Nomanis

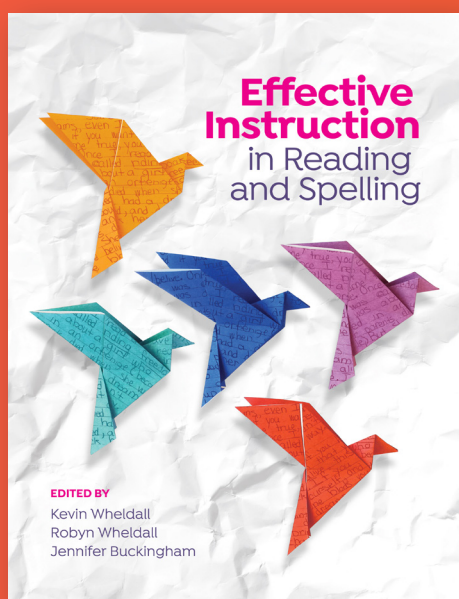Reading | Teaching | Learning | Connecting

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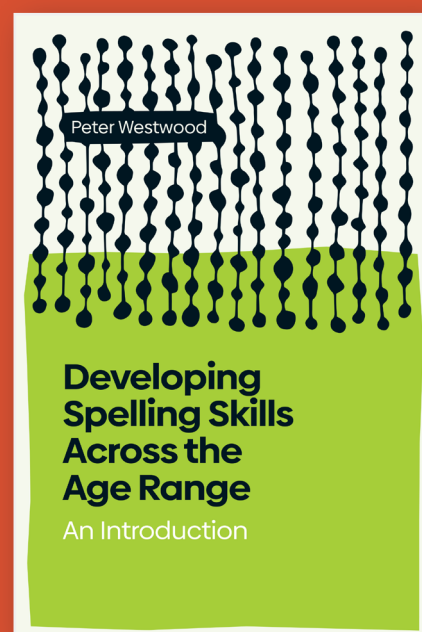It is ideal for use in initial teacher education (ITE) degrees and other higher education courses for primary school teachers. It is also a practical yet scholarly reference book for any teacher of reading.

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Can AI save the reading world?

Kevin Wheldall

When I was director of the Centre for Child Study at the University of Birmingham in the early 1980s, we took delivery of our first 'departmental microcomputer' (DM); yes, just the one. We were very enthused initially by its possibilities but soon began to see that it could do, well … not very much at all really.

In the end our departmental statistician became annoyed with us because we spent so much time on it word processing research papers (a revelation!) rather than using it to run exciting, complicated experiments *per se*; the real reason for its purchase.

I had hoped that it might be possible to get 'the departmental microcomputer' to tutor low-progress readers. I am still hopeful that this might be possible one day. But I refuse to be taken in by the blandishments of IT gurus like Bill Gates who assure us that, within 18 months, the new (admittedly staggeringly powerful) AI technology will be capable of teaching kids to read and all our literacy problems will be solved. Perhaps, one day … but not yet.

To answer the question why, let's look, for example, at what it would take to operationalise the Pause, Prompt and Praise (PPP) strategy (subsequently reconstructed as Reinforced Reading).

First the machine would have to select a book appropriate for the low-progress reader's current level of reading proficiency. Putting aside questions of what constitutes the most appropriate book for a developing reader, I guess we could have the contents of all of the likely books already preloaded in the machine's memory. An algorithm could presumably base the choice of book on previous and current reading performance.

Then we have the critical problem of the machine 'listening' to the child read and offering appropriate specific feedback. Voice recognition has come a long way and we use it in many ways already in our everyday lives. And a very frustrating business it can sometimes be, even when we enunciate loudly and clearly. Now, students come in many shapes and sizes and so do their voices, peculiar and idiosyncratic to the individual. Add in accents and dialects.

We could train the machine to recognise the speech characteristics of each individual reader and to 'listen' accordingly, noting also that there may not be appropriate pauses between words as we tend to run words together. This would be quite a task for the teacher who has many students requiring individual tutoring.

Next, pausing for five (now three) seconds or until the end of the sentence to correct an error. This should not prove to be too difficult to program.

But prompting, knowing what specific prompt to use and when, could prove more challenging. To do this effectively, the machine needs to be capable of comprehending the sentences being read as well as matching the child's vocal input to the stored words of the text. Tricky, but AI looks promising in this respect.

Next, praising for correct reading should be relatively straightforward but the praise should be specific to performance, not generic 'nice reading' type comments. Again, comprehension by the machine is required here to be effective.

And finally, the machine needs to be able to generate appropriate questions at the end of the reading session to test for comprehension and to make sense of the child's answers: difficult but not impossible, judging by recent advances in AI.

In this example using PPP, I have sought to share the many sophisticated processes and skills needed to hear a child read. And just how likely is it, that an inanimate tutor could share a personal response to the story being read? I guess time will tell.

Emeritus Professor Kevin Wheldall AM, Joint Editor

What we've been reading

Nicola Bell

'Fun and murder-y' is a literary genre that I really enjoy, and I've been reading a lot of that type of book lately. One was *The Bullet That Missed* by Richard Osman. It wasn't my favourite in the *Thursday Murder Club* series, but I still really liked it and am keenly anticipating the release of Osman's next book. Another one was *The Woman in the Library* by Sulari Gentill. The structure of this book was interesting and difficult to describe. It alternated between chapters of a murder mystery and correspondence from an increasingly attached fan of the murder mystery's author. Though complex, it worked for me. I sped through the book because I couldn't wait to see the resolution of both plots. *The Satsuma Complex* by Bob Mortimer was another fun read, although I must admit that it was at times just a *little* too Bob-Mortimer-ish. The final book I read in this genre was *Everyone in My Family Has Killed Someone* by Benjamin Stevenson. This one felt the most like an interaction. Throughout the story, Stevenson has his narrator explicitly invite readers to guess at the murderer, which I found both infuriating and compelling. (No, I did not guess correctly.)

For something completely different, I am halfway through reading Kenneth Grahame's *The Wind in the Willows* to my 6-month-old. Boy, its syntax is a lot more complex than I remember from childhood! I'm lucky to have such a forgiving audience; he doesn't complain too loudly when I awkwardly stumble over the many, many, many clauses.

Ying Sng

I like books that tell a story. Something with a plot. Preferably one that has a happy ending. I don't think that's too much to ask. This self-realisation came to me when I finished reading *Horse* by Geraldine Brooks. Please don't be put off, it's an awesome book. Her writing is beautiful and the way she weaves different narratives across three different centuries around a character (OK, it's a racehorse!) from history is amazing but the ending to *Horse* was like a punch in the stomach that I hadn't steeled myself for. I don't care for horseracing and know nothing about horses except that they are magnificent to behold but I was invested in this horse and the characters around it. If you have read it, let me know what you thought. Hopefully this bereft feeling will have left me and I'll be ready to talk about it.

My book group does a Kris Kringle with books that get circulated between all of us. *The Seven Skins of Esther Wilding* by Holly Ringland was one of them. It's a story of loss and a gentle retelling of how different people process grief. I'm not familiar with selkie folklore but I loved how it was incorporated into the story and I'm keen to find out more. Although there were moments when I found the main character a bit annoying, I would ration the number of pages I read each time I picked the book up. It was almost like I wasn't ready for the story to leave my life.

I also read a couple of tiny books. The first was *Cold Enough for Snow* by Jessie Au. This book wasn't what I was expecting. It was beautifully written and a poignant commentary of her relationship with her mother. Was it because I was expecting a story with a plot? Maybe. I think this is a book I'll try to revisit later.

The other tiny book I read was *Small Things Like These* by Claire Keegan. I don't know how the author managed to convey so much in so few words. Seriously, you could read the whole book before your cup of tea gets cold! The central character was a middle-aged, Irish coal merchant with five daughters. Apart from being middle-aged, I have nothing in common with him but as I read the words on the page, I felt all his emotions and his gratitude for what he had. Nothing was ever explicitly stated but Claire Keegan's words painted a series of haunting pictures that remain in my mind.

Mark Carter

One of the reasons I prefer non-fiction is that reality is often more bizarre than anything that somebody can make up, with the bonus of being real. I am a casual reader of popular books on quantum mechanics. To be clear, I don't actually understand quantum mechanics, except by analogy. Nevertheless, I find it fascinating that the quantum world operates in a totally different way to the macroscopic world that is familiar. My most recent read was *Quantum Physics* by Michael G. Raymer. The book is a little heavy-going and not recommended as your first foray in the area but, if you stick with it, gives detailed and clear

explanations of some very complex issues. These include an eloquent explanation of how quantum phenomena can exist as both particles and waves, as well as how quantum cryptography can be used to generate virtually uncrackable encryption. The latter is certainly prescient given the seemingly endless series of recent online data leaks.

However, is reality really stranger than fiction? To test the proposition, I decided to stroll into the unfamiliar world of fiction. A good starting point seemed to be Lewis Carroll's classics, *Alice's Adventures in Wonderland* and its sequel *Through the Looking-Glass, and What Alice Found There*. Yes, I do realise they are children's books but I had sound justification. First, books on quantum physics frequently use the *Alice* series as their go-to analogy to illustrate the weirdness of the very small. Second, children's books seemed like a good place to start as they are not necessarily constrained by adult notions of how the world *should* work. Finally, I did not read much fiction as a child. I was far more interested in things that were real, like Bigfoot, ESP, UFOs and the Loch Ness Monster. And no, the profound irony is not totally lost on me.

So how strange is Alice's imaginary world? For a start, mathematics appears to be badly broken. Multiplication does not work in Wonderland and two eggs cost less than one in the Looking Glass. What can you expect when the shopkeeper is a sheep? Unfortunately, I have listened to a professor of mathematics education arguing that maths is just a social construct, such that 2 + 2 does not necessarily equal four, using disturbingly similar examples to Carroll, with the addition of some tortured logic. Sadly, the broken maths in Alice's world is also present in the real world, at least according to some.

There is also a queen who believes six impossible things before breakfast. I'm sure that at some point in my life this would have seemed bizarre but, as a casual observer of U.S. politics over the past several years, colour me unimpressed. Carroll also describes a delightful menagerie of talking animals. Admittedly, the sheer variety of conversing critters was impressive, but talking animals are not exactly unheard of – some parrots have impressive vocabularies. In addition, recent research suggests that chimpanzees may possess some basic syntax and can produce complex vocal sequences. (Feel free to insert your own joke about politicians here.)

Then there is that cat that periodically disappears. Even this has parallels in nature, with transparent sea creatures and those that use camouflage to become practically invisible. In the quantum world, Schrödinger's famous cat lives in a superposition of being dead and alive, in some sense being simultaneously both fully dead and fully alive, at least until some feline ambivalent passer-by opens its box. The weirdness of quantum superposition means that tiny phenomena, like electrons, exist as a probability cloud and are only forced to be somewhere specific(ish) when observed. In this case, I think quantum mechanics has the edge in weirdness.

On a personal note, I enjoyed the whimsy of the *Alice* books a lot more than I thought I would and occasionally found myself laughing aloud. But, based on this sample at least, reality remains more bizarre than fiction. There was, however, something weird about the *Alice* books. I am normally platform agnostic and don't really mind how I consume information, switching freely between audiobook, e-book and dead tree versions. However, in the case of Alice's adventures, I enjoyed reading much more than listening, and the paper versions, retrieved from decades of storage in a garage, somehow seemed to impart more enjoyment. Perhaps reading old texts is enhanced by a slightly musty smell? Not really bizarre, but most certainly a bit odd.

Anna Desjardins (Notley)
I began the year with *The Lincoln Highway* by Amor Towles. This is completely different from his bestselling *A Gentleman in Moscow*, but no less absorbing. Amor Towles has a knack for capturing characters' voices in a way that lifts the story off the page and puts it right in front of you. And this story is full of 1950s American characters to sink your teeth into – small-town Mid-Western farmers, sheriffs and salesmen; young ruffians, charlatans and train stowaways; the orphaned and the abandoned; the privileged and the pampered; the disappointed, the destitute, and the dreamers. On one 10-day journey down the Lincoln highway, you'll meet them all, and become truly invested in the lives of the four main characters who share that fateful drive in an old blue Studebaker. Do read it.

I then moved on to *Circe*, my first taste of Madeline Miller (although I also have *The Song of Achilles* waiting to be read on my bookshelf). This just hit the spot in terms of reinventing Greek mythology for modern times. Miller invests the gods she writes of with great humanity, bringing an immediacy and relatability to the stories she tells and embellishes. Of course, the idea of retelling ancient myths is not novel, but it is rare to find it so well done that the language is both fresh and accessible, while retaining a lyrical quality that honours the source material.

Over this time (and truth be told, for many months prior), I had been stopping and starting *All That I Am*. I bought the book last year at an evening in conversation with Anna Funder hosted by my son's school, inspired by Anna's insightful discussion of her experiences writing modern historical fiction and non-fiction. But suffice to say, it failed to immediately grab me. I think the chopping and changing of time frames and narrators, who were not yet linked together in any clear way in the early chapters, made it difficult to find an entry point into the story. But thankfully, I persisted, because once the chapters moved close enough in time to begin telling essentially the same story from two different viewpoints, it was a gripping read and an eye-opening window into the real-life experiences of exiled German intellectuals in London during World War II. Upon finishing it, I wanted to reread the beginning to get a 'clear run' at the whole story, but somehow that hasn't happened. Maybe that beginning just isn't for me!

Most recently, I signed up to two book club sessions in my local community. For one, I have just enjoyed reading Elizabeth Strout's *Lucy by the Sea*. I'm not sure I was quite ready to read about the recent years of the pandemic, as lived through by the characters in this book from New York – it's all still a little too close for comfort! But I certainly appreciated the way Strout elevates what we might call 'ordinary lives' into story material – no epics required; every human story is full of weight. And appropriately on that note, for the other book club, I was asked to read *Tell Me Again* by Amy Thunig. This is a memoir, a genre I wouldn't normally pick up of my own volition, but I was interested in checking out the Arts and Cultural Exchange of Parramatta who were hosting the discussion, so I dutifully got the book and I'm so glad I did. In just a few short, selected episodes from her childhood and early adulthood, Amy weaves her current and past selves together, welcoming readers into a circular notion of time. More stories like this need to be told to give us all a better understanding of what growing up as an Aboriginal child in Australia can be like and to hopefully open the conversation around moving forwards together.

Finally, if you are looking for something fun to read with a primary school aged child, do run out and get *The Adventures of Nanny Piggins* by R. A. Spratt. We are currently working our way through the series, and have been enjoying a chapter a night, following the exploits of three young children and their glamourous nanny (the world's most famous flying pig). There is nothing Nanny Piggins can't do, and the read aloud potential is unparalleled. When not dissolved in fits of giggles, I am currently perfecting my Russian bear and Latin American armadillo voices.

Siobhan Merlo
Yesterday, with my newborn grand-baby-in-law asleep on my lap, I finally finished *This Other Eden* by Paul Harding. This beautifully crafted book captures the perspectives and daily lives of the inhabitants of a small island off the coast of Maine on the cusp of the 19th century, who, due to their race and various 'differences', had been 'othered' by the society of the time. A small community, they coexisted in peace for a century until a Christian preacher, in the spirit of trying to 'help', reported the situation to the authorities, recommending that something needed to be done. With the eugenics movement gaining momentum, this led to the eviction of the community from the island, the deaths of some and institutionalisation of others. Although a tragic story, I enjoyed this book for the empathy the author created with the characters, the exceptional imagery, and the obvious research the author has done to bring the story and characters to life. In essence, Paul Harding has provided a 'voice' to the people who could not speak their truths, even if it is many years after the fact. If you love history as I do, and enjoy extending your vocabulary too, this book is well worthwhile.
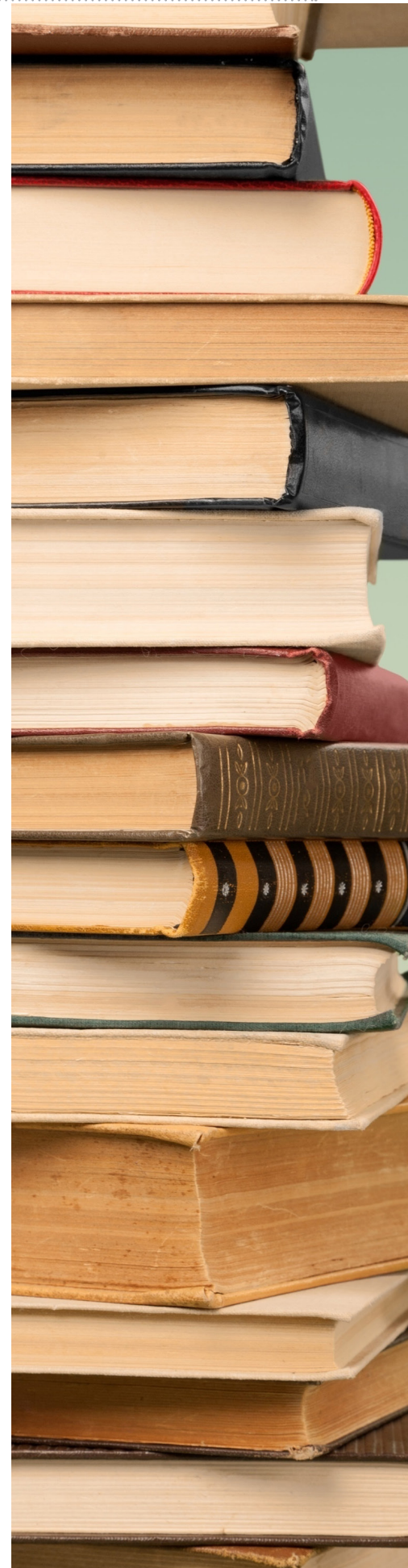
Jennifer Buckingham

My younger daughter is doing the Higher School Certificate (final year exams) later this year so I decided to read some of her HSC texts. *Hag-Seed* is Margaret Atwood's take on *The Tempest*, drawing on the theme of cold revenge and with a cast of duplicitous and comical characters. Like all of Atwood's work, it is highly imaginative and somewhat disturbing but an enjoyable read. My daughter loved *Hag-Seed*, binge-reading it in less than two days and she has now bought more of Atwood's books. Another HSC text I read was Kazuo Ishiguro's intriguing novel *An Artist of the Floating World*. Ishiguro received the Nobel Prize for Literature in 2017 but I haven't read any of his books before. *An Artist of the Floating World* is written in a style intended to mimic an English translation of a Japanese text even though it was written in English. Once I knew that fact, it seemed to make it easier to read. I don't know why this shift in perception made a difference; maybe I need to study HSC English again. The book is set in post-World War II Japan, with the protagonist coming to terms with the ways in which his nationalist propaganda artwork during the war influenced events and continues to affect his life and family. This book piqued my interest in Ishiguro so I went on to read another of his books, *Never Let Me Go*, a dystopian novel about a group of young people who have been cloned and raised separately from the rest of society for the purpose of providing organs to the 'normals' who need transplants. I'm planning to read more of Ishiguro's work. He has a subdued style that initially disguises the horror of the ideas he explores, revealing it slowly.

While I was in Edinburgh I wanted to read something fondly familiar set in Edinburgh. The choice between a book from Alexander McCall Smith's *Sunday Philosophy Club* series (the Isabel Dalhousie books) or a Rebus book by Ian Rankin was decided by serendipity. I found the second Rebus paperback, *Hide and Seek*, in one charity shop and donated back to another one later. I didn't embarrass myself by reading it at The Ox bar (Rankin's local), though.

