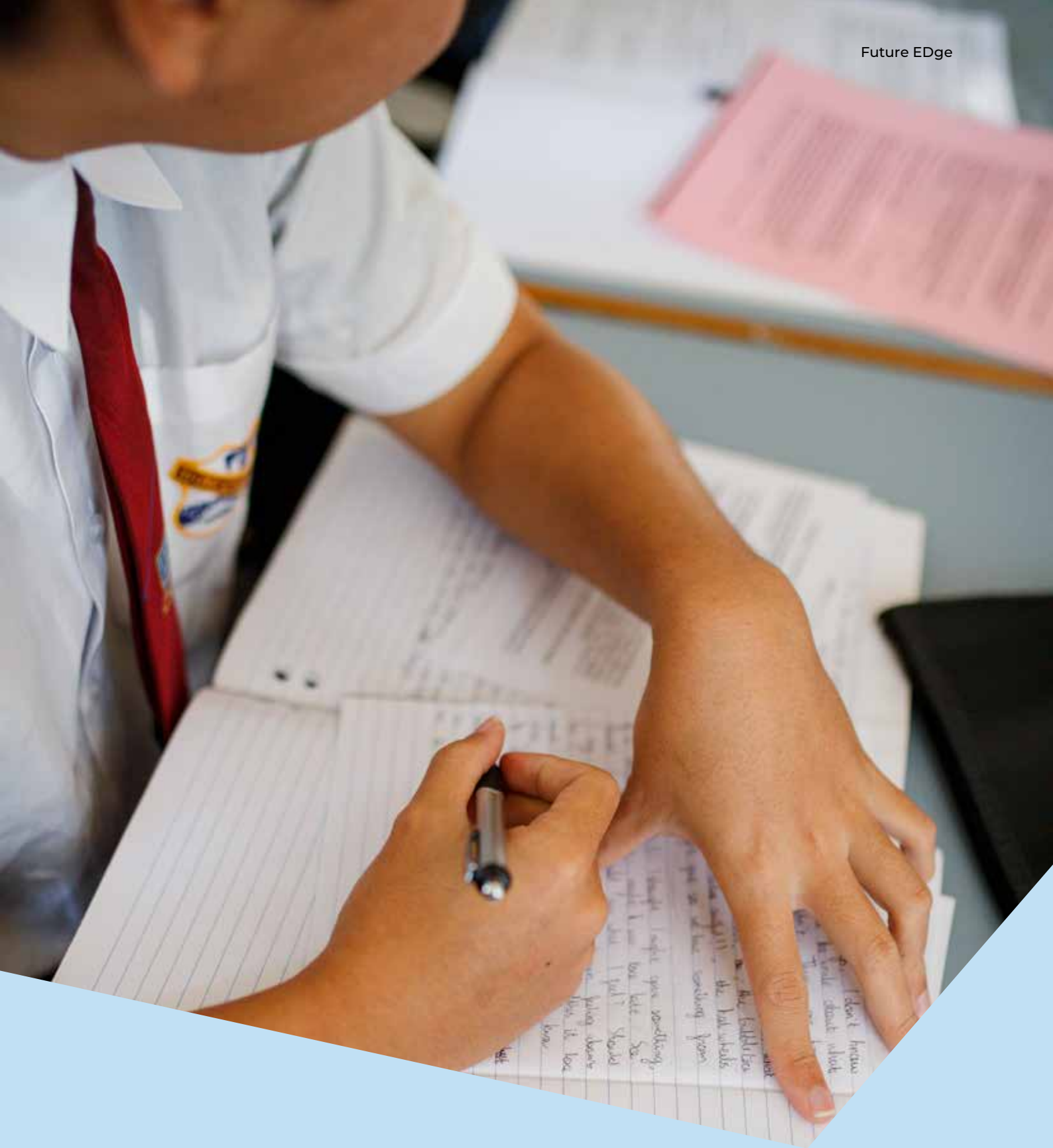
Three years ago, in introducing the Education for a Changing World initiative in 'Future Frontiers: Education for an AI World', we invited readers to marvel at the recent accomplishments

of machine learning. A computer program had just triumphed in the ancient strategy game of Go against a human player for the first time. Machine learning was improving medical diagnoses and beginning to impact employment in the kind of professional occupations previously considered impervious to mechanisation.

In the years since, the development of AI has continued to accelerate, astounding us with the potential for these technologies and unsettling us with the risks of malicious use and possible negative consequences.

With COVID-19, the need for the Education for a Changing World initiative has become only more pressing as we find our relationship with computer technologies changing once more. On an unprecedented scale we have turned to programs that can help us connect virtually in real time for social, work and educational purposes. And in so doing, it has become far more common for us to have conversations about online safety, privacy, data collection and the ethics of technology design and use. In a digital age, we need more than just the ability to use computer and information technologies to change what we do – we need to understand how they can use and change us.

After news broke recently of a data breach at controversial AI facial recognition company Clearview, a corporate spokesman dismissed concerns with, "data breaches are part of life in the 21st century." The various applications of facial recognition have



been the subject of heated ethical debates about the use of machine learning, but these concerns are amplified when the security of data cannot be assured.

The company, which built one of the world's largest facial recognition databases by mining images from social media accounts, is now working to acquire a national database of every mug shot taken in the United States over the past 15 years. The implications of a private company assembling this information are concerning, and the potential consequences of this sensitive information being freely available to anyone is worrying.

While we often think of specific new applications of machine learning technologies as pressing ethical challenges, higher-order skills like critical and creative thinking will be necessary to understand the complex interrelationships between technologies, and anticipate how these developments will shape our society and culture.

From data privacy to deep fakes and election interference, it is clear now that our challenge is not just about preparing students for a radically different labour market, or even teaching young people how to ethically apply the powerful tools provided by these advanced technologies: it is grappling with the very human consequences of technology that is able to think and act with inhuman scale and speed.

The Education for a Changing World initiative started out as an exploration

of how education systems can tackle the looming challenges posed by AI and machine learning, but in the years since it has also prompted us to return again and again to the most fundamental questions educators have always faced— how can we support young people to grow and become engaged citizens? How do we prepare students with the skills and knowledge they need to become independent lifelong learners and creative problem solvers?

We can all agree that these are goals of a good education, and we know how we must broadly ensure they are achieved. Evidence of teaching effectiveness must be combined with the vital role of subject knowledge, automaticity of recall and logical reasoning skills in facilitating higher-order problem solving and creativity, alongside uniquely human qualities of empathy, caring and capacity to genuinely collaborate. Those foundations will foster well-rounded students able to shape and traverse the decades that lie ahead.

For our work to be successful we need to be able to explicitly identify the teaching processes that help students build these attributes and make them available to students in schools across the state regardless of background. We also recognise that even so-called future-focused skills are deeply rooted in traditional discipline knowledge, and acknowledge that to be successful we need to be able to separate these foundations into teachable, learnable and assessable components. These are the learnings

and skills that will open doors of 21st century opportunity; they must be available to all students.

While we should avoid framing our understanding of skills required for the future as a zero-sum contest between humans and machines, it is worth acknowledging the limits of AI when considering the best ways of teaching creative thinking.

Machine learning replicates logical patterns to create an impressive replication of functional intelligence. But we can't assume computers will take over the intellectual and interpersonal work. Students still need to develop mastery of these basic cognitive skills in order to develop the ability to find the kind of unexpected but productive ideas and logical connections that define creative thought.

The more we look into higher-order skills like creative thinking, the more clearly we can see the role of foundational knowledge and skills in building confidence, fluency, and preparing young people to innovate.

These are the kind of challenges we will tackle in Future EDge. Here you will find important ideas from leading international education experts alongside accounts of how to translate theory into practice from teachers in NSW classrooms.

This issue starts, appropriately, with how we help build critical thinking skills in the youngest of learners. In 'Critical thinking and book talk', Irish academic and teacher, Dr Mary Roche, provides an illustration of how

functional skills are entwined with critical and creative thinking from even the earliest stages of education.

As every teacher and every parent knows, reading stories aloud not only gives children access to the building blocks of literacy but also provides a precious opportunity for young people to grapple with questions about how the world works. Extended via the use of Roche's 'book talk' techniques, conversations about stories can introduce young children to ideas of logic, ethics and reasoning, and encourage them to think far beyond the words and pictures on the page. Providing guidance on how to intentionally harness the curiosity of children when engaging with texts, Roche examines how critical and creative thinking skills develop alongside foundational literacy skills.

We also turn to expert NSW teacher, Yasodai Selvakumaran of Rooty Hill High School, to share her journey of developing expertise in translating critical thinking theory into classroom practice. Winner of a 2018 Commonwealth Bank Teaching Award and named one of the world's top 10 teachers in the Global Teacher Prize in 2019, Yasodai is an excellent representative of the many talented young teachers who are finding exciting new ways to integrate evidence-based practice into the classroom. In her article, Selvakumaran articulates how her engagement with critical and creative thinking has shaped her career and practice, providing insights and examples of how she

has successfully implemented these strategies with her students.

When it comes to explicit instruction in higher-order skills, Dr Ronald Beghetto's paper 'On creative thinking in education' answers eight common questions about how to teach, identify and assess creative thinking. Describing creative thinking as a deeply analytical process, Beghetto counters the common misperception that the creative process is mysterious or unknowable. While creative thinking can generate exciting and unexpected outcomes, the creative thinking process is an important skill that students must be taught in order to make the most of the technological changes we encounter on a near daily basis.

Few people are better qualified to guide us through the uncertain territory ahead than Mark Scott. Arriving to lead the NSW Department of Education fresh from navigating the seismic shifts in the media industry at the helm of the ABC, Mark describes the cultural and economic changes that have taken place over recent years and examines the implications

for our education system, proposing an evidence-based approach to driving strategic education reform and improving student outcomes across NSW.

The challenges we are experiencing now will not last forever, but for young people today they will likely not be the last problems of this scale they will face. COVID-19 is an important reminder of how connected and multifaceted our world is, and why it is never the wrong time to educate students to cope with uncertainty and complexity – and to seize the boundless opportunity for new knowledge and innovation.

These are very big ideas, and there are no easy answers. Over the coming issues we will hear more from experts and educators about some of the most pressing topics on the future of education. We'll be sharing global research, innovative case studies, and thought-provoking reflections from educators in the classroom.

Future EDge is about education for what comes next. Let's think ahead together.



Critical Thinking and Book Talk:

An approach to developing
critical thinking abilities in
the early years

Mary Roche





A lot has been written about critical thinking – what it is, how to do it, who should do it and why. There have been many different definitions and explanations as to its reasons and purposes. These can include pragmatic reasons such as the need for workers with critical thinking skills in the new knowledge economy. Other reasons are to do with how the ability to think critically can lead to living a meaningful life or more social cohesion resulting in increased equality, inclusion and democratic values. So, what is critical thinking, and when should we begin the process of becoming critical?

For me, critical thinking means thinking for yourself, examining all possible sources and making your mind up in the light of the evidence.

For me, critical thinking means thinking for yourself, examining all possible sources and making your mind up in the light of the evidence.

It is the opposite of passively receiving knowledge or mindless herd-thinking. It means being able to sift through information and arguments, recognising that there can be several legitimate perspectives and stances. It involves being able to express one's ideas coherently and logically. It means knowing the difference between opinion and fact and being able to support and explain the position taken after critical reflection.

Another way is to begin asking open-ended questions. Closed questions only have a right or wrong answer, for example 'How many hours in a day?' or 'How many buttons does your coat have?' Open-ended questions, however, allow for speculation, evaluation and leave scope for more than one answer being correct. For example, we could ask open questions about favourite traditional stories. Was Goldilocks silly or rude to go into the bears' house uninvited? Why, I wonder, were the Little Red Hen's friends so reluctant to help her? What would you have done if you were Cinderella? Is the wolf always a baddie?

I argued in Roche (2015) that critical thinking is necessary for reflecting on and making sense and meaning of our lives and our world. Without it we risk being mere receivers and consumers of others' knowledge. In an age of powerful digital knowledge distribution, being able to think for oneself is crucial for an enlightened and active citizenry. Artificial intelligence (AI) is all around us and can be of huge benefit to humankind, but we are also only just beginning to understand some of the risks associated with the misrepresentation of truth and facts via contemporary digital media. This brings us to recognising that critical thinking is essential for critical literacy.

For example, Noriko Arai, a mathematician at the National Institute of Informatics in Japan, conducted a multiple-choice reading skill test on 15,000 high school

students. The results indicated that many of the students tested 'lacked the ability to visualise an image from a written sentence, essentially to think for themselves'. Arai argues that these results are concerning as AI is weak at tasks that humans could easily excel at, including reading comprehension, interpretation and meaning making. Young people place their future employment prospects at risk if they do not excel in these human strengths. This is a global concern and Australia is not immune, as demonstrated by the recent debates over declining PISA scores.

While critical thinking is not new, all students will now need to develop increasingly sophisticated higher-order thinking skills to thrive in a world of smart technologies. For this to occur, children need to start developing critical thinking skills from their earliest years. This can begin very simply. Small children can be encouraged to give reasons for their answers to questions. If we ask a toddler whether she wants a red or a yellow lollipop, she might say 'yellow'. When asked why, if she replies with something like 'Because I like yellow – my teddy is yellow', then she has backed up her choice with a valid reason. This kind of interaction could be seen as a simple example of practising early critical thinking.

It would seem, then, that children need to be helped to develop healthy scepticism and critical engagement with all kinds of texts. Teaching children to think for themselves can begin as early as toddlerhood and

can continue into primary school and beyond. That's where, I believe, an approach called 'Critical Thinking and Book Talk' (CT&BT, Roche, 2010) can play a role. It is premised on the idea of developing young children's ability to make meaning from the texts and images of picture books as they discuss them together.

Developing the Critical Thinking and Book Talk approach

Since the mid-1990s I have been discussing picture books with children at all levels of primary school, as well as with teachers at in-service courses and with parent groups. One thing is common to all groups: everybody loves a read aloud. Whether the audience is composed of the smallest kindergarten children, the senior classes, teachers, parents or grandparents, a calm atmosphere – a sense of tranquillity and relaxation often descends when people are engaged by a good story and visually stimulated by wonderful artwork.

Listening to literature being read aloud is probably one of the most valuable and pleasurable experiences beginning readers and writers can have. The process has many advocates: literacy experts like Michael Rosen, Teresa Cremin, Mem Fox and Jim Trelease support read alouds as a part of every child's day both at home and at school.

Neuroscientists and paediatricians like Hutton et al (2015) suggest that interaction and discussion during or following read alouds stimulate high levels of brain activity. Promoters of the Philosophy for Schools movement have also discussed the benefits of doing philosophical and critical thinking with children.

Read alouds offer adults a chance to model good reading and thinking

This process is grounded in the idea that a read aloud can be a powerful entry point into classroom dialogue, discussion and critical thinking.

strategies and to expose young learners to a rich variety of literature. When this exposure is accompanied by supportive and engaging discussions, children can extend their world view and develop important critical thinking skills.

Read aloud and CT&BT are not the same thing, however. A read aloud is simply that – the teacher or adult reads a story aloud. CT&BT (Roche, 2010) takes that process a stage further. We finish the read aloud and immediately discuss the book. This process is grounded in the idea that a read aloud can be a powerful entry point into classroom dialogue, discussion and critical thinking.

I call my approach Critical Thinking and Book Talk to distinguish it from Circle Time (Mosley 1998), the Philosophy for Children (P4C) movement in Australia, the US, the UK and elsewhere, and from the Irish process known as 'Thinking Time' (Donnelly 1994).

I focus solely on picture books as discussion starters. But all these programs share some features, such as democratic practice and social construction of knowledge.

The concept of CT&BT is grounded in values of reciprocal care, courtesy and respect for others' views. No conclusions are sought. Children are expected to listen to each other with attention, contribute to the discussion if they wish and provide reasons for agreeing or disagreeing with others.

When they are engaged in the process of listening to a story being read aloud, looking closely at the images and then engaging in discussion together about the story, children are not just developing their literacy or their critical thinking. They are developing cognitively, socially and emotionally. They are learning to be part of a community of enquiry; to be reflective; to co-construct knowledge with their peers and teacher; to make meaning, to develop moral judgement.

Fisher (2006: 33-4) speaks about how engaging in this form of classroom discussion develops in children 'the habits of intelligent behaviour'. The children negotiate the rules with the teacher. They basically follow the golden rule of 'treat others as you

would like to be treated', i.e. listen actively and respectfully, think hard, don't interrupt, speak respectfully, agree and disagree with courtesy, always providing a reason for why you agree or disagree. These are all essential skills for their future lives, particularly an AI-influenced future in a knowledge economy.

I have given examples from my own work with very young students during my teaching career (Roche 2000, 2007, 2011, 2015) where the children saw problems with some traditional stories very quickly.

Some 5-year-olds said:

- 'The little red hen needs to get new friends. Simple.'
- 'Goldilocks is so stupid. She shouldn't have gone into the house: worse things than bears could have been in there.'
- 'There's a lot of violence in them stories.'

