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# Bulletin


## Special Issue: Thinking about Learning

**THE BULLETIN**

The Bulletin is published three times a year. For information about submitting articles, and for requests to reprint articles, please contact the editor: *bulletin.editor@ldaustralia.org*.

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# From the President

**Lorraine Hammond**

My LDA President's Report, written at the end of a very complicated 2020, is a simple offering: A practical note that reports on how one teacher, working in an interesting and very challenging context, documented the results achieved in a Foundation (first year of formal schooling) class as she embarked on an explicit instruction approach to early literacy. I'm sure the note will ring a bell with readers, and will give us all food for thought.

By way of background: For the last three years I have led professional development and instructional coaching in the Kimberley Schools Project in Western Australia (*https://kdc.wa.gov.au/the-kimberley/kimberley-schools-project/*). I work with 23 schools and hundreds of staff from socially disadvantaged schools with students who often speak English as a second language/dialect and record some of the poorest attendance rates in the nation. The Kimberley Schools Project privileges explicit instruction.

Two years ago I started at Halls Creek District High School, at the same time one of my graduates took up the challenge to head to this part of the Kimberley. She had completed two units with me on explicit and Direct Instruction and strategies to support students with learning difficulties and learning disabilities.

Our Kimberley Schools Project team documented that each day my former student was teaching phonological awareness and systematic decoding instruction to her Foundation class. This lesson takes about 45 minutes and includes a fast-paced review of previously learned material such as phoneme segmentation and letter sound knowledge as well as decoding words, non-words, irregular words and passages of text. This segment of the lesson is referred to as the 'Daily Review'.

We use DIBELS (Dynamic Indicators of Basic Literacy Skills), which is a free resource with an excellent research base (*https://dibels.uoregon.edu/*), to monitor student achievement. We administered the formative assessment five times during the year. I'll report here the scores achieved by this Foundation class on one of the DIBELS subtests: the Phoneme Segmentation Fluency (PSF) test. Phoneme segmentation is a critical precursor skill for encoding (spelling) and decoding (reading) words. The PSF test requires students to segment words into phonemes (e.g., shout = /sh/ /ow/ /t/), and the score is the number of phonemes correctly segmented in one minute. More information about the PSF test is provided here: *https://dibels.uoregon.edu/assessment/dibels/measures/psf.php* .

The PSF test was administered to this class five times during the year: in Term 1 Week 3, Term 2 Weeks 3 and 9, and Term 3 Weeks 3 and 9.

Table 1 summarises the final assessment – the Term 3 Week 9 PSF results – for the 21 students who remained in the class for the year, categorising the children in terms of the risk factor cut-offs included in the DIBELS norms for PSF. Over half of the students in the class were well clear of the 'at-risk' cut-off in the skill of phoneme segmentation by the end of three terms in their first year of schooling.

Figure 1 on the following page tells the story much more clearly, however. The columns indicate the PSF scores at each testing time for each of these 21 students. The first thing to notice is the steady and very impressive gains shown over the year by almost all the students. They started at a very low level; bringing them to this point represents a considerable achievement. The second thing to notice in the chart is the attendance factor, which is reflected in the fact that all the low scores were achieved by students who were simply not present for all the testing occasions (the reasons for non-attendance are not documented here). It was only the students who were actually in class during the year who made strong gains – which suggests strongly that these critical precursor skills do not develop without explicit teaching.

Overall, this Foundation class was identified by the team as achieving outstanding early literacy results through formative assessment data gathered by DIBELS testing. The Daily Review aspect of the teaching routine was judged to be particularly effective. It quickly became apparent that the 'little and often' daily reminders of literacy precursors were having a significant impact on student achievement in reading.

For schools in the Kimberley, and schools I work with in Perth and other parts of Australia, the Daily Review provides multiple opportunities for practice and reduces the load on working memory to identify letter sounds and apply these to decoding and encoding words. Kirschner, Sweller and Clarke (2006), argue that "The aim of all instruction is to alter long-term memory. If nothing has changed to long-term memory, nothing has been learned" (2006, p. 77). Helping students to remember the many unnatural skills required to learn to read, irrespective of their oral language competency, is critical.

| DIBELS norms: Risk Status | PSF Score range corresponding to first year of schooling, Term 3 Week 9 | Number of students (%) (n= 21) |
|---|---|---|
| No risk | 44 and over | 11 (52.38%) |
| Some risk | 16-43 | 5 (23.81%) |
| Severe risk | Less than 16 | 5 (23.81%) |

Table 1. DIBELS Phoneme Segmentation Fluency 'risk' status for 21 students in the Halls Creek District High School Foundation Class at the end of Term 3

No one claims that it is easy to achieve success when education is delivered in disadvantaged communities. But we are quite sure that we can claim that it is worth using evidence-based teaching practices as we keep trying!

I wish all LDA members and readers happy and successful teaching experiences in 2021.

## Reference

Kirschner, P., Sweller. J. & Clarke, R.E. (2006). Why minimal guidance during instruction does not work: An analysis of the failure of constructivist, discovery, problem based, experiential, and inquiry based teaching. *Educational Psychologist, 41*, (2), 75-86.

*LDA's President, Dr Lorraine Hammond AM, is an Associate Professor at the School of Education at Edith Cowan University.*

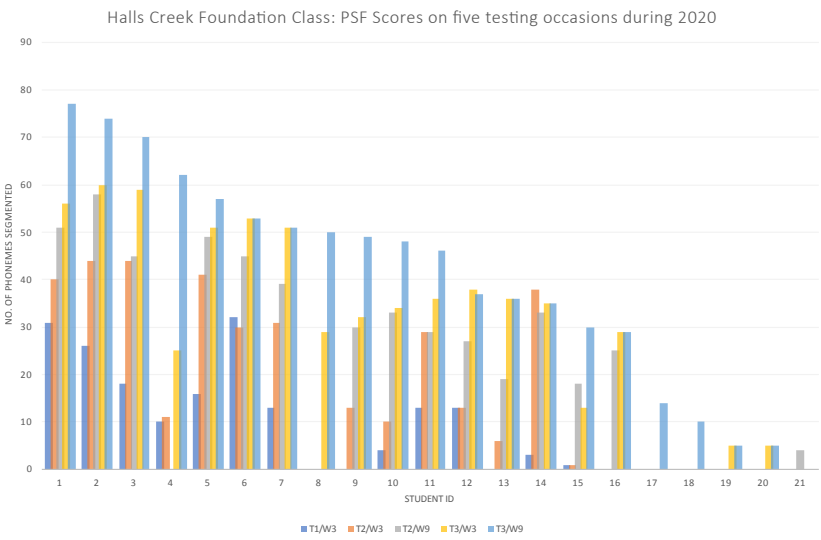



Figure 1: PSF Scores on five testing occasions during 2020. (Note: T1/W3 refers to Term 1 Week 3, etc.). Not all students were present for all testing occasions.

# Report from the General Manager

**Michael Roberts**, General Manager of LDA

As we all know 2020 quickly became a year like no other, and many of our plans for 2020 failed to materialise. Nevertheless, through the lessons learned and the new opportunities created, some progress has been made, and we look forward to a better year in 2021.

Below is a brief summary of the progress made in 2020 against the four priorities that had been set.

## Priority 1: Expand LDA's membership base and profile

The plan to increase our membership base has not eventuated. Our membership numbers are largely stable at around 500, but we lost nearly half of our institutional members this year. The pandemic certainly disrupted schools, and it is probable that this was a contributing factor. However ongoing problems with the online membership renewal system had a major impact, particularly in the case of our institutional members.

We had thought at the beginning of 2020 that the adoption of a new name for LDA might appeal to a broader range of members and help expand our membership base, but discussion of this issue was put on hold as we worked to concentrate on more pressing matters during the year. Council has indicated renewed interest in considering a name change during 2021.

There has been an increase in our social media presence over the year. The LDA Twitter, FaceBook and LinkedIn accounts have all shown strong increases in numbers of followers, and the YouTube Channel that we created in May has grown rapidly in terms of number of subscribers.

Politicians, media and other organisations have sought LDA's views more frequently than in previous years. The success we have achieved in this area is due largely to President Lorraine Hammond's work and member Jennifer Buckingham's efforts, particularly with the Primary Reading pledge.

## Priority 2: Expand and enhance Professional Development (PD) services

Our planned Jan Hasbrouck national LDA tour for May unfortunately had to be cancelled due to COVID.

We decided to turn to the digital world to provide regular, free professional learning to fill the void and provide quality PD. We have held 22

one hour Weekly Wednesday Webinar (WWW) sessions, presented by leaders of the education world including Anne Castles, Pam Snow and Emily Hanford, along with leading practitioners of effective evidence-based classroom instruction. A huge thank you to all presenters and volunteers who gave up their valuable time to contribute.

Feedback about the quality of our professional development has been very positive.

### Priority 3: Expand and strengthen partnerships with like-minded organisations

Work in this area was put on hold during the disruption associated with the pandemic, and was also delayed until the new website was ready.

### Priority 4: Improve governance and strategic direction

There have been discussions within Council with regard to LDA's Constitution and legal structure, with agreement for a change in legal structure to enable us to better comply with government requirements and operate more efficiently. Our current Constitution will be reviewed and a new draft constitution will be completed and presented to our members in early 2021.

We have complied with audit and government regulations, but due to COVID-19 restrictions and the subsequent cancelling of our national tours, we did not meet budget revenue targets.

### Setting up an improved LDA website

Finally, there has been continuing work by LDA Council members and administrative staff on the development of a new and improved website. Feedback on the original website was that it was very dated and while it contained a wealth of information, it was very difficult to navigate. Of particular concern were problems with the online membership renewal system, which led to many difficulties for members attempting to renew their membership online.

The new website is now going through an extensive testing phase and is expected to be ready early in 2021. Once it is launched, members will be notified and encouraged to log in to the new website in order to ensure that all contact details are correct and updated.

The adoption of a new website will create better opportunities to promote what we do to a wider audience, and expand our partnerships.

I am very much looking forward to the new year. Best wishes to all of you for 2021.

*Michael Roberts, General Manager of LDA*

# Tribute
# Elaine McLeish

**Elaine McLeish is the retiring LDA Consultant Administration Officer. These words of thanks were provided by Ann Ryan, past Convenor of the LDA Consultant Committee.**

After 22 years of active service to LDA, Elaine McLeish has glammed up her lipstick, donned a new hat and stepped out to a new chapter of her life. This marks another change for LDA, most especially for Consultants and the Consultant Committee. Elaine is a Life Member and a past Council Member, and served for many years as our much appreciated Consultant Administration Officer.

Elaine joined LDA as a Consultant Member in 1998, being an experienced teacher armed with special education qualifications and a passion to support vulnerable students and their families. Soon after, Rosemary Carter retired as Referral Officer, and Elaine took on this role. As it was done in those days, Rosemary handed over all records from 1991 set out in one exercise book! Elaine has now passed on a meticulously kept database, cloud files and website documents to incoming Consultant Administration Officer, Bec Rangas, demonstrating the many demands for innovation and adaptation that Elaine met with resilience and enthusiasm throughout her time.

True to the mission of LDA, there seemed no end to Elaine's availability to provide welcome support and advice to families calling for assistance on how best to access services for struggling students. This was also extended to teachers seeking advice on how and whether they too could provide specialist teaching services as LDA consultants. To many, Elaine became the voice of LDA, and she is warmly regarded for the knowledge, understanding and compassion she shared with those seeking assistance.

The Consultant Committee and Networks (learning communities of consultant members) have benefited greatly from Elaine's meticulous administration skill. Commonly heard from Consultants: "I'll ask Elaine, she'll know", "She's my lifeline", "I will miss her terribly". The earliest memories for many are of a radiant, relaxed and welcoming 'meet-er and greeter' at PD events, who brought all into the fold.

Elaine has contributed much to LDA and will be well remembered for improving the quality of service delivery and outcomes for many students experiencing learning difficulties. With great thanks, we wish Elaine plenty of time to enjoy grandchildren, travel and a well-deserved rest.

# Council news

**The Council news section for this issue of the Bulletin is based on the AGM report presented by President Dr Lorraine Hammond on 28 November 2020.**

There is no doubt that 2020 has been a challenging year for everyone involved with LDA. Teachers, Consultants and allied professionals involved in education have felt great uncertainly about everyday life and work, and many of our members have been seriously affected by COVID19 and the lockdowns.

LDA has tried to stay in touch and provide an opportunity for colleagues to connect with each other during the pandemic, through providing free professional learning. In fact, we have all become fast learners at delivering professional learning online.

LDA extends a warm welcome to our newest Council Members for 2020/2021: Priscilla Carlisle, Lyn Stone and Troy Verey. We also had a number of resignations of members of the 2019/2020 Council in 2020, with the resulting casual vacancies on Council by filled by Ros Neilson, who joined Council in March, Lynne Ivicevic, who joined Council in June, and Olivia Connelly, Alison Clarke and David Morkunas who joined Council in July.

Members of Council farewelled during the year included Consultant Members Ann Ryan, Lyn Franklin, Kate Gurjian and Juanita Lee who all stepped down from Council, and we thank them for their contributions to LDA Council and to our Consultant Members. Ann Ryan made particularly significant contributions, serving on the Executive as LDA Secretary as well as being the Convenor of the Consultants Committee and the Editor of the LDA eNews. Jo Whithear, who had been with us for a number of years, also stepped down, along with Dianne Steel, who was a great help in Queensland during the David Kilpatrick tour in 2019. Dr Lynne Ivicevic and Alison Clarke joined Council during the year but did not renominate for Council for 2020/2021. Lynne contributed to the production of the LDA eNews, and Alison, a former Vice President, was invaluable in organising the Kilpatrick tour in Melbourne – she has been a friend to LDA for many years. LDA appreciates all their contributions.

Over this past year there has been a lot going on behind the scenes to support LDA. We would like to thank all of those involved, particularly those who also work full time and have families and busy lives. Our General Manager, Michael Roberts, who brings a wealth of experience to his role with LDA, has made himself available on weekends and after hours for those of us who work closely with him. He has also been supported by some paid staff, including Duke Babovic (Administration Officer), and Ian Munro (Data Manager – short term contract). Bec Rangas has recently replaced Elaine McLeish as Consultant Administration Officer, and Kathy Benson, of Accountable Bookkeeping, has taken over Accountant duties. Their support for LDA is very much appreciated.

LDA Council has a number of specialised Committees as well as the Executive, and they have all worked hard in a range of areas, including managing the membership lists and planning the new LDA website, which will be launched early in 2021. The Sustainability Committee has been working to review and implement the findings of the Explicate Report that was conducted in 2019 to review LDA governance. The Publications Committee has continued to produce high quality material that raises issues important to evidence based teaching practices. LDA Consultants have been served well by Olivia Connelly who took over from Ann Ryan this year as the Convenor of the Consultants Committee. The Professional Development Committee has been supported by Michael Roberts, who has introduced all our free webinars and helped with securing some excellent speakers. We thank all our volunteers for the additional time they have spent supporting LDA.