Kevin Wheldall

What have I been reading recently? My iPhone mainly! No, seriously, I must confess to my addiction which provides me with amazing content both personally and professionally. May I recommend *Quillette*, in particular, for excellent essays to be read as pro-science/reason antidotes to the rampant woke-ism in universities and elsewhere. Traditional academic rigour and respect for evidence is under serious attack.

As to recently read books, may I start with *The Bookbinder of Jericho* by Pip Williams. Readers who enjoyed her breakthrough novel *The Dictionary of Lost Words* will be very well satisfied by her follow up. It reeks (in a good way) of its historical period; one can almost smell the working-class heroine's life on the barge and in the bindery. And her passion for reading almost anything that she can, quite literally, get her hands on as she works at the Oxford University Press is inspiring. A must read for bookish types.

First prize this time around, however, must go to Ian McEwen for his novel *Lessons*. An extraordinary book, it moves about a bit timewise, which in less accomplished hands could be irritating, but we are in safe hands here in another novel about the book world.

Less well-written but nevertheless enjoyable was former spymaster, Stella Rimington's *The Devil's Bargain*. It is not on the same level as John Le Carré or Graham Greene in terms of literary style, but she makes up for this in her undoubted depth of knowledge of spooks and their world.

Finally, I have continued to delve into the life and works of William Morris, polymath extraordinaire. *Arts and Crafts: An Illustrated Guide* by Steven Adams was most enjoyable while *How We Might Live: At Home with William and Jane Morris* by Susan Fagence Cooper focuses on the mutually reinforcing, if somewhat complicated, relationship between Morris and his wife. Cooper makes a strong case for a consideration of Jane's work and contributions in her own right but William's sheer, multifaceted brilliance cannot help but put her in his shadow.

Robyn Wheldall

Faced with the task of creating or, more accurately, recreating a garden in the style of the Arts and Crafts movement, I was delighted to receive *Gardens of the Arts and Crafts Movement (revised edition)* by Judith B. Tankard for Christmas. This book, which is meticulously researched and beautifully presented with glorious photographs, reinforced my appreciation, yet again, of the non-fiction form. It seems hard for me to make a sustained shift away from non-fiction, notwithstanding the blandishments of my inspiring bibliophile colleague, Dr Alison Madelaine, who has been advocating strongly that I should do so – it would enhance and improve my life, she emphasises. I am sure she is right, but the 'real stuff' keeps hooking me in. (Shame on me, I hear you say!) Apart from educating me in the personalities that influenced, and the forms and styles that characterised, the gardens of the Arts and Crafts movement (a favourite subject of mine), was the discovery that even in the bucolic realm of gardens there were new professional tensions that arose in this period. Horticulturalists were protective of what they believed was their domain, whereas the architects had decided that the garden should be an extension of the home. The idea that the garden should have 'rooms' that flowed from the house, and therefore in the architect's purview, encroached upon the outdoor space that traditionally was a matter for the horticulturalists. Spades clashed as the turf war raged (pardon the pun). Humans … wherever they are, in whatever discipline they work, will end up falling out. Even in the genteel province of the garden.

And humans will find things to disagree about even when it comes to pasta! This takes me to another book I recently really enjoyed, *Taste – My Life Through Food* by Stanley Tucci. What a gem this autobiographical book is. And there are recipes too! Tucci weaves endearing personal and sometimes heartbreaking details into his explanation of his life through food. I enjoyed reading about his experiences in pandemic lockdowns under the same roof as young adults, young children and the voracious appetites that had to be satisfied. We also learn about the transgression of pairing the wrong form of pasta with various sauces. No longer can I look at the penne pasta in my pantry as a universal ingredient. And is it really acceptable to break spaghetti before you pop it into a saucepan of boiling, salted water? (Personally, it seems obviously sacrilegious to me to snap spaghetti!)

Finally, Ann Patchett had me at the first sentence of her first essay of her collection, *These Precious Days*. For those who know me, they will understand the appeal of this opening, 'Marriage has always proven irresistible to my family'. Enough said. The rest of the essay and the entire volume does not disappoint. Beautifully written and again generously autobiographical, Patchett's collection has further confirmed my love of non-fiction. I will, however, endeavour to have some fiction titles to reflect on by the time of the next *Nomanis*.

Alison Madelaine

I love a good novel about art, and this time I read two: *Woman on Fire* by Lisa Barr and *The Muse* by Jessie Burton. *The Muse* was definitely one of my top reads for the year so far. As usual, I read some Aussie rural noir: *Clarke* by Holly Throsby and *Exiles* by Jane Harper. Neither were page-turners but still enjoyable enough. *Halifax: Transgression* (based on the TV series 'Halifax') possibly had the most brutal and graphic descriptions of murders of any book I've ever read. But despite my warnings, my 81-year-old mum still wanted to borrow it (and she read it too)!

Unlike Mark and Robyn, fiction is my preference, but being a member of three book groups sometimes has me picking up non-fiction. This time I read *Nomadland: Surviving America in the 21st Century* by Jessica Bruder and *Between the Stops: The View of My Life from the Top of the Number 12 Bus* by Sandi Toksvig, but the book I *really* enjoyed was *With My Little Eye* by Sandra Hogan. This was about an Australian family who worked for ASIO in the 1950s. From a very young age, the three children assisted their parents with various missions and kept many secrets, something that most young children would not be capable of doing. When her father died, the eldest daughter became convinced that he hadn't really died, but was instead in deep cover on some secret mission. As they grew older, the three children were able to talk more freely about the life they had led as spies, resulting in this book being written.

What is the 'Science of Reading?'

Tim Shanahan

That depends on who you talk to. There is no agreed upon definition. Nor is there any official body like the *Académie Française* that can dictate a meaning by fiat. In 2020, *Reading Research Quarterly* published a science of reading issue (it blossomed into two with more than 50 articles). There weren't 50 definitions, but it was close.

The disagreements turned on two points: the role of instructional research and the scope of reading covered.

Some use the term in reference to neurological and cognitive science studies of how brains process written words (e.g., *Reading in the Brain: The New Science of How We Read* by Stanislas Dehaene or *Language at the Speed of Sight* by Mark Seidenberg). The problem with that approach, as valuable as those studies are, is that it ignores instructional research – the studies that consider the impact of how and what we teach. That approach wouldn't bother me if its purveyors weren't trying to tell us what and how we should teach.

No one in medicine would willingly apply basic scientific findings to medical practice without some intermediary tests of effectiveness and safety. Imagine, for instance, physicians administering COVID vaccines without proof that they work. Despite careful attention to basic research, only about 10% of medical therapies ever make it all the way through the testing process. 'Can't miss' hypotheses based on terrific basic science research often fail to work in medicine and there is no reason to think it would be any different in reading education. A century of failed hypotheses in teaching (e.g., right-handedness training, learning styles, programmed readers, eye training) should disabuse us of this idea (Shanahan, 2020).

To me, a science of reading – if we are talking about education – requires that our prescriptions for teaching be tempered by rigorous instructional evaluations. If a claim hasn't been tried out and found effective, then the claims – no matter how heartfelt – aren't part of reading science.

Basic research shows that phonological activation takes place when people read words silently and simulations are showing that computers' responses to words are affected by the statistical properties of the words they process. Such findings suggest that readers look for visual patterns when they read and that reading requires that those patterns be processed phonologically. That's fascinating, but it doesn't reveal how we can best teach reading.

As cool as those studies are, I don't argue for explicit systematic phonics and phonemic awareness instruction because of them. I advocate such teaching because there are more than 100 studies showing that it improves kids' learning (National Early Literacy Panel, 2008; National Reading Panel, 2000). Those brain studies strengthen the case admittedly, but without them I'd still support phonics. Conversely, if I only had the brain evidence, then no deal – not enough support for me to include that in my teaching routine.

When someone tells you what to do in the classroom based on what they think a 'science of reading' shows, be sceptical. Ask to see the research that shows that teaching those things or in those ways improves learning.

The other definitional disagreement has to do with the scope of what counts in a science of reading. Historically, that term was used to refer to word reading ('decoding' in current parlance) – a tradition that goes back more than 200 years. Current claims align well with those historical uses. If someone says your school isn't aligned with the science of reading, they likely mean that you are not teaching phonemic awareness and phonics in the ways that they think you should.

There is nothing wrong or misleading about using the term that way. If my child had dyslexia and he was being taught to guess words based on the pictures – an approach inconsistent with the basic science but also with the instructional science – I'd complain. That a science of reading or, more properly, a science of reading instruction, includes much more than that wouldn't mean that I was being misleading – only that I was applying a general category to a specific case.

Many of those *Reading Research Quarterly* articles were aimed at trying to expand the scope of how science of reading is currently being discussed. It's great to try to reveal the entire scope of evidence that is encompassed by science of reading,

unless the point is to distract folks from ensuring their kids get explicit phonics teaching.

I make that point because I know of no-one who uses the term science of reading to exclude research on vocabulary, reading comprehension, domain knowledge or oral language, no matter how narrowly they may be using the term in a specific instance. Reading researchers shouldn't feel threatened when parents try to make sure that a particular part of the research is applied and applied well.

In case that isn't clear: indeed, a science of reading instruction includes more than phonemic awareness, letter name learning, phonics, decoding and text reading fluency. But importantly, a science of reading includes all those aspects of reading, as well.

How does Science of Reading differ from National Reading Panel?

The last time these science of reading debates broke out was in the 1990s. That time, the U.S. government intervened. The term then was not 'science of reading,' but 'scientifically-based reading instruction (SBRI)'. That term focused specifically on instructional studies and provided a specific legal definition of the term; then scientists were empanelled to determine the scope of the matter based on research reviews.

I served on that panel. That effort led to strong public support for explicit teaching of phonemic awareness, phonics, oral reading fluency, vocabulary and reading comprehension. Based on those reviews, the feds adopted policies that promoted such instruction in the primary grades. At that time, fourth grade reading achievement rose in the U.S. – something we haven't seen since those policies were allowed to lapse.

To me, the National Reading Panel results are part of a science of reading. But remember that was carried out in the late 1990s. During the past two decades, research has expanded and we know more about what should be included in a science of reading instruction. Topics like writing and spelling to improve reading, text complexity, teaching reading comprehension within science and social studies, differentiation of instruction, quality of instruction and text structure have all generated extensive bodies of research since the Panel closed its books. (A science of reading is always a moving target since knowledge is always conditional and research is always ongoing.)

How do I know if an instructional program or approach is part of a science of reading?

This question comes up a lot these days. And no wonder.

A couple of weeks ago I issued a blog that explained that some widely touted practices are not part of a science of reading. You wouldn't believe the messages that I received from people angry with me for daring to write that. They assured me that those practices were part of the science of reading, and they knew it because they believed it.

I asked an author of a program touting some of those practices under the science banner about this.

She knew there was no research supporting what she was selling as 'science of reading', but she defended her approach since it was 'just logical that those things work given the science'.

She may or may not be right about that. I don't know. I do know that my hunches, biases, deeply held beliefs and inklings aren't science – and I don't know how hers get to be so sanctified.

In this case, she not only was embracing practices that haven't yet been studied, but those which research hasn't supported.

Unfortunately, the only real protection against that kind of logical overreach is *caveat emptor,* buyer beware. When someone tells you that something is part of the science of reading, you need to ask for the study or studies that proved that to benefit learning. Finding support for those claims shouldn't be on your shoulders but on theirs.

The lack of research supporting an instructional approach is NOT proof that an approach does not work. It may work, even if it hasn't been tested yet. Lots of time is necessary to stretch research findings beyond what was directly studied. There is no other information to go on.

There is nothing wrong with advocating or adopting instructional approaches without evidence – as long as everyone recognises that to be the case. When untested practices are promoted under the guise of a science of reading, it isn't okay. It's dishonest, false advertising, fake news; it's just another case of someone trying to manipulate you to do what they want you to do.

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This article originally appeared on the author's blog, Shanahan on Literacy.

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Are Tasmania's 'Reading Wars' over?

Marshall Roberts

Experts seeking distance from $1M report suggests issues run deep.

The Premier's Literacy Advisory Panel is set to hand down its final report to Tasmania's Department for Education, Children & Young People (DECYP) any day now. The Panel's Final Consultation Report was brimming with recommendations rooted in the scientific consensus of reading and writing research, so you'd be forgiven for thinking Tasmania is taking a bold new path, which will lead to better outcomes for all students. We could even set a precedent that evokes envy in mainland jurisdictions.

I suspect, though, that the battle is far from over. There have been multiple reviews of literacy instruction which have recommended the adoption of science-based approaches and, so far, DECYP and its earlier manifestations has avoided any meaningful adoption. Whether the Department of Premier and Cabinet will follow through on this Panel's final recommendations in an oversight capacity to achieve more successful change, remains to be seen.

One thing is certain, though: the cultural resistance to adopting science in reading instruction remains in place and will come in to play – hard – in at least two ways. The first way is, unfortunately, through the social inertia that accompanies obliviousness.

This was made embarrassingly clear to me when I recently quizzed two literacy experts on their involvement in the earlier review of Tasmanian literacy instruction, carried out by the Peter Underwood Centre (PUC).

Professor Pamela Snow is the Co-Director of La Trobe University's SOLAR (Science of Language and Reading) Lab. Rosalie Martin founded Speech Pathology Tasmania, co-founded the Tasmanian 100% Literacy Alliance, and was awarded 2017 Tasmanian Australian of the Year for her work promoting literacy in prisons. I was surprised to see their names in a list of acknowledgments for 'expert input into the 2019 final report of the Peter Underwood Centre for Educational Attainment's review into literacy instruction in Tasmania.

One of the findings of that review – costed to taxpayers at $990k over three years – was that a scientifically debunked approach to reading instruction was popular amongst Tasmanian teachers. While I was reading to inform my 'Merchants of Illiteracy' background paper, it became clear that the PUC had failed to recognise that this popular teaching strategy had actually been debunked by researchers, decades ago. Instead, the PUC effectively promoted the strategy, pumping more pseudoscience into the echo-chamber of Tasmania's scientifically naive literacy teaching landscape.

It was confusing, then, to see Professor Snow and Rosalie Martin listed for expert input into that report. I asked them about this and learnt that they were just as surprised as I was: they had been asked to suggest relevant scholarly research supporting good practice, which they did. But they were not offered access to a draft copy of the report showing how and whether that research was taken on board.

A snippet from the *PUC fact sheet for teachers*.

They didn't even know they'd been acknowledged for 'expert input' and were keen to reassure me that they didn't endorse the report's analysis and synthesis of the literature with the concluding content, adding that they were happy to go on record saying so.

Professor Snow's name appears to have since been removed from the report hosted on the PUC website, but it can still be seen in an archived version on the internet.

What issues could prompt such a distancing? An example is the flawed instructional approach in the PUC report, which is what alerted me to the apparent 'expertise mismatch'. The approach is called 'three/multi-cueing/ MSV' (Meaning, Structure/Syntax, Visual). In classrooms, its influence is recognisable in posters of characters such as 'Skippy Frog' (skip the word and come back later), 'Peekin' Poodle' or 'Eagle Eye' (look at the picture), and 'Tryin' Lion' (try a word that makes sense). In a nutshell, it encourages children to use context to work out what a challenging word might be (see image next page).

What reading researchers found, decades ago, is that these techniques are actually the fallback coping mechanisms that poor readers resort to when they can't successfully decode a word using phonics-based approaches (quite often simply because they haven't been taught phonics adequately). Or, as Perfetti and Helder put it in *The Science of Reading*, this strategy, 'rather than supporting the child's developing word-identification system, encourages guessing' (p. 25).

In short, schools are *teaching* children to be *poor* readers – as comprehensively demonstrated in U.S investigative journalist Emily Hanford's 2019 podcast, At a Loss for Words.

Unfortunately, despite that PUC report being three years

old, this isn't just old news. I was alerted to Tasmanian school social media proudly featuring Skippy Frog and friends in 'back to school' photos at the end of the summer holidays. These instructional methods are very much alive and well in Tasmania and, as the PUC noted, popular amongst Tasmanian teachers. Indeed, the PUC produced a fact sheet for teachers as one of the outputs of its literacy review, and this fact sheet effectively promoted the three-cueing system even more, as well as mischaracterising it as a phonics-style 'decoding' strategy, when it is usually anything but. Looking at a picture of a phone to guess 'phone' is not the same as knowing that 'ph' at the beginning of a word represents the /f/ sound. When reading researchers speak of 'decoding' in early reading, they're almost always referring to using known letter-to-sound correspondences to work out what sounds the word includes. So, in this fact sheet, the PUC has promoted a dodgy technique, *and* managed to blur the distinction between good and poor instruction, in one fell swoop (see graphic above).

No wonder, then, that Rosalie Martin and Professor Snow were keen to put some distance between themselves and that report.

Thankfully, the Premier's Expert Panel has finally called out this three-cueing approach in its Final Consultation Report, though it doesn't go nearly far enough into the uncomfortable truth. The report states that "the information presented to the Panel was that current practices, such as balanced literacy approaches and the three-cueing systems do not work effectively for all students" (p. 29). Unfortunately, not only is three-cueing not *effective* for all students, it's *harmful* in terms of impacts on learning in fledgling readers. As noted

above, it encourages guessing, and takes the reader's attention off exactly the thing they most need to attend to – the word – to try to find clues about what the word may be, from other sources around the word.

Two luminaries in the reading research sphere, Anne Castles and Kate Nation, describe the damage in their 2022 overview of the current science:

> *"Is there evidence that attending to semantic and syntactic cues provided by context helps children to learn to read words? For beginning readers at least, the answer is no … Consistent with our earlier discussion, children need to focus on the decoding process and in Landi et al.'s experiments, context detracted from this process and learning suffered." (p. 155)*

Tasmanian teachers are yet to be told this *en masse*. I like to think about what may happen when they are. Realising that despite their training and HECS debts, they've never been told the basic facts about what scientists know about how a child best learns to read, it may be teachers who are pursuing universities in class actions, rather than desperate parents looking for legal avenues to take the Department to task for the train wreck of their children's ill-supported foray into reading and writing.

Teachers who have 'seen the light' (I've personally heard from several) are now consoling themselves against the haunting memories of the children they've instructed with flawed approaches, with the slogan, 'when we know better, we do better!'
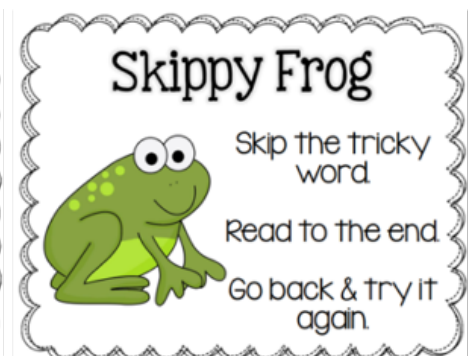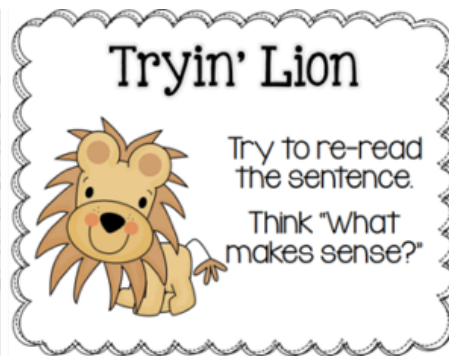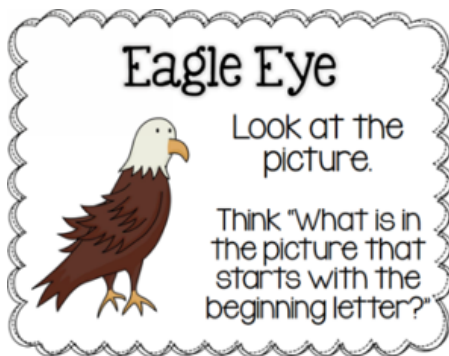
Eagle Eye

Look at the picture.