As my research advanced, I chose several sophisticated picture books for discussion. These included Mike and Dosh Archer's 'Yellow Bird Black Spider', as we will see below. My approach to teaching critical thinking positions it as the opposite of receiving information passively which is, sadly, what happens in many didactic classrooms. Because it involves active engagement with ideas, there is some effort involved. It does not automatically mean that you reject the thinking of others. Instead, you look at the issue and evaluate their responses and arrive at your own conclusions as to whether you agree

or disagree with their ideas. But you must be prepared to provide reasons for your judgements.

Sometimes, more than one answer is acceptable. I have had many experiences where children could not reach consensus on something and realised that several people could hold a correct or partially correct view. This happened, for example, when discussing 'Yellow Bird Black Spider', in which an anarchic yellow bird flouts convention and is reprimanded by a conservative black spider (Roche, 2007, 2015). Most children are happy when the bird tires of the spider's nagging and eats him. They argue that the bird has the right to be different, to be himself. However, one day a young girl in my group said, 'but what about the spider's right to be himself?' And, suddenly, we all realised that perhaps this was a contest of two rights where the problem could have been resolved by dialogue. Each had to accept that the other had rights. This is a very empowering realisation for children.

The idea that the teacher does not hold all the answers is equally liberating for the teacher. As I reflected on this incident, I realised that I had been uncritically siding with the yellow bird group all along. The children had taught me to think more critically. This happened more and more often as we continued with the work.

This is just one example of what critical thinking looks like in practice, and these are the types of thought processes that teachers can look out for to see if their students are

beginning to think critically. Watch out for (and model) tentative suggestions such as 'well maybe', 'what I wonder is' or 'what if'.

Teachers need to be careful too, that they don't tell children what the book is about. I discussed 'Yellow Bird' with several groups of 8-year-olds. Only one group felt that the dominant message in the book was about freedom. Their explanations were stunningly sophisticated. It was very tempting to take the book into the next group and say 'X class said they think this book is all about freedom. Do you agree?' However, that would have been a denial of the principles underpinning the teaching approach. That would have involved me imposing the views of another group on the children – essentially telling them what to think. It is important that each class group can think in ways that are appropriate for them and make their own meaning of the book. If they wish, after several readings with different groups, teachers could discuss various interpretations with different classes.

Planning for the session

There are many factors to be considered when organising a CT&BT session. A list is provided below, however it is far from exhaustive and you can create your own as you go along.

Bear in mind the outcomes you are hoping for

These include engagement, pleasure, active

thinking, co-construction of knowledge and active dialogue. What we are seeking to achieve has to do with 'promoting meaningful interactions among people' (Hoffman, 2010: 13) and 'learning to be curious, sceptical, engaged, and non-complacent' (Luke, 1991: 143). Sipe's and Bauer's (2001) work with young children showed that kindergarteners can respond very knowledgeably to traditional fairy tales told in picture books. They suggest that literary understanding emerges as the young readers make both intertextual and real-life connections during interactive read alouds.

We need to keep in mind that readers are positioned by texts, and so texts need to be interrogated for any assumptions and underlying agendas. Hilary Janks (2010) argues that from the writer's point of view the ideal reader 'is the one who buys into the text and its meanings'. Teachers and parents can assist children to be critical about texts before buying in completely by engaging dialogically with it and them.

Choosing which book to use is important

The best picture books have relevance for the child's life. This prompts them to think and talk about issues that have meaning for them. They are the kinds of books that are open to a variety of interpretations and responses: books that leave 'gaps' for readers to fill. Iser (2010) spoke of the virtual space created between the reader and the text and maintained that texts should have gaps in

The best picture books have relevance for the child's life. This prompts them to think and talk about issues that have meaning for them.

characters and events that engage readers in the kind of dynamic process of reading that leads to revealing the text's meaning (Khrais, 2017).

You must like the story yourself or find it intriguing or puzzling or attractive in some way. Read it to make sure and to make yourself familiar with the ideas and concepts. Your enthusiasm will be infectious. Remember that a picture book is unique in that the pictures and the written text work together to tell the story. Sometimes they even tell different stories, such as Pat Hutchins' 'Rosie's Walk'.

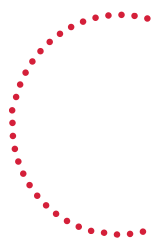
Make sure everyone can see the pictures

Use a visualiser if your school is lucky enough to have one. Alternatively scan or photograph the pages of the book and beam them onto the whiteboard via the data projector.

Set aside at least thirty minutes to allow engagement with the story

You cannot rush through a story and then expect children to engage seriously with it. Allow time for discussing the cover, the 'peritext' (endpapers) and predicting what the story might be about. Allow time also for reading the images. Children need

From Gorilla by Anthony Browne
© 1983 Anthony Browne
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to see the pictures, and they often see far more in them than adults do.

You could decide to read the entire story aloud first, and then perhaps reread and provide opportunities for the children to examine the pictures, encouraging what Jane Doonan called 'close looking'. Many experts advise that children need adequate time to examine both text and images. For example, Goodman (1998) suggests that often teachers privilege the act of decoding text over the need for closely examining and making meaning from the pictures. A parent in a one-to-one situation would find this step of 'looking closely' much easier.

As the children get used to being free to articulate what they think about a book, you could begin to nudge them to look beneath the surface more and more.

Can we tell what the author thinks about friendship/inclusion/home/beauty/war/peace? How do we know? Is the author trying to tell us something or trying to get us to think in a certain way? How do we know that? These kinds of questions encourage children to look for underlying ideologies both covert and overt – the beginnings of critical literacy. The messages are continued in the artwork. Do the colours in the illustrations convey meaning? How? Think of the opening spread in Anthony Browne's 'Gorilla' (1983). At breakfast, Hannah is wearing red, but the rest of the picture is rendered in cold blues and black. Her suit-wearing Dad, seated opposite, is remote, emphasised by the newspaper he is reading. Contrast that with another image towards the end of the book. They are together, both wearing red, and the room is depicted in a warm yellow glow. What is Browne asking us to think and feel?



Every part of the book matters

Whichever approach you decide to use, do let the children have time to closely examine all of the pictures – including the covers front and back, the endpapers and the introductory pages. Many people skip over the opening pages in order to get to the ‘story’. If you search for examples of people reading stories aloud on YouTube, you will see what I mean. The readers rarely pay any attention to the cover, endpapers or front matter. Yet this peritextual, or paratextual, material often provides hints and clues about the story and frequently provides interesting areas for prediction and inference and animated discussion. The peritext is very important for setting the scene and providing clues and cues as to what the story is about. The covers and endpapers and title pages have been carefully chosen and considered by the design team in conjunction with author, illustrator and the publisher.

Prepare to document the session

For teachers, it might be useful to record what is said either by audiotaping or videoing (both of which need permission from participants and/or parents) or by writing down what is said very quickly. This allows you to later enjoy the ‘nuggets’ you may have missed in the heat of the moment. It also helps with assessing and evaluating the process. There is no requirement to do formal assessment on CT&BT in Irish schools, however good practice would include assessment for progress. In my resources section for the Irish National Council for Curriculum and Assessment (NCCA) I provided some advice on assessment, for those who wish to do this.

Here is an example from practice with pre-schoolers

This episode is available on the [NCCA's Vimeo page](#)

In the clip I read 'Penguin' by Polly Dunbar (2007) to a group of 3-year-olds. I began by identifying new words like cover, front/back, author, illustrator, blurb, spine, endpapers and dedication. I pointed to the 'front cover' and we discussed what we saw. Lily was very excited and told me gleefully she had that book at home. Based on our discussion around the peritext, Evan was able to predict and even summarise quite a lot about the story before we even started to read it.

You might be wondering just what this has to do with critical thinking. It is all to do with creating an invitational approach. In Roche (2015) I explained that by suggesting to these young children that they might listen to the story and look at the pictures and then decide for themselves afterwards if they considered that Polly Dunbar's blurb worked well, or if the understanding they had in relation to the stars on the endpapers were probable, they are being invited into a dialogue. It is open ended and there are several possibilities for being 'right'. When a parent or teacher says 'I wonder why Polly Dunbar chose stars for the endpapers' children can offer guesses, opinions and explanations. By the time they come to discuss the pictures and the story they are confident that their thoughts and ideas matter. They realise that artists and authors and publishers make choices and that everything they see in the book has been deliberately put there by someone. This is a very important lesson and could provide the foundation for critical and visual literacy.

Yes and no answers can be avoided by carefully posing open-ended questions. Even where they occur you can gently nudge the child into providing a reason. This is important especially when children start a discussion with 'I liked the part where' because, by asking them for reasons, they are encouraged to think critically.

The children may not always respond to a story

They might be tired. There might be too many interruptions – roll call, milk delivery, ‘my teacher wants a loan of a black marker, please’, the intercom. They might not have got out to the playground because of the rain. If this happens, acknowledge it and try again another day.

How to do a Critical Thinking and Book Talk session

Simply seat the children in a circle and re-read or ask the children to recall the main points of the story. Invite questions or reactions. Then sit back and listen to what the children say. Wait your turn to talk. Donnelly (1994) advocates the use of a ‘tip-around’ to allow all children to participate in the discussion. A child volunteers to begin the discussion and then ‘tips’ the next child lightly on the shoulder. The ‘starting’ child has the power to choose in which direction the discussion goes. I usually remind the participants at the end that if the discussion had started somewhere else, or had gone in the opposite direction, it would have been very different and completely new knowledge would have been created. This idea of the creation of new knowledge, thinking thoughts that no-one has thought before, connecting new ideas with old and building up insights from listening to others is a very powerful experience for children. So is having the power to

speak or not. In didactic classrooms silence is expected or even demanded. Here, in this dialogical setting, it is permitted. It can mean ‘I’m still thinking’ or ‘I’m happy to just listen’.

This involves recognising the child as a knower who has thoughts worth listening to. It also means recognising knowledge construction as a process. If we reify knowledge and see it as a ‘thing’ that can be transmitted or delivered from a knowing expert to a non-knower – in the sense of Freire’s (1972) ‘banking model’ – then we will be very unlikely to see any value of discussing picture books with children as a means of generating knowledge.

Such a stance would also mean that we would find it difficult to imagine teachers learning from what their pupils say. Yet the idea of ‘teacher as learner’ dates right back to Socrates. If we see knowledge as an always incomplete, partial, evolving and dynamic process that is socially constructed then we can engage in discussion as a form of ‘problem-posing’ (Freire, 1972) and see our discussions as a way of becoming a community of enquiry. It is not just about having skills. This kind of work embraces knowledge, skills and dispositions – the cognitive and the affective domains. It encompasses the idea of working together to construct knowledge and make meaning together. Each group of children brings their own ways of knowing to the process.

Some focus more on making meaning from the story as a whole; others engage wholly with images.

For example, in Roche (2015) I described how Deirdre, a teaching friend, used a visualiser and a whiteboard as she read Anthony Browne's 'The Tunnel' (1992) aloud. She said her class of 8 and 9-year-old boys took nearly two weeks to digest the book.

They actually only paid cursory attention to the story. The real engagement for them was studying the illustrations. They spent ages examining each picture, discussing it, going back to check details on previous pictures, explaining to me and to each other what they thought the various elements of the pictures meant. It was a real eye-opener for me. Up to now I always focused almost exclusively on the text and the narrative ... the CT&BT approach has given us permission to linger! (extract from conversation with DL, 6 July 2013)

In a research review on using picture books in classrooms, Wolfenbarger and Sipe (2007) state that 'our society is inundated with visual images. Sport team logos, automobile emblems, yellow arches, and other product packaging have become symbols to which children and adults attach recognition and meaning' (citing Kress & van Leeuwen, 1996). They suggest that visual images such as these logos 'signal meaning without requiring an accompanying verbal text because they are linked to other visual media

Children need some skills in deciphering and decoding the constant stream of visual imagery coming at them. They can make a start in early years classrooms by examining picture book images with a knowledgeable teacher.

(television) and highly contextualized places and experiences (such as ordering fast food, eating cereal, attending sporting events). Children have learned to expect pictures to have personal and social meaning' (2007: 274). Wolfenbarger and Sipe (2007) also speak about Carger (2004) who worked with 8- and 9-year-olds in Chicago. Carger provided opportunities for the children to talk about picture books she read aloud. She found that the children developed as art critics and their command of English language flourished. She writes that the 'students engaged in divergent thinking ... [A]rt provoked them to reflect and to engage in authentic inquiry' (2004: 280).

Most teachers have had training on decoding text during their courses on teaching reading. I doubt that most get anything like the same training in decoding images. Yet it is a vital part of critical literacy. Our society is bombarded with images through advertising, social media, television, cinema and packaging. Children need some

skills in deciphering and decoding the constant stream of visual imagery coming at them. They can make a start in early years classrooms by examining picture book images with a knowledgeable teacher. Teachers could read work by Moebius and Doonan as a starting point for examining the picture book codes of line and shape, colour, positioning, size, perspective, viewpoint and framing. The more that teachers know about image construction, the more they can encourage children to examine images intelligently and critically. I have listed some of these resources in the appendix.

Be prepared to be amazed at the philosophical turn the discussion might take

Timetable the discussion as 'discrete oral language', 'comprehension', 'literacy', 'Social Personal Health Education', 'Nature and Environment' or 'Civics'. Be creative! Look at what a 9-year-old child in 3rd class said after I read 'Yellow Bird, Black Spider' aloud:

I disagree with some people and I agree with others who said that freedom is doing whatever you want, but only in a way. You can only have freedom if you're alone. Because if you were really free to think what you like and say what you like and do what you like it and there were other people around, it could be the baddest thing ever for them because you might want to do all bad things with your freedom ... Freedom could be

sometimes good but sometimes it could be the baddest thing ever. (7 February 2006)

That shows that the issues raised by the book far exceed a 'literacy' lesson. Bear in mind, however, that this class had been doing classroom discussions since Kindergarten. However, I did not tell them that the book was about freedom. I did not even think of linking with that concept at the time! This is really important. I used this book with several classes, yet only one group discussed freedom. I learned from listening to the children.

One class discussed rights. They all agreed that the yellow bird had the right to be himself, but as we saw earlier, one girl thought that the black spider also had the right to be himself – and a fair old ding-dong of an argument ensued as to whether it was a contest of two rights. Another class, in true black spider mode, thought it was a 'stupid story cos birds don't wear stripy socks or eat ice cream'.

Critical thinking is all about thinking for one's self, challenging assumptions and stereotypes, asking questions and questioning answers. Philosophising is about pondering alternatives, asking 'what if', and 'I wonder why' and offering ideas such as 'well, I think ... because'. Try it out, the 'read aloud' factor alone makes it worthwhile. Remember that picture books are not solely for the infant classrooms. Properly chosen books can provide a stimulus for discussion to senior primary and beyond. These kinds of ideas are located within the notion of

seeing literacy as more than decoding and encoding text.

For example, Jewett and Smith define literacy as social practice and argue that:

[E]ffective literacy draws on a repertoire of practices that allow learners, as they engage in reading and writing activities, to act as code breakers, meaning makers, text users, and text critics ...the fourth component, text critic, is not as widespread, especially in elementary classrooms. In this domain, learners critically analyze and transform texts by acting on knowledge that texts are not ideologically natural or neutral – that they represent particular points of views while silencing others and influence people’s ideas. In other words, the reader learns to look beyond the words on the page and into the province of how the text ‘works’ – linguistically, politically, culturally, and socially – to position the reader (2003: 69).

Leland et al (2013) argue that critical readers, who are able to size up the situation and draw their own conclusions, become agents of text. This is because, they say, readers have the power to make their own rational decisions about what to believe. However, those who do not engage in critical reading are far more likely to become ‘victims of text’ since they passively accept assumptions (Leland et al., 2013: 4). Children will not become ‘agents of text’ without a real effort by teachers and parents.

The why: recognising the other

The CT&BT teaching approach rests firmly on the assumption that the adult will recognise the child as a real person who is likeable and who deserves respect for their uniqueness – not generally a problem for a parent. The CT&BT dialogical approach is premised on real people talking to each other face-to-face. Its success depends on the interpersonal pedagogical relationship between the children and the teacher, and also between the children and their peers. It is a deeply affective approach.

This was brought home to me recently when I met some of my former research participants. They are all now in their early twenties and finishing university. When describing their memories of the process they returned again and again to how they had felt. They spoke about being proud of being listened to and about realising with some surprise that the children who attended learning support were just as able – and sometimes better able – to think and speak as they themselves were. Some of the shyer people spoke about how discussing things together gave them entries into approaching the ‘cool gang’ in the yard. One very shy young woman spoke about how, even though she had the option to remain silent and was very anxious, she made herself contribute because she had a lot to say. She is now completing a degree in Development Studies, during the course

Children who are exposed to the CT&BT approach have their sense of self-worth developed as they realise that they are recognised in class as people who are knowers and meaning makers.

of which she visited war-torn zones and refugee centres where she was tear-gassed and detained. She said she felt that the grounding she got in standing up for her beliefs and continuously practising agreeing or disagreeing without losing her cool during the weekly discussions throughout primary school helped her in those very difficult situations later. The CT&BT approach therefore needs the actual interpersonal relationship of real people talking to each other and tentatively exploring their co-creation of new knowledge (Lundie, 2016: 282).