LDA will be hosting a low-cost National Conference in January 2021. Face-to-face events are planned in WA, ACT, Queensland and NSW, COVID19 permitting, with other states and international audiences being able to access an online conference.

Finally, LDA has continued to advocate for evidence-based practice in education. In 2020 we partnered with AUSPELD and Five from Five on the Primary Reading Pledge. In addition, Dr Lorraine Hammond, Dr Molly de Lemos and former LDA Council Members Dr Jennifer Buckingham and Professor Pamela Snow worked with AITLS, the Australian Institute for Teaching and School Leadership, on a review of initial teacher education for literacy instruction. Both the Primary Reading Pledge and the AITLS review will be available very soon on the new LDA Website.

LDA extends good wishes to all our members, their colleagues and families for a safe and productive year in 2021.

# LDA Awards 2020

LDA was delighted to present two awards – albeit remotely – at the LDA AGM that was held on November 2020. Thanks are due to the Awards Committee for their work in organising the awards and their presentation. The awards were presented by Dr Nicole Todd, Convenor of the LDA Awards Committee.

The **Rosemary Carter Award** is presented to an outstanding LDA Consultant Member who has contributed to the field of learning difficulties through work with students, their advocacy for students and their families, and through education of the wider community. An important criterion is demonstrable efforts to address equity issues by making their services more accessible to disadvantaged families. In 2020 this award was presented to **Kristin Anthian**.

Kristin, a past member of LDA Council, holds a Masters degree in special education, early intervention and inclusion, and is accredited with InSpEd and CERI and IDA as a Structured Literacy Dyslexia Interventionist. Kristin has worked in education for over 30 years, both in the classroom and in learning intervention and consultancy roles with a wide variety of organisations. This work has included teaching of indigenous students and the identification of preschool students at risk. She was involved with the Victorian Curriculum and Assessment Authority (VCAA) in reviewing special provisions for VCE students with learning difficulties, and she speaks regularly at schools and conferences. She became the lead author of *Snappy Sounds* in 2019, a whole class systematic synthetic phonics program. Currently Kristin works as a private practitioner and in schools in the western suburbs of Melbourne, providing learning support to students who are experiencing difficulties with the acquisition of skills in reading, writing, spelling and maths. She is passionate about employing an evidence-based approach to assisting students with learning difficulties, and has contributed greatly to the LDA Consultant networks over this past year.

The **Mona Tobias Award** is presented in recognition of an outstanding contribution to the field of learning difficulties in Australia. This contribution may be in the area of leadership, research, practice or teacher and community education. In 2020 this award was presented to **Dr Bartek Rajkowski**.

Bartek is a Speech and Language Pathologist with extensive experience in the assessment, identification and remediation of reading and spelling difficulties, and is the director of Adelaide Speech Pathology Services. Following his doctoral research, Bartek developed a passion for helping teachers improve their knowledge of research into reading and reading difficulties, as well as their knowledge of the structure of the English language. He regularly presents his workshops to audiences around Australia and to speech and language pathology students as a casual lecturer at Flinders University. He is also the creator of *Reading Doctor* – a popular suite of evidence-based interactive teaching tools. He is a prominent advocate for students with learning difficulties and has been involved with various lobby groups, including the team which helped persuade the government to implement the Year 1 Phonics check. He is a wonderful friend to LDA and has so much to offer us, particularly as we re-design our website. We are very grateful to have him on Council.

Both Kristin and Bartek, in true 2020 style, presented animated and interesting webinar-style speeches in acceptance of their awards. Kristin's presentation was titled: *Going Virtual – Learning Support in Lockdown*, and Bartek's presentation was titled: *Aspiring to be a more effective teacher*. We hope to publish summaries of their presentations in the next LDA Bulletin.

Congratulations to the recipients!

# In this issue of the Bulletin...

**Ros Neilson**, Editor, LDA Bulletin

The theme of this issue of the Bulletin is *Thinking about Learning*. Stanislas Dehaene characterises human beings as not merely *homo sapiens*, the thinking species, but also *homo docens* – the species that teaches itself (Dehaene, 2020). The contributors to this LDA Bulletin invite readers to think about *homo docens* in the context of the classroom, and have addressed the topic from the point of view of both students and teachers. We are invited to think about how students learn, and also to think about how teachers can learn about best practice for teaching.

This Bulletin starts with a report from an ongoing research project that we hope we will be hearing more about over the next few years: the Q-Project, carried out at Monash University by a group of researchers who are interested in how teachers make use of current research developments in their field. They start with a theoretical model of how research can best be used in the educational context, and then present a case study of interview data from one teacher who was a confident user of research. Their model and the case study intrigued our Bulletin co-editors, and we decided to provide a sequel to their contribution that simply raised some of the questions and challenges that seem inevitable at the chalkface as teachers keep trying to learn how to be better teachers. We hope that our readers will continue the conversation – letters to the Editor will be welcome.

Two very practical contributions follow, bringing research on learning directly into the classroom. Ollie Lovell provides a distillation of important ideas from Cognitive Load Theory, with a wealth of examples of classroom activities to explain the concepts. David Morkunas allows readers to look into his own classroom to see how he implements the critical cognitive psychology concepts of spaced and interleaved practice and retrieval in the Daily Review routine.

Dr Sally Robinson-Kooi provides a practical summary of what teachers of EAL/D students (students whose first language is not English) have to understand about the learning challenges involved.

Dr Kevin and Dr Robyn Wheldall re-ignite the WARs, providing a sequel to their article published in an earlier LDA Bulletin [LDA Bulletin 2020, vol. 52(1)], on curriculum-based measures – tools that they have been researching that teachers can use to learn about their students' progress during a period of teaching intervention.

A teacher perspective follows: an account from Jessica Terradas-Colleu of her own efforts as a Special Education Teacher to use evidence-based research to support high school students with literacy difficulties.

The *Thinking about Learning* section ends with reviews of two books that are very relevant to the theme. Professor James Chapman comments on Westerveld et al.'s *Reading Success in the Primary Years: An Evidence-Based Interdisciplinary Approach to Guide Assessment and Intervention* (Springer Open Access, 2020), and Dr. Ros Neilson provides a review of what deserves to be the standard textbook on thinking about learning: Dehaene's *How we learn: The new science of education and the brain* (Penguin Books, 2020).

Our contributors to this edition of the LDA bulletin include researchers, classroom teachers and specialist consultants, and we thank them very much for their thoughtful efforts. We hope readers enjoy this issue.

*Ros Neilson*
*Editor, LDA bulletin*

# Using research evidence well in education

This article has been provided by a team consisting of **Connie Cirkony**, **Mark Rickinson**, **Mandy Salisbury**, **Joanne Gleeson**, **Lucas Walsh**, and **Blake Cutler**, who are working in a pioneering research project, the *Monash Q Project*. The Q Project is an ongoing study addressing the question of how research about teaching and learning filters, in a usable form, into teaching practice. The article provides a theoretical framework for the research question and follows this with a single illustrative case study taken from their ongoing data collection.

## Background

In Australian education, there have been increasing calls for the development of an evidence-based approach and a research-rich profession (Australian Productivity Commission, 2016; White et al., 2018). A national evidence institute has recently been established to "work with teachers and researchers to curate and translate evidence of what works in the classroom" (Australian Education Council, 2020). There is also widespread discussion about evidence-informed practices amongst educators, including members of Learning Difficulties Australia (e.g., Capp, 2019).

This article focuses on a specific question that is integral to these developments – *What does it mean to use research evidence well in education?* This question is important because improving teaching and learning through evidence-informed approaches requires clarity not only about what counts as quality evidence, but also about what counts as *quality use*. To date, there has been wide-ranging debate about the former (e.g., Nutley, Powell & Davies, 2013), but little discussion about the latter.

Against this backdrop, this article shares some early ideas about how quality evidence use might be conceptualised and operationalised in relation to education. The ideas presented are based on findings from the early phases of the Monash Q Project, a five-year study led by Mark Rickinson and Lucas Walsh focused on "quality use of research evidence" in Australian schools. We start by providing some background on the project, before outlining our *Quality Use of Research Evidence (QURE) Framework*. We then outline a brief example of quality use in practice, using the experiences of a special education teacher working in a school seeking to improve evidence-informed teaching. We conclude with some suggestions for reflecting on how we use evidence and how we support evidence use.

## Monash Q Project

The Q Project is a partnership between Monash University and the Paul Ramsay Foundation. It involves close collaboration with teachers, school and system leaders, policy-makers, evidence brokers, researchers and other key stakeholders across Australia. The project's overarching goal is 'to understand and improve high-quality use of research evidence in Australian schools.' It involves four main strands:

- **Strand 1: Conceptualisation of quality use (2019-2020)** – synthesising what is known about high-quality evidence use in health, social care, policy and education to develop a 'quality evidence use' framework for Australian educators.
- **Strand 2: School-based investigation of quality use (2020-2021)** – examining the evidence use practices in at least 100 schools across four Australian states to generate practical examples of high-quality evidence use in different contexts.
- **Strand 3: Development of professional learning (2022-2023)** – co-designing and trialling with up to 100 educators across four Australian states, a professional learning process to support high-quality evidence use in practice.
- **Strand 4: Engagement and communication campaign (2019-2023)** – bringing together key stakeholders within Australian education to spark strategic dialogue

and drive system-level change around evidence use in education.

This article introduces the conceptual framework from Strand 1, along with a specific school-based example from the early work of Strand 2.

## Quality Use of Research Evidence (QURE) Framework

Our systematic analysis of relevant literature in health, social care, policy and education revealed no well-established existing definitions of quality evidence use (Rickinson et al., 2020a). Drawing on ideas from all of these fields, however, we characterised quality evidence use as the:

> *thoughtful engagement with and implementation of appropriate evidence, supported by a blend of individual and organisational enabling components within a complex system.*

As shown in Figure 1, this definition sees quality evidence use as:

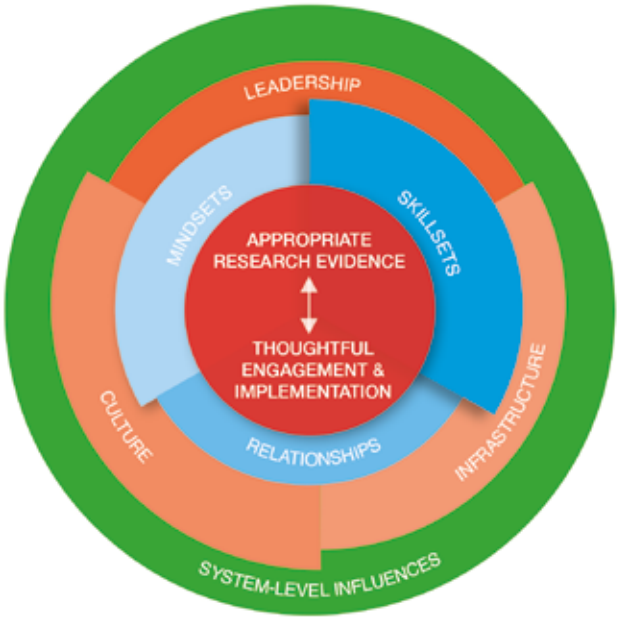
- comprising two **core components** (*appropriate evidence* and *thoughtful engagement and implementation*);
- being supported by three **individual enabling components** (*skillsets*, *mindsets*, *relationships*), and three **organisational enabling components** (*leadership*, *culture*, *infrastructure*); and
- influenced by the wider **system**.

This framework seeks to define and elaborate on what 'quality use of research evidence' might mean in education, and is intended as a resource for anyone who is interested in improving the use of research evidence within and across all levels of schools and school systems.

## Core Components

This framing works from the starting point that quality evidence use needs to encompass the nature of the evidence

**Quality use of research evidence in education is defined as...**
the thoughtful engagement with and implementation of appropriate research evidence, supported by a blend of individual and organisational enabling components within a complex system.




**CORE COMPONENTS**

**APPROPRIATE RESEARCH EVIDENCE**
The need for research evidence to be not only methodologically rigorous, but also appropriate for the educational issue, the context and intended use.

**THOUGHTFUL ENGAGEMENT AND IMPLEMENTATION**
Critical engagement with the research evidence, shared deliberation about its meaning and effective integration of aspects of the evidence within practice.

**ENABLING COMPONENTS - INDIVIDUAL LEVEL**

**SKILLSETS**
The knowledge and capabilities that are required to thoughtfully engage with and implement appropriate research evidence.

**MINDSETS**
The dispositions, attitudes and values that are required to thoughtfully engage with and implement appropriate research evidence.

**RELATIONSHIPS**
The interpersonal processes and connections that are required to thoughtfully engage with and implement appropriate research evidence.

**ENABLING COMPONENTS - ORGANISATIONAL LEVEL**

**LEADERSHIP**
The organisational vision, commitments and role models that support thoughtful engagement with and implementation of appropriate research evidence.

**CULTURE**
The organisational ethos, values and norms that support thoughtful engagement with and implementation of appropriate research evidence.

**INFRASTRUCTURE**
The organisational structures, resources and processes that support thoughtful engagement with and implementation of appropriate research evidence.

**SYSTEM-LEVEL INFLUENCES**

The complex interactions and inter-dependencies across the education sector to support thoughtful engagement with and implementation of appropriate research evidence.

Figure 1: Components of high-quality use of research evidence.

and the nature of the use. At its core, therefore, are two inter-connected aspirations: for the research evidence to be appropriate; and for the engagement and implementation to be thoughtful.

- *Appropriate research evidence* is about the need for research evidence to be not only methodologically rigorous, but also appropriate for the educational issue, the context and the intended use. From a research perspective, evidence quality is about methodological rigour. But from a research use perspective, evidence quality also needs to be about appropriateness. As Nutley et al. (2013, p. 6) argued: "Evidence quality depends on what we want to know, why we want to know it and how we envisage that evidence being used".
- *Thoughtful engagement and implementation* reflect a need for critical engagement with the research evidence, shared deliberation about its meaning and effective integration of aspects of the evidence within practice. "Evidence does not speak for itself"… so educators must actively "interpret and make meaning of it in order to use it" (Coburn, 2009, p. 71). Using evidence well therefore requires the integration of "professional expertise with the best external evidence from research" (Sharples, 2013, p. 7)

## Enabling Components

The Q Project's framework also builds on the idea that quality evidence use needs to be supported by a range of individual, organisational and system-level factors. That is, there is a need for:

- *education professionals* with not only the knowledge and skills to understand research evidence (*skillsets*), but also the values and dispositions to be open to its meaning (*mindsets*) and the relational sensitivity and capacity to work with others to figure out how to use it in context (*relationships*)
- *education organisations* with not only the structures and processes to enable staff to engage with evidence (*infrastructure*), but also the ethos and values to make evidence use a cultural norm (*culture*) and the leadership and commitment to demonstrate and promote its significance (*leadership*)
- *education systems* that support quality evidence use not only by specific individuals, institutions or contexts but through coordinated interventions across multiple levels and with varied stakeholders.

With this introduction to our conceptual framework, we now we turn to some of the initial Strand 2 findings about how practitioners are already engaging in research evidence use. In particular, we highlight the example of a teacher in special education who incorporates research evidence into her practice.