Think "What is in the picture that starts with the beginning letter?"

Tryin' Lion

Try to re-read the sentence.

Think "What makes sense?"

Skippy Frog

Skip the tricky word.

Read to the end.

Go back & try it again.

In the same way as a mining company can greenwash their horrific environmental impacts, Balanced Literacy consultants – and their publishers – can (and do) science-wash their unscientific approaches.

Social inertia aside, the second way cultural resistance will weigh-in to the ongoing battle, is through wilful, informed resistance from those people who have already nailed their colours to the mast and staked their careers on the anti-science, Balanced Literacy approaches. It seems there may be at least one of these people sitting on the Expert Panel itself, since their Final Report notes, "there was some opposition expressed to only adopting Science of Reading in Tasmania, suggesting that there should be options for other teaching methods, however the majority of the Panel agreed with the body of evidence supporting the Science of Reading approach" (p. 29). One may well wonder if the other desired teaching methods include 'the homeopathy of reading'.

This is where, once the Panel's final recommendations are handed down to DECYP, Tasmania's reading war is likely to devolve into 'black ops', covert skirmishes. My background paper was titled 'Merchants of Illiteracy' in a nod to the thoroughgoing Merchants of Doubt book and documentary. There are strong parallels between the apparent tactics of certain Balanced Literacy proponents and the tactics of other anti-science groups like tobacco industry lobbyists, which were excavated from recent history and exposed in *Merchants of Doubt*. The PUC's obfuscation of the science, in labelling the three-cueing system as 'decoding', was, I think, unintended and due mainly to ignorance of the nuances of the issues. I can't extend the same generosity to some of the consultants I examined in the background paper and, unless the whispers (and shouts) that we at CODE REaD Dyslexia Network are hearing from the coalface are exaggerated, this class of Balanced Literacy consultants is still very active in Tasmania.

Thanks to bodies such as the Australian Education Research Organisation (AERO), the words describing the characteristics of the approaches that are backed by the scientific consensus are starting to filter down into the consciousness of teachers: 'explicit', 'systematic', 'sequential', 'cumulative', 'direct', 'phonics' instruction, as part of a 'structured literacy' approach. The Balanced Literacy consultants who are happy to adopt more 'covert' approaches to spreading their influence, are misapplying these same words in their professional development advertisements, presumably because they want to attract those people actively looking for science-based approaches in line with new recommendations. In the same way as a mining company can greenwash their horrific environmental impacts, Balanced Literacy consultants – and their publishers – can (and do) science-wash their unscientific approaches.

The challenge for whoever is brave enough to take the wheel to drive Tasmania's move to a science-based approach to literacy instruction, will be to get DECYP coalface staff informed, fast. Fast enough that they can, before the impetus is lost, tell the difference between approaches based on science and those that are based on pseudoscience or an outright undermining of the role science has in understanding how learning happens. If no-one takes up this challenge, nothing will change. Again.

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This article originally appeared on the author's blog, Merchants of Illiteracy.

Since original publication, the Tasmanian Government has accepted all the 'priority' recommendations of the expert panel, and announced $65M funding, with statewide implementation to occur.

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Reading comprehension: Making sense of the existing and emerging evidence

Jennifer Buckingham

As greater consensus has been reached about how to teach children to decode and read words fluently, the focus of discussion among practitioners and researchers has shifted to reading comprehension. Some of this discussion has centred on the utility of teaching comprehension skills and strategies explicitly as awareness of the central role of background knowledge in reading comprehension has grown (Smith et al., 2021). The arguments against teaching comprehension skills and strategies are often framed in these ways:

1   Comprehension skills and strategies are not generic, transferable competencies
    … so it is a waste of time to teach them explicitly.

2   Reading comprehension is highly dependent on background knowledge
    … so an evidence-based approach to reading comprehension is to always embed instruction in a knowledge-building context.

These two statements are only partly true. Comprehension skills and strategies are not generic; they are used differently by the reader depending on the text and the task (Catts & Kamhi, 2014). However, they are transferable to the extent that students need to know how to use them appropriately for different purposes. The Scientific Advisory Committee for the Knowledge Matters Campaign (2023) describes these processes as 'strategies for sense-making' (para. 13). Research on classroom instruction has shown that it is a waste of time to *over-teach* skills and strategies (otherwise known as a dosage effect – more is not always better), but not a waste of time to teach them explicitly to beginning and struggling readers at all. And, while reading comprehension is highly dependent on knowledge of the topic of the text, for beginning readers there is, so far, limited but promising evidence that embedded or integrated comprehension instruction is effective.

Scientific research evidence doesn't say *don't* teach comprehension skills and strategies explicitly; it says don't *only* teach comprehension skills and strategies explicitly

Some authors differentiate between comprehension skills and comprehension strategies rather than considering them as a single set of cognitive or 'procedural' processes as Grissmer et al. (2023) do. However, different authors categorise them in different ways. Such (2021) says that 'explaining the main idea', 'summarising', 'making inferences', and 'making predictions' are skills, whereas 'comprehension monitoring' (which can include summarising parts of the text) is a strategy. 'Knowledge of text structures', 'vocabulary', and 'background knowledge' don't fit into either of Such's categories. Smith et al. (2021) add 'finding literal information' and 'drawing conclusions' to comprehension skills, and put 'summarising' in the strategy category along with 're-reading', 'self-questioning' and 'visualising'. Shanahan (2018) adds 'recognising supporting

details', 'comparing and contrasting', 'evaluating critically', 'vocabulary', and 'sequencing events' to comprehension skills, and expands the strategies list to include 'text structure' and 'making connections to prior knowledge'. Swain (2023) suggests teaching three comprehension strategies – 'monitoring', 'predicting' and 'summarising' – and makes the salient point that 'finding the main idea' and 'summarising' are essentially the same thing.

All of these authors agree, however, that comprehension strategy instruction is useful (to a point) but comprehension skill instruction is not. Their rule of thumb is that skills are just ways that students demonstrate comprehension and can't be taught, whereas strategies are meta-cognitive activities that facilitate comprehension and can be taught. While this sounds neat, the interconnected nature of the components of reading comprehension defies making clear distinctions between them, hence the differences in opinion about which is which.

Making inferences is an example of a skill that can be developed through teaching strategies. Deriving inferred meaning from text – going beyond the literal text – is an essential aspect of reading comprehension (Tunmer & Hoover, 2019). Making inferences is a non-generic skill that depends on other factors such as understanding of syntax, anaphoric connectives (e.g., pronoun referents) and background knowledge, as well as memory, and is therefore a product of these elements rather than a single skill that can be taught and applied to any text. However, it is also true that almost all texts require some level of inference, and that not all students know what an inference is, or when they need to make inferences to understand a text. So, although the types of inferences students make, and the information they draw on to make them will depend on the text and the task, there is still something called an 'inference'. Strategies like comprehension monitoring and knowledge of text types can help students to develop their ability to make inferences. There may not be one type of inference, or a singular way to teach it, and there may be no utility in doing weeks of repetitive 'inference' questions, but the concept of inferencing, and how to apply it, can and should be taught (Catts, 2021/22). Interventions aimed at improving inference making by helping students to know when and how to utilise their background knowledge and vocabulary, and to make connections, have been shown to be effective at improving inferences and have also improved reading comprehension (see Oakhill et al., 2014).

Much criticism of teaching comprehension skills and strategies has arisen because there are extreme versions of instruction in which the skill or strategy itself is viewed as the final product and therefore is the focus. This is the wrong way around. Comprehension skills and strategies are part of the process and not the product. In an evidence-based approach to comprehension instruction, skills and strategies are taught explicitly and cumulatively, and gradually integrated (Oakhill et al., 2014, 2023). The objective of teaching comprehension strategies explicitly is to make them metacognitively transparent and understandable to children so they can apply them in their reading, and then go on to use them implicitly.

Phonics instruction provides an analogy. Some children work out the alphabetic code and don't need a lot of systematic explicit phonics instruction. Others work it out over time with minimal guidance, albeit more slowly than with explicit instruction. But a significant proportion will not learn to decode without explicit instruction. Since we don't know in advance which children will be in which category, the most efficient course of action is to teach all children explicitly rather than take a wait-to-fail approach. Teaching the alphabetic code in a transparent and explicit way *for a limited time at the right time* gives students insight into written language that they then go on to use automatically and mostly unconsciously.

Likewise, some children will move fluidly from decoding to comprehension. However, for other children this is not a given. Comprehension involves the construction of a mental model of a text. This requires knowledge (background knowledge, vocabulary, text structures), as well as skills (retrieving and connecting background knowledge and vocabulary, making inferences, understanding grammar and syntax) and strategies (comprehension monitoring). Not all

children know how to do these things. And those that do know how, don't always use them.

Given that research tells us that poor comprehenders have difficulties with certain skills and strategies, and can improve them with explicit instruction (Peng et al., 2023), it makes sense to include them in Tier 1 instruction. Explicit instruction in comprehension strategies *for a limited time at the right time* has a strong and large experimental research base collected over several decades. Done properly, it is scientifically evidence-based practice. Petscher et al. (2020) include comprehension strategies among the set of practices that have 'compelling evidence in the science of reading' for younger and older students (p. 5).

As stated by Smith et al. (2023),

> *"[T]here is a significant evidence base related to reading comprehension instruction in middle-to-late elementary years that states that skills that contribute to comprehension need to be explicitly taught to students and that, particularly for less advanced readers, teachers cannot rely on incidental exposure and implicit coverage of skills as methods of teaching reading." (pp. 10–11)*

Teaching reading comprehension explicitly

Teaching comprehension explicitly involves systematic instruction in the sub-skills involved. Explicit and systematic instruction requires skills to be taught in a somewhat decontextualised way, at least at first. The skill being taught needs to be explained and many examples need to be provided. Students need to practise using the skill they have learned. This necessarily involves the use of text. This text can be drawn from a larger unit of study and/or can be selected specifically to demonstrate this concept and skill. Taking it from a larger unit of study is a good idea if possible, but if a relatively small amount of time is spent on explicitly teaching the strategy, the source of the text is not make or break. The strategy being taught should then subsequently be applied and integrated

with other strategies in studying larger units of work (either literature or other knowledge-building content). This will allow students to develop their skills as they acquire knowledge, and vice versa.

The stage of reading development is critical. Willingham (2006/07) says that comprehension strategy instruction isn't likely to be effective before third or fourth grade – not because of available evidence that content-embedded comprehension instruction (or any other comprehension instruction) was more effective, but rather because of an assumption that students are still learning to read accurately and fluently before Grade 3 so reading comprehension strategy instruction will be beyond their abilities. Hirsch (2016) makes the same assumptions in his recommendations. However, students who have had an explicit and systematic reading instruction program in Kindergarten and Year 1 are typically reading text at a level that does allow them to focus on comprehension in Year 2, so Willingham's and Hirsch's advice should be adjusted to reflect reading ability rather than grade level.

Embedding comprehension instruction in a content-rich curriculum – what is the evidence?

The evidence showing that background knowledge is a strong contributor to comprehension (and vice versa) is strong and not contested (Hwang et al., 2022). And a knowledge-rich curriculum has value that exceeds its contribution to reading comprehension. Knowledge is important in its own right.

However, when it comes to reading comprehension *instruction* in K–2, scientific reading research does not reject explicit instruction in comprehension strategies and does not yet provide strong support for the contention that comprehension instruction must always be embedded in a knowledge-building curriculum. Yes, students in those years should have a content-rich curriculum. No question at all. But when it comes to the way that content is integrated and combined with comprehension instruction for *beginning* readers, the best way to do this is yet to be established.

There is mixed research evidence demonstrating embedded or integrated comprehension instruction is an effective

Explicit instruction in comprehension strategies for a limited time at the right time has a strong and large experimental research base collected over several decades. Done properly, it is scientifically evidence-based practice.

approach for beginning readers, that is, from K–2. It is appealing and makes sense in many ways; however, at the moment, the evidence supporting it is promising but not uniformly strong and most studies are quite recent. It is also not always clear what such instruction looks like, with resultant misunderstandings of the process.

According to Cabell and Hwang (2020),

> *"the testing of integrated literacy and knowledge-building approaches is a growing area of inquiry, and there have been relatively few experimental studies in K–2 settings and even fewer that have tested content-rich [English Language Arts] instruction" [p. S102].*

It is worth reading the studies of content-embedded comprehension instruction in full but the evidence can be summarised as follows. Two publications in the list below are of the Core Knowledge Curriculum, which is often described as content-embedded reading

comprehension instruction; however, as described in more detail in the next section, this is not necessarily an accurate description for this curriculum in K–2.

- Cabell and Hwang (2020) describe two randomised control trials with Kindergarten students who had the Core Knowledge Curriculum. The trials resulted in large effect sizes for proximal (i.e., taught) vocabulary, science knowledge, and social studies knowledge; small effect sizes for standardised assessments of expressive vocabulary and science knowledge; and no effect for standardised receptive vocabulary, linguistic comprehension, or social studies knowledge. The study is continuing with first grade students but published results are not yet available.

- Smith et al. (2021) looked at the relationship between knowledge and reading in upper-middle primary school but didn't review studies of embedded instruction. They conclude that knowledge partially compensates for reading skill deficiencies.

- Hwang et al. (2022) published a meta-analysis of content-integrated reading instruction. There was a wide range of effect sizes for measures of vocabulary and comprehension, from small negative and small positive to large negative and large positive. The most positive effects were for researcher-developed, proximal assessments rather than standardised assessments, which is

typical but means that they need to be interpreted carefully. Fifteen studies included students in K–2. It is not clear which if any studies involving older students were measuring the effects of instruction in K–2.

- Grissmer et al. (2023) found that students attending schools that implemented a knowledge-building curriculum (Core Knowledge) from Kindergarten to Grade 6 had significantly higher literacy (combined comprehension and writing) scores in Grades 3 to 6 than students who attended schools using a variety of other undescribed methods of reading instruction. The assessment was specifically designed to measure learning of the Common Core standards. Participating students were mostly from high-to-middle income families. Students in the one low income school had even stronger results.

How does the Core Knowledge Curriculum teach and develop reading comprehension?

The elementary/primary school Core Knowledge Curriculum is a set of lesson plans to be delivered sequentially in each year level from Kindergarten to Grade 6. It covers Language Arts (i.e., literacy), Mathematics, Science, History and Geography, Visual Arts, and Music (Core Knowledge, 2023). There are teaching manuals, student reading materials and whiteboard slides for all units of work. Teaching materials

are written by a variety of authors. All materials are free to download but there are substantial costs for schools associated with printing them.

The method of teaching reading and knowledge-building with the Core Knowledge Language Arts Curriculum changes from Kindergarten to Grade 6. In Kindergarten, Grade 1 and Grade 2, there are two separate, parallel instructional components – 'Reading' (print awareness, phonemic awareness, phonics, word analysis, and fluency) and 'Read-alouds'. The rationale for Read-alouds is to expose beginning readers to language and information that exceeds what they would be able to access through reading. There is little expectation that reading will be the vehicle for knowledge acquisition at this point. The texts used for Read-alouds – both fiction and non-fiction – are suggested in the Core Knowledge Sequence for that year, and teachers are encouraged to use texts focused on a single topic for a sustained period of time – about two weeks. During Read-alouds, students do not see the written text but instead are provided with pictures that illustrate aspects of the text. The Read-aloud is followed by a structured whole class discussion that encourages the literal and analytical skills that enable comprehension. These include summarising, predicting, making global and text-based connections, activating prior knowledge and making inferences. These skills and strategies are gradually introduced to the 'Reading' component using texts specifically chosen for these activities, which are not necessarily on

topics linked to the Read-aloud texts, but do follow a broad theme (e.g., animals) over a number of weeks.

From Grade 3, these two components are linked, with the topic content in the domain units being incorporated into the Reading and Writing components. From Grades 4 to 6, literacy skill development in reading comprehension and writing is integrated with the domain units and novel studies.

This developmental trajectory is important to note because it shows that reading instruction in the early years involves explicit instruction in both phonic decoding and the so-called 'procedural skills' associated with reading comprehension. The knowledge-building component is largely oral at first and gradually introduced to print and independent reading. Although Grissmer et al. (2023) describe 'integration and focus across all grades and subjects' (p. 42), the two elements are not integrated in the early grades, and not until students have developed sufficient reading fluency to engage with written texts in a way that builds reading proficiency and knowledge in a reciprocal way.

What is the take-home message?
The take-home message is *not* that comprehension instruction embedded in a sequential knowledge-building curricula is a bad idea or doesn't work. It's a terrific idea for many reasons and is almost certainly the best approach for middle-to-upper primary (McKeown et al., 2009). It's logical, persuasive and very appealing to embed reading comprehension instruction in interesting and useful content as soon as students are able. Right now, however, scientific research evidence doesn't yet specify that it is the *only* or most scientifically evidence-based approach to reading comprehension instruction for younger students and should therefore replace other approaches. Petscher et al. (2020) describe content-embedded reading comprehension instruction as "promising but not (yet) compelling" (p. S273). It's still okay to teach comprehension skills and strategies explicitly and quickly *and* build knowledge, initially side-by-side and then increasingly together.

Grissmer et al. (2023) form this conclusion from their research on the Core Knowledge Curriculum:

"The results of this study would suggest that there are two separate but complementary, cognitive processes involved in development and learning: 'skill building' and 'knowledge accumulation'. Perhaps the phrases that better capture cognitive development would be - 'skill begets skill; knowledge begets knowledge; and almost certainly - skill x knowledge begets skill x knowledge'." (p. 11)

Similarly, Christodoulou (2022), a long-time proponent of knowledge-rich curricula, says,

"[K]nowledge & skills are a false dichotomy. Ingredients and cakes are also a false dichotomy! You can't be pro-cake and anti-ingredient!! If we accept that knowledge and skills are a false dichotomy, then we should also accept that knowledge and skills are NOT on a pendulum. The pendulum is the wrong metaphor. The right metaphor is a pathway, a ladder or a journey." (para. 4)

Responsible teachers, curriculum developers and program publishers that have a commitment to the science of reading need to rely on the existing evidence while keeping an eye on the emerging evidence. The emerging evidence base around content-embedded instruction should be monitored and incorporated as appropriate.

In the meantime, as Duke et al. (2021) write,

"Scientific research has revealed many individual instructional practices and combinations of practices that foster reading comprehension development. Some conversations about reading comprehension engage an either/

Making inferences is an example of a skill that can be developed through teaching strategies. Deriving inferred meaning from text – going beyond the literal text – is an essential aspect of reading comprehension (Tunmer & Hoover, 2019).

or approach, such as these two statements, respectively: (1) Don't teach strategies; build knowledge. (2) Don't focus on comprehension; focus on word reading. This tendency does not reflect research findings and does not maximize the likelihood that we will meet the needs of all developing readers … As a field, we can advocate for particular research-supported instructional practices without denigrating other research-supported instructional practices." (p. 664)

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An excerpt from …
'A deep dive into phonemic proficiency' (Bell, 2023)

Nicola Bell

In recent years, there has been a spike in the popularity of literacy programs that claim to train young students in attaining phonemic proficiency. This has led to (sometimes heated) discussions within both academic and educational circles, which have focused on the efficacy of these programs and the strength of research on which the programs' rationales are founded. (For examples of the perspectives involved in these debates, see Brady, 2022; Clemens et al., 2021; Kilpatrick et al., 2022; Parker, 2022; Seidenberg, 2022; Shanahan, 2021.) Unquestionably, all parties involved in the discussions want only to promote the practices that will lead to the very best literacy outcomes for students. Nevertheless, there remains confusion about how certain instructional strategies related to phonemic proficiency fit into the "science of reading". The aim of the present article is to address some of this confusion by investigating, in depth, one popular program that promotes such strategies: *Equipped for Reading Success* (Kilpatrick, 2016).