Children who are exposed to the CT&BT approach have their sense of self-worth developed as they realise that they are recognised in class as people who are knowers and meaning makers. They soon see that they are valued as being capable of forming opinions and articulating them. They are aware that they are being provided with opportunities to think critically, to listen and evaluate the responses of others and to engage in co-constructing knowledge with their peers. They see that there is an emphasis on respect, courtesy

and care. The children are being encouraged to develop their habits of intelligent behaviour, as we saw earlier, as they learn tolerance, understanding and empathy towards others. I realised this when a group I had previously worked with were about to leave primary school. They were invited to present a display of memories of primary school and most of them chose their CT&BT sessions as the highlight of their primary school life.

Teacher professional development

Teachers and parents must make themselves familiar with a wide range of picture books and be able to choose them with some discretion – especially if you have limited funds. Teachers will need to read and re-read the books themselves several times before introducing it to a class or child. You don't just bring along a book, read it aloud and let the children have a chat. You will need to examine the pictures, doing what Doonan (1993) calls 'close looking', rather than merely skimming over the pictures so as to 'get on with the text and the story'.

You will need to think too. This is essential. It is also very hard work. You can't encourage critical thinking in children unless you can think critically yourself. However, you will need to be keenly aware that by pre-reading the book and studying the pictures you will form your ideas about the book. It is difficult to refrain from imposing these ideas on the children. You need to guide and facilitate, not dominate.

Developing the skill of listening attentively is important also. I am a talker, and the skill of staying quiet so as to really hear a child demanded huge effort and was something I struggled with for many years. Even when I thought I was being attentive to children, video evidence showed me that I was dominating the classroom talk. It took a lot of self-training to gradually change my practice. My PhD was a self-study action research project based on that process.

Critically studying picture books supports students' understanding of their own thought processes

I have had experiences where children would frequently say 'Hang on: I kind of disagree with myself now' or 'First I was thinking X and now I have kind of changed my mind and I think Y'. Sometimes children expressed surprise and they would say 'Whoa! I never knew I knew that until I sort of thought it and said it at the same time'. One or two children have said 'I'll pass because I don't really have any thought yet' or 'I don't know enough yet. I need to think some more'. Sometimes, as I later transcribed my scribbled notes from discussions, I found myself intrigued by something a child said and I would type it out and discuss it with the child. They nearly always had an explanation. One of the practices I used in order to encourage reflection and metacognition was to type out several transcripts and

present them to the children in booklet form for their perusal. This was often very enlightening. Some would hold fast to their views and others would say 'Oh, I've been thinking about that since and I kind of disagree with myself now because now I know that ...'.

In Roche (2007: 254) I described one such episode. The children were immediately engrossed and spent the first few minutes quickly scanning the pages for their own contributions. When they found their own name, they read their own contributions several times and eagerly showed them to each other. Only then did they read through the transcripts. The children then evaluated their own thinking.

C: Actually, it's kind of good to read these again. I wouldn't say what I said there again now though, because when you read what other people said you'd kind of get different feelings about what to say.

K: I think the discussion on 'Yellow Bird' was pretty good. I'm kind of amazed at myself ...at what I said. It's actually quite sort of ... grownup.

J: I remember after doing that Thinking Time I kept thinking about my feelings and my mind and my soul and wondering about it and stuff. I like what I said here. I'd still agree with it.

Metacognitive activities that ask students to reflect on what they know, care

about, and are able to do help learners develop an awareness of themselves. CT&BT helps to develop a culture of metacognition in a classroom. The very fact of having to justify their stances and explain their viewpoints, means that children are automatically being given opportunities to become metacognitive learners.

Maxine Greene suggests that activities that engage us in our own quests for answers and for meanings, also serve to initiate us into the communities of scholarship and, if our perspectives widen sufficiently, into the human community, in its largest and richest sense:

Teachers who are alienated, passive, and unquestioning cannot make such initiations possible for those around. Nor can teachers who take the social reality surrounding them for granted and simply accede to them. (Greene, 1978: 3)

Critical thinking in an AI future: some concluding thoughts

AI is here. It is all around us as we use the internet, hail taxis, check our smart watches or set the many devices in our homes to function in our absence. Whether it ultimately becomes a blessing or a curse for humanity remains to be seen. It will depend on how we understand its power and potential.

In an article for Irish Tech News in May 2018, Alison McGuire wrote about those speaking out about the threats posed by applications of AI. She mentioned Stephen Hawking who expressed a concern (via his AI-enabled voice) that thinking machines 'could spell the end of the human race'. She also quoted Anja Kaspersen – former Head of Strategic Engagement and New Technologies at the International Committee of the Red Cross, and former Head of Geopolitics and International Security at the World Economic Forum – who spoke about the threat posed by 'AI potentially becoming weaponisable', but balanced those fears against the idea that 'many AI applications have life-enhancing potential, so holding back its development is undesirable and possibly unworkable. This speaks to the need for a more connected and coordinated multi-stakeholder effort to create norms, protocols, and mechanisms for the oversight and governance of AI.'

According to McGuire, ‘now we have arrived at the point where governments have decided to release directives with the intentions to regulate AI. I believe ethical behaviour is going to become even more of an issue as technological intervention in daily lives increases.’

So, what ethical behaviour will be needed? How will we educate people to have balanced rational views on the role of AI in their lives? How will we teach children to be sceptical and critical and questioning? In the conclusion to my book ‘Developing Children’s Critical Thinking through Picturebooks’ (Roche, 2015) I stated that I believe that we owe it to our children to help them become critical and caring citizens.

As caring parents and teachers in an age when AI – with all its benefits and risks – surrounds us, we want to help our children to be more aware of inequality and the risks of ‘fake news’. We want them to be tolerant, empathetic and courageous people who challenge injustice and are unafraid to speak out on behalf of those who are less fortunate. We would like our young people to engage creatively and morally with the world and so we encourage them to be people who think independently and who maintain their philosophical and intellectual curiosity throughout their lives. We want them to see literacy as empowering and liberating and to be competent and confident readers and writers. We want to gift them a lifelong love of reading that will provide endless hours of

pleasure. And, thus, through reading and discussing picture books with them from their earliest days, we hope to provide them with what Luke (1991: 131) calls ‘equality of educational possibility’.

... as teachers of literacy we need to look beyond a continual and exclusive concern with ‘new’ and better methods in order to rethink from a social and cultural perspective the consequences of our instruction, whether with elementary school children, secondary students, or adults and immigrant second language learners. Who gets what kind of competence from our teaching? To what ends? What kinds of literate subjects does our pedagogy produce? Fitted to what kind of society?

These are the kinds of questions that keep me going in my work to promote CT&BT as a form of dialogic teaching for improving critical literacy. I hope I have managed to convince readers that simply promoting books and reading is not enough: for CT&BT to be successful, teachers, parents and caregivers must engage in critical discussion with children using picture books as stimuli.

References

- Carger, C. L. (2004) Art and literacy with bilingual children. *Language Arts*, 81, 283–292.
- Centre for Literacy in Primary Education (CLPE). (2018) Reflecting Realities <<https://clpe.org.uk/publications-and-bookpacks/reflecting-realities/reflecting-realities-survey-ethnic-representation>>.
- Donnelly, P. (1994) *Thinking Time, Philosophy with Children: the educational, psychological and philosophical rationale for doing philosophy with primary school children*. Open University, M Ed. Milton Keynes. Unpublished thesis.
- Doonan, J. (1993) *Looking at Pictures in Picturebooks*. Stroud. Thimble Press.
- Fisher, R. (2006) 'Talking to Think: why children need philosophical discussion', in D Jones & P. Hodson (eds). *Unlocking Speaking and Listening*. Abingdon. Routledge.
- Freire, P. (1972) *Pedagogy of the Oppressed*. Harmondsworth and New York. Penguin Books.
- Goodman, Y. (1998) 'Foreword: The making of meaning through the picture book', in J. Evans (ed). *What's in the Picture: responding to illustrations in picture books*. London. Paul Chapman.
- Greene, M. (1978) Teaching: the question of personal reality. *Teachers College Record* 80 (1), 23–35.
- Hoffman, J. (2010) Looking Back and looking forward: lessons learned from Early Reading First. *Childhood Education*, 87 (1), 8–16.
- Hutton, J. S., Horowitz-Kraus, T., Mendelsohn, A., DeWitt, T. and Holland, S. (2015) Home Reading Environment and Brain Activation in Preschool Children Listening to Stories. *Pediatrics* September 2015, 136 (3), 466–478.
- Iser, W. (2010). 'Interaction between Text and Reader' in P. Simon (ed). *The Norton Anthology of Theory and Criticism*. United States. Norton and Company, Inc, 1524–32.
- Jewett, P. and Smith, K. (2003) Becoming critical: moving towards a critical literacy pedagogy an argument for critical literacy. *Action in Teacher Education*. 25 (3), 69–77.
- Khrais, S. M. (2017) Rereading 'A Rose for Emily' from the Perspective of Wolfgang Iser's Reader Response Theory. *International Journal of Comparative Literature & Translation Studies*. 5 (3), 29–31.
- Lau, J. (2019) *Philosophy Critical Thinking Web*. <https://philosophy.hku.hk/think/misc/about.php>, accessed December 2019.
- Leland, C., Lewison, M. and Harste, J. (2013) *Teaching Children's Literature: it's critical!* New York and London. Routledge.
- Lundie, D. (2016) Authority, Autonomy and Automation: The Irreducibility of Pedagogy to Information Transactions. *Studies in Philosophy and Education* 35 (3), 279–291.
- Luke, A. (1991) Literacies as social practices. *English Education*. 23 (3), 131–47.
- McGuire, A. (2018) Artificial Intelligence – a curse or a blessing? <https://irishtechnews.ie/artificial-intelligence-a-curse-or-a-blessing>, accessed December 2019.
- Mosley, J. (1996) *Quality Circle Time in the Primary Classroom: Your Essential Guide to Enhancing Self-esteem, Self-discipline and Positive Relationships (Volume 1)*. Accrington, UK. Learning Development Aids.
- Murai, S. (2016) Quest for artificial intelligence highlights lack of critical thinking skills in humans. <https://www.japantimes.co.jp/news/2016/12/01/business/tech/quest-artificial-intelligence-highlights-lack-critical-thinking-skills-humans/#.Xee5VOj7TD5>, accessed December 2019.
- National Council for Curriculum Assessment Ireland: NCCA (2013). *Aistear Toolkit: Assessing CT and BT*. <http://action.ncca.ie/resource/Childrens-thinking-and-talking/65>, accessed March 2019.
- National Council for Curriculum Assessment Ireland: NCCA (2013). *Aistear Toolkit Introducing CT and BT*. <https://vimeo.com/148627573>, accessed December 2019.
- Raising Children – the Australian Parenting website: <https://raisingchildren.net.au/> Accessed Dec 2019
- Reading Rockets. Articles about Reading Aloud. <https://www.readingrockets.org/atoz/1143/all>, accessed December 2019.
- Roche, M. (2000) How do I help my Pupils to Philosophise? Unpublished M Ed Thesis, UWE Bristol.
- Roche, M. (2007) *Towards a Living Theory of Caring Pedagogy: Interrogating My Practice to Nurture a Critical, Emancipatory and Just Community of Enquiry*, unpublished PhD thesis, University of Limerick.
- Roche, M. (2010) *Critical Thinking and Book Talk: Using Picturebooks to promote discussion and critical thinking in the classroom*. Reading News Conference Edition. Dublin. Reading Association of Ireland/Literacy Association of Ireland.
- Roche, M. (2011) 'Creating a Dialogical and Critical Classroom: Reflection and Action to Improve Practice', *Educational Action Research*, 19(3), 327–43.
- Roche, M. (2015) *Developing Children's Critical Thinking through Picturebooks: A guide for primary and early years students and teachers*. Abingdon. Routledge.
- Sipe, L., & Bauer, J. (2001) Urban kindergartners' literary understanding of picture storybooks. *The New Advocate*. 14, 329–342.
- Sipe, L. and McGuire, C. (2006) Picturebook endpapers: resources for literary and aesthetic interpretation. *Children's Literature in Education*. 37 (4), 291–304.
- Wolfenbarger, C. and Sipe, L. (2007) A unique visual and literary art form: recent research on picturebooks. *Language Arts*, 83 (3), 273–80.

Picture books referenced in text

- Archer, D. and Archer, M. (2004) *Yellow Bird, Black Spider*. London. Bloomsbury.
- Browne, A. (1999) *Zoo*. London. Red Fox
- Browne, A. (1992) *The Tunnel*. London. Walker Books
- Browne, A. (1983/2013) *Gorilla*. London. Walker Books
- Dunbar, P. (2007) *Penguin*. MA. Candlewick Press
- Ellis, C. (2016) *Du Iz Tak?* MA. Candlewick Press
- Hutchins, P. (1978) *Rosie's Walk*. London. Red Fox



Cultivating critical and creative thinking:

A teacher's journey

Yasodai Selvakumaran



In this article, Yasodai Selvakumaran shares what she has learned on her journey of teaching critical and creative thinking (CCT) in humanities classrooms. She reflects on how teachers can develop their own understanding of CCT and work with colleagues to craft an approach to teaching it.

Critical and creative thinking is woven through syllabus and curriculum documents, and these should form the basis of classroom approaches. Selvakumaran also shares examples from her own teaching and the reflections of her students, which demonstrate the value of CCT for student learning.

What do you think inspired your passion for teaching critical and creative thinking?

I can't remember exactly when I learnt to think. Can you?

Pinpointing when I learnt how to think is not as obvious to me as remembering when I learnt to speak English after arriving with none at pre-school, or learning how to tell the time. But I can remember moments where I knew that thinking mattered. An early lesson I have never forgotten was an excursion to visit our local grocer to learn about the cost of food and the idea of a budget. We had to measure the weight of vegetables, and speak with the shop owner and our teachers to work out the cost for what we chose. We then had to look at our coins and make a decision about what vegetables we were going to buy for the best value, and what our family liked to eat.



I remember distinctly that I was able to recall the ones my parents usually had in the house. I proudly handed over my coins to bring back something I knew we all loved.

Some will say this was a lesson in numeracy and communication, and I don't necessarily disagree. Thinking, however, was at the heart of the exercise and what I took from it. I now recognise just how pivotal this experience was in showing me the importance of making connections, asking questions and making informed decisions about how to spend my money. As a student, I never forgot this lesson. And as a teacher, I often reflect on this as I strive to create moments for my own students that might hopefully stay with them for decades to come.

My interest in CCT drew me into teaching and has continued to shape

my journey as an educator. These thinking skills are central to the values I strive to embed in my students, which include empathy, social justice, active citizenship and democracy. They continue to be the through line that I reflect on to be a better teacher and leader. In this article, I will share my journey of engaging with and cultivating CCT with students and staff. I will cover key questions in reflection, links to curriculum documents, and how to embed CCT in lessons and learning design to foster deeper learning and higher student engagement.

Why is it important to focus on critical and creative thinking?

In Australia, the importance of CCT has been affirmed most recently in

Of course, general capabilities like CCT go hand in hand with strong content knowledge.

the 2019 Alice Springs (Mparntwe) Education Declaration, through which all Australian governments committed to a renewed national vision and goals for education. A key goal is that all young Australians will become confident and creative individuals, successful lifelong learners, and active and informed members of the community. The agreement notes the importance of developing learners who are able to think deeply and logically, and to obtain and evaluate evidence as a result of studying fundamental disciplines.

The Australian Curriculum, developed by the Australian Curriculum Assessment and Reporting Authority (ACARA), sets out in more detail the expectations of what all young Australians should be taught. The Australian Curriculum describes CCT as ‘students thinking broadly and deeply using skills, behaviours and dispositions such as reason, logic, resourcefulness, imagination and innovation in all learning areas at school and in their lives beyond school’.

Of course, general capabilities like CCT go hand in hand with strong content knowledge. In history, for example, students need to understand key facts

and concepts if they are to accurately interpret historical sources or critically assess the validity of an argument. I have also found that learning new content can be enhanced by using strategies to encourage CCT, such as visible thinking routines including ‘Think, See, Wonder’. I regularly use these strategies to create an engaging ‘hook’, to assess prior knowledge and help students make connections to new content.

The question for educators, then, is how do we turn this vision into reality for our students? Of course, syllabuses and teaching resources help teachers to do this. But, beyond this, I believe that the answer is for each of us, as teachers, to begin by developing a personal understanding of what CCT means to us and for our teaching.

What do you think is the first step for teachers looking to improve how they teach critical and creative thinking?

The first step is to be curious and ask questions: you might start by reflecting on your own journey to becoming a critical and creative thinker. Next, your gaze could turn outwards: you could read about how other teachers and researchers describe these skills, and ask questions about others’ theories of practice. Through researching and exploring different approaches and experimenting with these ideas, you will develop your own

It is only once you have refined your own understanding of CCT that you can build a robust approach to teaching it.

evidence-informed theory of practice. This exercise is especially important for new teachers just starting out on their school career journey. The following questions are ones I use with colleagues to help with this process:

- 1 If you had to share your definition of CCT, what would it be?
- 2 What does your definition of CCT look like in your own classroom?