## Quality Use in Practice - an example

During 2020, the Q Project has undertaken an initial survey of close to 500 educators and follow-up online interviews with a sub-sample of 20 educators. The survey involved a convenience sample of 492 educators (32 per cent senior and middle leaders, 57 per cent teachers, and 11 per cent other staff) from 414 schools across New South Wales, Queensland, South Australia and Victoria. Of these, 12 per cent were involved in special schools and/or held a role connected to inclusion (e.g., learning support, gifted education, speech pathology).

This example features a teacher who took part in both the survey and the online interviews. Eleanor (a pseudonym) works at a small P–12 special government school in rural Victoria, and in her role supports a number of students with learning difficulties, including those on the autism spectrum. She has a master's degree and over 20 years of experience as an educator. Her school has identified evidence-informed teaching as one of the core improvement areas in the coming years.

## Using research evidence well

When asked what it means to use research evidence well, Eleanor wrote that it involves:

> "looking at the research and what it has found and seeing if it is compatible with the area that you are working in and seeing if it is usable and what you may need to do to make sure that it works for your context and cohort."

During our interview conversation, she added:

> "It's not just the teacher walking in and going 'Oh, I'll just do this because I've done it in my last school and this works', but actually looking at what is the best research out there for the students and what's been trialled before and found to be successful."

## The need for appropriate research evidence

Eleanor's responses highlighted the importance of contextual engagement with evidence.

Compared with other survey respondents, she indicated having a relatively strong ability to find research to help her day-to-day practices, confidence in accessing, analysing and interpreting research for her own teaching context, and a preference for research generated by universities or other similar organisations (e.g., articles, reports). Similar to others, she also drew from student data, action research, ideas from other schools or Professional Learning Communities (PLCs), and guidance from official bodies (e.g., Department of Education and Training).

In her current environment, Eleanor reported that her school regularly refers to evidence of what works when deciding on which programs or initiatives to implement. Her experience of working in a remote school emphasised the challenges of finding high quality research evidence that is appropriate for their students and relevant to her context.

## Quality of the research

Quality of the research was an important issue for Eleanor, too. She regarded high quality evidence sources as those endorsed by professional associations or official bodies, indicating impact, and backed by academic research. She was particularly interested in how many participants were involved in a study, the impact and currency of the findings, and the consistency of impact over time.

## Contextual relevance

Eleanor was also concerned about the age and ability of the participants in the research study, and interpreting the results in her context. For example, in her efforts to locate research to support writing development for students receiving curriculum adjustments, she asked: "Is there something in there that shows me that, you know, students of 18 years of age, but working at a seven-year-old or six-year-old level, how that they should be progressing, or what's the best way for writing for them?".

Eleanor was also concerned with the scope of the research findings in relation to how they might be adapted to her student cohort. For example, some research focused solely on students on the autism spectrum, but the relevance was less clear for students whose needs might be quite different, such as those with

intellectual disabilities. She commented, "Just because the research says, 'This is how it's done' – it might be how it's done, but we may need to look at a slightly different way for some students."

## The implementation process

According to Eleanor, this critical engagement with the evidence continues through the implementation process. She emphasised the need for ongoing evaluation of how closely the programme is implemented as intended (i.e., fidelity) along with the results.

*... improving teaching and learning through evidence-informed approaches requires clarity not only about what counts as quality evidence, but also about what counts as quality use.*

Overall, Eleanor's experiences speak to the core components of high-quality use of research evidence. Her example illustrates her thoughtful engagement with evidence, critical consideration of its appropriateness and applicability to a given context, and careful implementation of aspects of the evidence into particular parts of her practice.

## The importance of relationships

Eleanor's experiences also highlighted key collaborative relationships within and beyond her school. Similar to the overall survey findings, she indicated common practices in her school included seeking information from a variety of sources when making a decision and facilitating collaborative learning (e.g., Professional Learning Communities). Given the small size of her school, Eleanor highlighted the importance of relationships with the curriculum representatives from regional office and educators from nearby schools. Both played a role in sharing research and implementation strategies.

Eleanor's example of her current school's priority illustrates these practices in action. Her school had just started to update their approach to teaching writing for students with disabilities. With the support of their regional office, they were able to identify schools in their local area that were addressing the same approaches, to find out best practices.

Far from just adopting 'what works best', Eleanor demonstrated that these collaborations lead to more critical engagement with implementation approaches:

> "So, actually going and seeing, how is someone else using the same information in a different context? How it's being used. Is it something that could be useful for what we're doing? Or is it something that's like, 'well, yeah, it might be great for some of our kids, but maybe not others'?"

Her school also looked to other organisations to introduce different perspectives on how to provide adjustments for students on the autism spectrum. With the knowledge of what different schools and organisations in the region have taken on, Eleanor then charted out the next steps for her context, guided by the question: "Is that something that is fully appropriate?"

## Other enablers supporting the use of research evidence

Eleanor's story also highlighted the importance of enabling formal and informal processes to help staff engage critically with different information sources. When asked what might help staff in her school to use research evidence well, Eleanor spoke of the importance of having time to support these collaborative processes. The overall survey findings indicated that the provision of time was a key barrier for using research evidence. Addressing this point, Eleanor mentioned that her own school is planning to dedicate an hour each week for teachers and teacher aides to discuss current research, as opposed to having it "squished into a staff meeting".

# Reflections: Questions to be asked about improving the use of research

While Eleanor's case represents one practitioner's account of research evidence use, her experiences are consistent with the ideas in the QURE Framework and highlight some implications for others seeking to use research evidence better.

## Reflecting on how we understand the use of research evidence

Eleanor's experiences illustrate the expertise required to consider multiple lines of evidence in practical contexts. In education, the use of research is strongly connected with practical or tacit knowledge (Brown & Rogers, 2017; Greany & Maxwell, 2017). Coldwell et al. (2017) described teaching as a complex, situated professional practice, drawing on "a range of evidence and professional judgement, rather than being based on a particular form of evidence" (p. 12). With this in mind:

- How can quality use of research help us to understand not only the potential, but also the limitations, of research evidence in responding to educational challenges?
- How can we adapt research evidence to our local contexts, in connection with our professional judgement and expertise?
- How can 'thoughtful engagement with and implementation of appropriate research evidence' become part of the daily professional practice of educators?

## Reflecting on how we currently support the use of evidence

Eleanor's experiences also highlight the role of interpersonal processes and connections around research use, and the need to support these through infrastructure and norms. According to Greany and Maxwell (2017, p. 4), evidence needs to be "contextualised and combined with practice-based knowledge (i.e., transformed) as part of a wider collaborative professional/social learning process". With this in mind:

- How can we draw on and ask questions about research evidence during formal and informal conversations about teaching and learning?
- How can quality use of research be part of powerful and sustained improvement processes and cultures within and across schools?
- How can we support quality evidence use not only within specific individuals, institutions or contexts but through coordinated interventions across multiple levels and with varied key stakeholders?

These questions form part of the broader conversation regarding research use that the Q Project is seeking to foster (Rickinson et al., 2020b). Working towards high-quality use of evidence in Australian education is a system-level opportunity and a system-level challenge. We invite school practitioners in all school contexts to join us by visiting: *https://www.monash.edu/*

education/research/projects/qproject.

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*Connie Cirkony, Mark Rickinson, Mandy Salisbury, Joanne Gleeson, Lucas Walsh, and Blake Cutler are members of the Monash Q Project and based at Monash University in the Faculty of Education. The Monash Q Project is a five-year study to understand and improve the use of research evidence in Australian schools. A partnership between Monash University and the Paul Ramsay Foundation, it is about supporting educators to use research evidence better to improve teaching and learning. To learn more, see our Quality Use of Research Evidence (QURE) Framework, our Q Project team and partners and on Twitter @MonashQProject*


We encourage you to connect with the Q Project and be part of strategic dialogue and system-level change around research evidence use in Australian education.

# Sequel to *Using research evidence well in education*: Reflections from the Editorial Team

**The case study provided by the Monash Q Project Team sparked off a series of debates amongst the editorial team consisting of Ros Neilson, Tom Nicholson and Molly de Lemos, and we have taken the liberty of adding a sequel of our own to the article. We hope that readers will feel challenged, as we did, to relate the questions raised in the Q Project article to their own experiences of using research in the teaching world.**

What is your next move when a teacher says, *"Very nice theory, but it's of no help to me running a class …"?* The ideas presented in the Q Project article raised a good deal of discussion within the editorial team, and this sequel to their article documents some of our own ideas.

Eleanor, the case study participant in the Monash University Q Project study reported in the previous article, was an experienced teacher working in a school that supported access to research evidence, and she was clearly able to make practical use of evidence to inform day-to-day teaching. What an ideal world! Even within this positive context, however, we felt that several of Eleanor's comments raised yet more questions for us as we reflected on our own experiences.

Eleanor was working in a small, rural special school, and this meant that one of her first concerns was to check that research "works for your context and cohort." Our editorial team commented that this need to check on relevance is critically important for staff in all types of schools. The context in which any research is conducted may be relevant, and it is important that we find out when it is relevant and when it isn't. One example of this challenge is the issue of deciding the extent to which direct instruction research applies equally to high achieving students and those who struggle. Another is the question of language of instruction: does research that applies to learners of English apply to other languages, and do the same researched-based strategies apply to students whose first language is not English? The understanding of possible contextual qualifications is important, and we are aware that more research would always be helpful.

Our editorial team smiled at Eleanor's quote about the temptation of not using research evidence: "Oh, I'll just do this because I've done it in my last school and this works" … we felt we had to admit that this approach seems to us to be characteristic of almost everything that humans tend to do. Indeed, the point was made in the article above that much of the professionalism that teachers bring to schools is tacit knowledge. It is perhaps the most experienced and well qualified teachers who don't assume that they already know all the answers. It is always difficult, however, to keep an open mind about your own assumptions - especially if you don't have time to re-think before the next class starts.

We gnashed our teeth at the challenge faced by teachers having a preference for what Eleanor called "research generated by universities or other similar organisations". Which organisations? What if they don't agree? We felt that, like Eleanor, we have to rely on a consensus approach, trusting avenues of information that have a good track record of empirical investigation and sound theory. And we noted the qualification that, as human beings, all of us are prone to looking for confirmatory evidence.

We were impressed that Eleanor raised the issue of fidelity of implementation of research. For us all, the issue is not just fidelity in the study that generated the research evidence, but also the potential fidelity with which the research can be translated into practice. We have all seen bits and pieces of effective, research-based programs being used extremely ineffectively, and have all had the experience of just being unable to implement a program in practice that should work in theory.

Eleanor's reference to collaboration was heartening. We agreed that networking and sharing opportunities are becoming easier and perhaps more common for all of us, and it is important that school systems make time for this to occur.

Finally, Eleanor's comment on the danger of having information "squished into a staff meeting" was very telling. It is so important for school leaders to take the initiative here, protecting their teaching staff from unreasonable demands that consume more time than is reasonable – the year 2020 has taught us that, if nothing else.

The six questions raised at the end of the Q Project article are huge ones, and they were necessarily left hanging. Our LDA Bulletin editorial team was left concluding that they may never yield easy answers. We feel strongly, however, that they are useful questions to guide us in our endeavours to make a difference to teachers who need support in "running a class."

We wish the Q Project team well, and we look forward to hearing more about their research.

*Ros Neilson, Tom Nicholson,*
*Molly de Lemos,*
*LDA Bulletin Editorial Team*

# Cognitive Load Theory in action

In this article **Dr Ollie Lovell** provides a tantalising sample of some of the ideas that he has included in his recently published book, *Cognitive load theory in action*. The concepts are relevant to teachers of students of all learning abilities and all ages – very practical principles of learning that can help teachers understand how to avoid leaving students floundering and puzzled as to what to do next.

Cognitive Load Theory (CLT) is a series of instructional recommendations built upon knowledge of how humans learn. The recommendations provide the basis for teaching strategies that apply to all ages and all disciplines.

I first encountered CLT through a now famous tweet by the renowned educationalist Dylan William in early 2017 when he wrote, *I have come to the conclusion that Cognitive Load Theory is the single most important thing for teachers to know*. And that tweet sent me down a rabbit hole of researching CLT out of which I still haven't emerged (Lovell, 2020).

There are two key reasons why I am particularly passionate about Cognitive Load Theory. The first is that it is based upon fundamental immutable principles around how people learn. The second is the solid research basis on which it is built, that stretches back four decades. To me, this is a powerful combination of foundational theory and experimental validation, that can give teachers confidence that it holds real promise for the classroom.

I am a classroom teacher, and the head of the mathematics department in a secondary school. Over the past year my explorations into CLT have been focussed around trying to convert its findings into practical and actionable advice for teachers. This work has been conducted in conjunction with the originator of CLT, John Sweller, which has proved a very fruitful partnership. To my mind, this is the kind of collaboration that education would benefit from more of, a classroom-based teacher translating academic research into practical terms for a teacher audience, and doing so under the oversight of academics, who are checking the interpretations for consistency with the underlying theories and research at every turn!

In this short article I will share some of the key ideas that have emerged from this project and give examples of some practical classroom strategies that emerge from the key CLT principles.

I have tried to make the key foundational principles of CLT accessible and understandable through what I have called 'the ABCDE of CLT'. The acronym stands for:

**A**rchitecture of human memory,
**B**iologically primary vs. secondary knowledge,
**C**ategories of cognitive load,
**D**omain general vs. domain specific skills, and
**E**lement interactivity.

Due to space limitations, I will restrict the discussion to only three of these five principles for the purposes of this article – covering only the 'ACE' of CLT, before providing some examples of the practical implications of the theory.

## The A of CLT: Architecture of Human Memory

Why is it that students often forget to do simple things, like start a sentence with a capital, or end it with a full stop? This question, and many others, can be easily answered once we have a solid understanding of the architecture of human memory.

We can characterise the resources that all humans think with in a simplified three-part model.

First there is the environment. This an unlimited external store of information. This is where books, notes, presentations like this one, and google exist.

We then have our 'working memory'. Working memory is the site of our consciousness – it's where all of the thinking happens. Working memory is an internal store of information, but it is a *limited* internal store of information.

Finally, we have our long-term memory. Once we know something, this is where that information is stored. And, for all intents and purposes, long-term memory is an unlimited internal store of information. We do not have any evidence to suggest that it can be filled within a human lifetime.

As you can see in Figure 1, attention brings information from the environment into our working memory for processing. Rehearsal within working memory, and making connections to what is already known, is how learning happens. Once information is within long-term memory it can be retrieved, and it is also frequently forgotten.

But the key feature of the model shown in Figure 1 is that whilst the environment and long-term memory are unlimited in their capacity, working memory is not. What this means is that working memory is the bottleneck of thinking. Whenever we teach our students, working memory is one of the crucial constraints that we deal with.