Specific phonological awareness tasks in the program

Table 1 lists all the phonological awareness tasks that students are expected to progress through to complete the program. These tasks are outlined in the book's 'Phonological Awareness Development Chart' (p. 235 or Appendix A), and they correspond with levels in the 'Phonological Awareness Screening Test' (pp. 237–245 or Appendix C) and the program's 'One Minute Activities' (pp. 129–226).

Within each level, students may progress from the Multisensory Stage (where they can only do the task with external prompts), to the Knowledge Stage (where they can do the task independently but not quickly), to the Automatic Stage (where they can do the task independently and within two seconds). The "external prompts" employed at the Multisensory Stage refer to letter stimuli, tokens, clapping or any form of teacher support. Hence, it is only at this point that phonological awareness activities can involve letters, and to progress through the program, students must demonstrate that they can do the tasks in oral-only contexts.

Phonological awareness without letters

Kilpatrick makes it clear from the outset of the book that he sees phonological awareness as an oral language skill, and that the introduction of letters into a phonological or phonemic awareness activity fundamentally redefines it as a phonics activity.

Table 1.

Level	Task	Example
D	Syllable deletion (2-syllable words)	cowboy → boy under → der
E	Syllable deletion (3-syllable words)	pineapple → apple elephant → ele
F	Onset/rime deletion	cat → at man → m
G	Onset/rime substitution	not → hot tan → toy
H	Start-of-word deletion/substitution (1st phoneme in consonant cluster)	plane → lane class → glass
I	End-of-word phoneme deletion	cart → car sheep → she
J	Medial phoneme (vowel) substitution	bag → big ran → run
K	Start-of-word phoneme deletion/substitution (2nd phoneme in consonant cluster)	club → cub grow → glow
L	End-of-word phoneme substitution	pet → pen sent → send
M	End-of-word phoneme deletion/substitution (1st phoneme in consonant cluster)	best → bet lift → list

"Phoneme awareness is an oral language skill." (p. 15)

"A way to remember the difference between phonemic awareness and phonics is that *you can do phoneme awareness with your eyes closed but you cannot do the phonic skill of sounding out with your eyes closed.*" (p. 15)

"*It must be kept in mind that this activity* [i.e., using letters/spelling to illustrate phonemic awareness concepts] *is not phoneme awareness*. Rather, it is phonics … Do not assume if students can do this successfully that they are demonstrating phoneme awareness." (p. 79)

Contrary to this perspective, instruction that effectively targets phonemic awareness, whether delivered in a classroom or remedial context, often incorporates letter stimuli. Indeed, such an approach aligns with research evidence that demonstrates the efficacy of *combining instruction in letter knowledge and phonemic awareness* (see Chapter 3 of National Institute of Child Health and Development, 2008).

There is also a logical reason for using letter stimuli in phonemic awareness activities. Written graphemes provide a visual anchor for tasks that are otherwise abstract, complex and highly dependent on working memory. There is no empirically supported reason why they should be used only as an external support, rather than as an integral element of instruction. Phonemes are, after all, a "convenient fiction" (Seidenberg, 2021). The nature of coarticulation is such that spoken words are not truly separable into 44(-ish) individual speech sounds, each one categorically sounding and feeling a certain way. Nevertheless, we can approximate these sounds and feelings, and to do so is useful because knowing what sounds the squiggles on the page roughly represent is an excellent starting point in the journey towards learning to read.

As mentioned earlier, it is difficult to reconcile the reciprocal and interactive nature of reading development with the principles and strategies promoted in this program – in this case, with respect to having such a strong emphasis on oral-only phonemic awareness.

Phonological manipulation tasks

Another point regarding the tasks listed in Table 1, which form the basis of Kilpatrick's program and assessment, is that they all involve the deletion or substitution (i.e., manipulation) of word parts. The following quotes reflect Kilpatrick's emphasis on training phonological awareness in general, and phonological manipulation in particular.

"Students with good phonological awareness are in a great position to become good readers, while students with poor phonological awareness almost always struggle in reading. Poor phonological awareness is the most common cause of poor reading. Reading problems can be *prevented* if all students are trained in letter-sound skills and phonological awareness, starting in kindergarten." (p. 13)

"[P]honological manipulation represents the best way to address phonological awareness assessment and intervention. It has a stronger correlation with reading than any of the other tasks [e.g., segmentation or blending], it has the other tasks built into it, and it produces the best results in reading intervention studies." (pp. 75–76)

"[W]hen students respond instantly to a phoneme manipulation task, they are not even aware that the

A deep dive into phonemic proficiency

first step they performed involved efficient, unconscious segmentation of the target word. As a result, teachers can be assured that segmentation is automatic and unconscious. This represents phonemic proficiency and is the foundation of efficient orthographic mapping. It is for this reason that the *Equipped for Reading Success* program is based upon phonological manipulation activities. This training provides the assurance of the development of phonemic proficiency." (p. 76)

"One Minute Activities use phonological manipulation. Thus, they incorporate the other phonological tasks: segmentation, isolation, and blending. For this reason, they are the most efficient way to train phonological awareness." (p. 87)

There appear to be four main arguments that, within *Equipped for Reading Success*, are used as justifications for teaching phonological manipulation tasks.

Firstly, the author's ideas are based on an interpretation of Ehri's orthographic mapping theory, and it is this that provides the theoretical foundation for promoting phonological manipulation. However, in her formulation of the theory, Ehri mentions only the phonological awareness tasks of segmentation and blending, which are the key skills required when applying grapheme–phoneme correspondence knowledge to decoding and spelling (e.g., Ehri, 2017). This does not mean that teaching phonological manipulation is incompatible with the theory of orthographic mapping. It does mean that the theory provides no direct support for such teaching at the expense of instruction related to segmentation and blending.

Secondly, Kilpatrick argues that reading is more strongly correlated with the "advanced" phonological awareness task of deletion than with the "basic" phonological awareness task of segmentation. Indeed, in comparison

with segmentation tasks, both blending and deletion tasks do appear more strongly correlated with reading measures – at least in the studies cited (i.e., Kilpatrick, 2012; Swank & Catts, 1994). Blending, though, is a "basic" phonological awareness task just like segmentation. So why is it not targeted in the training program or assessment?

The main reason appears to be related to Kilpatrick's third point: that phonological manipulation tasks incorporate an element of blending anyway (as well as the other basic skills of segmentation and isolation). For example, to replace the /r/ in "grow" with /l/ (Level K), the student must:

1 **Segment** the word into phonemes

2 **Isolate** the /r/

3 **Substitute** the /r/ with a /l/

4 **Blend** together the phonemes to produce the resulting word.

By itself, the fact that manipulation tasks necessitate segmentation, isolation and blending does not mean such tasks are most effective in producing positive reading outcomes. It may instead be the case that phonological manipulation activities are unnecessary, and that better results would be seen if the basic skills most directly related to literacy development were targeted without imposing that additional working memory load.

This leads to a point that has not yet been factored into discussions at all: to perform the above steps without external prompts and in the space of two seconds requires a great deal from a student's working memory. From a statistical perspective, this means that working memory is likely to account for at least some of the shared variance between phonological manipulation and reading proficiency. It is also why we need to draw conclusions about instruction from studies that have implemented that instruction – not just those that have focused on correlations between skills.

From a practical perspective, the working memory factor inherent in phonological manipulation tasks also means that students with difficulties in this area can be expected to

Written graphemes provide a visual anchor for tasks that are otherwise abstract, complex and highly dependent on working memory.

struggle a great deal. Could practising phonological manipulation improve these students' working memory and, by extension, their reading skills? Possibly, but working memory deficits have proven very resistant to training programs in the past (Melby-Lervåg et al., 2016). Again, we need to turn to the results from studies wherein phonological manipulation skills have been trained.

This is an excerpt from Dr Nicola Bell's piece, 'A deep dive into phonemic proficiency'. The full article is available on the FiveFromFive website.

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Figuring out figurative language in high-scoring narratives

Damon Thomas

Recently, I started a new research project with four colleagues to investigate the writing choices made by primary and secondary school students who scored highest of all Queensland students on the three most recent NAPLAN writing tests. I have done this sort of research in the past but always focused on successful persuasive writing across the tested year levels (i.e., Years 3, 5, 7 and 9). For our new project, named NAPtime, we will investigate the narrative writing choices valued by NAPLAN markers for the first time. The Queensland Curriculum and Assessment Authority (caretakers of completed NAPLAN tests up here) granted us access to the 285 highest-scoring Queensland writing samples written for the 2019, 2021 and 2022 NAPLAN tests (i.e., roughly 20–25 samples per year level for the three years of the test). In the next couple of years, my colleagues and I will use a variety of linguistic and rhetorical frameworks to identify patterns in the students' writing and communicate our findings to the education community.

My first exploration of the successful writing samples will focus on the students' use of figurative language to entertain their readers. Figurative language choices are often referred to as figurative devices, rhetorical devices, literary devices or figures of speech, and are commonly associated with poetry and argumentation. But high-quality narratives are also overflowing with artful and playful uses of figurative language. In fact, this is often what makes the stories we read so engaging.

Figurative language has been the focus of research and teaching for (literally) thousands of years. The figurative language choices I'll be looking for in the NAPLAN writing samples were identified first by Aristotle and other rhetoricians way back in Ancient Greece. Aristotle outlined the ins and outs of five canons of classical rhetoric – Invention, Arrangement, Style, Memory, and Delivery – which included everything a speaker or writer would need to discover, organise and communicate compelling ideas through spoken and written texts. Of most relevance to our NAPtime research project is the third canon, Style, which concerns how we put the ideas we have into words that are communicated with others. This is the part of classical rhetoric that dealt with figurative language.

Figurative language in the Australian Curriculum: English
It's quite amazing to see just how much emphasis is given to figurative language in the Australian Curriculum: English. Even a cursory glance

will show this is one of the most underrated aspects of English teaching. Unlike certain other aspects of English that are only dealt with in niche sub-strands of the curriculum, figurative language can be found across all three strands (i.e., Language, Literature and Literacy), spread out across a full eight sub-strands!

While figurative language is taught from Year 1 to Year 10, it becomes especially prominent in the secondary school years, where it is mentioned directly in six content descriptions for each secondary year level (i.e., 7, 8, 9 and 10). In this sense, teaching students to interpret and use figurative language is likely a regular part of every secondary English teacher's day job.

Despite the wide reach of figurative language, this aspect of English is, arguably, treated in a fairly disjointed manner in the Australian Curriculum: English. Figurative language pops up here, there and everywhere. It is described as serving many varied functions in different types of texts, such as enhancing and building up layers of meaning; shaping how readers interpret and react to texts; influencing audience emotions, opinions, and preferences; evaluating phenomena; and conveying information and ideas. At times, it is described as a stylistic tool of poetry, songs and chants; at other times it's a persuasive tool of argumentation; and at other times it's a literary tool of storytelling.

All these uses make figurative language feel a bit like sand slipping through your fingers; nothing really ties it together.

The Australian Curriculum: English refers to 14 figurative devices explicitly (i.e., metaphor, simile, personification, onomatopoeia, assonance, alliteration, hyperbole, idiom, allegory, metonymy, ellipses, puns, rhetorical questions and irony).

This might seem like a lot, but more than 200 figurative devices have been identified in the writing of William Shakespeare alone (Joseph, 1947)! It would be interesting to know how and why these 14 figurative devices have been named in the curriculum.

Figurative language in the NAPLAN writing tests

Another place educators come across figurative devices is in the NAPLAN writing marking guides. The persuasive writing version of the test includes a criterion named Persuasive devices, which involves "The use of a range of persuasive devices to enhance the writer's position and persuade the reader" (ACARA, 2013, p. 6). In the glossary of the persuasive writing marking guide, nine figurative devices are mentioned: alliteration, simile, metaphor, personification, idiom, puns, irony, hyperbole, and rhetorical questions. The guide also includes some descriptions of the effects of other figurative devices (e.g., parallelism, anaphora, epistrophe) without mentioning the technical names (e.g., "Words or phrases at the beginning or end of successive clauses or statements" (ACARA, 2013, p. 87) refers to anaphora and epistrophe).

The NAPLAN narrative writing marking guide (ACARA, 2010) drops the Persuasive devices criterion and replaces it with another named Character and setting, which involves "The portrayal and development of character" and "The development of a sense of place, time and atmosphere" (p. 4). Only metaphor and simile are mentioned in the glossary as part of key vocabulary choices, while ellipsis is mentioned as a key resource for building text cohesion.

What can we take from the emphasis on figurative language in these marking guides? It seems the designers of the NAPLAN writing test are expecting students to use figurative language in both versions, but only really sets markers up to identify the use of specific figurative devices in the persuasive version. There is possibly an assumption here that figurative language is more important in persuasive writing than in narrative writing. When you add the Australian Curriculum's substantial but disjointed emphasis on figurative language into the mix, it's quite likely that some Australian teachers would feel unsure about the aspects of figurative language to teach and in which genres.

When you add the Australian Curriculum's substantial but disjointed emphasis on figurative language into the mix, it's quite likely that some Australian teachers would feel unsure about the aspects of figurative language to teach and in which genres.

Our approach in the NAPtime research

Educators and curriculum designers in contemporary settings might get a better grip on figurative devices if we follow the lead of classical rhetoricians who divided them into two categories: schemes and tropes. Both can be described as fundamental to how we put together sentences in written or spoken texts.

Simply put, a scheme (from the Greek word *schēma*, meaning form or shape) involves changing the usual pattern or arrangement of words in a sentence. A well-known scheme is alliteration, which involves the repetition of initial phonemes in two or more adjacent words, such as when Professor McGonagall from *Harry Potter* described students as "behaving like a babbling, bumbling band of baboons!"

A trope (from the Greek word *tropein*, meaning to turn) involves changing the normal meaning of words in a sentence. A well-known trope is metaphor, which involves making a comparison between two different things that have something in common, such as when Mrs Dursley from *Harry Potter* is compared to a crane (i.e., a longnecked bird): "she spent so much of her time craning over garden fences, spying on the neighbours."

Dividing the 14 figurative devices mentioned in the Australian Curriculum: English and the nine in the NAPLAN persuasive writing marking guide into schemes and tropes shows that these documents strongly favour tropes (i.e., nine tropes vs. three schemes in the curriculum and eight tropes vs. one scheme in the NAPLAN marking guide). A key interest of my research into high-scoring NAPLAN narratives will be to determine how the students used schemes and tropes to entertain their readers, and how well these key policy documents reflect the choices valued in the NAPLAN writing context.

I will pay close attention to the following 19 schemes and 17 tropes that are particularly useful in contemporary writing (Corbett & Connors, 1999). Clearly, this is more than double the number mentioned in the curriculum and NAPLAN, and some may not have been used much or at all by the high-scoring students. It's also possible that some devices were only used in certain year levels, so there is potential for interesting findings here. If we discover that NAPLAN markers rewarded students for using figurative devices that do not even appear in the key policy documents guiding our teachers, there will be fascinating implications for the usefulness, equity and ongoing enhancement of these documents.

Without further ado, here is a table of the schemes and tropes that I will look for in my first NAPtime article, with pronunciations, definitions and examples:

Scheme	Definition	Example
Parallelism	Refers to when words, word groups, or clauses in a sequence have a similar structure	He enjoyed studying English, history, and science.
Isocolon (ī-sō-cō'-lon)	A type of parallelism that occurs when parallel elements not only share a similar structure but also have the same length, such as the same number of words or even syllables	In this classroom, minds expand, ideas ignite, and knowledge flourishes.
Climax	Works together with parallelism. Occurs when words, word groups, or clauses are arranged to build up in importance or intensity	By the end of the school year, students will be armed with skills, wisdom, and a burning desire to make their mark on the world.
Antithesis (an-tith'-ə-sis)	A type of parallelism that occurs when contrasting ideas are placed side by side	Despite the rules and routines, the class had wild bursts of creativity. They seemed to value both conformity and rebellion.
Anastrophe (ə-'na-strə-fē)	When the usual word order of a clause or sentence is inverted	A place of endless possibilities, a school is.
Parenthesis (pə-ren'-thə-sis)	The insertion of a verbal unit that interrupts the normal flow of a sentence's structure	A school – with students hurrying between classrooms and the sound of slamming lockers – is a vibrant and dynamic place.
Apposition	Placing two elements side by side, where the second element serves as an example or modification of the first	The teacher, a tireless advocate for learning, guides the students with dedication and passion.
Ellipsis	The intentional omission of a word or words that can be easily understood from the context	You can enter the Year 5 classroom down the corridor, and Year 6 up the stairs.

Scheme	Definition	Example
Asyndeton (a-sin'-də-ton)	The purposeful omission of conjunctions between connected clauses	Books, pencils, notebooks, a backpack filled to the brim – all essentials for a day of learning.
Polysyndeton (pol-ē-sin'-də-ton)	The purposeful use of many conjunctions	The young student struggled to carry her books and her pens and her laptop and her calculator and her highlighters to class.
Alliteration	The repeated use of the same sound at the start of several consecutive words	A boisterous banter of students blended with the rhythmic rattle of rolling backpacks.
Assonance	The repeated use of similar vowel sounds in stressed syllables of consecutive words, with different consonant sounds before and after them	The playful students stayed late to engage in debate.
Anaphora (ə-naf'-ə-rə)	The repeated use of the same word or words at the start of several consecutive clauses	In this class we pursue our dreams. In this class we discover our potential. In this class we become who we are meant to be.
Epistrophe (ə-pis'-trō-fē)	The repeated use of the same word or words at the ends of consecutive clauses	In the classroom, we learn. In the hallways, we learn. In the library and the gym, we learn. Everywhere in this school, we learn.
Epanalepsis (ə-pon-ə-lep'-sis)	The repeated use of a word or words at the end of a clause that was used at the beginning of the same clause	Learning to write is the most important part of learning.
Anadiplosis (an-ə-di-plō'-sis)	The repeated use of the last word of one clause at the beginning of the next clause	Education is the key to unlocking doors, and doors lead to endless possibilities for a life lived well.
Antimetabole (an-tē-mə-tab'-ō-lē)	The repeated use of words in successive clauses, but in reverse grammatical order	In this class you will not only learn to read, but you will read to learn.
Chiasmus (kī-əz'-mus)	When the grammatical structure in successive word groups or clauses is reversed	As teachers, we shape our students, but then our students shape us.
Polyptoton (pō-lip'-tə-tahn)	The repeated use of words that are derived from the same root word	The new learnings of the learners helped them learn most of all.

Trope	Definition	Example
Metaphor	The comparison of two different things by implying a connection between them	Schools are fertile gardens where knowledge takes root and young minds can bloom.
Simile	The comparison of two different things by using 'like' or 'as' to make the comparison explicit	The children gathered around the teacher, like bees around a hive.
Synecdoche (si-nek'-də-kē)	When a part of something is used to represent the whole thing	Many hands helped make the school fair a success.