I should pause here and acknowledge that this journey might not always be easy, but it is worth the effort it takes. Creating new knowledge or approaches takes time. It is hardly linear and can be confusing, frustrating and time-consuming. Yet, for me, grappling with ideas that are new, different and challenging is crucial to learning about others, and informing and expanding our own understanding of the world. If we want our students to be better thinkers, we must ourselves strive to clearly communicate ideas in different modes and respectfully engage in debate that advocates for a healthy democracy and fairer world. Embracing the process may well be as difficult as it is enjoyable – but it will be worth it.

In terms of my own journey, in 2013 I was introduced to Harvard Visible Thinking Routines (Ritchhart et al., 2011) as a way to explore CCT in teacher professional learning. I recommend using these routines when developing your own definitions of CCT. The following questions follow a Harvard Visible Thinking routine called ‘Think/Puzzle/Explore’:

- Do you think that critical thinking and creative thinking are similar or different? Why?
- What puzzles (or questions) do you have about CCT?
- How can you explore CCT and the way they support each other?

By reflecting on and discussing definitions, similarities and differences, individual teachers and teams can explore their own philosophies and values. This can help to provide a common baseline from which to work together to determine an approach suitable for the particular context in which we teach.

It is only once you have refined your own understanding of CCT that you can build a robust approach to teaching it.

What is the next step in building a robust approach to teaching critical and creative thinking?

In my own practice, I turned here to the syllabus. The revisions to the 7-10 history syllabus in 2014 particularly

shaped my thinking, as I came to see that CCT is a fundamental capability for students to develop just like literacy and numeracy. CCT is in fact one of seven general capabilities in the Australian Curriculum, alongside literacy, numeracy, information and communication technology capability, personal and social capability, ethical understanding, and intercultural understanding. Both the ACARA and NESA syllabus documents group CCT as a single capability, while acknowledging that it involves two types of thinking skills.

ACARA's Critical and Creative Thinking learning continuum can be used as a starting point to understanding the 'typical' progress in CCT ability across learning stages, from Kindergarten to Year 10. This continuum is domain general, but can be tailored to specific subjects. It outlines key verbs that help to identify learning on a continuum, including 'reflecting', 'inquiring', 'exploring', 'organising', 'generating', 'analysing', 'synthesising' and 'evaluating'. Each verb is then broken down into sub-elements. 'Inquiring', for example, contains the sub-elements of 'pose questions', 'identify and clarify information and ideas' and 'organise and process information'. Outcomes for each of these sub-elements are outlined across six levels of achievement, from Kindergarten to Year 10. You can use this resource to understand how CCT develops in each stage of learning.

ACARA also provides resources that explain what CCT looks like in individual subjects. These resources

can help you define learning intentions and outcomes for lesson plans and assessments. For example, in senior secondary modern history, the 'demands of historical inquiry' include 'the ability to pose intelligent questions, interrogate, select and cross-reference sources, and develop interpretations based on an assessment of the evidence and reasoning'.

NESA also provides subject-specific definitions of CCT from Kindergarten to Year 10 including within syllabus documents, which make clear that CCT is tied to content learning outcomes for each subject. However, while NESA provides icons (CCT being represented as 'gears') and statements to link CCT and the other general capabilities to syllabus content, it may not always be immediately clear how this should work in practice. As such, it can be useful to take the time to critically reflect, both individually and in teams, on how CCT can be fostered in the context of each particular subject, unit of work and lesson.

Some strategies to focus on CCT in each subject can include:

- Reading through the subject-specific approaches to CCT in the 'learning across the curriculum' pages of each NESA syllabus. For example in history K-10, CCT is described as 'being central to historical inquiry', while in geography K-10 'students develop CCT as they investigate geographical information, concepts and ideas through inquiry-based learning'. It becomes clear

from the way our syllabuses are structured that there is a recognition of subject-specific ways of approaching CCT and the other capabilities, and how closely CCT skills relate to strong content knowledge.

- Examining the rationale statements for each subject can also highlight the subject-specific nature of CCT skills. For example, the rationale for Stage 6 society and culture states that it is 'a conceptually based course that promotes students' awareness of the cultural continuities and changes with societies and cultures. It provides them with the skills to critically analyse social theories and complementary and contrasting viewpoints about people, societies and cultures.' Although it may seem obvious to start with the rationale, taking the time to link how this fits in with a personal, subject and/or school-wide definition of CCT can ensure a consistent approach.

What is your advice for teachers looking to embed critical and creative thinking into their classroom practice?

As with any initiative or approach used in education, context is crucial to designing lessons with critical and creative thinking at the heart of learning. However, there are some common threads that can assist. Firstly, begin with the end in mind. Talk to your colleagues about where critical and creative thinking fits into assessment and programs so that you can plan for this at the outset. In backward mapping assessment, it is essential to include both outcomes that have the capability attached, as well as those that don't. Making explicit where critical and creative thinking fits in to programs and lessons can also help colleagues trial similar strategies. For instance, the verbs used to set learning intentions and success criteria, such as 'inquiring' or 'analysing', can reflect the essence of what critical and creative thinking is for a lesson or sequence of lessons. A key point to remember here is that CCT is one capability of many in the curriculum, and that it should be used when appropriate.

The teaching of CCT across a school should be informed by multiple perspectives from research and practice, piloted and aligned to the school purpose. For example, at Rooty Hill High School, we have our own 'Creativity Wheel', which draws on the

work of Dr Bill Lucas and Dr Ellen Spencer, to support our high expectations environment. This school-wide approach has helped shape the way I think about and approach the teaching of CCT through its use of five domains: being inquisitive, being imaginative, being collaborative, being persistent and being disciplined. These domains are further divided into 15 sub-domains as illustrated in the Creativity Wheel diagram on page 41 (Lucas & Spencer, 2017).

Building critical and creative thinking skills: Rooty Hill High School case study

My leadership in teacher professional learning has been enhanced by my involvement in co-leading our school initiatives in critical and creative thinking.

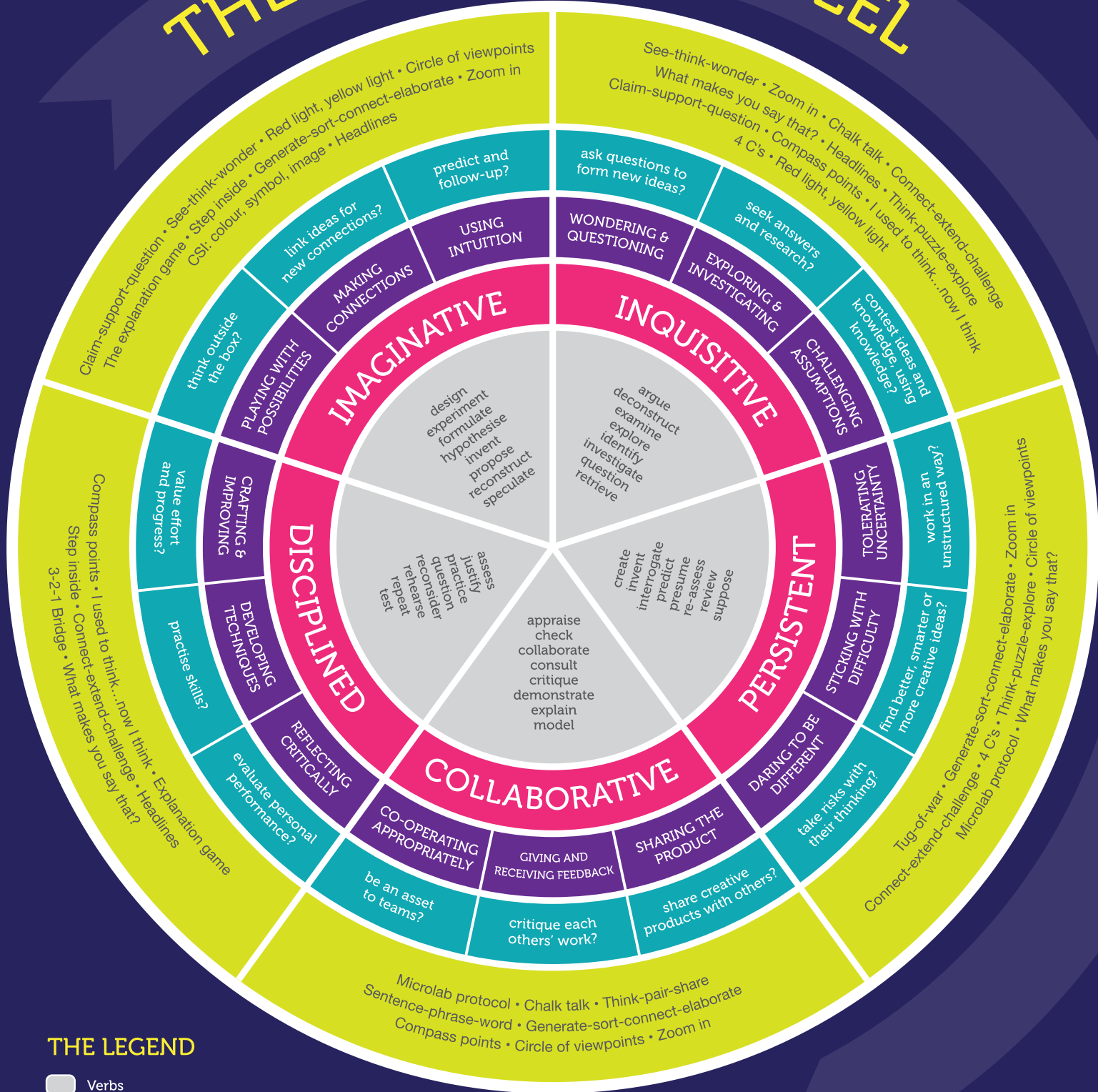
I worked with another colleague, Shae Dunbar, to exhibit innovative practice for an Australian Learning Lecture (ALL) Series case study of the Rooty High School Creative Inquiry Cycle.

It built upon a 2016 trial with Year 7 history that used inquiry-based approaches to explicitly develop critical thinking and creativity in students. We measured the success of this via levels of student engagement and by tracking how many staff adopted the tools.

Student feedback, reflection and work samples from the program demonstrated increased levels of higher-order thinking and use of academic language than previous years. This has been captured in the ALL case study and video highlighting the Rooty Hill High School journey with staff and students, published in October 2017. The [case study and video](#) is available on the ALL website.



THE CREATIVITY WHEEL



THE LEGEND

- Verbs
- Creativity disposition
- Creativity sub-disposition
- In our programs and our practices do we provide opportunities for students to...
- Visible thinking routine

Do you have a favourite example of critical or creative thinking in action in your classroom?

Reflecting on some of the moments that made my classes last year, my first thoughts are about my Year 11 society and culture class engaging with their own version of ABC's Q&A. This was their first introduction to the Q&A type of panel discussion show. I wrote the learning intention specifically for the students to engage respectfully with ideas that are different to their own, especially as this is not always modelled in what we see in the media or in society. This is all the more reason for teachers to design learning experiences that give students the agency and the ability to grapple with what respectful debate should look like. The Year 11 students were able to unleash their creativity in re-creating the show – they led the way in allocating hosts, choosing theme music and arranged the classroom for the set-up of the panel. We co-designed expectations, brainstormed and voted on topics, allocated fact checkers and set up a mock live Twitter stream via Google Classroom. Students successfully showed that they could empathise, be respectful in debate, justify their opinions and comment courteously.

What struck me was how much they enjoyed the lesson – they loved it so much that they asked to do it all again the next day and, as critical and creative thinkers, they were able to suggest and implement ways to

improve the activity's design. When students took learning creatively into their own hands, the learning actually exceeded the intent or design of the lesson. Success in CCT can also be measured by the unexpected, and this itself is a feature of CCT.

What are your go-to strategies for teaching critical and creative thinking?

The notion of making thinking visible has had the largest influence on my own practice in cultivating CCT. The Harvard Visible Thinking routines (Ritchhart et al., 2011) were first introduced to me by colleagues at my school and through the TeachMeet network. I deepened my knowledge through further reading and following other educators online. I found the Project Zero network of educators, where people share their insights from Harvard's professional learning programs on making thinking visible, to be especially helpful. I was drawn to the visible thinking routines as a practical tool that could be quickly embedded in the classroom. I worked with colleagues to trial and embed the routines into our assessment and programs at Rooty Hill. As a humanities teacher, I drew upon these strategies to help students grapple with different perspectives, show empathy and justify historical, social and cultural conclusions.

In history, a visible thinking strategy that I've found works well for diverse groups of students is the routine of

Colour, Symbol, Image. In teaching the mandatory unit Rights and Freedoms in Year 10 history, I asked students to analyse the lyrics and meaning of Archie Roach's song 'They Took the Children Away', using this routine to learn about the Stolen Generations. I provided students with a scaffold, asked them to choose a colour, symbol and image that connected their understanding of the song to their prior knowledge of the Stolen Generations and to then justify their choice. One student, for example, chose the red colour of the outback soil, a symbol of two hands letting go of each other, and an image of two young girls from the film 'Rabbit Proof Fence'. The student linked each of these to the lyrics of Roach's song and used them as evidence to justify their understanding of the Stolen Generations. This student demonstrated deep thinking, making deep connections that reflected empathy and the ability to change interpretations in light of evidence. The colour, symbol, image strategy helped them to connect their learning with prior knowledge.

I have found that these thinking routines need time to develop, just like any routine in the classroom. Often the first time I introduce a routine it is met with questions about the process: students need some time to use it well. Even with teacher professional learning, modelling a new strategy sometimes works brilliantly or sometimes flops spectacularly. For students to be successful in critical and creative thinking, teachers need to trial and refine strategies. They

need to 'tolerate uncertainty' (Lucas & Spencer: 2017) – something many of us find challenging.

In March 2019 I had the opportunity to deliver a masterclass at the Global Education and Skills Forum in Dubai as a Global Teacher Prize top ten finalist. I chose to share my experience using the Colour, Symbol, Image routine to teach students about the Stolen Generations. I titled the session 'Cultivating a community of critical and creative thinking' and explored our school context and snapshotted some visible learning strategies in sharing our journey. [A video of the masterclass \(25 minutes\)](#) can be viewed on Global Education & Skills Forum YouTube channel.

How important is reflection for developing critical and creative thinking skills in students? Is it also important for teachers?

Student self-reflection and student sample work is the basis of refining our approaches as it shows evidence of learning and where there may be gaps, and enables us to adapt our teaching where needed. I found that to create conditions for deep reflection amongst my students, I needed to make it a



part of the routine of a lesson cycle. I had to explicitly model the language I wanted students to use in the way I set my learning intentions and success criteria.

Here is an example of a reflection from a Year 9 history student demonstrating how students can identify and reflect on CCT in their learning. It shows how the student learnt the content and deeply engaged with the material, and her acknowledgement that clarifying and validating source material was at first 'highly confusing' demonstrates her ability to tolerate uncertainty and persevere. The student also writes explicitly about historical skills in CCT including empathy, hypothesising and determining the accuracy of content. This particular reflection is all the more impressive given the student initially struggled with this learning, yet was able to persevere and further develop

her knowledge and CCT capability. Her reflection also demonstrates other capabilities including ethical understanding, as evidenced in her assessment of the ethical failings of convict transportation.

Year 9 history reflection extract (as submitted by the student)

Different information at different websites was highly confusing as I had to clarify and validate the historical content. However, with the assistance of the teacher, I was able to easily balance which websites were accurate and which were not, resulting in a well-polished piece of work.

This assessment task which was publishing a portfolio detailing the life of a slave/convict/free settler assisted in learning more about the hardships a convict was required to overcome during



the transportation from England to Australia (earlier known as New South Wales). I was able to refine the skill of 'empathy' as I was obligated to write each journal entry in first person relating the emotions Mary Reibey experienced. This was a difficult task as I was not present at this particular period of time, but it inclined me to use my imagination and hypothesize the emotions. Upon researching about Mary Reibey, I gained knowledge about the transportations which took place to relocate convicts from England to Australia. Many were convicted of minor crimes if portrayed in the modern world. And so there was a great injustice apparent in early England.

As part of the lesson design, this particular reflection was then uploaded by the student with their work to the Rooty Hill High School digital platform called MyLearningHub. This platform reflects a school-wide approach to valuing the general capabilities and enabling students to have opportunities to showcase their work. As a teacher I have contributed to, and led, many professional learning sessions that focused on CCT. Through this, I have learnt that in order to develop CCT, we first need to trial, reflect and model the process with both teachers and students. A pivotal learning for me, as a leader, is knowing that embedding CCT does not reach an end point. We teach and re-teach different aspects to students, induct new staff, and support those with experience to

A pivotal learning for me, as a leader, is knowing that embedding CCT does not reach an end point.

develop their practice even further, while ourselves constantly adapting to new demands such as changing syllabuses and scholarship.

Any concluding thoughts?

Critical and creative thinking matters in all aspects of teaching and learning just as it matters to the way we understand the world and live our lives.

Through sharing ideas, exploring and experimenting, we can seek to define and redefine what CCT looks like in our classrooms and beyond.