Put simply, this is why students forget to do simple tasks like end their sentences with a full stop. For beginning writers, the act of writing is very cognitively demanding. It utilises the vast

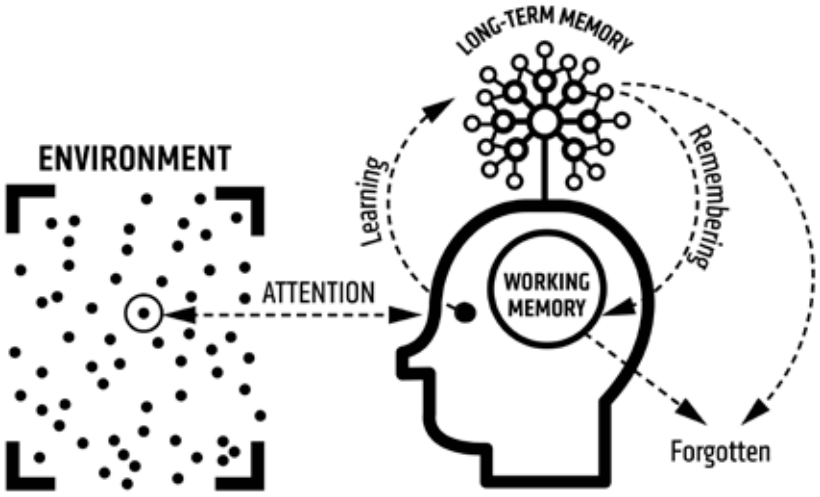



Figure 1. Model of the architecture of human memory

majority of working memory capacity, and this means that there's very little left to remember to do simple tasks.

Acknowledging this fact, Cognitive Load Theory is designed around this fundamental idea: *Working memory is the bottleneck of thinking*.

## The C of CLT: Categories of intrinsic and extraneous load

The capacity of working memory as a bottleneck can be understood further by considering the categories of intrinsic and extraneous load, as characterised in Figure 2.

When students juggle information in their working memory, we say that they are encountering 'cognitive load'. But not all cognitive load is created equal. Some of it is desirable, and is required for the student to learn the key ideas. We call this cognitive load that is directly associated with the learning task, 'intrinsic load'.

On the other hand, there are things that teachers do, or environmental factors, that distract students from the core information at hand. This also generates cognitive load, but we call this type of load 'extraneous load', because it is extraneous to the learning task.

Cognitive Load Theory is built around the key idea that *instruction is enhanced by reducing extraneous load and optimising intrinsic load*. Said another way, when we reduce the distractions that students face (reduce extraneous load), we free up working memory capacity, which can then be directed to productive learning (optimise intrinsic load).

The vast majority of the CLT effects and recommendations (including the three introduced later on in this article) are focussed around reducing extraneous load, and this originates in large part from the manner and structure of instructional presentation. A small number of the effects relate to the optimisation of intrinsic load as well.

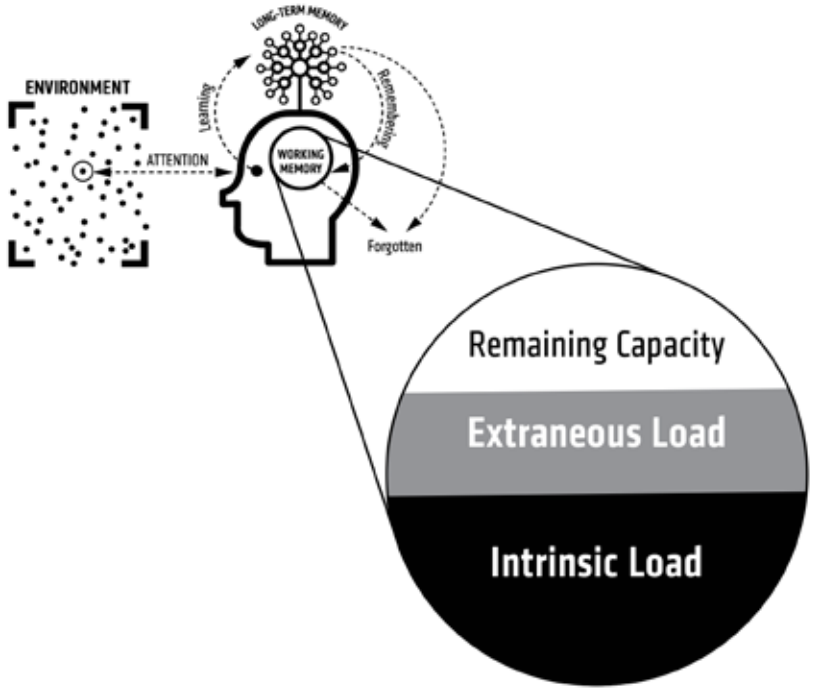



Figure 2. Categories of cognitive load

## The E of CLT: Element Interactivity

If we are to reduce extraneous load and optimise intrinsic load, how are we to actually do it? A good first step is to understand the source of cognitive load, which is *element interactivity*.

Put simply, all cognitive load comes from the number of elements that we are asking students to consider at any one time, and the number of interactions between those elements. If we ask students to do a simple task, like learn the location of the country of Poland on a map of Europe, there are not many interacting elements in the task, so it will be low in cognitive load.

If, however, we ask students to find the coordinates (latitude and longitude) of Poland on that same map, we suddenly introduce a whole lot more elements that they must contend with. One of the key insights of CLT is that there are many things that teachers do that unwittingly increase the number of elements that students must contend with, but that are superfluous to learning. These unnecessary elements represent extraneous load, and they are what CLT's instructional recommendations assist us in reducing.

The other key point in relation to element interactivity is that not all 'elements' are created equal. Crucially, new information is very burdensome on working memory, and even a small number of elements of information can overload students. In contrast, familiar information, information that has already been learnt by students and stored in long-term memory, can be drawn upon by working memory and utilised with very little working memory strain. This key insight, that information stored in long-term memory eases the burden on working memory, illustrates the importance of students truly learning information, and undercuts the common, but incorrect, narrative that students no longer have to learn 'facts', because everything is available on google.

## Instructional recommendations: Practical implications of CLT

Now that we're aware of the 'ACE' of Cognitive Load Theory, we can start to consider some of its instructional recommendations that will allow us to reduce the extraneous load that our students encounter, and improve instruction.

## The split-attention effect

Some time ago I was in a year 7 or 8 science class and the teacher was teaching their students about the periodic table. She had a slide on the board that looked something like this:

**Learning to read the periodic table**

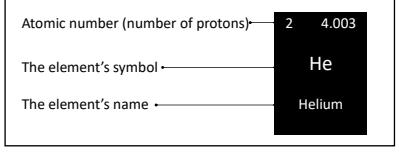
- ❑ Each box on the periodic table represents an element
- ❑ The atomic number gives the number of protons in the element
- ❑ The one or two letters in the middle of the box gives the element's symbol
- ❑ The word at the bottom of each box gives the element's name

Each student also had their own periodic table in hand, and the teacher was guiding them to look at the table in their hands, and relate it to the key information on the slide.

Now, the teacher's instructions were clear, and this task seems quite simple, but as I looked around the room, quite a few of the students seemed puzzled. They were looking up at the slide, then down at the periodic table, and trying to make sense of the two together. What was happening here was that the format of instruction was actually causing the students to split their attention between two places, and mentally integrate the written instructions on the board, with the periodic table in their hands. There were a set of interacting elements that were separated, and the students had to mentally integrate them. This mental integration was causing extraneous cognitive load.

After the class, I spoke to the teacher about the lesson, talked about the idea of split-attention, and we came up with the following, altered slide:

**Each box on the periodic table represents an element**




This format reduced the need for students to try to work out what-goes-with-what, and eased the burden on working memory.

Similar alterations have been demonstrated to be effective in randomised controlled trials. For example, Bobis, Sweller and Cooper (1993) found that students were better able to complete a folding task when split attention was reduced by integrating the instructions onto the paper itself. In Figure 3 below, the left-hand side of the page shows a split-attention format, with the printed instructions to be used by the students presented separately from the circle of paper they were meant to be folding. The right-hand side shows an integrated format, with the instructions actually printed on the to-be-folded circle.

Split-attention can also show up in the way that we write or speak. Consider the following two explanations of human cognitive architecture.

Split attention format:

> *There are three key resources we all draw upon in order to think: the environment, working memory, and long-term memory. The first is an unlimited external store of information. The second is a limited internal store of information. And the third is a practically unlimited internal store of information*

Integrated format:

> *There are three key resources we all draw upon in order to think: the environment, working memory, and long-term memory. The environment is an unlimited external store of information. Working memory is a limited internal store of information. And long-term memory is a practically unlimited internal store of information.*

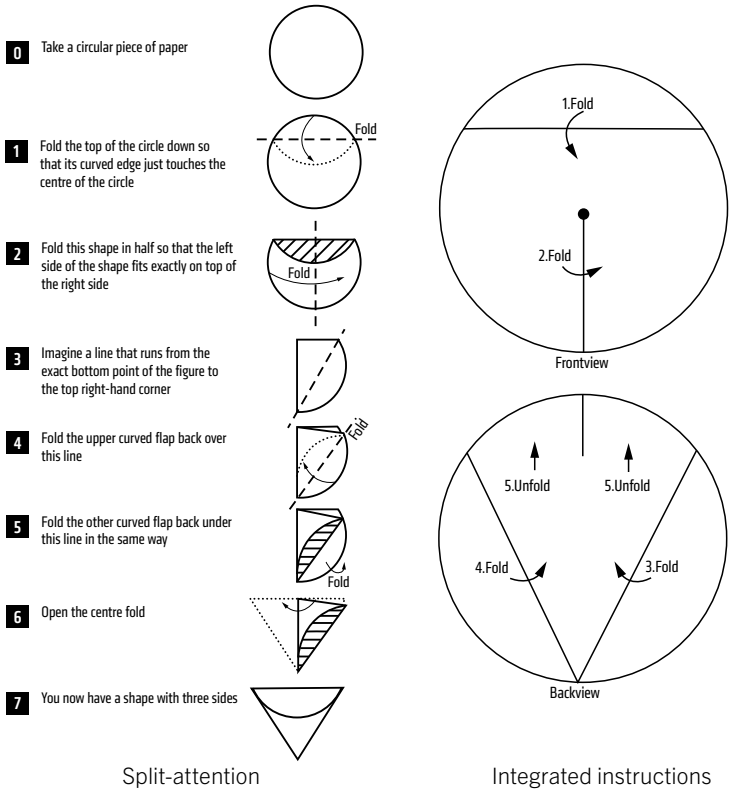
As you can hopefully see, in the first example, readers must hold in working memory what is meant by the 'first', 'second', and 'third' as they read on. In the second example, the three components are repeated at the start of each sentence, reducing the need for readers to keep in mind what is meant by 'first', 'second', and 'third', and therefore easing the burden on working memory.

The split-attention effect can be remembered with the rhyme, *'Information that must be combined should be placed together in space and time!'*

## The transient information effect

Another way that students' working memories can be put under unnecessary strain is through transient information. Transient information just means, 'information that disappears'. Whenever we introduce new information to students, then expect them to hold it in working memory while they do something with it, we're exposing them to transient information.

The most common occurrence of this that is seen in classrooms is due to the use of slideshows. Because of the




Split-attention Integrated instructions

Figure 3: Split-attention versus integrated instructions in a paper-folding task (Bobis et al.1993, p. 16).

nature of the PowerPoint presentation, when the instructor changes slides, often a lot of the information disappears.

For example, imagine that a teacher is teaching their students about punctuation, and provides two slides of instructions, as follows:

**Punctuation: The full stop**

Full stop
Rule: Use full stop at the end of a sentence.
Example: I rode my bike to the shop.

2

**Punctuation: The comma**

Comma
Rule: Use an example to separate items in a list.
Example: At the shop I bought some oat milk, bread, broccoli and vegan sausages.

Rule: Commas sit at natural pause points within a sentence.
Example: I like cats, especially those with big furry tails.

3

A following slide then requires students to use this information in an activity:

**Punctuation: You try**

**You try**: Complete the following by placing a comma or a full stop at the locations marked (once you're done, change the letter at the start of each new sentence to a capital)

*Dogs are mammals that have been bred to live with humans _ not in the wild _ they have been bred by humans for a long time _ and were the first animals to ever live with humans _ there are many types of dogs _ such as beagle _ retriever _ Jack Russell _ the dingo is also a dog _ but many dingoes have become wild animals again _*

4

In such an instance, the transience of the information, the fact that it's no longer visible to students when it comes time to complete the activity, means that the students must hold that new information (what full stops and commas are, and how to use them), in working memory whilst completing the task. This is likely to cause a high load on working memory for students unfamiliar with these punctuation marks, and could be aided by simply reducing the transience of information, which could be achieved by simply adding a small 'remember' box:

**Punctuation: You try**

**Remember**
**Full Stop**: use a full stop at the end of a sentence.
**Comma**: Use a comma to separate items in a list.
**Comma**: Commas sit at natural pause points within a sentence.

**You try**: Complete the following by placing a comma or a full stop at the locations marked (once you're done, change the letter at the start of each new sentence to a capital)
*Dogs are mammals that have been bred to live with humans _ not in the wild _ they have been bred by humans for a long time _ and were the first animals to ever live with humans _ there are many types of dogs _ such as beagle _ retriever _ Jack Russell _ the dingo is also a dog _ but many dingoes have become wild animals again _*

2

## Worked examples

One of the most widely known recommendations arising from Cognitive Load Theory is that, for novice learners, worked examples can be an effective instructional strategy. However, it wasn't until I really dove into the research that I realised that what I, and many other teachers bring to mind when we hear the term, 'worked examples', is not at all what the Cognitive Load Theory research is referring to.

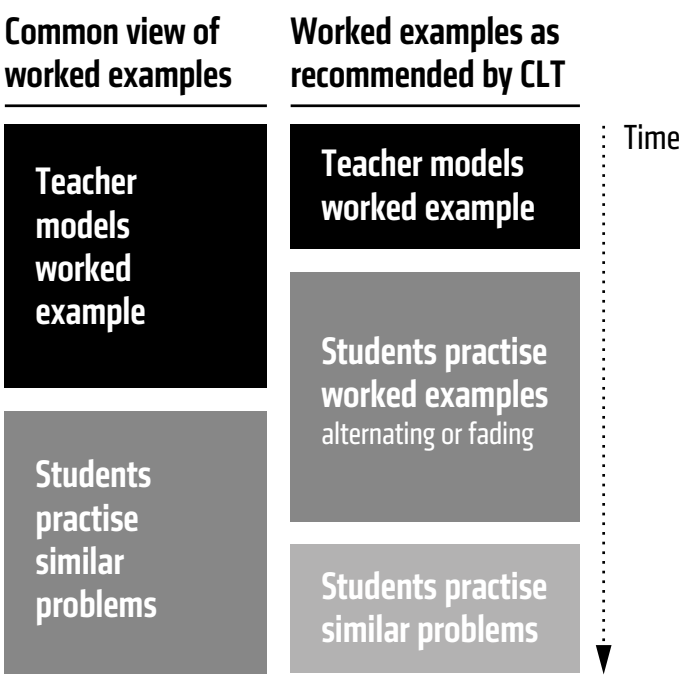



Figure 4. Common view versus CLT view of 'worked examples'

Most teachers (including myself, prior to exploring the CLT research), see worked examples as something like the following: The teacher models two questions on the board, asks the students if they have any questions (perhaps does a check for understanding), then sets the students free on some independent practice. However, this is not at all what CLT means by 'worked examples'.