Trope	Definition	Example
Metonymy (mə-tahn'-ə-mē)	The substitution of a word or word group with another that is closely associated or suggestive of intended meaning	The pen is mightier than the sword.
Pun: Antanaclasis (an-ta-nak'-la-sis)	The intentional use of one word in two or more different ways	If you never learn the content, you'll never learn to be content.
Pun: Paronomasia (par-ə-nō-mā-zha)	The intentional use of words that sound similar but have different meanings	The teacher plainly explained how the plane's crash was unplanned.
Pun: Syllepsis	The intentional use of a word in a way that modifies two or more other words, but with each of those words understanding the original word differently	The teacher did not raise her voice or her hopes.
Anthimeria	One part of speech is substituted for another	The student papered the hallway with his artistic skills.
Periphrasis (pə-rif'-ə-sis)	The use of a descriptive word or word group instead of a proper noun or the use of a proper noun to refer to a quality or characteristic associated with it	Sarah was crowned the Queen of Knowledge for her amazing academic results.
Personification	Giving human qualities or abilities things that are not human	The library books whispered enticing stories, beckoning the students to embark on magical adventures.
Hyperbole (hī-pur'-bə-lē)	The intentional use of exaggerated terms to emphasis meaning	For maths we were forced to sit and work through a thousand complex equations.
Litotes (lī'-tə-tēz)	The intentional use of understated terms to minimise meaning	Jim's performance in the science fair was not unimpressive.
Rhetorical question	Posing a question, not to receive an answer, but to express a point indirectly	Can you deny the importance of education in a child's life?
Irony	The use of words in a way that mean the opposite of their literal meaning	The 50-page maths assignment was every student's idea of a fun-filled holiday.
Onomatopoeia	The use of a word that imitates the sounds it describes	Over the courtyard she clashed and clattered on the way to the classroom.
Oxymoron	The combination of two terms that are usually contradictory or opposite to each other	The silent cacophony of the empty classroom filled the air.
Paradox	Making a statement that seems contradictory but that holds some truth	The more you learn, the more you realise you don't know.

I look forward to letting you know what we find. My hypothesis is that figurative language plays a much larger role in high-scoring narratives than the narrative marking guide suggests.

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This article originally appeared on the author's blog, Read Write Think Learn.

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Classroom-based oral storytelling: Reading, writing and social benefits

Trina Spencer

Chelsea Pierce

Need to promote students' academic and social development? Storytelling is an efficient and powerful language activity that impacts reading, writing and social skills. It easily integrates into classroom routines too!

The notion that speaking and listening skills are a necessary foundation for reading and writing is well established and pervasive in the United States' academic standards (see Figure 1; National Governors Association Center for Best Practices & Council of Chief State School Officers, 2010). Students' listening comprehension significantly predicts their reading comprehension (Babayiğit et al., 2020) and expressive language (i.e., speaking) fosters writing performance (Bishop & Clarkson, 2003). Extensive research documents the central role of oral language skills such as vocabulary, discourse structures and grammatical knowledge for literacy development (Kim et al., 2015; Lervåg et al., 2017).

U.S. students represent a diverse group with distinct differences in preparation for the oral language demands of academic environments. For example, many students with disabilities experience difficulty learning oral language naturally (Norbury et al., 2016), which negatively impacts their attainment of reading and writing skills (Bishop & Clarkson, 2003; Mackie et al., 2013). Students who speak a non-English language or a non-mainstream dialect of English at home may enter U.S. schools with less experience in the language (and type of language) in which reading and writing instruction takes place. The effects of poverty can also exacerbate students' oral language differences (DeNavas-Walt et al., 2013). Without the foundational oral language skills firmly established, students struggle to acquire successful reading and writing repertoires (National Center for Education Statistics, 2011, 2019).

In addition to its pivotal role in the development of reading and writing, oral language is necessary for social interactions and social–emotional well-being. Early oral language skills are one of the best predictors of later social skills (Pace et al., 2019) and difficulties expressing one's self is linked to behaviour problems (Chow et al., 2018). Without regular exposure to sophisticated school language due to the COVID pandemic, students' oral language acumen, especially as it relates to social–emotional development, is suffering. Oral communication and social exchanges are further inhibited by wearing masks. As a result, schools (over 90% of respondents) are concerned about the impact of reduced oral language exposure on students' language and social development (Bowyer-Crane et al., 2021).

Given the large percentage of students who would benefit from intentional oral language instruction (Kieffer & Vukovic, 2012; Nakamoto et al., 2007) and the enormity of the current pandemic context, it can be overwhelming for teachers to address the diversity of students' needs in their classrooms. Avoiding the suggestion that teachers need to become language experts, science of reading
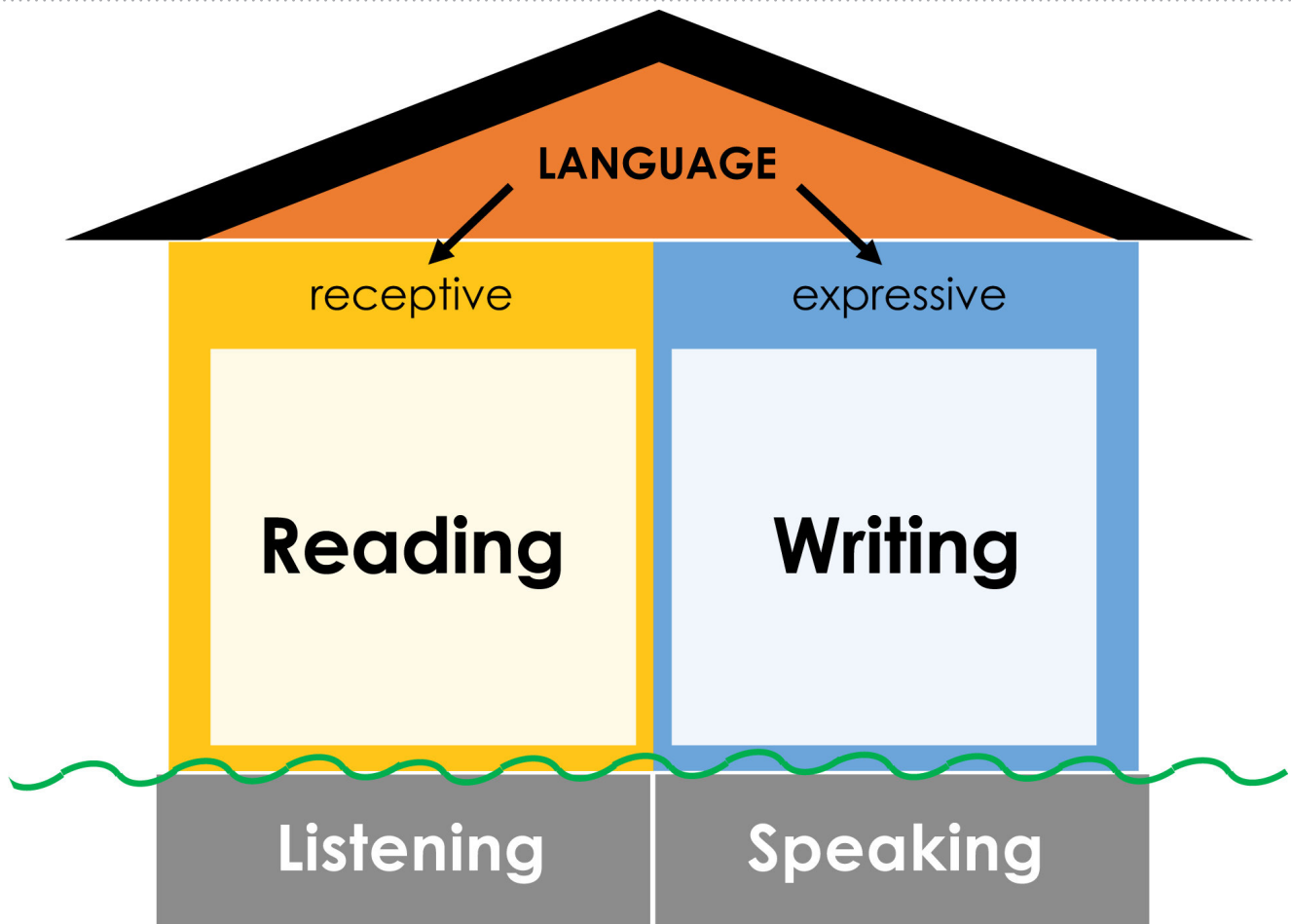
Figure 1. Listening and speaking as the foundation of reading and writing

experts recommend teachers focus on a few critical oral language repertoires, which include vocabulary, grammar and syntax, and text structures (Cervetti et al., 2020; Phillips Galloway et al., 2020). This cluster of language features is often referred to as academic language.

As opposed to conversational language, academic language is primarily used in school to acquire and express knowledge (Snow & Uccelli, 2009) and involves "word-, sentence-, and discourse-level language patterns" (Phillips Galloway et al., 2020, p. 331). Although there are some differences between oral and written academic language, there are also shared features. As a result, oral academic language has been identified as a pivotal skill repertoire (Snow & Uccelli, 2009) for boosting reading and writing achievement among all students. Knowledge of vocabulary, sentence structures and discourse patterns aid social communication too.

The case for narratives
Schema theory (Mandler, 1984) posits a cognitive bridge between oral and written language that results from shared features. Whether spoken or written, narratives share word-, sentence-, and discourse-level patterns (Pinto et al., 2015), and therefore form a suitable bridge for transferring oral academic language to written modalities (Spencer & Petersen, 2018b; Westby et al., 1994). This theoretical framework is bolstered by numerous correlational and causal investigations. For example, early narrative language predicts academic achievement (Bishop & Edmondson, 1987), especially reading comprehension in the fourth, seventh and tenth grades (Snow et al., 2007), and writing (Kim et al., 2015). There is also convincing evidence that narrative-focused oral interventions improve students' reading comprehension (Clarke et al., 2010; Petersen et al., 2020) and writing skills (Petersen et al., 2022; Spencer & Petersen, 2018b).

Narrative has many definitions, depending on which discipline and literature are consulted. Sometimes, narrative is referred to as a genre in parallel to exposition (Gottlieb & Ernst-Slavit, 2014); sometimes, narrative is a device for making sense of emotionally charged experiences and trauma

(Richardson, 2000) or a basic principle of mind that organises our thinking (Turner, 1996). For classroom purposes, we choose to define a narrative as the monologic telling or retelling of a real or imaginary past event, with causally related elements presented in temporal order, in spoken or written form. Simply put, narratives are stories.

Storytelling is a common communication modality that emerges as young as two years old in typically developing children (McCabe, 2017). The plot of the story requires proper sequencing of macrostructural episodic components – problem, action, consequence – to give an organisational backbone to it. Additional components include character, setting, feeling, complication and resolution or ending. These elements are arranged according to rules about their order and grouping called story grammar (Stein & Glenn, 1979). Story grammar provides the latticework of generative language much like a trellis offers a stable structure around which ivy grows. The story grammar framework of narratives has been adopted by
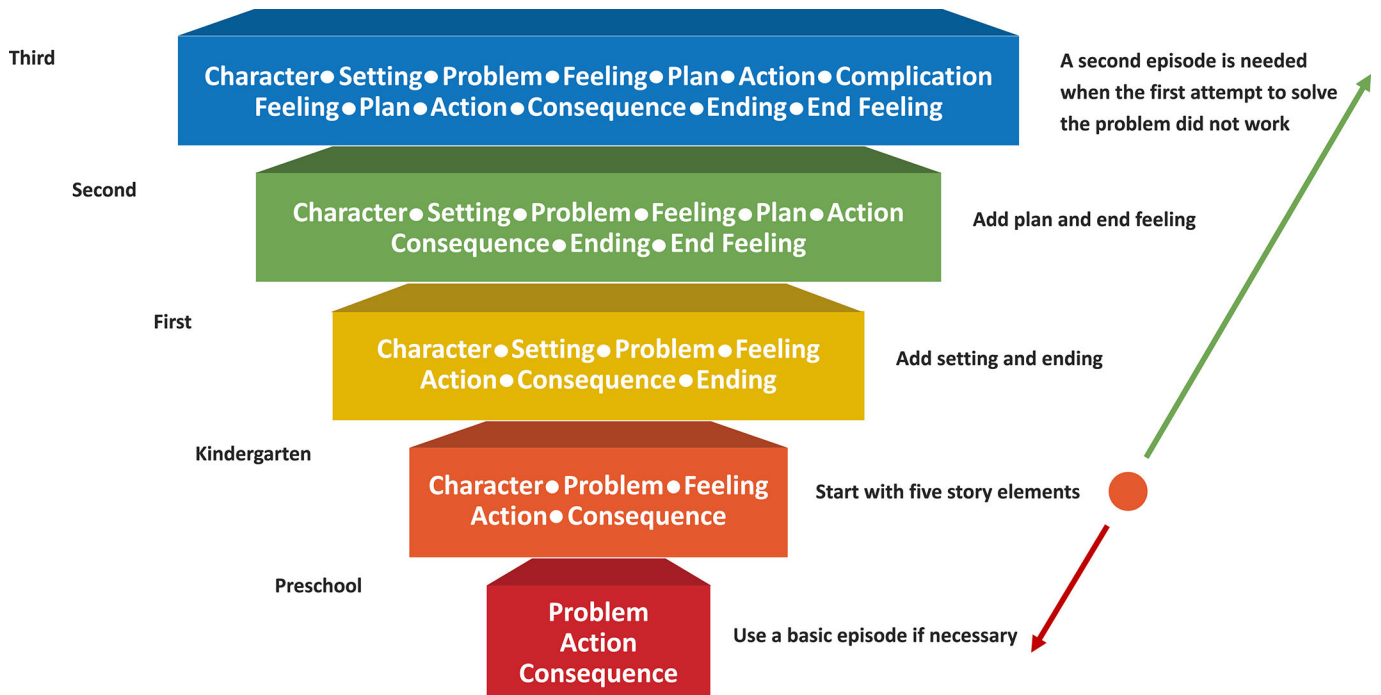
Third

Character●Setting●Problem●Feeling●Plan●Action●Complication
Feeling●Plan●Action●Consequence●Ending●End Feeling

A second episode is needed when the first attempt to solve the problem did not work

Second

Character●Setting●Problem●Feeling●Plan●Action
Consequence●Ending●End Feeling

Add plan and end feeling

First

Character●Setting●Problem●Feeling
Action●Consequence●Ending

Add setting and ending

Kindergarten

Character●Problem●Feeling
Action●Consequence

Start with five story elements

Preschool

Problem
Action
Consequence

Use a basic episode if necessary

Figure 2. Story grammar framework

U.S. schools and is pervasive in the Common Core State Standards (National Governors Association, Center for Best Practices & Council of Chief State School Officers, 2010). Explicit or tacit understanding of narratives at the discourse level is necessary to understand literature at all levels of complexity.

Narrative elements within the story grammar framework form a useful schema (Mandler, 1984) that helps to order causally and temporally related events, but comprehension also requires knowledge of words and sentence structures. Because listeners and readers are naïve to a storyteller's experiences, narratives necessitate the use of sophisticated, descriptive language (i.e., narrative language). For example, storytellers make use of causal and temporal subordinate clauses, as well as elaborated noun phrases, adjectives and adverbs to paint clear pictures for their listeners or readers (Benson, 2009). In addition to the word-, sentence- and discourse-level patterns available, narratives naturally integrate several cognitive abilities such as attention, memory, inferencing and theory of mind (Curenton, 2011). As students learn to understand and produce narratives, they simultaneously learn to orchestrate the converging cognitive and linguistic processes needed for skilled reading and writing.

While the link to reading comprehension and writing is convincing by itself, there are additional reasons to use narratives in the classroom. Storytelling is fun, ubiquitous, culturally flexible and socially important. The natural consequence of telling a story is attention, which is the most common form of approval. Children want to tell stories and gain approval from adults (e.g., "How was your day?") and peers (e.g., "That happened to me once."). Parents of children with disabilities wish for their children to be able to report about school events (Pituch et al., 2011) and children who are good storytellers are more popular among peers (McCabe & Marshall, 2006). Students do not need to be cajoled during storytelling exchanges because they generally enjoy talking about preferred topics or themselves. Furthermore, stories about personal experiences are the most common type of narrative children produce (Preece, 1987), making the teaching of narrative skills immediately useful for social contexts. Narrative communication could be leveraged to express trauma or report abuses, thereby providing a layer of protection for children (Fong et al., 2020). Although there can be cultural differences in storytelling styles and structures, narratives are common in most cultures (Westby, 1994) and can be tailored for cultural, personal and situational

relevance (Curenton, 2006, 2011).

In typical development, narratives and the academic language features are established in students' oral language repertoires before they are expected in informational discourse and written form (Curenton, 2011). Oral language skills acquired through parents' bedtime stories and book reading are later integrated with students' code skills (i.e., decoding and spelling) to convert oral language experiences into written language success. However, students without oral narrative proficiency may struggle to make that conversion when written text is present. Similarly, students without fluent word reading skills may miss opportunities to advance their academic language. A series of studies led researchers to conclude that "comprehension-building interventions may be most beneficial when presented in a format that does not require extensive other skills such as decoding" (van den Broek et al., 2011, p. 265).

There is also the issue of cognitive load. When students are asked to work on word reading and comprehension at the same time and their decoding is not automatic, all their cognitive energy is spent on decoding with little left for comprehending. If comprehension is worked on without text, then their attention is reserved for learning vocabulary, sentence structures, and discourse structures that will transfer to written language when their code

skills are proficient (van den Broek et al., 2011). Finally, students are less likely to resist oral language tasks, especially oral storytelling activities, because they are generally easier, more fun and perceived as more relevant and useful (Curenton, 2006).

Recommendations for infusing oral storytelling in classrooms
In the remainder of this article, we present seven recommendations for infusing oral storytelling in classrooms. Because we focus on the practical and implementable aspects of oral storytelling, there is insufficient space to cover the theoretical and empirical grounding for each of the recommendations. Nonetheless, schema theory (Mandler, 1984), theories of learning (Engleman & Carnine, 1991), and an extensive research base related to effective instructional design (e.g., Watkins & Slocum, 2004) and narrative-based interventions (Favot et al., 2020; Pico et al., 2021; Stetter & Hughes, 2010) informed their selection for inclusion here. The specific recommendations were chosen because they can be put into practice tomorrow without extensive preparation or the purchase of materials.

Teach using retelling, then generalise to personal and fictional generations
Retelling is considered one of the most valid methods of measuring comprehension, whether one hears or reads a passage (Reed & Vaughn, 2012). It is a critical skill that integrates both listening for understanding and then expressing one's understanding. Working on retelling, at a minimum, sharpens students' ability to listen for patterns in stories and then organise their understanding using the relations between story events.

As retelling is a critical comprehension skill, necessary for both oral and written language comprehension, it is a great place to begin. However, in the context of oral storytelling, retelling is considered a stepping stone to more complex expressions of oral language such as personal and fictional stories. It is easier to begin teaching narratives (i.e., discourse structure) and narrative language (i.e., vocab and complex sentences) within the context of story

retell activities before transferring students' knowledge of narrative to the creation of their own stories. After retelling a modelled story, teachers can ask students, "Has something like that ever happened to you?" and provide support as students generate personal stories (Spencer & Slocum, 2010).