By sharing my own journey with CCT, I hope I might spark reflections or new ideas in others. I hope to leave the message that teacher and student agency must remain at the heart of any approach, cultivated in a way that empowers students and teachers to have choice in designing and engaging with learning. The last thing one would want, in promoting CCT, is for teachers and students to feel like CCT was being forced on them. This would be in direct contrast with everything that CCT stands for. For teachers, being explicit in defining CCT is essential to helping us model

our chosen approaches to students and peers, measuring what we value, and amplifying what we want our colleagues and students to know, do, live and be (UNESCO, 2014).

References

Australian Curriculum Assessment Reporting Authority (nd). *General Capabilities Creative and Critical Thinking*. <https://www.australiancurriculum.edu.au/media/1072/general-capabilities-creative-and-critical-thinking-learning-continuum.pdf> (accessed January 31, 2020)

Australian Curriculum Assessment Reporting Authority (nd). *Representation of general capabilities*. <https://www.australiancurriculum.edu.au/senior-secondary-curriculum/humanities-and-social-sciences/modern-history/representation-of-general-capabilities/> (accessed January 31, 2020)

Australian Learning Lecture (2017). *Building Critical Skills Rooty Hill High School*. <https://www.all-learning.org.au/programs/building-critical-skills-rooty-hill-high-school> (accessed February 10, 2020)

Australian Government Department of Education Skills and Employment (2019). *Alice Springs (Mparntwe) Education Declaration*. <https://docs.education.gov.au/documents/alice-springs-mparntwe-education-declaration> (accessed February 21, 2020)

Global Education Skills Forum (2019). *A world where every class is a masterclass – Yasodai Selvakumaran*. <https://www.youtube.com/watch?v=ia05xSXJ0Kg> (accessed February 28, 2020)

Gilbert, R. (2018). "General capabilities in the Australian Curriculum: Promise, problems and prospects", in Reid, A. and Price, D. (2018). *The Australian Curriculum: Promises, Problems and Possibilities*. Deakin, Australian Curriculum Studies Association, pp. 129-141.

Lucas, B. & Spencer, E. (2017). *Teaching Creative Thinking: Developing learners who generate ideas and can think critically*. Crown House Publishing, West Wales.

NESA (2016). *Learning across the curriculum: Geography K-10*. <https://educationstandards.nsw.edu.au/wps/portal/nesa/k-10/learning-areas/hsie/geography-k-10/learning-across-the-curriculum> (accessed February 14, 2020)

NESA (2016). *Learning across the curriculum: History K-10*. <https://educationstandards.nsw.edu.au/wps/portal/nesa/k-10/learning-areas/hsie/history-k-10/learning-across-the-curriculum> (accessed February 14, 2020)

NESA (2013). *Society and Culture: Stage 6 Syllabus*. <https://www.educationstandards.nsw.edu.au/>

[wps/wcm/connect/a595c986-4712-41dc-9588-0febca96a575/society-culture-st6-syl-from2015.pdf?MOD=AJPERES&CVID=](https://www.educationstandards.nsw.edu.au/wps/wcm/connect/a595c986-4712-41dc-9588-0febca96a575/society-culture-st6-syl-from2015.pdf?MOD=AJPERES&CVID=) (accessed February 18, 2020)

PZ Sydney Network (2020). *About Project Zero Sydney*. <https://www.pzsyl.net/about-1> (accessed February 16, 2020)

Rooty Hill High School Creativity Wheel (nd). https://www.researchgate.net/figure/Rooty-Hill-High-Schools-Creativity-Wheel_fig2_312039075 (accessed March 4, 2020)

Ritchhart, R., Church, C., and Morrison, K. (2011). *Making Thinking Visible: How to Promote Engagement, Understanding, and Independence for All Learners*. Jossey-Bass: San Francisco

Schulman, L. (2005). "Signature Pedagogies in the Profession" *Daedalus*. Vol. 134, No. 3, On Professions & Professionals (Summer, 2005), pp. 52-59.

UNESCO (2014). *Learning to Live Together*. United Nations Educational, Scientific and Cultural Organisation, France.

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On creative thinking in education:

Eight questions, eight answers

Ronald A. Beghetto

Creative thinking in education has often been described as a critically important 21st century skill. A skill necessary for young people to successfully navigate an increasingly uncertain future. If we pause to think about such a claim, we likely will realise that it is a bit problematic to describe creative thinking as a 21st century skill. Such claims overlook the fact that the ability to think in creative ways is something people have always done throughout the course of humanity. High creative self-efficacy is also linked with increased motivation and academic aspirations, meaning that creativity supports overall learning and achievement (Beghetto, 2006).

It is also problematic to describe our experience of the 21st century as involving more change than what people experienced during other historical periods. That said, it is understandable why people are placing emphasis on creative thinking, given the amount of uncertainty we face with rapid global and technological changes.

Indeed, machines are now capable of (and in some cases surpassing) some of the high water marks of human intelligence and creativity, such as: producing original music compositions, writing original news

stories, generating creative recipes, and outperforming humans in strategic and, in some cases, creative thinking (for example Jeopardy, Chess, and Go).

Not surprisingly, the rise of machine learning and advances in artificial intelligence has resulted in a range of concerns, including everything from rethinking what it means to be human (are we turning into cyborgs?), reconsidering what should be taught in schools (if machines are better at storing and retrieving information than humans, how should subject matter be taught?), and even worrying

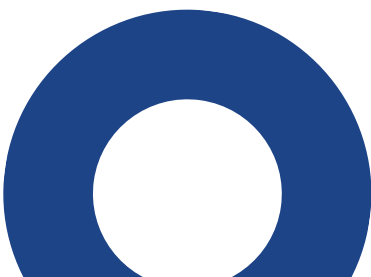


about potential existential threats to humanity (will we survive a world run by smart machines?).

In order to understand the educational implications of such concerns and the role that creative thinking can play in addressing them, it is important to first clarify several core questions, including what exactly creative thinking is. Do students always need to be thinking creatively? Is creative thinking yet another curricular add-on that needs to be taught and tested? Should schools bring in creativity specialists to work with teachers and students? How can educators support creative thinking in young people?

The purpose of this paper is to explore these and related issues by addressing the following commonly asked questions:

- 1 What is creative thinking?
- 2 How does creative thinking relate to other forms of thinking?
- 3 How do we determine whether an idea is creative?
- 4 When do we need to think creatively?
- 5 How are creative possibilities generated?
- 6 How do we select from possibilities we generate?
- 7 Is creative thinking domain-specific?
- 8 Is creative thinking teachable?





1 What is creative thinking?

Creative thinking is defined here as: a process of generating thoughts (ideas, interpretations or insights) that are evaluated by oneself or others to be original and meaningful in the context of a particular task, situation or domain.

Prior to unpacking the various elements of creative thinking, it is important to briefly discuss a few key operating assumptions about the definition, including how it connects to the way researchers have conceptualised the creative process and how there are no guarantees when it comes to creative outcomes.

Creative thinking is a process

Creative thinking is defined here as a process. A process implies a series of phases, steps or procedures that people go through to produce creative thoughts. Creativity researchers and creators themselves have described various components and process models of creative thinking (Runco, 2018; Sawyer, 2012; Wallas, 1926). Some of the models focus on a sequence of steps, while others highlight components of the process.

Generally speaking, most descriptions of creative thinking can be boiled down to two core processes or components (Beghetto, 2016a; Cropley, 2006). The first is generating possibilities (For example a student generates multiple ideas for a school fundraiser) and the second is evaluating those possibilities (the student carefully considers each idea,

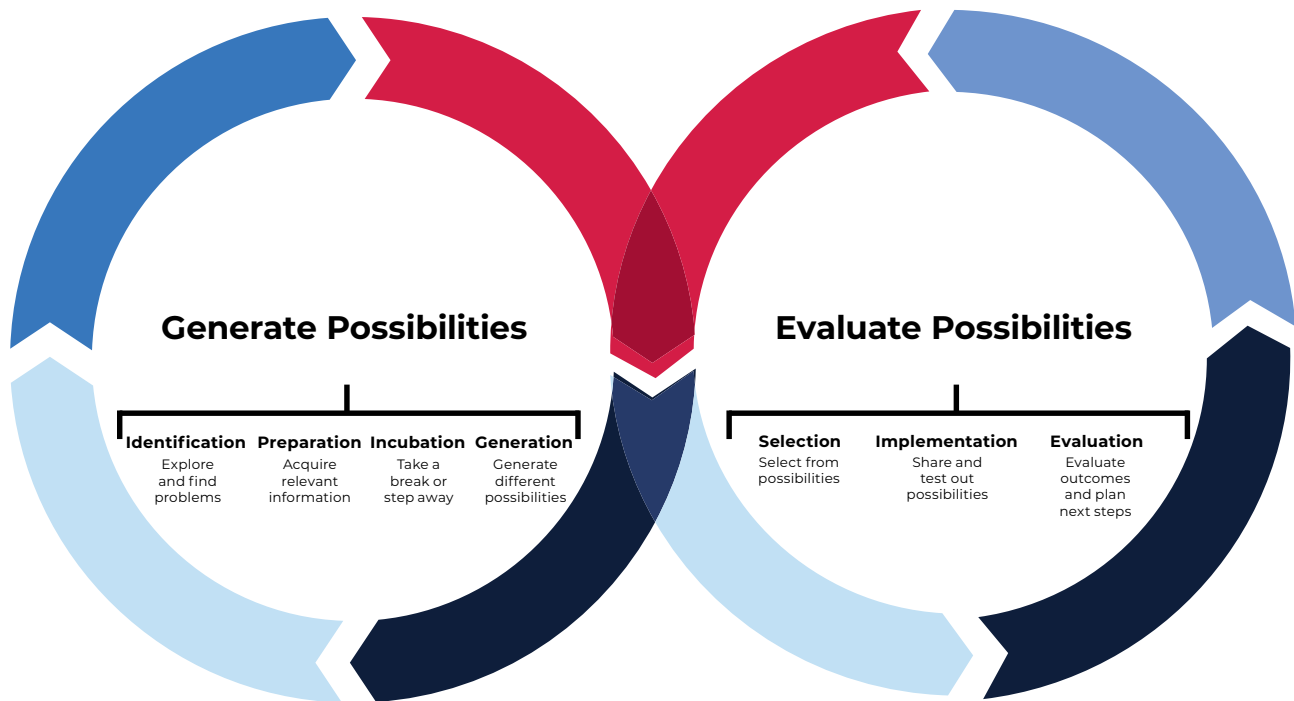


Figure 1. Example components of creative thinking

selects one to share with the student council, receives feedback, makes modifications, and implements the idea, which results in a successful and creative school fundraiser). Both generating and evaluating ideas are explicitly recognised in the definition introduced earlier.

Researchers tend to expand on the two core components of generating and evaluating by including a variety of additional processes or features. These additional components are sometimes labelled differently and placed in different sequential positions, which has resulted in a variety of models that range from two to eight or more components (see Sawyer, 2012 for a detailed overview). Although there is no single model or consensus on all the features or processes involved in creative thinking, there does seem to be general agreement on several of the

components, particularly the two major components of generating and evaluating ideas.

Figure 1 provides an illustration of seven common components of creative thinking, which are germane to the questions addressed in this paper. As depicted in Figure 1, generating and evaluating possibilities represent the two overarching components. On the generation side, there is identification, which involves recognising, exploring, and identifying unique features of a topic or situation, including finding a unique problem to solve (see question 2 for a discussion of problem finding). Preparation is a component found in almost all creative process models and refers to knowledge, skills and resources necessary to understand and generate possibilities for addressing the situation or problem.



Several models also include incubation, which refers to stepping away from the topic or problem and returning to it later with fresh perspective (see Cropley & Cropley, 2010 for an alternative view). Then of course there is generation, which involves generating a variety of candidate possibilities for addressing the situation or problem.

On the evaluation side, there is the selection of potentially viable possibilities, implementation or testing out of the selected possibilities, and evaluation of the results, which can include subsequent steps and new directions. Some models also include recursion (Runco, 2018), which highlights that the process is not always unidirectional and linear, but rather represents a much more dynamic and iterative process of circling back and forth through and across components. The recursive aspect of creative thinking is denoted by the circling arrows in Figure 1.

Taken together, creative thinking represents an often effortful and prolonged process, which differs from the more mysterious and instantaneous way that some people, including some people who have generated highly creative ideas, have characterised it. For instance, Jim Henson, the creator of the Muppets, once said “I don’t know exactly where ideas come from, but when I’m working well ideas just appear” (Henson, 2011).

On first blush, Henson’s description suggests that creative ideas appear out of thin air. What we sometimes do not acknowledge when we hear such descriptions, is that prior to those ideas appearing and being recognised as creative or viable, there is a great deal of preparation involved, which includes past experiences, development of relevant knowledge, creative confidence and, in the case of highly creative ideas, expertise.

This is all a long way of saying that there tends to be more than meets the eye when it comes to creative thinking and it does not end with generating an idea. Indeed, the implementation of potentially creative ideas often includes setbacks, multiple iterations, and sometimes even the abandonment of highly original ideas in favour of ideas that may be less original, but actually work (Beghetto, 2016a; von Thienen et al., 2017).

A process, not a guarantee

Becoming familiar with components and processes of creative thinking can be helpful for understanding and supporting students’ and one’s own creative thinking. But it is important to stress that there are no guarantees that following the steps of a process model will yield creative ideas or outcomes. In some cases, process models will effectively describe and potentially even guide a successful outcome, in other cases they may fall flat.

A student who, for instance, recognises that she is having an unusually difficult time getting along with one of her teachers (identification), might spend time thinking about the situation, comparing it to similar experiences she has had, and gathering information from others who might help (preparation). After spending several days actively thinking about it and feeling like she keeps running into dead ends, she takes a break from it and turns her attention to an upcoming swimming competition (incubation). In the car ride home from her swim meet, she returns her attention to the problem and is able to come up with several unique ideas for how she can address the issue (generation). The next day at school she selects a possibility that seems both unique and feasible (selection), tries it out (implementation) and is able to creatively resolve the situation (evaluation).

The next time this same student confronts a different situation and tries using the same steps, she may find herself circling back and forth between different aspects of the process before generating an idea that works. Yet another time, she may try going through the steps, and fail to yield a viable idea, even after repeated attempts. The point is that creative thinking is a process that involves generating and evaluating possibilities, but there is no single process or set of steps that works all the time for all people in all situations. When it comes to generating creative ideas that can have a real-world

impact, much depends on the situation, the people involved, and the socio-cultural and historical context (Amabile, 1996; Glăveanu, 2015).

Moreover, students need to have the confidence and willingness to engage in creative thinking endeavours (Karwowski & Beghetto, 2018). The most direct way of developing this confidence is to provide them with opportunities that require creative thought. This includes inviting young people to tackle challenging problems and issues that matter to them. It also involves establishing a learning environment that encourages the exploration and generation of multiple perspectives and ideas, provides honest, yet supportive feedback and offers multiple opportunities for students to actively reflect on and learn from success and failures. Further discussion of these themes will be covered in the questions and responses of the remaining seven questions.

2 How does creative thinking relate to other forms of thinking?

Although there are distinguishing features of creative thinking, it does relate to other forms of thinking, in particular problem solving and critical thinking.

Creative thinking and problem solving

Creative thinking is often used to solve problems, particularly problems that are ill-defined and complex. As discussed, creative thought is needed when confronted with uncertainty about the nature of the problem, how to approach it, or what the outcomes might be. This is because in order to solve such problems, we need to develop new and meaningful ways of thinking through the problem, process and outcomes.

Although creative thinking is often used to solve ill-defined problems, creative thinking goes beyond problem solving. Creative thinking is used to explore new possibilities of a settled topic or even anticipate and identify the need for something new, including finding new problems to be solved.

This aspect of creative thinking has been called problem finding (Kozbelt et al., 2010; Mackworth, 1965) and is often featured in creative process models (see Figure 1).

Creative thinking is used to explore new possibilities of a settled topic or even anticipate and identify the need for something new, including finding new problems to be solved.

Problem finding can include asking your own questions about a topic (even seemingly settled topics), detecting the need for something new, identifying and constructing your own problems to solve, and engaging in the exploration of new possibilities about an existing topic or situation – all of which can lead to creative insights, ideas and outcomes. Problem finding and exploration of the problem is often viewed as being as, or even more, important than problem solving (see Mackworth, 1965). Indeed, quotes attributed to highly accomplished creators reflect this sentiment. Two examples from Albert Einstein and Jonas Salk are on page 55.

In this way, problem finding is a feature of creative thinking that is different from more general problem solving experiences. As Mackworth has explained, ‘an activity like problem finding would seem to be close to the heart of originality in creative thinking’ (1965, p. 54). This difference between problem finding and problem solving comes into sharp relief when we consider how students typically experience school-based problem solving.

In most cases, school-based problem solving involves working through a presented problem, which already has a solution, and a predetermined pathway for arriving at that solution. Problem finding flips this school-based model on its head because it introduces more uncertainty by transforming a predetermined exercise into a to-be-determined process. In such a situation the students would have an opportunity to identify the problems to be solved and develop their own process for solving them (see Beghetto, 2018, and responses to question 8).

Creative thinking and critical thinking

There is clear overlap between creative and critical thinking, but there are also some important differences. Both creative and critical thought include evaluative thinking (making judgments of value or merit of new ideas and different possibilities). Critical thinking and creative thinking differ in that critical thought is not primarily focused on generating new ideas and possibilities.