In the CLT literature, worked

| **Worked examples** | **Similar problem 1.** |
|---|---|
| We are practising using the phrase **'…*In contrast*, …'**<br>'In contrast' is used to show that the ideas presented before and after the 'in contrast' are opposites, or almost opposites. | Write a sentence using '… *In contrast*, …' for each of the topics below.<br>*Don't forget this comma!* |
| Food example:<br>*My favourite food is baked beans. In contrast, my brother hates them!* | Food example: |
| Film example:<br>*Harry thinks that The Matrix is an excellent film. In contrast, I think it's boring.* | Film example: |
| Sport example:<br>*I am very bad at soccer. In contrast, Faduma is amazing!* | Sport example: |
| Music example:<br>*My Dad loves classical music. In contrast, my mum is a big fan of heavy metal.* | Music example: |
| Example from school subjects (harder):<br>*In English we indicate that we are asking a question by raising the pitch of our voice at the end of a sentence. In contrast, in Mandarin a question is indicated by saying 'ma' at the end of a sentence.* | Example from school subjects (harder): |

Figure 5. Worked examples in a lesson on sentence structure

examples are a form of instruction that sits between teacher modelling, and student independent practice, and extends the period of scaffolded learning. Figure 4 captures the distinction.

A good example demonstrating the efficacy of this type of approach comes from Ward and Sweller (1990). In this study, one group of students were given standard homework that consisted of ten practice problems. Another group were given 'alternating worked examples', which means that they were given five worked problems, and five very similar problems for them to do themselves. In this context, the students who did the alternating worked examples, even though they did only half as many questions, did significantly better. The key idea here is that students often spend much longer in the novice stage than we might expect, and persisting with more structured support for longer, in the form of worked examples, can often be beneficial.

Worked examples are often considered primarily the purview of 'algorithmic' subjects like mathematics. However, they can also be effectively used in many other arenas. Figure 5 provides an example of what worked examples could look like in supporting students with their writing.

The worked example demonstrated above, and the homework example, are both forms of 'alternating' worked examples. The student reads or sees a worked problem presented, then attempts a similar one herself, then again encounters another worked example, then does yet another herself, and so on.

Another form that has been shown to be very effective is the *faded* worked example. Faded worked examples start with a fully worked example, then omit a line of working in each subsequent problem, requiring students to do more and more of the problem type on their own. This approach is captured in Figure 6.

This approach could be used with the 'in contrast' example above, with a maths problem, or even when teaching primary students to 'count on' or 'skip count'. Here, for example, is how a faded approach could be used to teach skip counting, as lead by the teacher:

1. Students count out loud together to 36.
2. Count to 36 emphasising (loudly, it's fun!) every third number.
3. Count to 36 whispering the numbers in between every third number.
4. Count to 36 emphasising every third number and whispering all other numbers.
5. Count to 36 only saying every third number but tapping along on desks for other numbers.
6. Do the same, but this time without overtly tapping.
7. Do the same, challenge students not to bob their heads or do anything that can externally be seen as counting.
8. Skip count from 0 to 36 by threes.

## Conclusions

I have only been able to present a few of the key ideas of Cognitive Load Theory within this short article. I have discussed the 'ACE' of CLT, and provided practical examples relating to the split-attention effect, the transient information effect, and alternating and faded worked examples. But we've really only been able to scratch the surface. There are many other valuable effects – all with intriguing names - that it's important for teachers to know about, such as the redundancy effect, the modality effect, the expertise-reversal effect, and the goal-free effect. There are also other CLT recommendations, such as those targeted at optimising intrinsic load. These strategies include pre-teaching, segmentation, and carefully considering and designing sequencing and combination of concepts. I hope that this article has whetted your appetite, and encouraged you to explore this fruitful area of research, and the wide array of classroom recommendations, further.

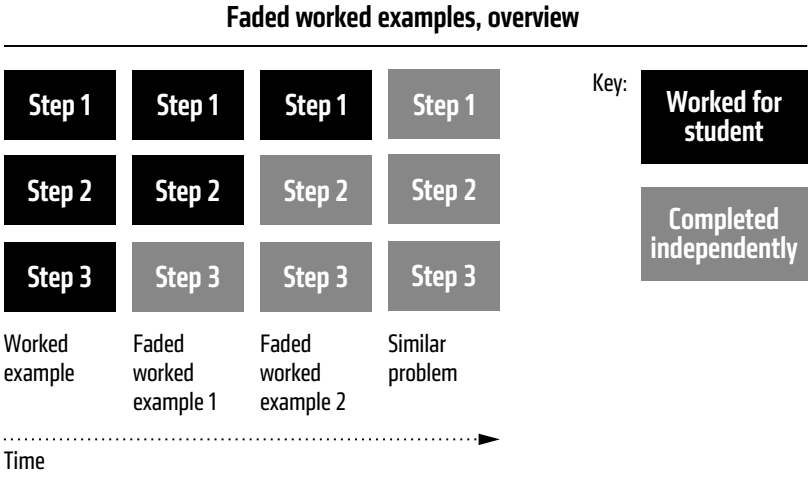



Figure 6. Overview of faded worked examples

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# Spaced, interleaved and retrieval practice: The principles underlying the Daily Review

In this article, classroom teacher **David Morkunas** explains three principles of learning: spaced practice, interleaved practice, and retrieval practice. These all come together in a powerful classroom routine: the Daily Review. Extra suggestions are provided for supporting students with learning difficulties.

I teach Grade 4. For 40 weeks a year, I have the pleasure of stuffing my students' brains with as many skills and pieces of knowledge as possible before shipping them off to the verdant fields of Grade 5. There are no end-of-year exams in my year level, so my main concern as we approach summer is ensuring that my students remember what we have taught them, so that they can build on these ideas when they hit the older grades. Like many teachers, I fear that the summer holidays, while necessary (and well-earned!), represent the perfect opportunity for students to forget everything they have learned throughout the year.

So how do we know that a student has learned something? Can we really say that a student has nailed something if they cannot remember it six weeks after it was taught? We know that learning represents a change in long-term memory, so teaching a concept once during a school year and then leaving it for the next teacher to cover will not lead to effective retention of ideas.

This is where the ideas of spaced, interleaved, and retrieval practice come in. These techniques are designed to strengthen the connections in students' memories, allowing them to remember what they have been taught for longer. The good news is that they are easy to understand, and do not require huge amounts of work to implement in the classroom.

## Spaced Practice

As the name suggests, *spaced practice* involves scheduling your study sessions at regular intervals. This is contrasted by *cramming*, which is the art of studying immediately before a test or exam. The research suggests that cramming is effective if you are simply aiming to do well on an assessment. Sadly, the effects are short-lived, and the material is soon forgotten once the test is over (I am living proof of this: I can barely remember a thing from the commerce degree I studied before teaching).

Spaced practice is beneficial in that it helps to counteract Ebbinghaus' forgetting curve, wherein we begin to forget knowledge and skills immediately upon learning them (Weinstein & Sumeracki, 2019, p. 88). By providing students with regular opportunities to review prior learning, they are far more likely to transfer knowledge and skills into long-term memory. At my school, we review prior learning every day (more on this later).

## Interleaved Practice

*Interleaved practice* is the idea of studying a range of topics during a single study session, as opposed to focussing on a single domain (usually called *blocked practice*). Imagine that you are studying for a maths test, and you have three topics to revise (A, B, and C). This is what a *blocked practice* approach might look like:

- Monday: Topic A (60 mins)
- Wednesday: Topic B (60 mins)
- Friday: Topic C (60 mins)

This is very similar to how I studied during my school days. Now consider a schedule which uses *interleaved practice*:

- Monday: Topic A (20 mins), Topic B (20 mins), Topic C (20 mins)
- Wednesday: Topic B (20 mins), Topic C (20 mins), Topic A (20 mins)
- Friday: Topic C (20 mins), Topic A (20 mins), Topic B (20 mins)

Notice that we are still studying each topic for the same length of time. The difference is that we are studying each topic in shorter blocks and weaving them together during each study session. Interleaving is still a relatively new idea in research, but its efficacy has been measured across many different domains, including mathematics, music, and sport (Weinstein & Sumeracki, 2019, p. 93).

## Retrieval Practice

*Retrieval practice* is the act of bringing information from long-term memory into working memory. As humans, we do this every day: remembering someone's address, or a sourdough recipe, or an actor's name are all examples of retrieval practice. Retrieving information from long-term memory allows us to strengthen this information, making it more durable and less likely to be forgotten (Kirschner & Hendrick, 2020, p.213).

In the classroom, we can provide our students with opportunities to recall concepts that we have taught previously by using frequent low-stakes quizzes that we call Daily Reviews (discussed in more detail below). This has the added benefit of telling us as teachers who has remembered skills and knowledge and who might need to be retaught.

## Bringing it all together – The Daily Review

Now that you are familiar with these three ideas, it is time to look at how they can be used in practice. Please note that the approach I outline below is what we have chosen to use at Bentleigh West Primary School: it is by no means the approach that you *must* use at your school. There are myriad examples of daily and monthly reviews online and in books; feel free to borrow and steal the ideas that you feel would work for you.

The *Daily Review* is a 20-25 minute session that runs at the beginning of every Maths and English block. It uses the ideas of spaced, interleaved, and retrieval practice to revise previously taught knowledge and skills in order to ensure that our students consolidate their understanding and cement the changes to their long-term memory. If you wish to follow me down this exciting path and begin doing these sessions in your classroom (I promise, it really is fun for all concerned), then you will need a few things:

### Mini Whiteboards

An absolutely essential piece of kit. These allow you to scan student answers at a moment's notice and determine almost instantly whether your class understands what you have just taught. If my room were ablaze and I could only retrieve one thing, it would be the mini whiteboards. Take them from my cold, dead hands.

### Review Material

You need some way to present the previous learning to your students in a quick and dynamic fashion. We create most of our lessons in PowerPoint, so it is simple to grab those slides, pare them down to the essentials, and use them for our Daily Reviews. It takes a bit of work to get started, but after a while you too will become a sorcerer of slides. That being said, you certainly don't have to use PowerPoint – I have seen people conduct review sessions using paper quizzes, cloze activities, and active recall sessions where students are required to write down what they can remember about topics. We find that PowerPoint works well for our purposes, but your mileage may vary.

When it comes to the material itself, brevity is your friend. If you are converting lesson materials into review materials, you must cut down anything unnecessary or superfluous and focus on the core principals in each topic. Each section should include a student-friendly definition, maybe a rule for the class to recite, an example question to run through quickly and then some work for students to complete independently. Note that you won't need to do each part of a topic every time you review it (more on this below).

### Schedule of Topics

It is important to keep track of when you first teach a concept, so that you know when to include it in a Daily Review and when to leave it out. I receive a lot of queries about how long the gaps should be, but the research doesn't yet point to a clear answer (Weinstein & Sumeracki, 2019, p.142). If you leave topics in your reviews for too long, students will not be able to take advantage of retrieval practice. Conversely, if you leave topics out for an extended period, you run the risk of students simply forgetting the material. We generally review concepts for the next few days after they are taught, then bring them back after a couple of weeks for a day or two. Depending on how well the students do, we then decide whether to leave a topic in, remove it for the same length of time, or remove it for a longer period.

### Timetabling

You need to carve out time in order to administer your Daily Reviews. We run our English and Maths Reviews at the beginning of their respective blocks, after which we move on to other activities. Think closely about the makeup of your timetable and try your best to make the time for the reviews.

Now that you have your ducks in a row, how does a Daily Review work?

### 1. Decide on which topics to review

This will be a combination of topics you have taught recently, as well as a selection of topics that you have taught previously throughout the year. At the beginning of the school year, it is really helpful to review content from the previous school year (I coordinate closely with the Year 3 teachers to decide on what to include in these first few weeks). For a Maths Review, I will choose anywhere from 8-12 topics, and spend no more than a couple of minutes on each. This ensures that students benefit from *interleaved practice*. Here is a sample of the topics that we might cover in a Maths or English Review:

**Maths Review (Grade 4)**

- x4 multiplication facts
- Subtraction across multiple zeroes
- Short division
- Decimal place value
- Prime factorisation
- 12-to-24 hour time conversions
- Classifying angles
- Identifying units of measurement
- Independent probability
- Multi-step worded problems

**English Review (Grade 1)**

- Phonemes
- Phonological awareness
- Syllabication
- Writing lower case alphabet
- Spelling rule application
- Morphology
- Reading irregular words
- Punctuation identification
- Fluency
- The Writing Revolution skills practice

### 2. Teach the review

By necessity, reviews need to be delivered at a fast pace. This is important for a few reasons. Pace helps with engagement, as you rarely give students any downtime for them to chat to their neighbours or generally muck around. A quick pace also ensures that you can cover the requisite topics of your review in 20-25 minutes.

When a topic is in a review for the first time, it's beneficial to read a definition or walk through examples together as a class before getting students to work independently. As a topic is covered more and more, you can start to remove these

scaffolds. This will allow you to speed up the pace of the review, and will also help you identify those students who have committed the information to long-term memory (while also allowing you to assist those who haven't).

Once reciting a definition or working through an example, you should then give your students a chance to demonstrate their knowledge with some questions that they can complete independently. They can use their mini whiteboards for this, allowing you to check their progress in real-time. After a while, you will become expert in knowing which students will need a bit of extra help, and who can be left alone to crack on.

### 3. Review the Review

Make sure that you adjust the contents of your reviews regularly, in order to take advantage of *spaced* and *retrieval practice*. If your students are consistently nailing a set of questions, then take them out for an extended period. Likewise, if your students are struggling with something that was due to be taken out of your review, leave it in for a bit longer to allow them the benefit of extra exposures. If you work with other teachers in the same year level or subject, you can discuss strong and weak topics and make changes together.

### 4. Considerations for students with learning difficulties

It is crucial that you design your Daily Reviews to cater for those with learning difficulties. Here are some ways to do just that:

- Design independent questions to ramp up in difficulty. Students who are more capable can race to the harder material, while ensuring that every student has accessible content to engage with.
- Be economical with text on your slides, and don't expect struggling readers to read huge paragraphs. If having a lot of text is unavoidable, then read the material aloud for students who need it.
- Check in regularly with students who need extra help while the rest of the class are working. You can nudge them in the right direction or walk them through another example.
- Create a culture of mistakes. Often, students who are not confident about their work will avoid doing it. Instead, remind students that their effort matters more than their outcome, and that no one is ever judged for making a mistake. My review slides are totally infested with mistakes, and when I point them out it gives students implicit permission to make their own.

## Conclusion

I first began using Daily Reviews in earnest in 2018, and I was blown away by the benefits I saw in my classroom. My students remember more than I ever thought was possible, and I am now very comfortable sending them off to Grade 5 knowing that they will build on what they learned this year.

Daily Reviews can take a bit of work to get off the ground, but I can assure you that the advantages far outweigh this cost. I can also help you one last time (and put in a totally shameless plug at the same time). If you follow me on Twitter (*@DaveMorkunas*), you will gain access to several templates I have created for teachers to begin their own review decks. These are not a substitute for creating your own slides, but they will help you to understand the basic idea and flow of our Daily Reviews.