Because personal stories are the form of communication students are most likely to use with friends and family, students who learn the linguistics of personal stories (e.g., past tense, first person) can put it into practice immediately. Personal stories are also needed to express emotions and report adverse experiences. Once students regularly tell personal stories, they are ready to create fictional stories, which are in higher demand at school. If students can develop personal and fictional generation skills via oral language, they will be better prepared to engage in personal and fictional writing tasks.

Model simple stories and increase their complexity over time
To not overwhelm or frustrate students with nascent oral language repertoires, begin with short, simple stories. Because retelling is an expressive language task dependent on a listening task, it involves the integration of cognitive-linguistic repertoires. It is truly a complex academic skill to retell something. Students benefit from the language they hear when someone reads to them; however, children's literature is not developmentally appropriate for students' expressive language (Curenton & Craig, 2011).

For story retelling activities, teachers should choose stories that are more difficult than what the students can decode but not as complex as what adults would read to them. Selecting the right type of story can be nuanced, which is why some published storytelling interventions include short and simple stories for retell practice (e.g., SKILL, Gillam & Gillam, 2016; Story Champs, Spencer & Petersen, 2018a). It is not imperative to use commercialised narrative programs. What is important is that students begin with a length and complexity of story within their zone of proximal development. In other words, select, create or adapt stories that students may struggle to retell

In the context of oral storytelling, retelling is considered a stepping stone to more complex expressions of oral language such as personal and fictional stories.

EXAMPLES OF
Complex Sentence Structures

CAUSAL SUBORDINATE CLAUSES

- Javon was frustrated **because** he could not reach his hat.
- Maria went to her grandmother's house **so that** she could help her clean.
- David was bored **since** he could not play on the tablet.

TEMPORAL SUBORDINATE CLAUSES

- **When** Javon stood on a stool, he could reach his hat.
- Maria got to eat cookies **after** she helped clean her grandmother's house.
- **Before** David could play on the tablet again, he had to do his homework.

ELABORATED NOUN PHRASES

- Javon, **who was short for his age**, could not reach his hat in the closet.
- Maria quickly ate cookies **that her grandmother made**.
- David could play on the tablet again, **which was his favorite thing to do**.

Figure 3. Examples of complex sentence structures

themselves, but can retell with teacher support. As students gain confidence and proficiency, increase the length and complexity of the stories in terms of narrative structure, complexity of sentences and novelty of vocabulary.

For young children (e.g., three to five years old), students with significant disabilities, and those with limited English proficiency, we recommend starting with short (about 50–70 words) stories that contain all the main story grammar elements (i.e., character, problem, feeling, action, consequence). Only if necessary should model stories be reduced to the most basic story components of problem, attempted action to solve the problem and the consequence of that action (see Figure 2). Story grammar elements should never be taught in isolation because it removes the purpose for the

story and voids the activity of meaning, and purpose and meaning promote motivation and generalisation (Gillam & Ukrainetz, 2006).

Once students can independently retell a simple story with the five main parts, add the setting and ending. As students become proficient, longer stories with more story grammar elements can be used (e.g., complication, plan, resolution, end feeling). Eventually, storybooks or students' classroom curriculum can be used to help extend their newly acquired narrative knowledge and oral academic language skills to less contrived contexts. Starting with simple stories help students experience success and acquire the academic language skills needed to be successful with more challenging narratives.

One pitfall that should be avoided is continuing intervention with

simple stories for too long. They are necessary to begin with, but the complexity of model stories should increase gradually over time (Spencer & Petersen, 2020). If teachers do not modify the difficulty of stories students are asked to retell, learning stagnates. To avoid this, teachers should monitor individual students' retelling skills and adjust the stories and intervention accordingly. Free narrative retell assessments are available at www.languagedynamicsgroup.com as part of the CUBED suite of literacy assessments. Each grade level (preschool to third) set of the Narrative Language Measures Listening includes 22–25 stories with easy-to-use scoring rubrics. Teachers can use whatever grade level is developmentally appropriate for individual students to monitor their progress or to inform differentiated instruction.

Explicitly teach story grammar
When students understand the narrative discourse structures, it becomes easier to teach and practise other forms of complex language. The story grammar framework should be explicitly taught to students so that they can retell stories that include all the episodic features and as many additional story grammar elements as possible. Narrative structure does not take very long to establish so once students know the main parts of the story appropriate for their grade level (see Figure 2 for structures aligned with grade-level expectations), teachers can begin prompting students to use longer and more complex sentences and less common words. These sophisticated sentence structures are considered literate language because they are more common in written narratives (Benson, 2009). Therefore, teaching and practising them through an easier modality (i.e., oral) will decrease the demands of understanding complex sentences when they appear in written material.

It is important that storytelling remains fun for students and that they are successful, so the demands should be increased gradually. These are also areas in which differentiation can occur. For example, all students in the large or small group can be expected to retell a story with the five main parts, but some students can be prompted to use

complex sentences or precise vocabulary (e.g., splashed, filthy). As soon as students are ready and capable, they should be prompted to use causal and temporal subordination and elaborated noun phrases. See Figure 3 for examples of these complex sentences.

Use visuals when possible
Icons, gestures, illustrations, photos, props and videos can all be used to support students' storytelling. Ideally, there is one image for every story grammar element included in a model story, at least in the beginning. If the five main story elements are taught, including character, problem, feeling, action and ending, then five images will help students to use at least one sentence per picture.

When students generate their own stories, teachers can draw the students' story parts on a whiteboard or sticky notes. This strategy is known as pictography and can be a fun way to capture students' narrative creations (Gillam & Ukrainetz, 2006). Icons or symbols can facilitate learning the story

grammar framework (Pico et al., 2021), making the abstract schema more concrete for students, especially those with disabilities (Spencer et al., 2013). In some storytelling interventions, students make gestures to correspond to the story parts (see video demonstrations at www.languagedynamicsgroup.com).

As students retell the model story, icons or gestures offer some support, but less than illustrations or pictures. Illustrations and pictures would correspond to a specific story, whereas icons and gestures can be used generically with any story. Likewise, icons or gestures can serve as prompts for students as they generate personal or fictional stories.

Visuals are powerful prompts for teaching narratives, but to avoid prompt dependency, they should be faded as quickly as possible. This is because in typical reading comprehension and writing tasks, students do not routinely have the benefit of visuals. Fading of any visual supports will prepare students

Visuals are powerful prompts for teaching narratives, but to avoid prompt dependency, they should be faded as quickly as possible.

Steps for Retelling While Fading Visuals

1 Student(s) retell using pictures & icons

2 Student(s) retell using only the icons

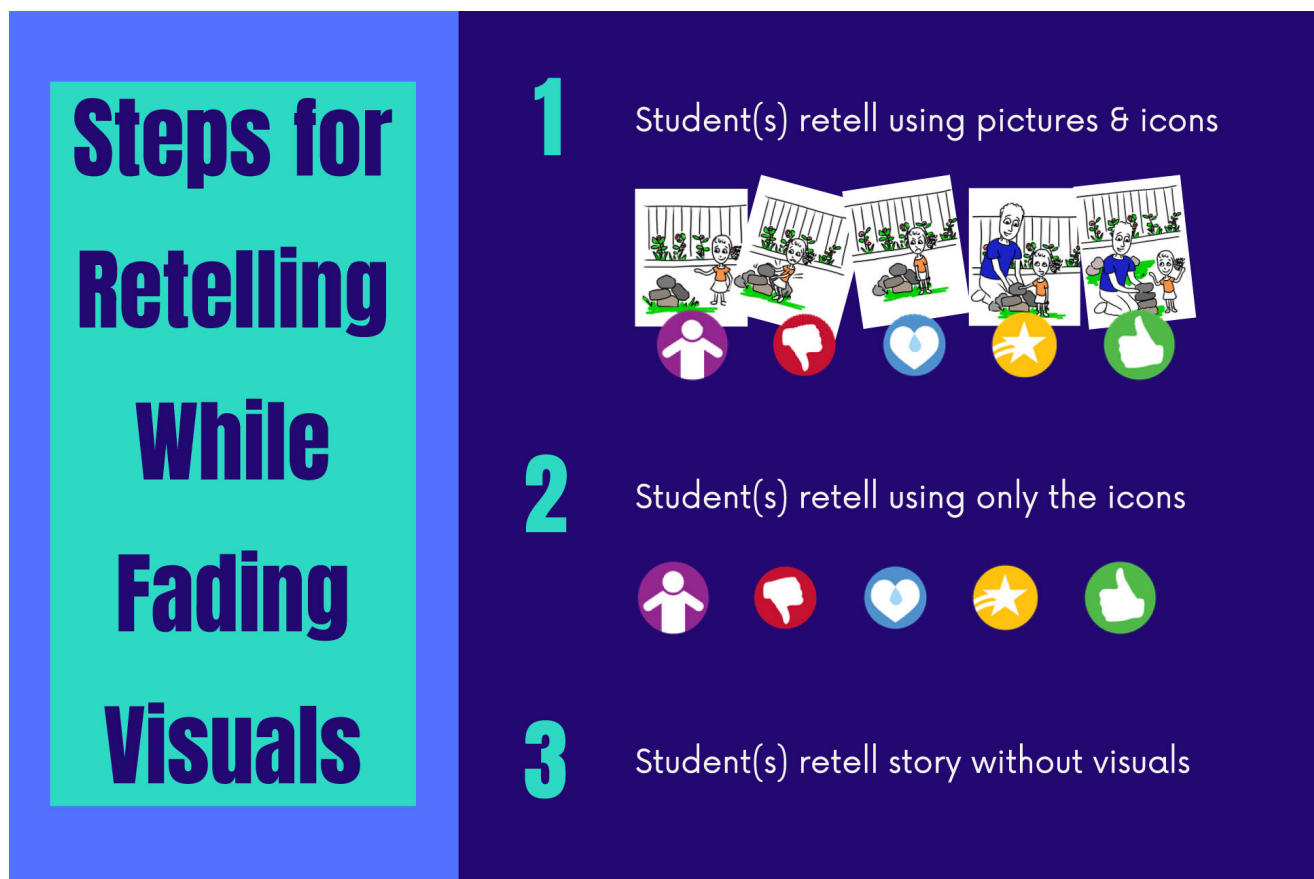**3** Student(s) retell story without visuals

Figure 4. Example steps for fading visuals

for the higher demands of reading and writing. Ideally, students will be able to retell a story they heard (or read) independently and to generate personal and fictional stories in oral and written form. The fading of visuals within every intervention session helps to facilitate students' independence with these tasks, as well as sharpen cognitive repertoires. Figure 4 shows an example of steps for retelling while fading visual supports. These steps have been used in several storytelling intervention studies with great success and with a wide range of students (Spencer et al., 2013, 2020).

Use effective and efficient prompts to individualise

Even when visuals are used, teachers will need to consistently model the language they want students to produce and prompt them to imitate the target skills. We recommend a simple, two-step prompting procedure to provide students with the right level of support, without frustrating them with lengthy least-to-most prompt hierarchies. For prompting students to include a story grammar element they may have forgotten (e.g., action), teachers can first ask a wh- question related to that part (e.g., "What did he do to fix his problem?"). If the student can retell the missing part with just the question, they can continue with the story. However, if the question prompt is ineffective, the second step is to model what the student should say and ask them to repeat the model (e.g., "He asked his mother for a bandage. Now you say that.").

If a student uses a simple sentence when the teacher expects a longer more complex one, the recommended prompt is to model what the student should say and ask them to repeat it (e.g., "Say it like this. Listen. He was sad because he fell."). The same type of model-imitate prompt can be used to get students to use specific vocabulary words (e.g., "He splashed into the puddle. You say it like that."). The models and what teachers expect of students should be shortened or lengthened according to students' individual abilities.

Promote generative language, not memorisation

It is imperative that teachers promote generative language rather than memorisation during storytelling activities. There are several ways to avoid

Even when visuals are used, teachers will need to consistently model the language they want students to produce and prompt them to imitate the target skills.

leading students into rote learning. First, model different stories in consecutive intervention sessions. The goal is for them to learn the underlying structures of stories and the language patterns used to tell stories generally. These are abstract concepts and students need multiple examples of stories with those patterns to understand them (Spencer & Petersen, 2020). That is not to say that stories can never be repeated. When it is time to increase the complexity of models, return to stories used previously, but make them longer or require the students to use longer sentences or less common vocabulary words. That way, there is something new to learn even when they know the gist of the story.

Second, vary the sentences that students are prompted to say. There are many sentence patterns students need to learn. The more patterns they learn the more likely students will recombine learned clauses to produce novel sentences. For example, students can say, "He fell in the mud", or "He got all dirty because of the mud", or "Mud was all over him." All these sentences describe the problem of the story using different sentence patterns.

Third, reinforce and praise response variation and novel sentences students produce. Even if it is not the most complex sentence, if a student recombines words and patterns in a manner they have never heard before, this is generative language and warrants celebration.

Extend storytelling into classroom routines and beyond the classroom

Once students learn the storytelling basics, students' narratives can take on many forms and functions, and storytelling activities can occur anywhere and anytime. For instance, narratives may include storylines about relevant social situations such as bullying, peer pressure and tattling. Teachers can craft their own stories to be relatable to their students and teach problem solving. Just as students can learn the social–emotional content embedded in narratives, cultural expectations and traditions can be transmitted through storytelling. Teachers can give students opportunities to tell stories that originate from their family's culture, as many students are exposed to oral storytelling traditions at home (Au, 1993). Consider drawing ideas for stories to use in the

classroom from cultural activities students engage in at home.

Storytelling activities do not need to be limited to teacher–student interactions either. Students can be divided into pairs to take turns retelling a story (e.g., turn-n-tell). During snack or lunch time, students can tell each other stories. Partner retelling can be incorporated into transition times such as when students must wait or move from one activity to another. This type of 'transition listen' is a way to embed storytelling into less structured parts of the daily routine while still making the time productive.

Students can be encouraged to tell family members stories they learn in class. If sticky notes were used during intervention, students can take their pictography home. They should be allowed to tell the stories to family members in whatever language is most comfortable for them. Because storytelling relies on cognitive schemas, once established they are present in all the languages students use.

Finally, oral storytelling can be done remotely (e.g., Zoom, Teams). Teachers can use short YouTube videos, images in PowerPoint slides, or Boom! decks to prompt a virtual storytelling exchange. Teachers can start by creating (or reading a prepared story) and then have students take turns retelling it or generating a story for the whole group, as partners in breakout rooms or to a family member. The possibilities are endless. The only critical feature is that students should have many opportunities to tell and retell stories.

Wrap up

There is a clear, urgent need to address oral academic language in schools due to its integral relation to reading and writing. A focus on narratives offers a promising approach for accomplishing this. We presented oral storytelling as a versatile option for promoting academic language of diverse students and offered recommendations for getting started. Although the recommendations are supported by a solid experimental literature (Favot et al., 2020; Pico et al., 2021; Stetter & Hughes, 2010) showing the effects of monolingual and bilingual oral storytelling interventions on listening comprehension, vocabulary, personal generations,

reading comprehension and writing of students in preschool to third grade, with and without disabilities (Gillam & Gillam, 2016; Hessling & Schuele, 2020; Petersen et al., 2020, 2022; Spencer et al., 2013, 2020), the true test will be in its transportability to real-world classrooms. Teachers are invited to explore how oral storytelling activities can enhance their literacy instruction and examine the extent to which narratives bridge oral and written language.

The additive social–emotional benefits of oral storytelling should not be underestimated. Although the research base is less developed for social domains, a focus on narratives may simultaneously promote social skills and language development. We know that children who can tell stories proficiently are able to express emotions and report abuse (Fong et al., 2020). As a sense-making device, storytelling can help children understand the world and heal from trauma (McCabe, 2017). At this time when students' oral language and social–emotional development is at serious risk, an approach that can enhance students' social well-being, in addition to their academic achievement, is sorely needed.

Take action!

Guidelines for putting oral storytelling into action in your classroom:

1   Teach using retelling, then generalise to personal and fictional generations.

2   Model simple stories and increase their complexity over time.

3   Teach story grammar before complex sentences and vocabulary.

4   Use visuals, when possible, but fade them.

5   Use effective and efficient prompts to individualise.

6   Promote generative language not memorisation.

7   Extend storytelling into classroom routines and beyond the classroom.

Conflict of interest

Dr Spencer is an author of a commercialised narrative program and receives financial benefits related to its sale. Copyrighted images have been reproduced with permission. The authors did not receive funding from public, commercial or not-for-profit sectors to write this article.

More to explore

- Published narrative studies, syntheses, infographics, and video demonstrations: https://trinastoolbox.com

- Free narrative retell assessments and video demonstrations: www.languagedynamicsgroup.com

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Open-plan classrooms are trendy but there is little evidence to show they help students learn

**Anika
Stobart**

**Jordana
Hunter**

If you step into a newly built school these days, chances are you will see classrooms that look very different to the classrooms most of us spent our school years in as children.

On a recent visit to a new primary school in Melbourne, Grattan Institute's education team entered a large room that contained two classes, separated not by a wall but a wide pillar that left room for teachers and students to move between the two 'classroom' spaces.

In the first space, students were leaning forwards at their desks, concentrating on their teacher. The room was very noisy. The teacher was only metres from her students, but her voice was all but drowned out by the second 'classroom' on the other side.

This appears to be the trend in new classroom buildings around Australia.

For example, in 2017 the New South Wales Government committed to building open-plan classrooms, each for up to 120 students, at more than 100 new schools. The Victorian Government is building 'new flexible learning communities'.

What does the research say about open-plan classrooms?
Arguments in favour of open-plan classrooms use phrases such as '21st century teaching' and 'innovative design'.

The idea is to have flexible classroom spaces that can cater for large groups of students, while also allowing students to break into smaller groups, directing their own learning while receiving support from a team of teachers working collaboratively.

But there is limited evidence open-plan classrooms help learning. In 2018 the University of Melbourne published a systematic review that only found 21 relevant studies since the 1960s that evaluated the impact of educational spaces on student learning outcomes. Of these, the studies showed open-plan environments had mixed effects on academic performance.

We do know too much noise is bad for learning. A 2015 Australian study compared speech perception in traditional and open-plan kindergarten classrooms. It found that the noise coming from other classes in the open-plan setting made it more likely for students to misunderstand their teacher. The study found traditional classrooms were the only classroom type to be within, or close to, recommended noise levels.

Many open-plan learning spaces don't align with internationally recognised evidence-based strategies for high-impact teaching.

For example, explicit teaching – where the teacher explains key concepts and procedures clearly and models how to solve problems to the whole class – is difficult to do well in a noisy environment. Imagine trying to teach division of fractions to your Year 5 class while the Year 4 class on the other side of the pillar practises their Mandarin oral language presentations.

Too much noise is bad for all students

Of course, traditional classrooms can also be noisy, but a 2013 United Kingdom survey of 2,500 high school students across six schools suggested students at schools with traditional classrooms were more positive about their school acoustics than students at schools with open-plan classrooms.

Too much noise is bad news for all students. But it is particularly worrying for students who have issues with hearing, auditory processing, and other additional learning needs, such as ADHD.

This is also inconsistent with state governments' stated priorities of ensuring schools are inclusive spaces that cater for students with additional learning needs.

New classrooms should be built using evidence

State governments need to review the existing research – and seek more if needed – and ensure all new classrooms can support the learning of all students. This includes those with additional learning needs and those unlucky enough to be seated at the back of an open-plan classroom.

The New South Wales government recently promised to cease building open-plan classrooms. Other states should follow suit.