Indeed, critical thinking can be used to make decisions along well-established lines of thought and action (Given these two existing options, which

“What people think of as a moment of discovery is really the discovery of the question.”

— Jonas Salk

“If I had an hour to solve a problem and my life depended on the solution, I would spend the first 55 minutes determining the proper question to ask for once I know the proper question, I could solve the problem in less than five minutes.”

— Albert Einstein

seems best? Given these two claims, which is most accurate?). That said, critical thinking can and does play an important role when it comes to ensuring that creative ideas lead to beneficial and positive outcomes (Cropley et al., 2010).

When educators encourage young people to use critical thinking in conjunction with creative thought, they can help students learn how to focus on more than simply generating and selecting new ideas that work by also considering broader and more critical questions such as: success for whom, under what conditions and at what costs? Two students who come up with a creative idea for selling the same snacks that are sold as part of a school fundraiser for a cheaper cost, for instance, may successfully generate money for the two students, but ultimately undermine and do harm to the school fundraiser that supports families of students in need.

Combining creative and critical thought or even ethical thinking (Moran,



2014) can thereby help young people actively anticipate, monitor and respond to potentially negative and unintended consequences of their creative ideas. Doing so will enable young people to develop a more principled approach to their creative endeavours – moving beyond creating for the sake of creating and toward ensuring that their ideas and actions are helping and not harming others.

Developing a set of guiding questions, like the following, can help remind students to critically consider the potential impact of the possibilities they are generating and selecting for implementation:

- What is beneficial about this idea?
- How will sharing or implementing this idea impact me and others?
- Who will benefit from this idea?
- What are the potential costs, hazards and risks of sharing or trying to implement this idea?

- Do the costs outweigh the potential benefits – how do I know?
- Who else can I ask for feedback on this idea before trying it out?

Similarly, critical thinking also plays a role in helping young people decide when (and when not) to be creative (Kaufman & Beghetto, 2013). There are many cases where it is most beneficial for young people to be able to critically think through a situation and make decisions about whether the potential costs would outweigh the potential benefits of doing something new or creative. A student deciding to follow previously taught safety procedures when conducting a chemistry experiment rather than try to come up with a new approach is an example.

In sum, creative thinking differs but can benefit from critical thinking. The benefits of helping young people think critically about when and when not to be creative as well as the potential impact of their creative

thoughts and actions can help ensure that they are developing their skills in a way that can lead to positive and beneficial outcomes for themselves and others (see also responses to question 4 and question 6).

3 How do we determine whether an idea is creative?

Although there are no guarantees when it comes to generating creative thoughts, there are generally agreed upon criteria for judging whether something can be called creative.

Researchers generally agree on two criteria necessary for creativity: originality and meaningfulness as defined within a particular context (Kaufman, 2016; Plucker et al., 2004; Runco & Jaeger, 2012). These criteria are also reflected in the definition of creative thinking introduced earlier. A bit more discussion of these criteria may help clarify how they work together in making judgements about creative thinking in and beyond educational contexts.

Originality and meaningfulness

Originality is necessary for creativity. Something must be considered new, unique, different, or novel to be creative. Most people recognise that something can't be called creative if it is not original. In fact, sometimes originality and creativity are used interchangeably. Doing so is problematic, which becomes

evident when we consider why originality cannot serve as a stand-in for creativity.

Imagine a student who is taking a written science exam. The exam asks students to represent the changing states of matter. The student, who is a skilled dancer, jumps up and starts performing an interpretive dance of the changing states of matter. By any account this would be a highly unusual and surprising response. Still, no matter how original the dance, it does not meet the task constraints of the written exam and therefore would not be considered creative. Although this is an extreme example, it illustrates how originality is not the same thing as creativity.

Creativity requires more than unconstrained originality. This is why standard definitions of creativity specify that in order for something to be called creative it also needs to be meaningful, useful, effective, or meet the task constraints of a particular situation, problem or context.

Lest this second criterion seem coldly rational or overly utilitarian, it may be helpful to recognise that the meaningful criterion can also refer to interpreting something as beautiful, moving, or aesthetically pleasing. A group of students who produce an original and moving documentary about the struggles and successes of teenage identity development would certainly qualify as creative.

Creativity therefore can be thought of as structured originality. When making judgements about

whether an idea is creative, originality is structured by the particular requirements of a task, situation or domain. A student's original poem about life in school submitted to a limerick poetry contest would also need to adhere to the five line format and rhyme scheme of a limerick in order to be considered creative. As these examples illustrate, the student's originality is structured by the requirements of the task, situation, and domain.

A retrospective judgment

Like all determinations about creativity, the judgments we make about creative thinking are made retrospectively. We cannot really know in advance whether the next idea we come up with will be considered creative. There is always some level of uncertainty involved in creativity and thereby some element of surprise (Beghetto, 2019; Simonton, 2018). We retrospectively recognise, "Wow – that's a creative idea!" Of course, we may also later recognise that an idea we thought was creative in the moment, is not really that original once we receive some feedback on it. It is also possible that an idea we view as mundane is recognised by others as quite creative.

In the context of educational environments, it is therefore important for students to share their potentially creative ideas so teachers and peers can provide feedback. This is particularly important in the context of academic topics where corrective feedback and clarifications can be

necessary for supporting students' academic understanding. Such feedback can also help students shape their potentially creative thoughts into creative contributions (Beghetto, 2016b).

Different levels of creative ideas

Can we really call a primary student's insight in science class creative when such an idea would be viewed as quite ordinary in a secondary or higher education classroom? The short answer is yes. As noted in the definition of creative thought, although the criteria for making judgements remains the same regardless of context (original and meaningful), the determination about whether a particular idea or thought is creative is situated in particular contexts.

The Four-C model of creativity (Kaufman & Beghetto, 2009) can be helpful for recognising how these different levels of creative magnitude still adhere to the two generally agreed upon criteria of originality and meaningfulness. The four levels of creative magnitude include mini-c, little-c, pro-c and big-c creativity.

Mini-c creativity refers to self-recognised creative ideas, insights, interpretations and experiences. A student who has a new and personally meaningful insight about a recently taught science concept would be an example of mini-c creativity.

Little-c creativity refers to creative contributions recognised by other people in our everyday environment.

A student who shares a unique and meaningful idea for how to design a science experiment during a class discussion is an example of little-c creativity.

Pro-c creativity refers to creative contributions recognised by professionals and experts in a particular domain or field of study. A scientific study published in a peer-reviewed journal would be an example of pro-c creativity.

Big-c creativity refers to creative contributions that have made a lasting and profound contribution to a field or domain. The scientific contributions of Marie Curie are an example of big-c creativity.

In educational contexts, the focus is typically on mini-c and little-c levels of creative thinking. As mentioned, we want to encourage young people to share out their unique mini-c perspectives and receive feedback to ensure that they are meeting the constraints of the subject matter they are learning. Oftentimes students' original ideas benefit from teachers providing guidance on how to meaningfully connect those ideas to the topic at hand. Other times students may need encouragement or prompting to come up with their own unique ideas or interpretations. In both cases, guidance and prompting can help shape mini-c thoughts into little-c contributions.

4 When do we need to think creatively?

We don't always need to think creatively.

In many cases routine and habitual forms of thinking and acting work perfectly well. Providing the expected answer on an exam or following the safety steps in a science lab are examples of when thinking in expected and routine ways are particularly beneficial. Thinking creatively becomes necessary when confronted with uncertainty. If routine ways of thinking no longer work or if we experience an ill-defined problem, then it is a sign that we need to think creatively.

Uncertainty as a catalyst and condition for creative thinking

In this way, creative thinking is a process that starts in a state of uncertainty or what has been called a 'state of genuine doubt' (Peirce, 1958). When we experience states of doubt we do not know how to proceed. In such situations, we are at an impasse because our typical ways of thinking through a situation are no longer viable. When we are confronted with uncertainty, we need to think creatively to resolve it. In this way uncertainty serves as a catalyst and condition for creative thinking.

Uncertainty can be encountered or provoked. When we encounter uncertainty, we are caught by surprise, we

If routine ways of thinking no longer work or if we experience an ill-defined problem, then it is a sign that we need to think creatively.

experience a rupture that 'either disappoints an expectation, or breaks in upon some habit of expectation'(Peirce, 1958). A student who has always been able to resolve conflicts with peers may encounter uncertainty when turmoil emerges amongst team members on a group project and the student is at a loss for how to help resolve it.

Provoked uncertainty, on the other hand, refers to intentionally introducing uncertainty into our experience (e.g. the art student approaches the blank canvas). As with encountered uncertainty, provoked uncertainty serves as stimulus for creativity. Teachers can provoke uncertainty in their lessons by breaking from the routine of simply reading a story and checking comprehension, and introduce a new requirement of having students develop their own, unique alternative endings (for example "Having read this story together, now I'd like you to come up with your own ending to this story").

By introducing uncertainty in the structure of routine lessons and activities, teachers help students break from routine thought and

engage in creative thinking. Indeed, Graham Wallas, who is credited with one of the earliest creative process models, described how creative thinkers intentionally break habit as a stimulus for creative thinking:

This antinomy between the stimulus of habit in time and place and circumstances, and the stimulus of breaking habit, is constantly reflected in the lives of those who are capable of serving mankind as creative thinkers (Wallas, 1926: 82).

Regardless of whether uncertainty is encountered or provoked, it serves as a sign and condition for engaging in creative thought. Helping students to read those signs can go a long way in developing their understanding of when it might be more or less beneficial to engage in creative thinking.

5 How are creative possibilities generated?

Creative possibilities are generated by thinking processes and procedures that enable people to produce a wide array of new and potentially viable ways of addressing the uncertainty faced in a problem, situation, or endeavour.

Creativity researchers have described a variety of thinking processes and procedures involved in generating possibilities, including: divergent thinking, possibility thinking, combinatorial thinking, abductive reasoning, analogical thinking, trial and error, frame shifting, and assumption flipping (Beghetto, 2016a; Simonton, 2018). Of these, divergent thinking (Guilford, 1968) has, by far, received the most attention in the literature. Divergent thinking is 'the process that allows a person to find original ideas' (Runco, 2018: 477), which includes generating multiple, different and unique ideas.

Regardless of the particular name of the process or procedure used, generating possibilities represents a core component of creative thinking, which is aimed at generating and exploring various options that may help us creatively resolve the uncertainty we are experiencing.

One way to think about generating possibilities is that it involves our imaginative capacity to draw on, but ultimately go beyond, previous knowledge and experiences in order

to envision new perspectives and alternative ways of making sense of a problem or situation. Doing so can help us move beyond what is and toward new alternatives for what might or could be (Bruner, 1986; Craft, 2010).

Creativity researchers have described various procedures or tactics for generating new possibilities. Many of these approaches represent the combinatorial feature of creative thinking (Rothenberg, 2015; Ward & Kolomyts, 2010). Creators and creativity researchers have long recognised that creative ideas often emerge from the combination of different stimuli, whether those be ideas, experiences, concepts, materials, styles of music, cuisines, or just about anything that can be combined. In fact, even the definition of creativity itself represents a combination of originality and meaningfulness and the same can be said of the core components of creative thinking (that is, a combination of generating and evaluating ideas).

Janusian thinking (Rothenberg, 2015) is an example of a combinatorial thinking procedure. This tactic is named after the Roman god Janus whose duality of gaze simultaneously combines sight of the past and sight of the future. In practice, this tactic involves combining different, even opposing, concepts (such as friend and enemy, spoon and fork) in an effort to generate a new concept (such as frenemy, spork).

Another example of a procedure for generating ideas

is to use simple tactics to rethink or transform a situation or problem, such as substituting an existing character in a story with a new character (Eberle, 1996). Substituting an existing element with a new element can lead to new combinations and potentially creative outcomes. Assumption flips are another example (Beghetto, 2016a). Assumption flips are used to generate new ways of thinking about a situation, challenge, or problem (such as viewing two things that seem unrelated as connected; viewing the cause as the effect; seeing the problem as the solution, and so on). Assumption flips also involve combining different ways of thinking with an ill-defined problem or situation in an effort to generate new insights.

Employing such strategies may increase the likelihood of generating new possibilities and they are generic enough to be used across various situations and domains. What worked in a past situation, however, will not always work in similar or future situations. As has been discussed, it is difficult to predict whether a particular tactic will produce a creative possibility because creative outcomes have an element of surprise to them and are determined retrospectively. In addition to tactics or processes, a person's motivation, knowledge, and willingness to explore different possibilities plays a key role both in generating and implementing creative ideas.

Indeed, some of the most heralded creative thinkers (e.g. Albert Einstein,

Thomas Edison) admit to having spent more time chasing dead ends than having creative breakthroughs. Generating creative ideas that can be implemented and make a large scale impact on the world are extremely rare (Simonton, 2018). The good news is, creative ideas that can make a more everyday impact on the learning and lives of students, their schools, and communities are much more commonplace.

6 How do we select from possibilities we generate?

We select from possibilities by engaging in another subprocess of creative thinking, often called convergent thinking, which involves making evaluative judgments about the viability of the various possibilities we have generated.

Once we have generated possibilities for resolving the uncertainty we face, we need to evaluate those possibilities. Creativity researchers typically describe this evaluative process as convergent thinking (Guilford, 1968). Convergent thinking involves making evaluative judgements about the merit of particular possibilities we have generated. This is a critical aspect of creative thinking. We need convergent thinking to ensure that the possibilities we generate and select meet the requirements of a specific task or situation. We also need convergent thinking to ensure that we are not recklessly implementing ideas that

can cause harm to oneself or others (Cropley, 2006; Cropley et al., 2010; see also question 2).

As illustrated in Figure 1, evaluating possibilities can encompass a variety of components. An idea can be selected from a simple thought experiment (for example “Which of these ideas seems the most reasonable or makes the most sense given this situation?”) and then directly tested (“Let’s give this idea a go and see if it works”) only to find out that the selected option did not pan out and must thereby be judged as a failed attempt. The failed attempt may, in turn, prompt us to revisit other options, rethink the nature of the problem, generate new possibilities, or even decide to go in a completely different direction. In this way, failures can be thought of as inconclusive outcomes because they can prompt new directions in thinking (von Thienen et al., 2017).

In other cases, the selection of a possibility may be more aesthetically driven or taste-based. A student taking a photography class may settle on a particular image to include in the school’s photography exhibition based on a personal, aesthetic preference. In the context of the classroom it can be helpful to have students go through a somewhat structured process of evaluating possibilities because students may not know how to critique ideas in a productive and helpful way.

Finally, when it comes to the selection of a new possibility that may solve a problem or challenge that students

are facing, the selection decision likely will be based on whether the solution or idea is reasonable and feasible (rather than trying to focus on the most original idea). Whereas creativity researchers are often interested in judging or differentiating between different levels of originality of an idea or solution, in educational contexts it often makes the most sense to select not necessarily the most original idea, but a new or different approach that actually has a chance of leading to positive resolution of the problem or challenge. A group of students may, for instance, come up with an ambitious and highly original idea for designing a smartphone app for addressing an identified problem of students asking questions about homework. A more reasonable and feasible solution however might simply involve a new way of using existing technology to solve the problem (such as a Google doc). Both are creative ideas, but the second one is more feasible and thereby increases the chances of successful resolution of the problem.

Educators can establish some basic ground rules or a checklist that can help guide young people as they learn how to provide feedback supportive of creative thinking. The checklist can include explicit reminders based on insights drawn from the creativity studies literature, including:

- providing specific, deep, and useful critiques of ideas (Gibson & Mumford, 2013).
- remaining open to new possibilities, even

when providing evaluative critiques (Beghetto, 2016a).

- ensuring that unique ideas have some practicality and practical ideas have some uniqueness (Mumford, Medeiros, & Partlow, 2012).
- exploring first steps and potential setbacks to help ensure successful implementation of the ideas (Klein, 2007).

The following is an example of a checklist based on the above insights that can be modified and used to guide young people when working together to evaluate possibilities (adapted from Beghetto, 2016: 63):

- We agree to focus our feedback on ideas, not people (for example “I don’t understand how this fits?” vs. “What are you thinking? You must be crazy!”).
- We agree to consider each possibility presented, no matter how silly or unusual it may seem.
- We agree to preface our feedback with “What if ... ” to remind the person hearing our feedback that we are providing a suggestion that may lead to new ways of thinking.
- We agree to make our feedback specific (focus on a particular feature of the idea), deep (provide reasons for our comments and insights that may have been overlooked), and useful (the feedback should be helpful and actionable).
- We agree to try to make seemingly impractical ideas more useful

and somewhat common ideas more unique.

- We agree to identify some potential barriers to success, provide ideas for addressing those barriers, and identify some first steps that can be taken to put these ideas into action.
- We agree that we can start the process over at any time, including rethinking the problem or situation and generating a new set of possibilities.

Educators may also find it helpful to consult related materials that can help them and their students develop ground rules (see Littleton & Mercer, 2013), feedback activities (see Beghetto, 2018), and guides for giving and receiving structured feedback (see AITSL 2017).