In addition to this, if you search for either mine or LDA's YouTube channel, you will find the webinar I recently presented on this topic, which runs through a few example slides. Should you have any questions, my Twitter DMs are always open.

The last few years have seen an explosion of research about the role that memory has in learning. We can leverage these ideas from cognitive science in our classrooms to help ensure that our students remember what they have been taught for longer. Whether you choose to become a member of my ever-growing PowerPoint cult or choose to forge your own path for Daily Reviews, your students will reap the benefits.

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*David Morkunas is a Grade 4 teacher at Bentleigh West Primary School. He has presented seminars for LDA, ResearchED and SPELD, and he can usually be found hunched over a laptop, tinkering with PowerPoint animations.*

# The English language learner and second language development: Essential background knowledge for classroom teachers

**Sally Robinson-Kooi**, an experienced teacher of English as an Additional Language, provides information that can help teachers to understand what students whose first language is not English may or may not be understanding in class.

The multicultural nature of student populations in Australian schools means that most schools will have students who are from non-English speaking backgrounds. Reviews of empirical literature have revealed that little attention has been given to developing pre-service classroom teacher knowledge regarding their understanding of second language (L2) learning or the developmental process of acquiring a new language. This knowledge is important to enable teachers to develop an informed teaching and learning program for English language learners (ELLs) (Geva, Xi, Massey-Garrison, & Mak, 2019; Rosenman & Madelaine, 2012; Villegas, SaizdeLaMora, Martin & Mills, 2018).

The aim of this article is to provide mainstream classroom teachers with a succinct summary of background knowledge associated with second language (L2) development. It provides a foundation for (a) understanding the learning progression of ELLs; (b) identifying those who may also be at risk of developing learning difficulties; and (c) distinguishing between behaviour 'problems' and common student behaviours associated with the challenges of learning another language.

## English language learners in Australian schools

In Australia, ELLs are also referred to as English as an Additional Language or Dialect (EALD) students and come from a range of diverse cultural backgrounds. Students may have been born in Australia or overseas; they may have had schooling in their first language (L1) equivalent to their age peer in Australia; they may have had limited or no literacy instruction in their L1; or they may have excellent literacy skills in their L1 and other languages or dialects. In addition, they may come from advantaged or disadvantaged socioeconomic settings. A detailed description of the diverse multicultural backgrounds of these students is provided in *English as an Additional Language or Dialect teacher resource: EAL/D overview and advice* (Australian Curriculum Assessment and Reporting Authority (ACARA), 2014).

Unlike native English speakers, EALD students are simultaneously learning how to speak, read and write in a new language, English, whilst also studying the academic content. In 2018 The Education Forum conducted a special review of empirical literature on preparing pre-service mainstream teachers to teach ELL students in today's linguistically diverse classrooms (Villegas, SaizdeLaMora, Martin & Mills, 2018). The most important finding that emerged was that to be linguistically responsive to English language learners (ELLs), "mainstream teachers need some knowledge of second language development – knowledge that provides a foundation for understanding ELLs and designing instruction for them" (Villegas et al., 2018, p. 151).

When newly arrived EALD students enter an Australian school, they are usually placed in an age-appropriate year level. However, it is important to note that their learning and life experiences may not compare with their proficiency in English. For example, a student entering Year 8 at an early phase of English language development may already have covered the learning area content in their home country and language for that year level in mathematics, but they may not have sufficient English proficiency to understand the teacher's explanation of it or to demonstrate their previously acquired knowledge.

## The EALD learning progression

All teachers benefit from having a deep understanding of the processes involved in acquiring another language, a progression which usually takes approximately seven years from the commencement of instruction with EALD support. Salend and Salinas (2003) emphasized that acquiring and using a new language requires

enormous effort and has a profound effect on a student's behaviour and education outcomes. They categorised the stages of learning an L2 as comprising the following periods: reproduction or silent period; telegraphic or early production period; interlanguage period; expansion period; enrichment period; and independent learning period. The ACARA EALD student learning progression (ACARA, 2011) contains a similar four-phase developmental sequence of English language learning for students in Australian schools. The complete document is available to download from the ACARA website. An outline of the following four phases follows.

### Beginning English

The student rarely initiates/participates verbally, may be silent, and uses gestures and/or drawings. Later the student uses two or three words in simple present or past tense utterances. A subcategory, *Limited Literacy Background*, describes behaviours typical of students with little or no experience of literacy in any language.

### Emerging English

Students benefit from using L1 with peers and adults. They use short familiar phrases, and intonation and stress to gain meaning. In addition, they increase the use of English subject specific vocabulary, use simple past and present tense sentences, and common irregular verbs.

### Developing English

The student's everyday vocabulary expands, and more subject specific vocabulary develops. They may sound quite fluent, may self-correct simple oral and written language and may use L1 to plan a text.

### Consolidating English

The student has a sound knowledge of spoken and written English and good oral fluency but continues to need assistance for demanding academic reading and writing tasks. (ACARA, 2011).

It is important to be mindful that the transition between developing and consolidating English (described above) is a critical time because by now the student has developed Basic Interpersonal Communication Skills [BICS] (Cummins, 2000) and will often sound quite fluent. A common misunderstanding is that "once L2 speakers can communicate with their peers, they should be able to learn like their peers" (Geva, et. al., 2019, p. 142). However, if they no longer receive targeted EALD support, they can become what is known as 'entrenched second phase' language learners. This means that without support it can result in a student misunderstanding new concepts, such as unfamiliar subject specific vocabulary or grammatical structures, and hinder the development of their Cognitive Academic Language Proficiency [CALP] (Cummins, 2000). Continued EALD support is necessary to sustain their learning of academic content in all subjects as they progress through their schooling.

During this four-phase learning progression it is important to be aware that the effects of cognitive load, social adjustments, and stress often result in behaviours that can be mistaken for a learning difficulty. Lack of oral language is not a learning difficulty, nor does it mean the student has 'no language'. Therefore, gathering as much data as possible before the student commences school is an important step in building a profile of where they are at in their L1 literacy learning.

## Gathering background data

I have found that in many schools, apart from recording the main language spoken at home, little background data on EALD students is collected. Also, some schools fail to identify those non-English speaking background students born in Australia as actually being EALD students. Some such students may come to school having limited basic interpersonal communication skills in English and they may be mistakenly identified as having a learning difficulty due to poor oral English. The situation becomes more complex if parents feel they should say they only speak English at home and do not reveal other languages that may be used.

An important step when conducting an interview with the parents/guardians is to build a student profile, which may require the presence of an interpreter. The following guide questions may be used to collect information regarding the student's general progress in school, their L1 literacy development, home languages, cultural values, and any known health issues.

- **Time**: How long has the student been in Australia?
- **Schooling**: Where was it and how long were they in school? What were the outcomes? Have there been any interruptions in schooling? What are the student and family attitudes towards school? What was the previous language of instruction?
- **Home**: What language/s or dialects are spoken at home? What language is used when playing with peers? When did the student start to speak? Are they quiet or outgoing at home?
- **Culture**: What language/s does the student use in informal/formal situations with adults? How does the family interact with the English-speaking mainstream community?
- **Health**: Are they any medical issues, physical or emotional problems? (Geva, Massey-Garrison, & Mak, 2019; Salend & Salinas, 2003).

This information will help to identify any difficulties in the student's L1 development as well as any other underlying factors, such as trauma or lack of formal schooling. The information will also help to establish who needs to be involved in the EALD student's literacy program and whether there may be any underlying learning difficulties.

## Common behaviours which may be observed when EALD students are learning English

The following behaviours, some of which may be viewed as 'disruptive', are common and usually associated with the stress involved when learning a new language in a school setting. Students may:

- go through a 'silent period' where there is little or no verbal communication. This can be mistaken for a lack in cognitive processes, apathy, or reticence (Salend & Salinas, 2003)
- experience culture shock, feel anxious or ill
- have a short attention span affecting working memory
- struggle with writing systems, for example, direction of print differences (Geva et. al., 2019)
- display lethargy and isolate from peers
- display disruptive behaviour due to misunderstandings associated with unfamiliar school routines or lack of previous schooling
- exhibit 'inappropriate' responses such as shouting or laughing due to cultural confusions (Salend & Salinas, 2003).

Some factors may point to the EALD student also having a learning difficulty.

For example, if the student is making very limited progress despite receiving explicit and structured EALD teaching this may signify difficulties beyond L2 learning. Students may:

- exhibit continuous difficulties decoding regular letter and sound patterns, phonemic awareness, and phonological skills in L2 (Geva et al., 2019)
- have an oral language deficit in the L1
- older students may have a deficit in reading and spelling in the L1 and L2 (Geva et al., 2019)
- have difficulty in transferring basic skills from one task to another
- exhibit poor organisation skills
- have poor basic mathematical concepts in L1
- demonstrate a continued lack of concentration
- have continued psychological issues (Salend & Salinas, 2003).

## Cracking the code: Features of the first and target language

For teachers to foresee and understand the difficulties an ELL is most likely to encounter during their English literacy developmental progress, it is important to be familiar with features of the student's first language (Swan & Smith, 2012). This includes being familiar with the phonological differences between the student's first language and dialects, differences in writing systems, and cultural issues such as degrees of formality during class and student/teacher interactions.

Learning to read English requires students to crack the workings of the English language code. All writing systems are a code for spoken languages, and phonemes absent in the native language need to be explicitly taught alongside concentrated vocabulary instruction (Low & Siegel, 2009). Therefore, having knowledge about the similarities and differences between English and the student's native language is important. To illustrate how the code varies across languages, look at the word *peach* written in English, French, Mandarin and Arabic (see Figure 1). French and English both have writing systems that are alphabetic, that is, they represent individual spoken sounds. The Chinese system is logographic which represents both sounds and meaning, whilst Arabic has an abjad alphabetic writing system which mainly represents consonants with a few vowels.

Despite these variations in orthography, Low and Siegel (2009) found that EALD students from other language backgrounds, including those with very different writing systems to English, are quite able to learn to spell simultaneously with learning to read. Quality instruction, which builds on previously taught concepts and prior knowledge and is explicit, systematic, and sequential, is the key to success.

The acquisition of reading and spelling skills in English requires the mastery of two processes: "a phonological process based on the awareness of sounds in spoken words and an orthographic process based on the visual pattterns of the writing system " (Low and Seigel, 2009, p. 291). In Australia, the most popular EALD teaching methods are usually based on whole-language or constructivist approaches. Unfortunately, many students, including ELLs do not sufficiently develop English language skills this way. Explicit instruction emphasising phonological knowledge and the structure of English is seen as superior. Rowe (2006) summarised findings on effective teaching practices for EALD students with and without learning difficulties and found that, when introducing new skills, constructivist approaches can compound a disadvantage. This means that if there is insufficient explicit teaching followed by repeated practising, the student is unlikely to master the skill.

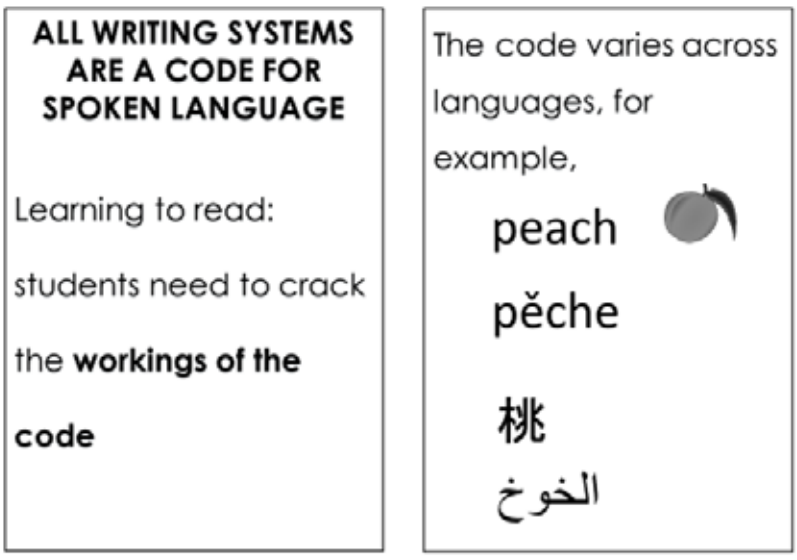


Figure 1. Example of the writing system code: English, French, Mandarin and Arabic

## Identification, assessment, and intervention strategies

Rosenman and Madelaine (2012) investigated the identification, assessment and intervention strategies used to predict the best literacy achievement in young EALD students. They found that, whilst the knowledge of identification, assessment, and intervention strategies to identify at risk students who are native speakers of English is extensive, this is not the case for EALD students. These students are often classified as at-risk or as having a disability due to limited oral language proficiency. The literature, however, suggests that limited oral language proficiency is not a good predictor of reading ability and such a classification may be misleading and detrimental to the EALD student.

Other researchers (Cummins, 2000; Low & Siegel, 2009; Geva et al., 2019) found a relationship between literacy achievement in L1 skills that impacts on achievement in L2 literacy development. They suggest that if a student has strong literacy skills in the L1 it is likely to transfer to their L2 learning.

The following research findings from the Rosenman and Madelaine study (2012) can assist teachers to identify students who may either have poor literacy skills due to limited English language proficiency or those who may (also) have a learning difficulty. First, oral language proficiency was found to be an unreliable measure, especially for kindergarten students whose reading was subsequently found to be on a par with native speakers in later grades, regardless of their oral skills in the early years. "Overcoming the

hurdles of learning to read seemed to be attributed to the role that high quality, systematic, and explicit instruction played in arriving at these outcomes" (p. 29). Second, there were some concerns in the use of standardised or adapted published assessments and screening tools regarding their cultural suitability and a student's understanding of the content presented. As many of these assessments were conducted as a single assessment, Rosenman and Madelaine emphasised the importance of using ongoing formative assessments and monitoring to track student progress. Third, they found that teachers need to develop a comprehensive "knowledge about language, literacy, child development and individual differences that may impact on learning to read" (p. 30) and suggest that professional development should include phonological processing skills, oral language, vocabulary and reading comprehension – all of which should be taught explicitly.

Rosenman and Madelaine warn against both an early classification of a student being at risk or conversely adopting a 'wait and see' approach. They recommend that, irrespective of a student's limited oral English, the use of screening comprising "phonological awareness, alphabetic knowledge, print awareness and rapid naming in English" (p. 31) appear to be reliable in detecting students who are likely to benefit from explicit literacy instruction which targets

*… phonological awareness, rapid automatized naming, and working memory assessments can reliably predict later reading fluency and comprehension.*

the *specific* area of difficulty, rather than immediate special education intervention.

These findings are consistent with recent research (Geva et. al., 2019) centred on ELLs in the US, Canada, Australia, and the UK which highlighted reading development of typical and atypical L2 learners. The researchers found that phonological awareness, rapid automatized naming, and working memory assessments can reliably predict later reading fluency and comprehension. ELLs in lower primary school are quite able to acquire reading skills similar to their native speaking peers despite having limited oral skills. By Year 4, however, when texts become more "cognitively demanding" (p. 117) the ELL's oral language skills appear to be the best indicator of reading fluency and comprehension.