Where necessary, state governments should also provide schools with funding to fix existing open-plan classrooms so teachers can reduce noisy distractions. Teachers should not have to build their own classroom walls 'with whiteboards and shelving'.

Some state governments are spending significant funds building new schools and upgrading others in coming years. For example, Queensland is spending $2 billion on education infrastructure this year alone.

While investments in school infrastructure are, of course, welcome, the danger is that many classrooms may be built in ways that undermine effective teaching. Classroom designs should not create more work for teachers, just to make sure their students can hear them – and each other – speak.

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What has the Science of Maths Learning got to do with survival and what relevance does it have in education?

Siobhan Merlo

For a very long time now, I have been putting much thought to the questions of: *Why teach mathematics? Why is it important for people's lives? How does it help?* In my day, mathematics, like literacy, was compulsory. But in some Australian states, maths is 'optional' in Years 11 and 12. Furthermore, there is a nationwide shortage of maths teachers in Australia, with many reporting they 'lack confidence' in how to teach it. This is not to mention Australia's declining mathematics PISA results (see www.acer.org/au/timss, www.acer.org/au/pisa/key-findings-2018). Additionally, several Australian universities have stopped mandating maths as a pre-requisite for courses which had previously required it. Yet we continue to have skills shortages in related industries, which have reportedly worsened over the past few decades.

It also seems to me that mathematics became somewhat abstracted from the world in which we live. There is curriculum content to cover but it is often unclear as to how it is all connected or why we would even *want* to teach these concepts to our students. In my own experience, when doing in-class support with students, I often asked them: "Why are we doing this mathematics?" Many of them replied that they did not know. Yet, all I could think was: "But how do they *not* know? Maths is related to *everything*!" Indeed, when listening to people speak, there is barely an utterance which does not include a mathematical concept. (Even in the preceding sentence, 'barely an utterance' refers to quantity.)

This is not to downplay the extraordinary dedication of many teachers, pedagogical leaders, curriculum coordinators and developers, mathematicians, educational product designers, academics and policymakers around Australia who are working tirelessly to rectify these systemic issues. Things are beginning to change! Furthermore, there have been important developments in neuroscience relating to the development of mathematical cognition in the past 20 years, and the dawn of the Science of Maths Learning is now emerging. But why did maths recede into the background and how do we get it back? Why is mathematics important? Why is it critically relevant to our lives and at least as relevant as literacy?

The brain and survival

As humans, we exist for survival: seeking ways to minimise threats and maximise rewards. Humans have basic physical drives which include seeking air, water, food, shelter and sex; and avoiding pain and physical injury. Furthermore, as our survival is largely dependent on our acceptance within the group, social acceptance and the avoidance of emotional harm are also very strong human drives.

The brain is constantly calibrating external/environmental and internal factors to determine: *What do I want/ need to go towards (reward)? What do I want/need to go away from (threat)?*

Senses detect incoming information (e.g., the smell of fresh bread). The amygdala in the limbic system evaluates the emotional importance of the incoming sensory information, based on whether the stimulus is beneficial or deleterious for our survival. The pre-frontal cortex works with the amygdala to elicit an action plan in response to the stimulus (e.g., eat the bread), or to fight, freeze or flee. Then, neurotransmitters are released (e.g., dopamine creates feelings of satisfaction and pleasure in the case of the fresh bread). As a result of the neurotransmitter response, memories are recorded in the brain (hippocampus) about whether experiences have been rewarding or dangerous, allowing us to optimise favourable circumstances and avoid dangers in the future (*greater control*). Hence, a sense of control is another significant human drive.

How well we are doing at 'surviving', and its connection with mathematics
'Mastery' is an element of 'control' and is therefore implicated in the drive for survival. This is arguably why the brain is particularly attuned to whether the outcome of an action is positive or negative (correct or incorrect – ring a bell?), and why competency in mathematics goes to the heart of our perceptions of ourselves.

Anxiety results when the brain perceives a threat or potentially threatening situation which one is *unable to control* – for example, maths tasks in class which I do not understand and perceive I will fail at, based on past experiences of failure or perceived failure (maths anxiety).

Competence in maths also has social and physical elements. Feelings of social isolation may be elicited when it is perceived that others are competent, and I am not. Indeed, some students may sideline other students who they perceive as 'not smart' because of their difficulty with maths, thus, threatening that individual's sense of belonging to the group (social acceptance). Furthermore, as emotional pain is registered as physical pain in the brain, maths anxiety also has physical impacts.

In other words, it is plausible that our competence in mathematics is strongly connected with the story we tell ourselves about how well we are doing at 'surviving'. It is therefore little wonder that repeated failure in mathematics may have a devastating impact on our life trajectory. In school, this might look like anxiety, learned helplessness and poor self-concept, social isolation, behavioural implications, school refusal, leaving school early and school detachment. In transition to adulthood and adulthood, it often translates into difficulty maintaining employment, unemployment, not venturing into further study, low income, mental health problems, poor financial decision making, never owning one's own home, and in the direst of circumstances, incarceration.

Why teaching mathematics helps children 'survive' and develop a sense of control and competence
Mathematics education equips children with important skills and knowledge

Anxiety results when the brain perceives a threat or potentially threatening situation which one is unable to control – for example, maths tasks in class which I do not understand and perceive I will fail at, based on past experiences of failure or perceived failure (maths anxiety).

they need to survive, including critical-thinking skills and logic to make astute decisions. Their ability to solve problems effectively enables them to optimise favourable circumstances and minimise unfavourable ones throughout their lives. Importantly, to get where they need to go and avoid what they don't want, they need to be competent in the socially agreed upon mathematical conventions by which to communicate in their interactions with others. Society uses multiple means to do so, including via language (e.g., describing properties of objects, where and how they are positioned, and how to get somewhere), the use of visual representations (e.g., clocks for time, maps for location, graphs and diagrams), symbolically or abstractly (e.g., numbers to represent size/how much/how many), and artefacts (e.g., money). These multiple modes of communication and interaction form the foundation of our mathematics curriculum and are useful tools in the toolbox which children can leverage when faced with more abstract problems to solve or important decisions to make. Equipping children in these ways gives them agency in their lives.

Although by no means exhaustive, here are some questions which link aspects of the maths curriculum to the relevance for survival:

Properties of objects

- What is it? Is it the same or different to something I have sensed before? Is it dangerous or could it be useful?

- How do I know it is what I think it is? Does it move or is it inanimate?

- What does it look like from different angles to confirm or disconfirm my hypotheses? (mental rotation/perspective)

- What can I do with it? Can it help me to get what I want or need? (tools)

- Can I manipulate it or combine it with something else to create something useful or rewarding? (mental rotation/composing/decomposing)

- How can I represent my understanding of properties of objects pictorially/diagrammatically to others? (visuo-spatial communication)

- How can I describe its properties to somebody else? (verbal communication)

Magnitude/number

- How big is it? Is it something I want (e.g., a big piece of cake), or something I want to get away from (e.g., a big dog)?

- How much is there? Is it something I want more of or need (e.g., fresh air), or something I want or need less of (e.g., too much rain)?

- How many are there? Are they something I want to go towards (e.g., family/friends), or get away from (e.g., traffic)?

- How do I describe how much/how many to others?

- How hungry am I?

- How tired am I?

- How sick am I?

- How heavy is it?

Importantly, to get where they need to go and avoid what they don't want, they need to be competent in the socially agreed upon mathematical conventions by which to communicate in their interactions with others.

- How can I represent my understanding of magnitude pictorially, symbolically or verbally?

Location/position
- Where am I?

- Where do I want to go to?

- Where is it?

- How can I represent my understanding of location/position pictorially? (visuo-spatial communication, e.g., maps, coordinates)

- How can I explain to somebody else where I am/it is? (verbal communication)

Movement
- How do I get to what I want or need? How do I get away from something I don't want or need?

- Is it something that moves? (distinction between animate and inanimate objects)

- Is it moving?

- Can it come to me? If so, what can I do to make that happen (e.g., Mum bringing lunch to school because I forgot it)? What can I do to get away from it (e.g., snake)?

- How do I catch it/use it/stop it?

Direction
- What route will I take? Which way is it?

- How can I explain to somebody else how to get there?

- What direction is one object from another?

- What are possible obstacles? How do I get around them?

- How can I represent my understanding of direction pictorially? (visuo-spatial communication, e.g., maps, coordinates)

- How can I explain the direction I am going to, or coming from, to others? (verbal communication)

- Is it up/down, backwards/forwards, left/right, north/south/east/west? (navigation)

Proximity/distance/length
- How far is it? (mapping and scaling)

- How can I represent my understanding of proximity/distance/length pictorially? (visuo-spatial communication)

- How can I explain to somebody else how far away it is? (verbal communication)

Speed
- How fast will I travel?

- How fast is it/are they travelling?

- Is it/are they travelling faster than me?

- How can I explain to somebody else how fast I am/it is/they are travelling?

Time
- What time is it? When do I have to be there?

- How long will it take to get there?

- Which way is quicker/slower?

- How can I represent my understanding of time pictorially? (visuo-spatial communication)

- What can I say to somebody else about what time it is or how long it will take? (verbal communication)

Money
- Will I have enough money to cover my essential costs (e.g., food and bills)?

- How much do I need to earn so that my earnings exceed my spending?

- How much will it cost to buy something rewarding (e.g., new console)? How much pocket money do I need to save each week to get it in 10 weeks?

- Can I afford it?

- Which interest rate is better?

- What jobs earn a good income?

- How do I negotiate a pay rise?

- How can I communicate about money? (symbolic/verbal communication)

Chance and data
- How likely is a certain outcome? (probability)

- How can I work this out? (analysis)

- What additional data can I collect to inform my decision? (data)

- Is it worth the risk? Costs? Benefits? (analytical decision-making)

- How can I represent this pictorially? (visuo-spatial communication, e.g., graphs)

- How can I explain my reasoning? (verbal communication)

Conclusion

So, what has mathematics education got to do with life? The answer is – just about everything! As the Science of Maths Learning is emerging, it is interesting to reflect on how connected the content of our curriculum is aligned with our biology. Children need to build the foundational skills necessary and be versed in the mathematical conventions to communicate and interact with others, so that they can use critical thinking and logic to make astute decisions and solve increasingly complex problems. In these ways, they are able to optimise favourable experiences and minimise negative outcomes. Thus, mathematics is not only relevant, but it also gifts children with agency in their lives and is essential for survival.

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Are SEND children different?

**Monique
Nowers**

It's a truism in education to say that all children are different, and of course they are. Each child is a precious, unique individual with their own set of characteristics, experiences and perspectives.

At the same time, we are also hard-wired to notice difference. When we meet someone for the first time, we don't think about the myriad ways that they are the *same* as everyone else; we are *drawn* to the differences. This is exaggerated when the person is an outlier in some way – very tall, short etc. – and, in education that attention falls on our pupils with special educational needs and disabilities (SEND).

What is so often lost, however, and what many involved in education often fail to appreciate, or account for, is the extent to which all children are inherently the same. In fact, *all* children are, in almost every way that we can think of that relates to school and learning, far more similar than they are different. Unfortunately, the consequences of such distorted thinking (i.e. the exaggeration of difference) are significant, and it's our most disadvantaged, framed as 'different', pupils who are the most negatively affected.

In schools, "all children are different" is often phrased as "children learn in different ways". This is well-meaning; however, it is hard to think of a more pernicious idea in education.

Fundamentally, all children learn in the same way. What *is* different for each child are the barriers they may face to accessing that learning *as presented to them*. This might seem a small, even meaningless distinction. However, in reality, the implications are huge. To understand why, we will need to bear several concepts in mind.

First, all traits/characteristics, from height and weight to working memory and processing speed, for example, occur on a continuum and relative strengths and weaknesses are normally distributed as per the bell-shaped probability curve (Figure 1, opposite).

As mentioned, we tend to notice the outliers. For example, a teacher may be aware of the tallest/shortest children in a class but may not notice (in terms of height) the children who are only relatively tall/short. The children all have more or less of the quality that makes them tall/short, but we usually only notice the extremes.

Second, it is important to note that this idea of trait continuums includes learning difficulties. For example, dyslexia: children who struggle to learn to read are *not qualitatively different* from those who find it easy, they just have less/more of whichever cognitive traits facilitate learning to read. The same goes for other traits, for example, executive function, working memory, processing speed, organisation skills and so on.

A related, yet less obvious, corollary is that for every child in your class who has, for example, such poor working memory that we *notice* their difficulty, there will likely be several more who are struggling nearly as much
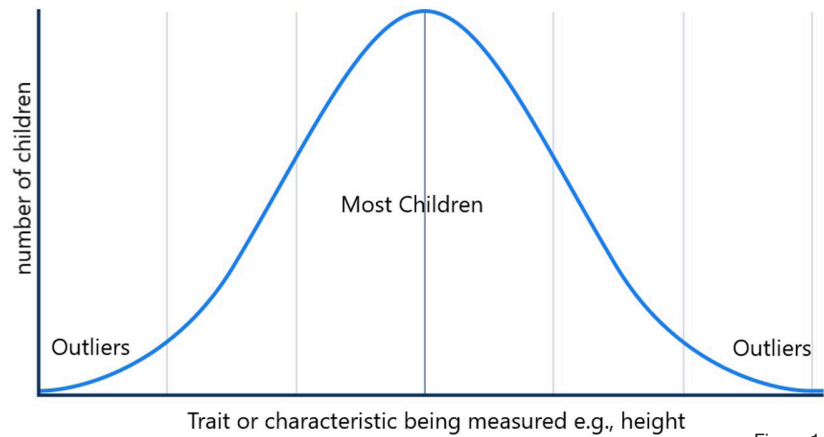
Figure 1

Vulnerability to Imperfect Teaching

Least able to learn in the face of imperfect teaching

Most able to learn despite imperfect teaching

Figure 2

as that one child but who haven't come to your attention. We will come back to this later.

The next part uses terminology that some may instinctively dislike. It is not my intention to upset or provoke, however, so a little kind forbearance on your part may be required.

I find it most useful to consider all learning-related traits as amalgamated into one continuum, which I think of as a 'vulnerability to imperfect teaching' or the 'ability to learn despite imperfect teaching'. This owes much to Siegfried Engelmann who used the term 'faultless' teaching. Please don't overthink either word. Of course, I understand that few – if any – things in this world could be described as perfect or faultless, that beauty often lies in imperfection and that for some a tendency towards perfectionism can be utterly disabling. It is just the word that most accurately and thus usefully captures my meaning here. Neither should you think that it blames teachers; there are many reasons out of the control of the individual teacher as to why teaching may be ineffective or 'imperfect'. The idea is simply to allow that any teaching can be made better or more effective.

Fundamentally, in fact, the idea is an incredibly positive one for both children and teachers, i.e., that all children can learn and that all can be taught. The pivotal issue is that they all have more/less of whatever qualities enable a child to learn in the absence of perfectly clear, specific and unambiguous instruction. So, what is different for each child isn't how they learn but the barriers they may face to accessing that learning *as presented to them*. This might seem a
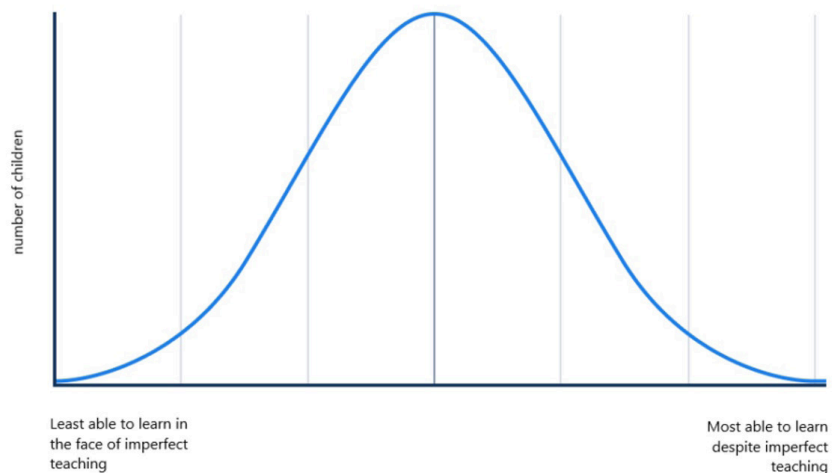
small, even meaningless, distinction. However the implications are huge (Figure 2, above).

The key point of this continuum is that those at the extreme left, the least able to learn in the face of imperfect teaching, do not need to learn something different, nor do they learn differently. What they need is for whatever is being taught to be taught 'better' (i.e., more faultlessly or perfectly).

In practice, teaching more effectively usually means:

1 breaking content down into more attainable steps

2 presenting each step clearly and unambiguously

3 giving sufficient time and practice to each child.

A graphic posted by Dan Willingham (Figure 3, next page) neatly illustrates the concept (like Dan before me, I have tried to identify the original artist but to no avail).

Again, we are back to using height as an example. The rungs need to be accessible to all who need to use the

So, what is different for each child isn't how they learn but the barriers they may face to accessing that learning as presented to them. This might seem a small, even meaningless, distinction. However the implications are huge.
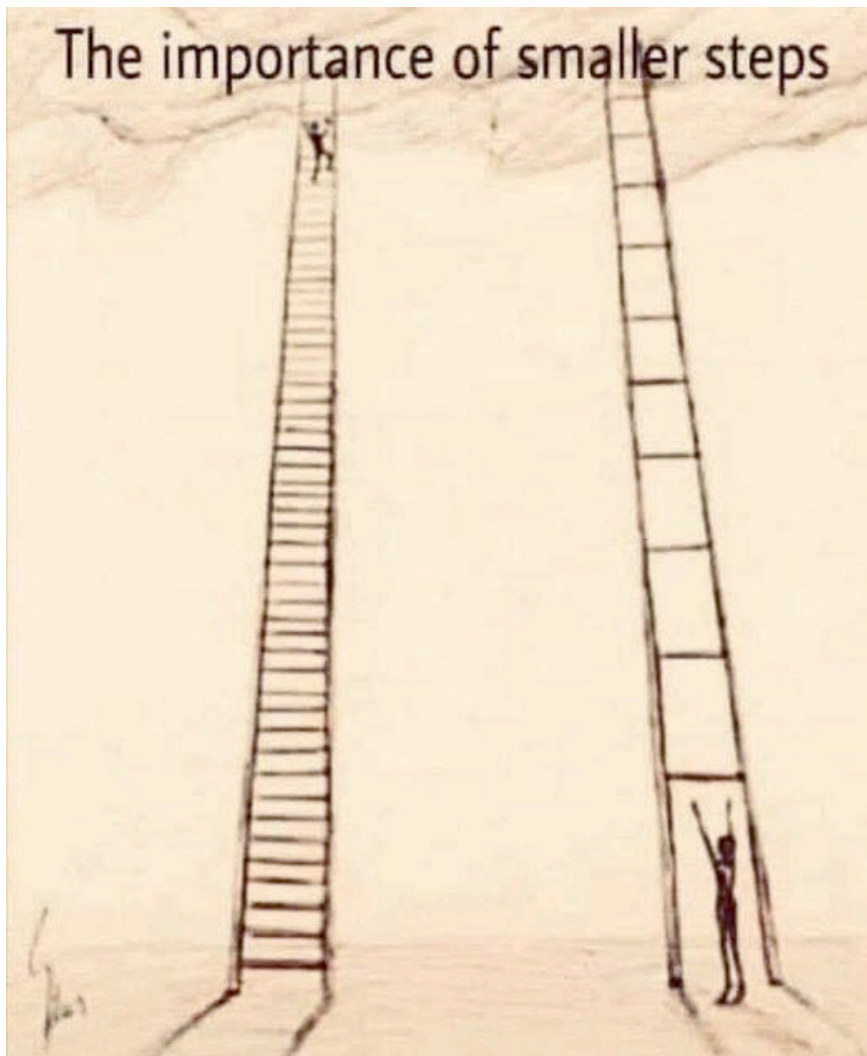
The importance of smaller steps

Figure 3

ladder. Space them too far apart and we will exclude people. Spacing them closer together might take more work and resources, but the ladder is then accessible to everyone. The people who could manage the large gaps are not disadvantaged, indeed many who might have coped with larger gaps will likely make faster, surer progress.