Inviting students to provide structured feedback to their peers as well as seek feedback from others, including relevant outside experts, can provide several benefits. First, structured feedback opportunities help students learn how to provide honest and supportive critiques of other’s ideas (rather than make shallow or hurtful comments). Next, it can help increase the likelihood that the students who are providing the feedback generate more creative solutions for the problems and situations that they themselves face (Gibson & Mumford, 2014). Finally, it can help young people recognise that creative thinking is not a linear set of steps to complete. Creative thinking can and often does require going back to reevaluate selected and discarded options,

explore new possibilities, and even rethink the problem itself.

7 Is creative thinking domain-specific?

Although there are features of creative thinking that are transferrable, it is helpful to recognise that creative thinking is constrained by specific domains, situations and tasks.

There are several commonalities in creative thinking regardless of domain, including: the criteria used to judge creativity (such as original and meaningful), some of the features of the process (for example generating possibilities) and evaluating those contextual and individual factors (supportive environment, confidence in one's ideas, willingness to explore and try out alternatives). That said, creativity researchers recognise that subject area, domain, and discipline matters – not only in generating creative ideas, but in implementing those ideas.

A couple of quick examples may help illustrate why this is the case. Consider a student who comes up with an idea for a science project, develops a project based on the idea, and submits it to a science exhibition for evaluation from a group of judges. The student's idea and project are evaluated as highly creative. Should we expect this same student to be able to develop a creative idea for a short story that will also be judged as

highly creative? The short answer is – it is possible, but not likely.

Although it is possible for students to generate creative ideas in separate domains that would be rated as highly creative, doing so is somewhat unlikely. One reason why it is unlikely is because generating highly creative ideas in a particular domain or subject area requires having developed sufficient knowledge, experience, and skill with the activities and tasks of each domain.

John Baer, a creativity researcher who has extensively examined this question, has consistently demonstrated that student creativity rated in one domain tends not to be predictive of creativity in other domains (see Baer, 2015 for an overview). That said, too much familiarity with a domain can hamper creativity by causing a narrow or overly fixed view of what should be done and how it should be done (Plucker & Beghetto, 2004; Simonton, 2016). We will return to this momentarily. Prior to doing so, let's consider another example.

Creative thinking can and often does require going back to reevaluate selected and discarded options, explore new possibilities, and even rethink the problem itself.

Imagine a student writes a short story and a poem for two separate contests. The student's short story is rated as highly creative by a panel of experts. Should we expect the student's poem to also be rated as highly creative? Again, it is possible for a student to produce both highly creative short stories and poems, but generally speaking it is unlikely that a student would be highly rated on both, unless the student has developed sufficient knowledge and skills of these two different forms of writing (see Baer, 2015).

As these examples illustrate, domain knowledge matters. Indeed, creativity researchers have long noted that 'no creative person can get along without previous experiences or facts, [that person] never creates in or with a vacuum' (Guilford, 1950: 448.). Creativity researchers generally agree that creativity is domain specific, even though it does include some domain general features. Some have offered a blended or hybrid view, which explicitly recognises that creativity has both domain general and domain specific features (see Plucker & Beghetto, 2004; Baer & Kaufman, 2005).

The Four-C Model (Kaufman & Beghetto, 2009) helps provide additional clarification of this domain specific issue. When young people are having mini-c creative insights while learning about a domain, extensive domain knowledge is less critical because students are still developing their competence. Consequently, young people can have mini-c insights

in and across multiple domains. Moreover, the more they learn about various domains, the more likely they will be able to connect those insights to the expectations of particular tasks in domains at the little-c level. However, once creativity is judged by others, particularly experts, then domain knowledge tends to be more important.

Generally speaking, the greater the level of creative magnitude (from mini-c to big-c) then the more likely domain knowledge, experience and expertise plays a role. Developing a deep level of domain knowledge can therefore be beneficial. As mentioned, however, it is also possible that too much formal training in a domain may, at some point, become counterproductive. Dean Simonton, a researcher who has extensively studied big-c creators, has demonstrated that there may be a point of diminishing returns when it comes to formal education. Specifically, his work suggests that the relationship between formal education and big-c creative contributions is not a simple linear association (Simonton, 2016). Rather the relationship is quite complex and can even result in an inverted-u shape, indicating that at some point along the way the positive relationship between formal education and highly accomplished creative productivity can become negative.

One take away from this work is that students' creative thinking likely will benefit from a blend of domain knowledge and skills and opportunities for cultivating

broader interests, experiences, and explorations of their knowledge in and across domains. In this way, students can develop the knowledge necessary to make meaningful connections, without becoming too narrowly fixated on what is already known.

8 Is creative thinking teachable?

Students already have the capacity to think creatively, so the better question is how can we provide opportunities for young people to become more aware, confident and intentional in using their ability to think creatively?

Creative thinking is something that students already have the capacity to do. Now, of course, students can learn how to be more confident, intentional, and competent at using their ability to think creatively. There is, for instance, evidence that targeted domain and task specific training can be beneficial in enhancing people's ability to generate creative ideas (Scott et al., 2004), particularly if anchored in real world tasks and performance. There are also general strategies that people can learn, which may be helpful for generating new ways of thinking about a problem, situation or task (see question 6).

Does this mean schools should hire teams of creative specialists to help enhance students' creative thinking ability? No. This is not necessary. It is also not necessary to have students spend time on

generic creative thinking exercises, like coming up with 1,000 different uses for a paper clip. The good news is creative thinking does not need to be taught as a separate, curricular subject that then needs to be rendered into curricular outcomes and assessment benchmarks.

Rather creative thinking is something students and teachers already do in and across subject areas. Yet it can be done more systematically, not as an add-on but as an enhancement to what is already being done. Although structure and routine are important, we sometimes over plan students' learning experiences. By making small openings into existing lessons and activities, students can be invited to explore, generate, and produce new ways of thinking about what they have been taught. One way of doing so is called lesson unplanning (Beghetto, 2018).



Lesson unplanning

Lesson unplanning refers to taking a lesson or activity and replacing some predetermined element (i.e. what students are asked to do, how they are asked to do it, the expected outcome) and replacing it with one or more to-be-determined elements (i.e. the students come up with their own task or problem to solve, their own way of completing it and a different outcome).

Here's a quick example. When we typically teach students an approach for solving a mathematics problem, we teach a procedure and then provide them with multiple practice problems to rehearse using the taught procedure. This is a good way to reinforce the taught approach by having them practice using it to solve a set of different problems. To encourage students' creative thinking, we could simply include an additional expectation that requires students to

By making small openings into existing lessons and activities, students can be invited to explore, generate, and produce new ways of thinking about what they have been taught.

not only use the taught approach but to come up with as many different approaches as they can to solve that type of problem (see Niu & Zhou, 2017).

Teaching for creative thinking does not require a new curriculum, hiring creative teaching specialists, or establishing new assessment benchmarks. Rather it is about making meaningful openings into existing teaching and learning experiences that encourage and require young people to think creatively. In addition to establishing

openings for creative thought in the existing curriculum, young people would also benefit from engaging in endeavours that require them to think creatively to address a real-world, complex problem or issue they are facing (such as bullying they experience on social media). One way of doing so is to provide students with opportunities to design and implement legacy projects (see Beghetto, 2018).

Legacy projects

Legacy projects are complex, real-world opportunities for students to:

- **Find problems that matter to them.**
What is a problem or situation you are concerned about that maybe no one else recognises? What do you already know about this problem? What do you want to know? How can you learn more about it?
- **Develop an understanding and argument for why solving the problem matters.**
Why do you want to solve this problem? Who is impacted by it? What will happen if nothing is done? How do you know? Who can help you learn more about it?
- **Work with others to generate, evaluate, and implement potential creative possibilities for addressing the problem.**
Who can help you think through this problem? What are some new ways of thinking about this problem? What are some possible ways of addressing it? What might

you be missing? What possibilities seem the most viable and actionable? What might go wrong? How will you test this idea out? Once you test an idea, what kinds of alterations do you need to make? Do you need to take a few steps back? How can you move forward?

- **Work toward developing a solution that makes a positive**

Young people would also benefit from engaging in endeavours that require them to think creatively to address a real-world, complex problem or issue.

and lasting contribution beyond the life of the project.

Will you carry the work forward? If so, how? If not, who can you involve that will? What kind of impact are you having? How do you know? Are there any unexpected and potentially negative outcomes? How might you address these and anticipate others? How do we know? How can we make sure this work lives on and makes a positive and lasting impact?

Legacy projects provide structured and supportive opportunities for students to think creatively.

In this way they serve as a vehicle for creative thinking. They also provide opportunities for students to experience and develop some of the core attributes of successful creative thinkers, including:

- building creative confidence
- engaging in productive struggles with complex problems
- learning how to weigh the costs and benefits of taking creative risks
- experiencing small successes as well as failures and setbacks
- reflecting on what they have learned about the process, the topic, and themselves

Even if a legacy project completely flops, students can still learn from it if given an opportunity to openly discuss what they tried, what they learned about the situation, and what they learned about themselves. This includes:

- discussing specific features of the failures and setbacks they experienced
- describing the various thoughts and emotions they experienced throughout the process (creative work can be frustrating as well as enjoyable)
- explaining whether and how they overcame the setbacks they faced
- explaining what it taught them about themselves and the nature of that specific creative endeavour

Legacy projects, and similar endeavours, can help round-out an extended experience of using creative thinking to do something that matters to students and others by helping students realise that they do have the capacity to come up with good ideas, they do have the capacity to put those ideas to work, and they do have the capacity to make a positive impact in the lives of others. They will also learn that such a path is not easy and may not work out, but that it is still worth the effort.

References

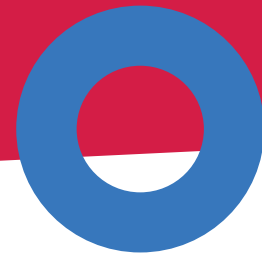
- Amabile, T. M. (1996). *Creativity in context: Update to the social psychology of creativity*. Boulder, CO: Westview.
- Australian Institute for Teaching and School Leadership (2017). Feedback. <https://www.aitsl.edu.au/teach/improve-practice/feedback>.
- Baer, J. (2015). *Domain specificity of creativity*. San Diego, CA: Academic Press.
- Baer, J., & Kaufman, J. C. (2005). Bridging generality and specificity: The amusement park theoretical (APT) model of creativity. *Roeper Review*, 27, 158–163.
- Beghetto, R. A. (2016a). *Big wins, small steps: how to lead for and with creativity*. Thousand Oaks, California: Corwin.
- Beghetto, R. A. (2016b). Creative learning: A fresh look. *Journal of Cognitive Education and Psychology*, 15(1), 6–23.
- Beghetto, R. A. (2006). Creative Self-Efficacy: Correlates in Middle and Secondary Students. *Creativity Research Journal*, 18(4), 447–57.
- Beghetto, R. A. (2018). *What if? building students' problem-solving skills through complex challenges*. Alexandria, VA: ASCD.
- Beghetto, R. A. (2019). Structured Uncertainty: How Creativity Thrives Under Constraints and Uncertainty. In C. A. Mullen (Ed.), *Creativity Under Duress in Education?* (Vol. 3, pp. 27–40). https://doi.org/10.1007/978-3-319-90272-2_2
- Bruner, J. (1986). *Actual minds, possible worlds*. Cambridge, Mass.: Harvard Univ. Press.
- Craft, A. (2010). Possibility thinking and wise creativity: Educational future in. In E. I. R. A. Beghetto & J. C. Kaufman (Eds.), *Nurturing creativity in the classroom*. New York: Cambridge University Press.
- Cropley, A. J. (2006). In praise of convergent thinking. *Creativity Research Journal*, 18(3), 391–404.

- Cropley, D. H., & Cropley, A. J. (2010). Functional creativity. In J.C. Kaufman & R. J. Sternberg (Eds.), *Cambridge Handbook of Creativity* (pp. 301–318). New York, NY: Cambridge University Press.
- Cropley, D. H., Cropley, A. J., Kaufman, J. C., & Runco, M. A. (2010). *The dark side of creativity*. New York, NY: Cambridge University Press.
- Eberle, B. (1996). *SCAMPER: Games for imagination development*. Waco, TX: Prufrock Press.
- Gibson, C., & Mumford, M. D. (2013). Evaluation, criticism, and creativity: Criticism content and effects on creative problem solving. *Psychology of Aesthetics, Creativity, and the Arts*, 7(4), 314–331. <https://doi.org/10.1037/a0032616>
- Glăveanu, V. P. (2015). Creativity as a sociocultural act. *The Journal of Creative Behavior*, 49(3), 165–180.
- Guilford, J. P. (1950). *Creativity*. *American Psychologist*, 14, 469–479.
- Guilford, J. P. (1968). *Creativity, intelligence, and their educational implications*. San Diego, CA: Knapp.
- Henson, J. (2011). *It's not easy being green: and other things to consider*. Disney Electronic Content.
- Karwowski, M., & Beghetto, R. A. (2018). *Creative behavior as agentic action*. *Psychology of Aesthetics, Creativity, and the Arts*. Retrieved from <https://doi.org/10.1037/aca0000190>.
- Kaufman, J.C. (2016). *Creativity 101* (2nd edn). New York: Springer.
- Kaufman, J.C., & Beghetto, R. A. (2009). Beyond big and little: The four C model of creativity. *Review of General Psychology*, 13, 1–12.
- Kaufman, J.C., & Beghetto, R.A. (2013). In Praise of Clark Kent: Creative Metacognition and the Importance of Teaching Kids When (Not) to Be Creative. *Roeper Review*, 35(3), 155–165. <https://doi.org/10.1080/02783193.2013.799413>.
- Klein, G. (2007). *Performing a project premortem*. *Harvard Business Review*, 85(9), 18–19.
- Kozbelt, A., Beghetto, R. A., & Runco, M. A. (2010). Theories of creativity. In J.C. Kaufman & R. J. Sternberg (Eds.), *Handbook of creativity* (pp. 20–47). Cambridge: Cambridge University Press.
- Littleton, K., & Mercer, N. (2013). *Interthinking: Putting talk to work*. London, UK: Routledge.
- Mackworth, N. H. (1965). Originality. *American Psychologist*, 20(1), 51.
- Moran, S. (2014). An ethics of possibility. In S. Moran, D. H. Cropley, & J. C. Kaufman (Eds.), *The ethics of creativity* (pp. 281–298). London: Palgrave Macmillan.
- Mumford, M. D., Medeiros, K. E., & Partlow, P. J. (2012). Creative Thinking: Processes, Strategies, and Knowledge. *The Journal of Creative Behavior*, 46(1), 30–47. <https://doi.org/10.1002/jocb.003>.
- Niu, W., & Zhou, Z. (2017). Creativity in mathematics teaching: A Chinese perspective (an update). In R. A. Beghetto & J. C. Kaufman (Eds.), *Nurturing creativity in the classroom* (2nd ed.). New York: Cambridge University Press.
- Peirce, C. S. (1958). *Collected Papers of Charles Sanders Peirce*. (A. W. Burks, Ed.). Cambridge, MA: Belknap Press of Harvard University Press.
- Plucker, J. A., & Beghetto, R. A. (2004). Why creativity is domain general, why it looks domain specific, and why the distinction does not matter. In R. J. Sternberg, E. L. Grigorenko, & J. L. Singer (Eds.), *Creativity: From potential to realization* (pp. 153–167). Washington, DC: American Psychological Association.
- Plucker, J., Beghetto, R. A., & Dow, G. (2004). Why isn't creativity more important to educational psychologists? Potential, pitfalls, and future directions in creativity research. *Educational Psychologist*, 39, 83–96.
- Rothenberg. (2015). *Flight from wonder: an investigation of scientific creativity*. Oxford ; New York: Oxford University Press.
- Runco, M. A. (2018). Creative Thinking. In L. J. Ball, & Thompson, V. A. (Eds.), *The Routledge international handbook of thinking and reasoning* (pp. 472–486). New York, NY: Routledge.
- Runco, M. A., & Jaeger, G. J. (2012). The standard definition of creativity. *Creativity Research Journal*, 24, 92–96.
- Sawyer, R. K. (2012). *Explaining creativity: The science of human innovation* (2nd ed). New York, NY: Oxford University Press.
- Scott, G., Leritz, L. E., & Mumford, M. D. (2004). The effectiveness of creativity training: A quantitative review. *Creativity Research Journal*, 16, 361–388.
- Simonton, D. K. (2016). Big-C versus little-c creativity: Definitions, implications, and inherent educational contradictions. In R. A. Beghetto & B. Sriraman (Eds.), *Creative contradictions in education* (pp. 143–180). Cham: Springer.
- Simonton, D. K. (2018). Creative ideas and the creative process: Good news and bad news for the neuroscience of creativity. *The Cambridge Handbook of the Neuroscience of Creativity*, 9–18.
- von Thienen, J. P. A., Meinel, C., & Corazza, G. E. (2017). A short theory of failure. *Electronic Colloquium on Design Thinking Research*. <https://ecdr.hpi.de/report/2017/001>.
- Wallas, G. (1926). *The art of thought*. London: Solis Press.
- Ward, T. B., & Kolomyts, Y. (2010). Cognition and creativity. In J.C. Kaufman & R. J. Sternberg (Eds.), *The Cambridge handbook of creativity*. New York, NY: Cambridge University Press.