## Conclusion

It is important that mainstream teachers have a knowledge and understanding of the developmental process involved in acquiring a new language. This knowledge is essential because it provides a foundation to understand the phases involved in the English language learning progression, and to distinguish between 'problem' behaviours and those commonly associated with the challenges of learning another language.

It is also important that teachers are familiar with the linguistic similarities and differences between the student's first language and English as this underpins the development of an informed explicit teaching and learning program. In addition, researchers have warned against classifying early primary school ELL students as having a learning difficulty due to their limited oral English language skills.

Researchers have found an assessment procedure that includes phonological awareness and alphabetic knowledge, followed by ongoing formative assessments that monitor student progress, to be the most effective methods in identifying those ELL students who may also be at risk.

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# More WARs: the development of the WARL and the WARN

**How do teachers know how well their students are learning what they are being taught? Kevin Wheldall and Robyn Wheldall, of the MultiLit Research Unit and Macquarie University, describe the development of two very practical tests that teachers can use to monitor students' progress during the early stages of learning to read.**

The MultiLit Research Unit has developed a series of assessment tools – curriculum-based measures (CBM) – that can be used to monitor the ongoing progress as students learn to read. In a previous issue of the LDA Bulletin, we reported the development of the *Wheldall Assessment of Reading Passages* or WARP, which can be used to assess the fluency with which students read passages of text (Wheldall, K., & Wheldall, R., 2020). The WARP is suitable for use with students who are reading at the Year 2 to Year 5 level (Wheldall & Madelaine, 2000; 2006). In this current article, we describe the development by the MultiLit Research Unit of two other curriculum-based measures of reading fluency that are suitable for use with younger children who are performing at Year 1 and 2 levels: the *Wheldall Assessment of Reading Lists*, or WARL (Wheldall et al., 2015), and the *Wheldall Assessment of Reading Nonwords*, or WARN (Wheldall et al., 2021, in press).

It is very important to have CBMs that can track progress across the first two years of schooling while students are (ideally) learning to read via explicit phonics instruction, and to have an efficient way of identifying students who are not making typical progress in the early stages of learning to read. By administering a test that identifies struggling students effectively, as early in the process as possible, teachers may be able to address the needs of struggling students in a timely manner and also to monitor their progress. This will result in fewer students being left to struggle for longer than necessary (Bell et al., 2020).

There are relatively few tests that measure general reading progress satisfactorily in the early years and far fewer still that allow monitoring on a regular basis. The two CBM assessment tools to be discussed here focus on the reading of single words (the WARL), and the reading of nonwords (the WARN).

To be of any practical use, any test or measure must be both reliable and valid. The authors of the test must be able to provide empirical evidence for the *validity* and *reliability* of their test. By validity, we mean the degree to which a test measures what it is supposed to measure. One of the most common ways of verifying if a new test is valid is by correlating the scores on the new test with scores on older tests that have already been established as

valid indicators of reading performance (*criterion validity*). By reliability, we mean that the instrument must be capable of delivering the same result consistently. The test should give the same (or a very similar) result when it is given to the same child on separate occasions close together in time. If Mark scores 43 on the test on Monday, and assuming that he has not been practising in between, then he should get a very similar score to 43 on, say, Wednesday, if the test is reliable. We call this *test-retest reliability*. Similarly, if the test has two different forms, say Form A and Form B, then they should provide very similar results. We call this *parallel forms* reliability. The most common measure of reliability is the correlation coefficient between the scores of the test on the two occasions it is given, or between the two forms of the test when they are given to a group of children.

This article will describe the construction of the WARL and the WARN and provide data on reliability and validity for both tests. This article also provides references to research we have carried out for the purposes of providing benchmark guidelines for the WARL and WARN. These benchmarks are guides based on a small but reasonably representative sample of students. Students who score below the score designating the 25th percentile

(bottom quartile) may be considered to be 'struggling' or low-progress readers and in need of reading intervention support. The 40th percentile scores provide minimum goals for students to achieve before exiting an intervention, in that scores within the 40th to 60th percentile range may be considered to be within the average range for literacy performance for that point in the school year. We hope that these benchmarks will provide rough approximations to guide instructional decision-making. It should be noted, however, that these are not '*norms*' in the strict sense of being based on large representative samples of students.

## Another brick in the WARL

We would like to acknowledge, at the outset, the major contribution of Dr Meree Reynolds in the development of this measure as part of her doctoral studies.

*The Wheldall Assessment of Reading Lists (WARL)* consists of fifteen word lists. To construct the lists of words for the WARL, we started with a database of the 200 most common high frequency single words found in children's storybooks and reading schemes read by five- to seven-year-old children (Stuart et al., 2003). These 200 words were arranged into 20 groups of 10 words, with the words with the highest frequency being used in the first group and so on. Five words were randomly selected from each of these 20 groups and presented on a stimulus sheet as a 100-word reading task. This procedure was repeated 15 times to produce 15 alternative forms of the curriculum-based measure, each comprising 100 words.

The fifteen 100-word lists created were administered to a sample of 112 Year 1 students, who read each list for one minute each. Descriptive statistics for the 15 WARL lists (see Reynolds et al., 2009) showed that the means and standard deviations of the word list measures were relatively similar. Two of the word lists were subsequently excluded by a process in which consideration was given to both outliers and intercorrelations.

Following the procedure used in developing the WARP (see Wheldall & Wheldall, 2020), a decision was made to select three word lists from the remaining 13 lists, to be designated as the Initial Assessment Reading Lists. They were selected on the basis that they had the most similar means and standard deviations for words read correctly per minute. In addition, they correlated very highly with each other. The set of three Initial Assessment Word Lists of the WARL was deemed to be appropriate for screening procedures, for placement of students at appropriate levels of support, for pre- and post-testing in research studies, and for program evaluation. The mean of performance on the three lists is taken as the most reliable index, expressed in terms of words read correctly per minute.

The 10 word lists that remained were designated for monitoring progress during an intervention. The lists were very similar to one another in relation to their means and standard deviations. They also correlated highly with each other and with the mean score of the three Initial Assessment Lists. We suggest that if two WARL lists are administered fortnightly and averaged, the data is likely to be more reliable, smoother and more even in increments, enabling easier interpretation. We have produced a designated order in which the Progress Monitoring Lists are used. When used in this order, the mean of each two successive progress tests is very similar.

Reliability and validity data for the WARL is summarised in Table 1 below.

Benchmark values for the WARL were subsequently calculated (Reynolds et al., 2011), for the average and bottom quartile scores for students at the beginning and middle of Years 1 and 2, as a guide for classroom teachers regarding typical progress.

| | | |
|---|---|---|
| **Participants: N = 122 Year 1 students (Reynolds et al., 2009)** | | |
| Parallel form reliability | Intercorrelations amongst 15 individual WARL lists | WARL – all list intercorrelations: .80 to .97 (most coefficients over .90) |
| **Participants: N = 335, Year 1 and Year 2 students. Assessed in February/March and again in August (Reynolds et al., 2011)** | | |
| Parallel form reliability | Three Initial Assessment Lists on both testing occasions | WARL Initial Assessment Lists intercorrelations: .93 to .96 |
| Test-retest reliability | Three Initial Assessment Lists, February/March and re-tested in August | List A test-retest: .82<br>List B test-retest: .84<br>List C test-retest: .86<br>Average t3 lists test-retest: .86 |
| Criterion validity | Average 3 Initial Assessment Lists; Martin and Pratt NW Reading Test; South Australia Spelling Test; Sutherland Phonological Awareness Test-Revised (SPAT-R) | WARL and Martin & Pratt NW Reading Test: .75<br>WARL and Burt Word Reading Test: .87<br>WARL and South Australia Spelling Test: .83<br>WARL and SPAT-R: .83<br>WARL and WARP: .91 |

Table 1. Technical data (reliability and validity) for the WARL. All correlations significant at p<.001.

## Be WARNed

Measures of phonological recoding (nonword reading) and measures of reading fluency for students in the first two years of schooling are uncommon. (See Colenbrander et al., 2011, for a review of nonword tests.) The *Martin and Pratt Nonword Reading Test* (Martin & Pratt, 2001) measures nonword reading but is not timed and offers only two forms. The Test of Word Reading Efficiency 2 (TOWRE-2) (Torgeson et al., 2012) includes nonword reading and is timed but, again, has only two forms available. The Year 1 Phonics Screening Check, introduced by the UK Department of Education and now used in several sites in Australia (Department of Education, Skills and Employment, 2020) is a one-off test given at the end of Year 1 that includes a measure of nonword reading but is, again, not timed.

The *Wheldall Assessment of Reading Nonwords* (or WARN) is a new curriculum-based measure of nonword reading developed by the MultiLit Research Unit (Wheldall et al., 2021, in press). The measure is intended as a quick and simple test to measure progress in learning phonics decoding skills (phonological recoding) during the early stages of reading skill development, and to identify young struggling readers. The advantage of the WARN over existing measures of phonological recoding is that it comprises multiple parallel forms, thereby allowing for continual monitoring of individuals over time.

The WARN consists of 13 lists of 50 nonwords. Three of the lists are used

as the Initial Assessment Lists, and the remaining ten lists form five sets of two Progress Monitoring Lists, to be used fortnightly for the purpose of tracking progress. The Initial Assessment Lists can be used for screening or as a post-test measure following an intervention, either after two school terms or at other intervals.

Students read from each list for 30 seconds to determine the number of nonwords read accurately within that timeframe, and their performance over three lists (Initial Assessment Lists) or two lists (Progress Monitoring Lists) is averaged.

The WARN offers content validity, as the test stimuli align closely with the content sequence of *InitiaLit Foundation (InitiaLit-F)*, an instructional program which adheres to best practice according to the available theory and research (MultiLit, 2017). Nonword stimuli on the WARN were constructed using phonemes taught in the *InitiaLit-F* program. The words in each list follow the sequence of the phonemes in the program, which in turn was based on the principles outlined by Carnine et al. (2006).

The *InitiaLit–F* instructional program (MultiLit, 2017), which is targeted towards beginning readers, comprises 11 succeeding levels (known as 'sets') of instruction in letter-sound correspondences as part of a systematic synthetic phonics program. For the purpose of constructing the WARN, Sets 1 and 2 were combined to form 10 'sets' in total. Ten nonwords were generated from each of the reduced sequence of sets, using the letter-sound correspondences taught at each successive set. The nonwords were three or four phonemes in length (CVC, CCVC or CVCC; C = consonant, V = vowel), and included digraphs (for example, fim, juck, nump, swong).

Each WARN list was created by randomly selecting five nonwords from the 10 nonwords constructed at each set, yielding a list of 50 nonwords presented on a stimulus sheet. This process of randomly selecting five words from 10 alternatives from each set was repeated 15 times to generate 15 lists, each comprising 50 nonwords.

All lists were administered to a sample of Foundation (first year of schooling) and Year 1 students. Means and standard deviations for each measure were calculated and all measures were inter-correlated. As expected, all 15 nonword lists produced very similar means and standard deviations and were highly inter-correlated (r = .92-.96, p < .001).

From these 15 lists, the most similar 13 lists were chosen and allocated to one set of three lists and five sets of two lists; the former to serve as the Initial Assessment Lists and the latter to serve as the Progress Monitoring Lists. The averages of these six sets were analysed to confirm that they were highly inter-correlated (r = .97-.98, p < .001).

Reliability and validity data for the WARN is summarised in Table 2.

Benchmark values for the WARN were calculated for the average and bottom quartile scores for students in the first and second years of schooling, as a guide for classroom teachers regarding typical progress (Wheldall et al., 2021, in press).

| Study 1: Initial test development<br>Participants: N = 163. Two schools similar to national average NAPLAN* Year 3.<br>85 Foundation** (First year of schooling) and 78 Year 1 students | | |
|---|---|---|
| | **Tests used** | **Correlation coefficients** |
| Parallel forms reliability | WARN Initial Assessment set of lists and 5 sets of Progress Monitoring lists | WARN intercorrelations .97 to .98 |
| Criterion validity | WARN Initial Assessment set of Lists and 5 sets of Progress Monitoring lists;<br>Martin & Pratt; WARL | WARN lists and Martin & Pratt: .85 to .86<br>WARN lists and WARL: .91 to .92 |
| Discrimination | WARN Initial Assessment set of lists, compared for Foundation and Year 1 | Scores doubled from first to second year of schooling, showing good discrimination |
| Study 1: Initial test development<br>Participants: N = 163. Two schools similar to national average NAPLAN* Year 3.<br>85 Foundation** (First year of schooling) and 78 Year 1 students | | |
| Test-retest reliability | Three Initial Assessment Lists on both testing occasions | WARN test-retest .89 |
| Criterion validity | WARN Initial Assessment set of lists; Martin & Pratt; WARL | WARN and Martin & Pratt: .90<br>WARN and WARL: .89 |

* NAPLAN: National Assessment Program – Literacy and Numeracy
** Foundation: first year of formal schooling

Table 2. Technical data for the WARN. All correlations significant at p<.001

## Conclusion

Curriculum based measurement (CBM) is a quick, reliable, valid and cost-effective method of tracking progress in reading. It provides valuable information which enables educators to monitor progress regularly and to make appropriate instructional decisions in order to maximize the reading progress of their students. The series of CBM instruments we have developed (collectively known as the WARs) provide an effective Australian solution to progress monitoring of reading.

But what of the future? A problem upon which we are still working is the development of yet another WAR, the *Wheldall Assessment of Reading Comprehension* or WARC. This is proving more difficult but we continue to experiment with a maze procedure, whereby students need to select the seventh words from a 200 word passage from a list of four plausible alternatives. Watch this space!

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## Disclosure

*Kevin and Robyn Wheldall are directors of MultiLit Pty Ltd, in which they have a financial interest. They receive a benefit from the activities of the company and the sale of its programs and products, including the measures that are the subject of this article.*

# Reducing reading failure in adolescence: Implementing direct instruction in a high school context

**Jessica Colleau Terradas** provides a report from a school that has implemented an 'Intensive Learning Team' strategy to rise to the challenge of meeting the literacy needs of adolescents who have difficulty accessing the high school curriculum.

I teach at Como Secondary College in Perth, where a disturbing proportion of students entering the high school have difficulty reading. This reflects nation-wide trends with respect to Australia's declining literacy standards: In Australia in 2016 it was reported that one in seven 15 year-olds failed to meet OECD basic reading standards (Thompson et al., 2016). Adolescent literacy remains a critical problem and a major contributor to low achievement in high school. High school students who cannot access the curriculum adequately due to literacy difficulties are at a major disadvantage in terms of employment prospects (Lamb et al., 2015). Literacy difficulties are often associated with oral language weaknesses (McLeod & McKinnon, 2007), and there are clear flow-on effects related to students' self-advocacy, coping mechanisms and self-esteem (Snow & Powell, 2005; 2008).