If we apply this ladder analogy to the continuum (Figure 4), we can see that the most vulnerable need smaller steps while the least vulnerable can *cope* with larger gaps. It is important to note that the 'more able' do not *need* the larger gaps, it is simply that they can manage

despite them.

What this means is that when a child doesn't understand, the responsibility is placed on the teaching and not the child. This way of thinking comes naturally to me, but my perspective as a tutor plays into that. If my pupil doesn't understand something, I interpret that as my having failed to teach it effectively. I may have misjudged their grasp of any required prior learning for example, or not worked through enough examples, or not broken it down sufficiently, etc.

In a classroom situation, however, the dynamic is quite different. If one teaches something to a class of 30 and

it seems that at least 27 children 'got it' then it is easy to see why one might be tempted, even if only unconsciously, to see the reason for the three (or even two or just one) not understanding as lying with them. This is problem number one.

Problem two is that while one might think 27 or 28 out of 30 ain't bad, for every child that the teacher realises didn't understand something, the bell curve strongly suggests there may be 2 or 3 more who also didn't understand but somehow evaded notice, several more who barely grasped it and perhaps many who broadly got it but with misconceptions that will cause problems later.

The good news is, however, just as we teach our pupils to learn from their 'mistakes', understanding what prevented each child from learning is *our* opportunity to learn how to make our teaching more inclusive, more 'faultless' and better for everyone. To illustrate, if we think back to my example of noticing a child having poor working memory, any improvements we make to our teaching to accommodate the needs of that child will also benefit many others in the class. If you read anything by Siegfried Engelmann you will discover that the incredibly successful and inclusive curriculums he and his colleagues wrote were honed through wide testing and learning from failure. If lessons failed to teach *all* children, they were redesigned in light of that failure to become more inclusive.

In the UK context, if we see all children, particularly those with SEN, as 'learning differently' we might not appreciate the full, positive impact of adopting a Quality First Teaching (QFT) approach, for example. Instead, we might see the demands of QFT as an unwelcome, added burden just to accommodate one child that we

Most vulnerable to imperfect teaching

Least vulnerable to imperfect teaching

Need smaller steps to access learning

Can manage with larger steps/cope with gaps

Figure 4

probably don't feel equipped to help. Multiply that perceived burden by several children and we can appreciate why teachers feel overwhelmed. This is a great shame as this means that teachers are less likely to make the changes that would not only benefit that child and their peers but, should they learn from and maintain them, also benefit future pupils.

As an example, let's apply this concept to the teaching of reading, in particular decoding. Teaching phonic knowledge in a clear and systematic way is merely putting in the smaller steps that were previously missing in a whole language/balanced literacy approach, i.e., moving to the left on my continuum. Mainstream programs will try to pick a 'sweet spot', towards the left of the continuum with as many steps and as much repetition as needed by most children. What then of the children who are still struggling? Should they learn something different? No, they just need even better teaching and/ or more time and practice. This might 'look' different and consist of different activities not needed by the majority. However, the content and purpose remain the same.

For example, some aspects of Ann Sullivan's excellent *Phonics for Pupils with Special Educational Needs* program (designed with the needs of special school pupils in mind) might look quite different to the phonics program used in mainstream schools. In reality, however, the goals and the content are the same, it is simply that Ann has broken everything down into the even smaller steps required by some of the pupils in special schools, the extreme outliers on the left of my continuum. They might be completely nonverbal for example, but they are not learning something different or in a different way – they are learning the same thing in the same way just in smaller, even clearer steps.

Some of you may be persuaded and might even think this is obvious. Sadly, however, the way of thinking I present here is radically different to the status quo in most education systems. We need only consider a 2021 comment from a representative of a balanced-literacy/whole-word publishing giant who, upset at increasing demands for

children to be taught reading more explicitly, publicly complained that she was 'very sad that we've turned the entire education system upside down for 20% of the kids'. Imagine being comfortable with, in effect, writing off 20% of all children. And I don't mean just the individual who wrote this; she was merely articulating the implicit, accepted outcome of most approaches to teaching and education more widely.

When we place too much emphasis on differences (even with the best of intentions), we also risk lowering expectations and limiting potential outcomes. It's simply a fact of life that some children will encounter greater difficulty achieving certain objectives than others. The problem is that the attainment of certain goals, such as functional literacy, can significantly impact a child's entire life experience, and we must be careful not to diminish their motivation or our expectation for them to succeed. By labelling certain children as 'different' and failing to recognise or acknowledge the extent to which they *can* be included, we marginalise them and compromise their future prospects.

This doesn't mean that we shouldn't be making accommodations for SEN children, *quite the opposite*. But these accommodations should be about smaller steps in, and improved teaching of, the same curriculum *or* making adaptations to the environment so that the child can access the teaching. For example, if we aren't able (for whatever reason) to keep the classroom environment quiet and calm enough for a noise-sensitive pupil to tolerate, then we may need to make some other accommodation for that (such as allowing noise-cancelling headphones, etc).

Ultimately the point is this: when we misconceive children with SEN as being *qualitatively* different in terms of learning, we risk making decisions that will not only limit the educational opportunities/outcomes for *that* child but will limit our opportunity to improve learning/outcomes for every other child that we teach.

Perversely, one reason that people reject the notion that children are more

What then of the children who are still struggling? Should they learn something different? No, they just need even better teaching and/or more time and practice. This might 'look' different and consist of different activities not needed by the majority. However, the content and purpose remain the same.

similar than different is that they think this idea means advocating teaching in a way that only suits the most able. They couldn't be more wrong. In fact, I believe that the notion that we should try to teach to each child's perceived individual differences helps perpetuate an educational system in which only the most able flourish.

SEN children are the canaries in the coal mine of the education system, succumbing not to foul air, but instead are the first casualties of less-than-optimal teaching. How many canaries are we prepared to continue to lose?

This article originally appeared on the author's blog, How to Teach Reading.

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The Royal Australian and New Zealand College of Ophthalmologists (RANZCO) Position Statement: The myth of a 'tracking' disorder in children with reading difficulties

1. Purpose

This position statement was developed by The Royal Australian and New Zealand College of Ophthalmologists (RANZCO). The purpose of the statement is to educate the public on reading difficulties in children with learning disabilities and specifically the lack of evidence to support eye movement problems being important causes of reading difficulties.

2. Background

It is well-accepted among health and education professionals that disorders in children that affect their ability to read and comprehend are a major obstacle to learning, which may have long-term educational, social, and economic consequences (AAP, AAPOS, AACO & AAO Hoskins Center for Quality Eye Care, 2014). Difficulty learning to read is commonly called dyslexia and is one of the 'specific learning disorders' (American Psychiatric Association, DSM-5 Task Force, 2013). Specific learning disorders are defined in the Diagnostic and Statistical Manual of Mental Disorders: DSM-5 as persistent difficulty learning key academic skills that lag significantly behind age expectations and are not explained by other cognitive impairment (American Psychiatric Association, DSM-5 Task Force, 2013). These difficulties may include "reading of single words accurately and fluently, reading comprehension, written expression and spelling, arithmetic calculation, and mathematical reasoning (solving mathematical problems)" (American Psychiatric Association, DSM-5 Task Force, 2013). Specific learning disorders are considered to be biologic in origin and result from the "interaction of genetic, epigenetic, and environmental factors, which affect the brain's ability to perceive or process verbal or nonverbal information efficiently and accurately" (American Psychiatric Association, DSM-5 Task Force, 2013).

There is strong scientific evidence that dyslexia is explained by the phonological coding deficit theory, a language-based disorder in which individuals have difficulty recognising how the sound segments which make up words (phonemes) correlate to the written symbols of those sounds (graphemes) i.e. sound to letter correspondence (Peterson & Pennington, 2012; Ramus et al., 2003; Shaywitz, 1996, 1998; Vellutino et al., 2004). It is a neurobiological disorder, characterised by changes primarily in the language areas of the left hemisphere in the brain, confirmed on MRI studies (Al Dahhan et al., 2020;

Démonet et al., 2004; Handler et al., 2011; Olitsky & Nelson, 2003; Vellutino et al., 2004). In a small subset of cases of dyslexia, a defect in timing visual events and controlling eye movements when reading known as the Magnocellular Deficit theory has been proposed (Stein & Walsh, 1997). This theory remains controversial. Studies not supporting this theory have found dyslexic readers have the same smooth pursuit and saccadic eye movements as non-dyslexic individuals when tested with non-verbal tasks rather than with reading (Bucci et al., 2009; Handler et al., 2011; Hutzler et al., 2006). Moreover, individuals who are born with eye movement disorders whereby the eyes are unable to move horizontally do not have a higher incidence of dyslexia (Hodgetts et al., 1998). Similarly, for acquired eye movement disorders, such as a nerve palsy affecting the movement of the eyes, dyslexia is not associated (Rucker & Phillips, 2018).

3. Eye movements and reading

Children with reading difficulties are sometimes thought to have an eye 'tracking' problem, but this is not the case (Brown et al., 1983). Slow 'tracking' or smooth pursuit eye movements are movements that occur as our eyes follow a moving target in space. It is well established that we do not read with these pursuit 'tracking' eye movements, but with horizontal rapid, high-velocity, small jumping eye movements known as saccades (Rayner, 1998). As such, abnormal 'tracking' is not relevant to reading.

A typical reading pattern comprises around 85% forward saccades, or jumps, across the page, with the length of the saccades dependent on the difficulty of text, while fixation pauses account for around 80–90% of the time. During the fixation pauses the words are decoded and processed allowing the brain to recognise the words. In addition, around 15% backward (regression) saccades

are used to verify the text that has been processed (Rayner, 1998).

A child with reading difficulties, including dyslexia, typically has eye movements consistent with a beginner reader or an adult reader reading difficult text (Handler et al., 2011; Olitsky & Nelson, 2003; Rayner, 1998). These include shorter forward saccades, increased fixation pauses of longer duration to decode individual words, and more backward saccades to verify and confirm what is written (Olitsky & Nelson, 2003; Rayner, 1998; Vagge et al., 2015). These eye movements are not abnormal and not unique to children with reading difficulties or dyslexia and have been shown to be normal when content is corrected for reading level (Olitsky & Nelson, 2003).

Children with dyslexia are often noted by teachers to lose their place or skip lines when reading. This has been found to relate to difficulty decoding letters or words as a consequence of their reading disorder rather than a visual problem or 'tracking abnormality' (Olitsky & Nelson, 2003; Peterson & Pennington, 2012; Rayner, 1998; Medland et al., 2010).

It is well established that there is no clear scientific evidence to support the use of eye movement exercises to improve 'tracking' eye movements in children with dyslexia (Rawstron et al., 2005). Such treatments are not recommended and detract from evidence-based treatments.

4. Recommendations

Children with suspected dyslexia or learning disabilities should be referred early for an educational assessment to a qualified practitioner, such as an educational psychologist, and may require medical assessment by a paediatrician or an eye examination by an ophthalmologist.

Once dyslexia is diagnosed, children should receive evidence-based educational interventions such as an individualised remedial reading program

designed to give direct, explicit, repetitive instruction in the areas of phonics, phoneme awareness, vocabulary, fluency and comprehension (National Reading Panel & National Institute of Child Health and Human Development, 2005; Rose, 2006; Rowe, 2005). As has been previously noted, "if the goal is improved reading or math, teach reading or math" (Fletcher & Currie, 2011).

Treatments such as eye muscle exercises and vision therapies to treat 'tracking disorders' lack supporting scientific evidence are not endorsed or recommended (AAP, AAPOS, AACO & AAO Hoskins Center for Quality Eye Care, 2014; Handler et al., 2011).

This position statement originally appeared on the RANZCO website.

The Royal Australian and New Zealand College of Ophthalmologists (RANZCO) is the medical college responsible for the training and professional development of ophthalmologists in Australia and New Zealand. This includes maintaining a Continuing Professional Development (CPD) system, a Vocational Training Program (VTP), organising scientific congresses and meetings and much more.

Book review
The Science of Reading: A handbook

Jennifer Buckingham

Snowling, M. J., Hulme, C., & Nation, K. (Eds.) (2022). *The Science of Reading: A handbook*. Wiley Blackwell.

The term 'Science of Reading' seems ubiquitous now, but when the first edition of *The Science of Reading: A handbook* (Snowling & Hulme, Eds.) was published in 2005, the term was seen relatively rarely outside of academia. It has now come to be shorthand for a set of research findings that are used to define and describe evidence-based practice, but this book is an insight into the real Science of Reading.

The Science of Reading: A handbook has 24 chapters organised in six parts: Word recognition, Learning to read and spell, Reading comprehension, Reading in different languages, Disorders of reading, and Biological and social correlates of reading. Chapters are written by some big-name researchers, including Anne Castles, Kate Nation, Kathleen Rastle, Mark Seidenberg, Kate Cain, Arne Lerväg, Monica Melby-Lerväg, Charles Perfetti, Rebecca Treiman, Donald Compton and Robert Savage. Other contributions are by researchers who are not household names among SoR enthusiasts but nonetheless have made serious and significant contributions to the literature.

I enjoyed the chapter by Paul van den Broek and Panyiota Kendeou in which they propose a 'Comprehensive Model of Discourse Comprehension'. Their chapter describes various frameworks that have been proposed over the past 90 years for the way in which mental models are created in order to comprehend text. They explain the difference between passive processes and active processes in reading comprehension and how they lie on a continuum of closeness to – and distance from – the text. For example, a simple reader-initiative (active) process that is close to the text is re-reading a sentence, whereas making inferences using background knowledge would be a process that is distant from the text itself.

A sizeable proportion of the book is devoted to word reading and spelling, and the cognitive processes that are taking place as phonological and orthographic information is synthesised. The level of detail is phenomenal. Some seems, at this stage, to be purely for the sake of intellectual inquiry, and there's always a place for that. But there are also chapters that describe the implications for this research for instruction, and the gaps in evidence that limit application.

It's impossible to summarise this book in a few hundred words in a way that does justice to its contents. But I can tell you this much: there's nothing in there that supports play-based learning when it comes to reading, so don't bother looking!

If you are relatively new to the scientific research on reading, this is not the first book you should read. It's probably not even the second book. But if you want an in-depth exploration of the incredible precision and complexity of the body of research known as the Science of Reading, written and edited by some of the very best researchers in the field, this book is worth having on your shelf.
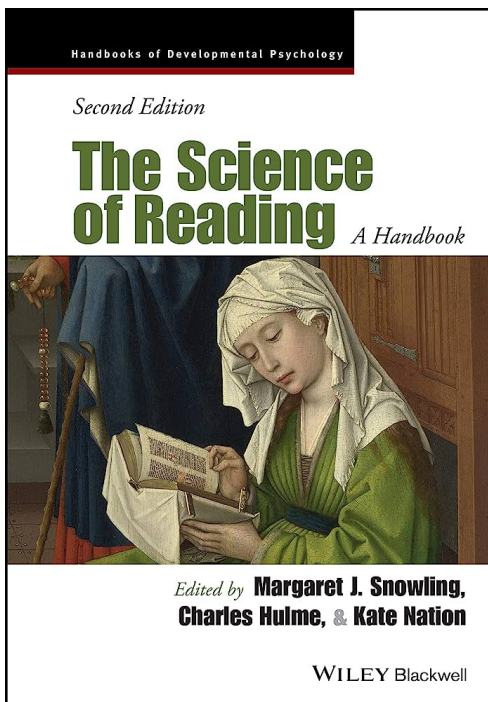
Dr Jennifer Buckingham [@buckingham_j on Twitter] is Director of Strategy and Senior Research Fellow at MultiLit.

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Nomanis Notes

Is the use of response cards an effective strategy?

Ernica Noel and Coralie Driscoll

Statement of the problem

The frequency of active student engagement and responding can be linked to academic achievement and level of disruptive behaviour. There is also a need for specific feedback to students on their performance. Low levels of student engagement and responding have been observed during group instruction in classrooms.

Proposed solution/intervention

Response cards can be used to increase learning and reduce disruptive classroom behaviour. A key feature of the strategy is the use of pre-printed cards or dry-erase boards to enable all students to give short (e.g., one-or two-word) answers to questions posed by the teacher. Pre-printed responses such as "yes", "no", "true", "false" or a word with a picture prompt could be placed on sheets of paper which the student will hold up or could be attached to display boards with Velcro. Alternatively, blank laminated sheets or small whiteboards could be given to students to write their answers (e.g., a letter) and subsequently hold up. While there can be some variation, the procedure usually adheres to the following basic steps: (1) teacher poses a question, (2) a few seconds are given to allow students to prepare and hold up their answers, and (3) the teacher briefly scans the responses and provides appropriate corrective feedback. Brief training in the use of the strategy is needed prior to use.

The theoretical rationale

It is claimed that actively preparing answers may be incompatible with some forms of disruptive behaviour (e.g., hitting). More time spent on-task can increase learning and decrease off-task behaviour. In addition, the teacher can use response cards as a quick indicator for measuring whether learning has taken place and if needed, appropriate feedback can be provided or teaching can be instantly adjusted.

What does the research say? What is the evidence for its efficacy?

Researchers report that using response cards is superior to other methods of active responding (hand-raising and choral responding) for enhancing academic performance and reducing disruptive behaviour. The strategy has been implemented across various classroom settings (regular and support classes), age groups, abilities, content areas (e.g., learning vocabulary, mathematics) and positions within a lesson (e.g., at the beginning, at the end). There is also limited evidence demonstrating a maintenance effect (i.e., remembering content over time).

Conclusion

The use of response cards is an effective, cost-effective strategy to increase opportunities for active student responding. Research supports its positive effect on academic achievement.

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Wheldall Sentence Comprehension Screener
WSCS

Language comprehension is foundational to the understanding of written text. It is also important in its own right, as language difficulties can limit classroom and social participation.
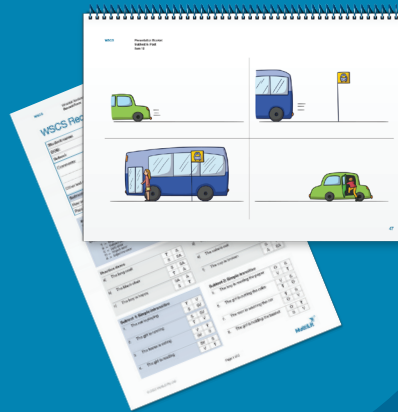
The WSCS is a new test designed to identify young children who may benefit from targeted language comprehension assessment and support. It takes approximately 5–10 minutes to complete, and is simple to administer.

Wheldall Assessment of Reading Nonwords
WARN

For beginners, reading depends largely on how well they can decode unfamiliar words. However, there are few tests that measure phonological recoding – or nonword reading – satisfactorily in the early years, and far fewer that measure fluency and allow for regular monitoring.

The WARN is brief and straightforward to administer and score, timed so that it measures reading fluency, and associated with valid and reliable Australian performance benchmarks.

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