Giving students an edge:

Educating for a rapidly changing world

Mark Scott



Although we're not yet even halfway through it, I think we can all appreciate that 2020 will be a year we never forget. Here in NSW, the year began with catastrophic bushfires underway, devastating many communities and schools.

And just as that threat abated, thanks to the hard work of the Rural Fire Service and unseasonable rainfall, a new global threat took over the headlines: COVID-19. As we approach the middle of the year, this pandemic has transformed communities on a global scale. We've seen things many of us would not have thought possible – shortages at supermarkets, businesses and whole industries under pressure, peak hour trains almost empty, states and countries closing their borders and, of course, serious threats to our health and wellbeing. When we wake up each morning to the daily news it's clear that we are in a period of rapid, and at times terrifying, change.

For me, these crises are salient reminders of a few key things: firstly, how lucky we are to live in a country that can so readily and capably respond to global disasters like pandemics and financial crises, and to large-scale local disasters like bushfires and floods. While there will sometimes be disagreement about the way we respond, I think we all understand the benefits that living in a wealthy nation with a strong health system and a robust democracy brings. Crises always bring to the fore the importance of strong and clear leadership – whether it's at the level of government, organisations, communities or schools – and reinforce the fact that effective leaders make the best decisions when they listen to experts and communities.



These moments also remind us that the choices and actions we each make in these crises – whether as a leader of a government, or a consumer in a supermarket – make a difference to the outcomes for us all.

Above all, I am reminded that throughout history, people have faced many challenges of different scale and significance, as individuals and as communities, and that we can emerge stronger on the other side when we look out for each other – and that education remains essential to tackling change. During the bushfires, schools reinforced their importance as the heart of so many communities, and we have heard already many stories of great acts of kindness and courage among the community in the face of this pandemic, on top of the extraordinary effort by teachers to virtually overnight establish and maintain learning from home.

It can be hard in times like these to move beyond the immediate needs of the now and plan for the challenges of tomorrow. And yet, there's never been a more important time to focus on how education can best prepare the young people in our care for their future. If there's one thing we can be certain about, it's that their future will be characterised by accelerating global and technological change. I was reminded of this a couple of months ago, just before the world as we knew it changed. As I rushed between meetings in a then crowded Sydney CBD, I caught a glimpse of the Financial Review's daily headlines. 'Atlassian: Tech Giant's New Sydney HQ', it proclaimed. And right below that – 'End of the Road for Holden'. The past and the future were both right there on that page.

On one hand, an iconic Australian company of the 21st century was growing; on the other, an iconic Australian brand from the 20th century was closing its doors.

These headlines made clear that the much-heralded ‘future of work’ is already here, as is further showcased by industry’s quick response to COVID-19. In a matter of days, Atlassian developed a WhatsApp service for the Australian Government to provide official updates to the public. Holden Special Vehicles, which is continuing to operate until 2021, offered to use their 3D printers to manufacture much-needed ventilators for our hospitals. The future of Australian industries is one of adaptability, ingenuity and innovation. The immediate challenge for educators is to ensure that our young people are equipped for this changing world.

A common learning entitlement for a changing world

When I became managing director of the ABC back in 2006, there was no such thing as an iPhone and no one could have predicted the volcanic impact that social media, YouTube and podcasts would have on the core business of being a national broadcaster. Yet, we felt the tide of change coming and did our best to prepare accordingly. By 2010, the ABC had launched a 24-hour news channel, a dedicated children’s channel and an online video-on-demand service – all of which would have been unthinkable a few years earlier.

The stakes were high then, but there are no higher stakes than the future of our children.

In 2018, we released the NSW Department of Education’s strategic plan for the next five years. Here, we articulated our vision to be one of the finest education systems in the world: a system that prepares every young person to live and work in a world that is beyond our horizons. A lot has changed over these past months, but that vision is as clear and important as ever. The extraordinary and tragic events of this year will pass, and we will rebuild, but our responsibility to prepare the more than 800,000 students in our care for the future will remain ever-current.

Boiled down to its most essential terms, the clearest way to achieve our vision is to make sure that every student, every teacher, every leader and every school improves every year. I know how focused our school leaders and teachers are on this, as they’ve showed these past few months – helping every child to keep learning and growing despite the difficult circumstances.

It’s important of course to clarify what we mean by *student improvement*.

We mean first and foremost that students develop, at increasingly advanced levels, the indispensable building blocks for lifelong learning: literacy, numeracy and deep content knowledge.

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We also mean that young people develop higher-order thinking skills – particularly critical and creative thinking. These skills, once needed by a relatively small proportion of the workforce, are becoming ever-more important and desirable to employers as tasks like information gathering and analysis are increasingly automated. Artificial intelligence has been described by University of NSW professor Toby Walsh as a revolution which will transform the way we live and work. While it's difficult to predict with certainty the specific impacts AI will have, or what workplaces will look like in the second half of this century, we do know that higher-order thinking skills will be essential.

This powerful toolkit of knowledge and skills is the common entitlement of every student.

Supporting performance and best practice

As Secretary of Australia's largest education system, I am acutely aware that the goal we have set for ourselves is not a simple one. The bar is high, as it must be in an increasingly globalised and competitive world.

The Programme for International Student Assessment (PISA) is an important global measure for us because it reflects students' literacy, numeracy and core content knowledge, and assesses how they can apply this to solve problems and think critically. Undertaken on a three-year cycle, PISA is a two-hour multiple choice test designed to measure how well a sample of 15-year-olds can use their reading, maths and science knowledge to meet real-world challenges. When the OECD released the results of the 2018 PISA at the end of last year, it's fair to say the results were something of a shock to education systems across Australia. Performance in mathematics in particular had continued to drop, with Australian students now only just on par with the OECD average.

While the intervening events make this seem a long time ago, there was rightly widespread concern among educators and community members. A simple number such as a PISA average score can never encapsulate the fullness of what our students know and can do. However, the results suggested that if we don't work hard to boost both our students' content knowledge and higher-order thinking skills, Australia runs the risk of being left behind.

Reversing this trend by supporting all students to grow – regardless of their level of achievement – remains a keen focus of ours even as we deal with the more immediate challenges we have been confronting.

The PISA results showed that too many students are not gaining foundational content knowledge and literacy and numeracy skills, let alone critical and creative thinking skills. That is not good enough. However, it would be a grave mistake to reduce the challenge before us to a simple 'either-or': do we teach students content or do we teach them higher-order thinking skills? We must do both. We know strong content knowledge is essential. We also know that the ability to think well and solve complex problems will be critical to securing our future.

The two are in fact intertwined. As Professor Geoff Masters, CEO of the Australian Centre for Educational Research (ACER) and independent lead of the NSW Curriculum Review, puts it:

If schools are incentivised to focus their efforts on basic skills to the exclusion of thinking and deep conceptual understanding, then performances on PISA are unlikely to improve and may continue to decline.

Ben Jensen, CEO of leading educational research group Learning First, reminds us that 'there is no villain' in PISA results and that knee-jerk policy changes are probably the worst thing we could do in response.

Instead, he argues, meaningful systemic change starts with understanding what is happening in our classrooms each day.

We can certainly learn from best practice in jurisdictions like Singapore, China and Estonia. These systems are focusing intently on improving teaching and learning, even as they concentrate on maintaining educational rigour amidst the turmoil of school closures this year. However, we must deeply understand our own system before we look to others for the answer. We need to understand what the curriculum looks like implemented in practice, not just on paper. We need to learn how we can better support our teachers to deliver world-class education and harness their expertise. And we need to communicate effectively across the system so that everyone understands what school improvement means and how we plan to achieve it. Realising our bold vision requires a belief that we can do better, a will to attempt the new, and the ability to try harder when we fail.

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Strong leaders, strong schools

One of the key things I've learned during my time at the department is that the challenge ahead requires strong school leaders. Being a principal is a demanding job. I want to make sure that for their hard work, our principals are seeing improvement within their schools and experiencing the rewards that improvement brings. Part of our response as a department has been to focus on reducing the administrative burden on schools and free up time for what's most important: high-quality teaching and learning. It's also about developing the leadership capabilities of our current and aspiring principals. We launched the School Leadership Institute in 2017 to provide rigorous and innovative leadership programs so that our school leaders can better support the learning of their teachers and students.

One example of the value of strong school leadership can be found at Blue Haven Public School on the Central Coast. At the 2019 Australian Education Awards, Blue Haven was named Primary School of the Year (Government category) and its principal Paul McDermott won the Primary School Principal of the Year award. It's not hard to see why.

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Since Paul became the principal at Blue Haven in 2016, the school has seen a dramatic improvement in its NAPLAN results – from the bottom 10% to the top 10% in just three years. A culture of high expectations ripples through the school. During the rapid transition to online learning for many students during COVID-19, the school's leadership team was able to reassure families that learning opportunities for students were the same – regardless of whether they were at home or in the classroom. Teachers worked tirelessly to ensure that all students had access to the same content, and maintained the same high expectations.

Blue Haven is a school located in a low socio-economic area, faced with the challenge of engaging not only its students but its parent community, many of whom did not have a positive experience of the education system themselves. When I spoke to Paul last year for my Every Student podcast, he explained that evidence-based practices and structures were key to the results that Blue Haven has achieved.



Paul implemented a signature pedagogy across the school, ensuring that all teachers were on the same page and collaborating closely. This signature pedagogy is based on explicit instruction, where teachers show students what to do and how to do it. Lessons are carefully planned and sequenced, and provide clear instructions and modelling.

Teachers closely monitor student progress and provide regular feedback. Blue Haven's signature pedagogy is used with all year levels and across all learning areas, with a particular focus on English and maths. This approach is designed to support students' mastery of literacy and numeracy – and the school's results show that it works.

Explicit instruction doesn't mean that students at Blue Haven don't get to develop their higher-order thinking skills. On the contrary, they are actively supported in doing so. Paul told me that classes do warm-ups at the beginning of each literacy and numeracy lesson to embed the basic skills into their long-term memories. This 'frees up their working memory for the more creative high-order thinking skills'. As Paul explains, these exercises have been 'helpful in getting the lift in our results but also providing our teachers with the platform then to move into that high order thinking style activity.'

The challenge for a system with a large degree of school autonomy is how to identify and scale excellence across the system in a way that is adaptable to the unique needs of each school.

The success of Blue Haven Public School would not have been possible if Paul was not able to implement strategies that were tailored to his school's needs. He emphasises that no single program is responsible for the school's rapid improvement. The signature pedagogy is a key part, as is strong professional development for the school's teachers, and the respectful and regular communication with parents that has strengthened the school community. We can fool ourselves into believing that educational change will always take decades. Blue Haven shows that with strong leadership, alignment of strategy and resources, clear community focus and evidence-based practice you can make a big difference in a short period of time.

Scaling success across a system

In a rapidly changing world, good educators should be slightly obsessed with the future, because it is already here in the faces of our students. It's not enough to continue doing the same as we've always done. These times demand a strong focus on improvement for each school, because a healthy system is made up of strong parts, as Blue Haven Public School shows.

In NSW, our public education system gives individual schools a large degree of autonomy to decide how best to meet the needs of their students.

Blue Haven shows that with strong leadership, alignment of strategy and resources, clear community focus and evidence-based practice you can make a big difference in a short period of time.

As the leader of this system, my challenge is to give our schools the decision-making authority they require while also ensuring they are strongly supported by the system. The pathway to school improvement is charted at the local level in every school's three-year plan but a key task for me and my leadership team is to build systemic measures that help to identify and support best practice in learning and teaching across all of our schools. We've sought to do this in a number of ways. Our Centre for Education Statistics and Evaluation (CESE) is Australia's first dedicated hub of education data and evaluation. CESE provides our teachers, school leaders and policymakers with high-quality data and evidence of what works in education. It evaluates education policies and programs, measures how much schools contribute to student growth and performance, and builds schools' capacity to effectively use data and evaluate their approaches.

We have also developed the Catalyst Lab Innovation Program to help build the educational evidence base by finding and testing new solutions to educational needs. This initiative challenges teachers to design solutions and innovations that can be scaled to serve the needs of schools across the system. Through this structured approach to innovation, our educators come up with solutions much faster than a traditional policy process would allow. In 2020, the Catalyst Lab will test and pilot two products designed by NSW teachers for teachers. The first is a web-based platform to help schools teach, track and report on higher-order thinking skills. The second, a programming tool, helps teachers design rigorous lessons which enable students to apply their learning to the real world. Even with many working around the clock to support student learning during COVID-19, teachers involved in rigorously testing these tools asked that the pilots continue. More than ever, they recognise the importance of new approaches and innovative use of technologies to support effective teaching and learning.

That's also what parents want and deserve. They want to know our approach to preparing their children for a complex future is founded on a rigorous evidence base, and that we are spreading proven effective practice across the system.

This publication is one more example of how we are doing it. I'm delighted that this inaugural issue of Future EDge includes a contribution from one of our star teachers and top ten finalist in the 2019 Global Teacher Prize, Yasodai Selvakumaran from Rooty Hill High School, who shares her story about teaching critical and creative thinking with great success.

In supporting the many thousands of outstanding teachers like Yasodai in our system, we need to also get the wider policy settings right. In December last year, I travelled with Minister for Education Sarah Mitchell to Alice Springs. There, in the red centre of Australia, education ministers set a new course with the Declaration for the Educational Goals of Young Australians – now known as the Alice Springs (Mparntwe) Declaration. The document presents updated educational goals for the 2020s, and reinforces the vision that we want all young Australians to be confident and creative individuals who are active and informed members of the community.

This is a once-in-a-generation moment for our education system in so many ways. We have an urgent duty to make sure students across NSW are kept safe and supported in their learning during these times of profound disruption and we have responsibility for actualising the national vision for education set out in the historic Mparntwe Declaration.

The NSW Curriculum Review gives us a great opportunity to refocus the curriculum so that it better supports teachers to prepare students for the future. This review will set the foundation for the next generation of students in our schools.

A key element of the NSW Curriculum Review is decluttering the curriculum so that teachers can focus on core content and concepts. Schools often tell me that it is difficult to find enough time to both teach the core content we know is so crucial, and give students the time and space to think deeply about it. Reducing syllabus content will enable students to explore core concepts in greater depth, and engage with the curriculum as critical and creative thinkers.

Likewise, the transfer and application of knowledge – using skills such as critical and creative thinking – should be embedded deeply into learning outcomes. Students of course need to learn the dates of the key battles of World War One and master mathematical formulas. Yet they also need to be able to apply what they've learnt to new situations, solve problems and critically evaluate information they are presented with, as PISA shows. The good news is that most subjects already have higher-order thinking skills at their core. With some careful curriculum refocus, and appropriate guidance for our teachers to deliver it, I am confident that we will get the balance right.

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Conclusion: Lifelong learning

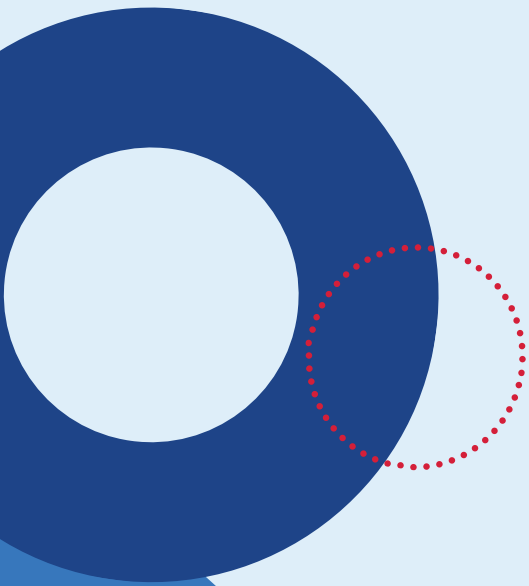
Today's troubling headlines will become history, but our mission to improve student outcomes across our large and complex education system will be ever-constant. The success of Blue Haven Public School shows that we can look to our schools for some of the answers. We also need to ensure we are putting systems in place that will provide equitable opportunities for all our young learners to build the knowledge and skills they are entitled to.

Back in 2017, Richard Watson warned in our Future Frontiers publication that we should not 'confuse movement with progress' and remember that things done with deep thought and clear evidence behind them will last the distance.

As he reflected, ‘you’ve most probably got one shot at major reform for the next generation so take your time and don’t waste theirs.’ It’s an important reminder that even though the pace of technological change may be rapid and iterative, educational change – and especially major reform – needs to be based on strong evidence, even if that takes time to gather. Once we have the evidence behind us we can make big gains in a small amount of time. But the stakes are too high to rush into change without doing the groundwork. As Blue Haven principal Paul McDermott says, ‘we’re not here to experiment with our kids’ future. We’re here to do what is proven to get the best possible results that we can’.

Education has always been the key to having an edge in periods of technological change as well as periods of crisis. As technology advances, old jobs disappear and new ones spring up, it’s imperative that everyone is able to learn new skills and embrace new opportunities. Today’s students will someday be our political leaders, innovators, teachers, nurses and parents to their own children, and they will face unprecedented challenges just as we are. Our teachers and school leaders will shape their future and that is why a strong foundation in literacy and numeracy, core content knowledge and those all-important higher-order thinking skills is the best preparation we can give them to succeed, no matter what the future holds.





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