In response to this problem, Como started screening incoming Year 8 students in 2009, and since 2015 the screening has moved to Year 7. It is important to intervene as early as we can, rather than using a 'wait-to-fail' strategy (Gaab & Ozernov-Paalchil, 2016). We use Progressive Achievement Test (PAT) scores to ascertain levels of achievement, and it has been found that about 15% lack the basic literacy and numeracy skills to access the secondary curriculum. For students identified as needing support, additional diagnostic tests are administered to determine the nature and extent of each student's learning difficulty.

*It is important to intervene as early as we can, rather than using a 'wait-to-fail' strategy*

The school has developed an Intensive Learning Team (ILT) consisting of two specialist teachers and a special need education assistant. The ILT runs an intensive, highly structured, evidence-based literacy intervention program that targets the points of educational need for each student. We have turned to strategies that have been supported in the research literature, involving direct and explicit instruction (Stockard et al. 2018; Liem & Martin, 2013). We use scripted Direct Instruction methods, such as Corrective Reading (Engelmann et al., 2007) and Spelling Mastery (Dixon et al., 2007). We also use unscripted Explicit Direct Instruction teaching methods (Archer & Hughes, 2011; Hollingworth & Ybarra, 2018) that incorporate principles of effective instruction that have been shown to be highly effective in large scale evaluations such as Project Follow Through (Meyer, 1984).

Highly effective teaching requires attention to a wide variety of details concerning the design, organization, and delivery of instruction. A key element of the program is to have students experience immediate and ongoing success, by minimising misconceptions and the chance of failure. Based on the 'I do, we do, you do' gradual release model, the teacher first demonstrates and practises with the students until they master the concept or skill being learned. The goal is to have students able to work independently. The teacher needs to break the learning into sub-tasks to reduce cognitive load and set tasks that are *'not too hard, not too easy, just right'* – the Goldilocks zone. Tasks must be at the right level of difficulty for students to be challenged while also experiencing success. This approach also demands a high level of student engagement so students cannot avoid work and cannot fly under the radar. A systematic, fast-paced, and explicit model of instruction, implemented with fidelity, is critical to accelerate struggling students in secondary school.

Our approach to errors made by students as they learn is based on Dehaene's (2020) approach. In Dehaene's (2020) model, errors are a fundamental part the process of learning new skills, and when quick feedback is given, errors are generative of change. As Dehaene suggests: "The quality and accuracy of the feedback we receive determines how quickly we learn" (p.200). Our teaching approach at Como therefore involves quick error correction. Students must, of course, feel that it is safe to take a risk and

make a mistake; Dehaene's point is that "neutral, informative feedback about errors should not be confused with punishment" (p. 207).

Automaticity is very important in the reading process, and we also take into account Dehaene's (2020) focus on repetition to aid learning. Repetition has positive impacts on our brain: it automates our mental operations until they become unconscious (Dehaene, 2020). During lessons, students receive the multiple exposures they need to build accuracy and automaticity in reading words. Faultless communication is used to minimise confusion. The consistency of wording helps students focus on the content to be learned and allows the teachers to use very effective, well-designed and precise language, with the support of the script. We are careful that when the teacher shows students a set of items that includes examples and non-examples arranged so that similarities and differences are readily apparent, there is no more than one interpretation possible.

At Como, students are typically removed from their usual English class for small group instruction (up to 15 per class), in which they participate until they can learn alongside their peers. The students do the reading components during their normal English periods while the spelling/writing program is usually done during Science or Social Studies periods. We cannot make this compulsory, but many parents choose this option for their children. We have found that, rather than being disadvantaged when they return to their regular Science and Social Studies classes, students perform better because of their improved literacy.

Our evaluation of our intervention is generally formative rather than relying on high-stakes testing. As such, the following comments about student progress are based on our informal testing rather than standardised test results such as NAPLAN. Progress of students working with the Intensive Learning Team is constantly and systematically monitored. Ongoing curriculum-based assessments and repeated low-stakes testing helps students determine whether they have understood or not, and if not, to realise what those gaps in their learning are. The minimum aim is to make one year of academic progress for one year of teaching in the program. This is considerably better than the progress students have made in primary school. We have noticed, however, that many students do much better than this and can make several years progress in just one year. The students have consistently demonstrated a fluency rate 1.5 to 2 times faster than when they first started the reading intervention. In spelling, progress as measured by the *South Australian Spelling Test* was an average of two years growth in one year of instructional input. Teachers consistently report that students graduate from the ILT program better able to cope with the literacy demands of mainstream classes. It is most satisfying to see the positive effect on the lives of students, who might otherwise have disengaged and dropped out, never having received the opportunity to explore their full learning potential.

After years of failure, motivation is a particular concern with struggling older readers. The Intensive Learning Team takes care to give students an early positive experience to reduce anxiety, and we ensure that students are conscious of their own improvement.

*Highly effective teaching requires attention to a wide variety of details concerning the design, organization, and delivery of instruction.*

Effort, concentration and progress is recognised and commented on with positive specific reinforcement such as *"You participated very actively today. Good effort"*. We take care not to overwhelm students, and practice activities are timed and short, with every bit of new information presented in manageable chunks.

The work of the Intensive Learning team has had ripple effects beyond our particular students. In parallel with the development of the ILT, the school as a whole has been implementing a model of Explicit Instruction based on Rosenshine's work (2012). This would help with the transition of ILT graduates into mainstream classes. This year, Como has joined the three-year Fogarty EDvance School Improvement program, to accelerate the implementation of Explicit Instruction across the school in order to improve student outcomes. The EDvance program is an initiative of the Fogarty Foundation, which focuses on building the capacity of school leadership teams to make informed evidence-based decisions and to plan strategically, improve educational outcomes in challenging communities across Western Australia (*https://fogartyedvance.org.au*). Furthermore, the Como initiative has since attracted considerable interest from schools across WA and interstate with teachers wanting to see the program in action. The ILT has developed a reputation for meeting the educational needs of students with learning difficulties. Many schools use Como's ILT as a model for implementing their own evidence-based literacy intervention.

Effective remedial program design is complex, and the level of training required is extensive. Current teacher training does not always expose teachers to the science of reading (Buckingham & Meek 2019), and professional development in the area is important. Como Secondary College's initiative, however, has in our opinion shown that, when done properly, a successful intervention program can improve employment prospects, and for some students, divert low-achieving adolescents from the 'school-to-prison pipeline' (Snow & Powell, 2011).

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# Book review
# Reading Success in the Primary Years

Reviewed by **James Chapman**, Professor of Educational Psychology, Massey University, New Zealand.

*Reading Success in the Primary Years: An Evidence-Based Interdisciplinary Approach to Guide Assessment and Intervention, by Marleen F. Westerveld, Rebecca M. Armstrong and Georgina M. Barton. Springer Open Access, 2020.*

*Open Access available at: https://link.springer.com/book/10.1007/978-981-15-3492-8*

Most teachers of reading in the junior primary school work hard to continually improve their teaching in a desire to achieve better literacy learning outcomes for their students. Many teachers are frustrated with not knowing what to do better, especially for those students who struggle with learning to read. These teachers are aware that Australian children should be doing better in reading and literacy in general, but they feel they don't have the necessary tools to make a significant difference for their students. The research reported in this book should be of interest to all teachers who want to improve the literacy outcomes of their students. The authors have undertaken challenging research in real Australian classrooms. Working with teachers, speech pathologists, school leadership teams and students, they describe and present results from a carefully designed research project that spanned two school years. Using a mixture of methods involving statistical analyses of results as well as in-depth interviews, the authors present findings that are important and relevant for teachers of reading and literacy in Years 1 to 4. Teachers who are motivated to do a better job for their students will find compelling approaches that can be adapted in their own classrooms. The authors provide excellent examples of up-to-date research and how this can be translated into practice. I recommend this useful book to all teachers of junior primary school students.

# Book review
# How we learn: The new science of education and the brain

Reviewed by **Dr Roslyn Neilson**

*How we learn: The new science of education and the brain*
*Stanislas Dehaene*
*Penguin Books, 2020.*

In 2009 Stanislas Dehaene, neuroscientist and science writer, published a book that captured the attention of many education professionals: *Reading in the Brain*. In that book Dehaene provided a very accessible account of some current developments in neuroimaging, explaining what brain imaging research can teach us about how humans learn to read. Dehaene described how neural networks that originally served other purposes, adapt to specialise in the demands of reading and writing – skills that are very new in human evolutionary history. He showed that our apparently effortless recognition of words is achieved through the activation of neural connections between the visual cortex and other parts of the brain that process sound and meaning. His explanation made perfect sense against the backdrop of what educational research has taught us about efficient teaching methods of teaching children how to read. The practical implications that Dehaene drew in his 2009 book, relating to systematic exposure to the phonemic basis of the alphabetic code, were very compelling indeed.

In his 2020 book, entitled *How we learn: The new science of education and the brain*, Dehaene displays a keen interest in both artificial intelligence and cognitive psychology, along with an inspiring reverence for the human ability to learn. The book is just as powerful as *Reading in the Brain* in terms of translating quite specialised research into accessible food for thought for readers, and its practical implications are equally compelling. Dehaene makes the point in the Introduction that one of the great human experiments in learning was the invention of formal schooling, which allows us to systematise and extend learning. The book is essentially a well-argued review of the evidence that is available to educators about how to maximise learning potential.

Parts 1 and 2 provide a fascinating but rather complex background. Part 1 begins by defining learning in some detail, arguing that it is a process in which the brain forms an internal model of the outside world, generates predictions, and changes itself on the basis of feedback about the accuracy of the predictions. Part 2 provides a wide-ranging account of how our brains learn, including the issue of plasticity and the nature and nurture question. This section presents intriguing data on babies' abilities to process environmental input and change their behaviour accordingly – I was surprised not only at how much babies can do, but at how much can be learned about babies if you know what to look for. Dehaene makes frequent references to artificial intelligence to help clarify the concept of learning, as he considers what programmers need to do to make computers learn.

Part 3 is the most accessible section of the book. It is organised around what Dehaene calls the four 'pillars' of learning: focused attention, active engagement, error feedback, and rehearsal and consolidation. A good deal of the material covered in this section may be familiar to readers who have thought about cognitive psychology, including concepts such as attention control, executive function, cognitive load theory and retrieval practice. The material is very elegantly organised and summarised, and the empirical support underlying the principles of learning is presented with clarity and simplicity. Interestingly, every point made about cognitive psychology research is accompanied by practical recommendations. For example, one fascinating area of research that was not familiar to me in this section involved the way in which sleep can allow the rehearsal of learned material – and one of the practical recommendations following from that point involved the suggestion that high schools could consider changing their hours to fit in with typical adolescent sleep cycles. The chapter that highlights the importance of immediate and supportive error feedback is perhaps at the heart of this section, with Dehaene arguing that errors, and the feedback that errors can generate, are an essential part of learning. His argument in this section steers a deft middle course between the two unhelpful extremes of passive acceptance of teacher input on one hand, and unguided discovery learning on the other hand – and along the way he provides a very cogent argument that end of year school grades are a very inefficient way to give feedback.

*How we learn…* is a challenging and very interesting book, and I think that it would be useful to set at least Part 3 as a core component of pre-service teacher education. It is certainly worthwhile for teachers to take the time to read and digest it, and parents will find it intriguing. Some readers may end up feeling that the book has served largely to justify, reinforce and perhaps extend the strategies that competent teachers already use, but I think that it offers much more than that. In the introduction, Dehaene writes: "When you close this book, I hope you will know more about your own learning processes." He has succeeded in this – this is a book that can make us all think.

# Consultant Notes

**Olivia Connelly**, Convenor, Consultants Committee

As I write this last Consultants Notes for the year, I have been reflecting on the year that has passed. Whilst 2020 was full of turmoil and distress, it has also in some ways been a year of change for the better. In my municipality, the City of Yarra, I've witnessed an outpouring of good will and community support for those who have suffered the most, as I'm sure you all have, right around Australia.

I've also witnessed an outpouring of support from our LDA Specialist Teacher Consultants to ensure that the students on their caseloads were not left behind as many schools struggled to offer a tiered model of support via remote learning. In the past many students experiencing challenges were offered face-to-face small group sessions within the school, but remote learning left many schools unable to provide these sessions, due to a variety of reasons such as lack of staffing, timetabling challenges and lack of familiarity with online practices.

But not our courageous LDA Specialist Teacher Consultants. Ably led by our past Consultant Convenor Ann Ryan and supported by many experienced colleagues in the team, rapid response online professional development sessions were organised. Professionals such as Sarah Barnes, Kristin Anthian, Diane Barwood, Barb Leiton and Lisa Phillips as well as many others pooled their resources and ideas on how LDA Consultants could continue to deliver carefully structured, impactful and evidence-based interventions online, every week.

What does it mean to be an LDA Consultant? In order to be granted LDA Consultant membership, you need to hold a post graduate degree with a significant LD component and have three or more years' experience in delivering evidence-based assessment and intervention in literacy and/or numeracy. Obtaining LDA Consultant membership is recognition of your significant contribution to the field of learning difficulties and reflects your dedication to evidence-based practice, particularly in the areas of literacy and numeracy, across the years of primary and secondary schooling. Consultant membership is acknowledgement of a steadfast commitment to ensuring that the diverse needs of students are met through ongoing engagement with research and best practice intervention. LDA notes that it can be difficult for research to filter into schools, and Consultants can act as a conduit in this regard, helping schools to apply principles of evidence-based practice.

LDA supports Consultants in the task of keeping up with research, providing excellent professional development and publications such as this Bulletin and the *Australian Journal of Learning Difficulties*. LDA Consultants also become part of dedicated regional networks that meet each term (all online this year!) to collaborate and share resources. In these meetings, the challenges of our profession are discussed and dissected, papers emerging from research are debated and unpacked, so that subsequent intervention sessions may reflect best-practice in education. These network meetings are a significant benefit of LDA Consultant Membership, allowing consultants to come together, develop close friendships and continue to refine and deepen their knowledge in the field of learning difficulties. Many networks regularly host an impressive array of speakers to ensure that learning never ceases. In addition, for a small annual fee, Consultants may register their own private practices with the LDA Online Tutor Search.

If you'd like to become part of the dynamic group of LDA Consultants, or if you have any queries, I encourage you to contact me directly via email: consultant.convenor@ldaustralia.org.

Finally, Elaine McLeish recently retired from her role as Consultant Administration Officer, and I would like to extend my sincere thanks to her. She was a friend and mentor to me as well as a source of deep wisdom and knowledge in my work as a consultant.

As Ann Ryan's tribute to Elaine in this issue of the LDA Bulletin makes clear, Elaine has made a tremendous contribution to LDA, and she will be missed.

I wish you all well for the New Year.

*Olivia Connelly*

*Convenor, Consultants Committee*

*Olivia Connelly is the Director of Gameplan, a language, literacy and learning practice in Brunswick East, Melbourne. She is passionate about supporting children, adolescents and adults with learning challenges using research-driven practices, and she presents regularly to schools and organisations. Olivia has been the recipient of a city of Yarra grant for four years in a row, to provide language and literacy services to two under-privileged schools in Melbourne. She is also the busy Mum of two very energetic children.*

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