Curriculum content for Teacher Preparation and In-Service Professional Development

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Overview

How children learn to read

- The science of reading
- The structures of language
- Evidence-based frameworks
- The importance of knowledge

The most effective way to teach

- The science of learning
- Explicit instruction
- A non-categorical approach
- Assessment and progress monitoring
- Planning for teaching and assessment

1 The brain and learning

- Novice vs expert learners
- How the brain learns and retains information
  - » Short- and long-term memory
  - » Cognitive load
- How the brain masters knowledge
  - » Retrieval and application in familiar and unfamiliar contexts
- Neuromyths
  - » Misconceptions of brain research

2 Effective pedagogical practices

- Planning and sequencing
- Explicit modelling and scaffolding
- Assessment and feedback
- Literacy:
  - » Early reading/phonics
  - » Explicit reading and writing comprehension tailored to discipline-specific content
- Numeracy:
  - » Six strands of mathematics
  - » Explicit instruction tailored to discipline-specific content
- Multi-tiered systems of support

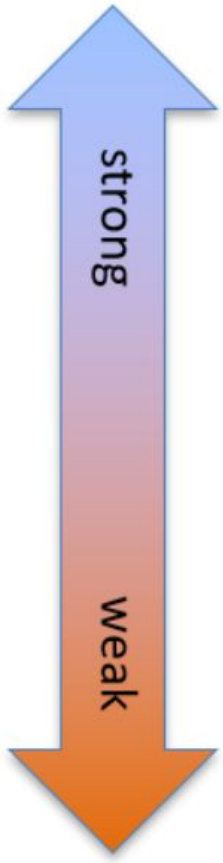
Strong Beginnings: Report of the Teacher Education Expert Panel (2023)

The science of reading

A definition

"[T]he body of work referred to as the 'science of reading' is not an ideology, a philosophy, a political agenda, a one-size-fits-all approach, or a specific component of instruction. It is the emerging consensus from many related disciplines, based on literally thousands of studies, supported by hundreds of millions of research dollars, conducted across the world in many languages. These studies have revealed a great deal about how we learn to read, what goes wrong when students don't learn, and what kind of instruction is most likely to work the best for the most students" (Moats, 2020).

Evidence hierarchy



Gold	Level 1	Systematic review or meta-analysis of relevant RCTs
	Level 2	At least one large RCT
Silver	Level 3	Well-designed controlled trials
	Level 4	Well-designed cohort studies and evaluations
Other	Level 5	Systematic reviews of descriptive and qualitative studies
	Level 6	A single descriptive or qualitative/case study
	Level 7	Opinion or report of committee

https://education.nsw.gov.au/about-us/education-data-and-research/cese/evaluation-evidence-bank/evidence-hierarchy

Why the quality of evidence matters

Research that is conducted using scientific research protocols is

- Reliable
- Replicable
- Generalisable

The structure of language

Orthography – the spelling system

- Like English, Portuguese is an alphabetic language.
- In alphabetic languages, the sounds in spoken words are represented by letters of the alphabet in written words.
- The letters of the alphabet and the accents are a code for the sounds in speech.
- They can be decoded to read words or they can be encoded to spell words.
- Like English, the spelling of Portuguese words is a function of:
    1. phonemes (individual speech sounds)
    2. syllables (sound based sub-units)
    2. morphemes (meaning based sub-units)

One word, three sub-lexical structures

Phonemes:

/t/ /e/ /l/ /ɛ/ /f/ /o/ /n/ /i/

Syllables:

te-le-fone

Morphemes:

tele- (“far”) + -fone (“sound”)

Orthography – the spelling system

- Children learn to read more easily in languages with a shallow orthography and simple syllabic structure.
- Portuguese has been described as having a moderately deep orthography.
- The alphabetic code is reasonably regular but dual processing of phonemes and morphemes is required to read many words .

		Orthographic depth				
		Shallow				Deep
Syllabic structure	Simple	Finnish	Greek Italian Spanish	Portuguese	French	
	Complex		German Norwegian Icelandic	Dutch Swedish	Danish	English

Seymour, Aro and Erskine (2003)

Tiny visual differences have dramatic effects

One tiny line transforms:

A grapheme from from <P> to <R>

A phoneme from /p/ to /r/

A word from PAT to RAT

Syntax – the organising system

- Syntax is the order in which words and phrases are arranged in a sentence.
- A small change in the order of words in a sentence can change its meaning, by a little or to mean the complete opposite.

I almost failed every test. ⇨ You passed, but barely.

I failed almost every test. ⇨ You did very badly.

I like Kate more than Alex. ⇨ Kate is your favourite.

I like Alex more than Kate ⇨ Alex is your favourite.

Evidence-based frameworks of reading

Evidence-based frameworks

- Simple View of Reading
- Cognitive Foundations Model
- The Five ‘Big Ideas’ or components of reading
- The importance of knowledge

Scientific evidence-based theoretical frameworks or models of reading

According to Hoover and Tunmer (2020), a framework

> "… provides a way for reading professionals to think about reading and its development and gives them mechanisms that, coupled with such understanding, will help them link what children must know to become strong readers to what teaching can best provide through the competent use of available tools."

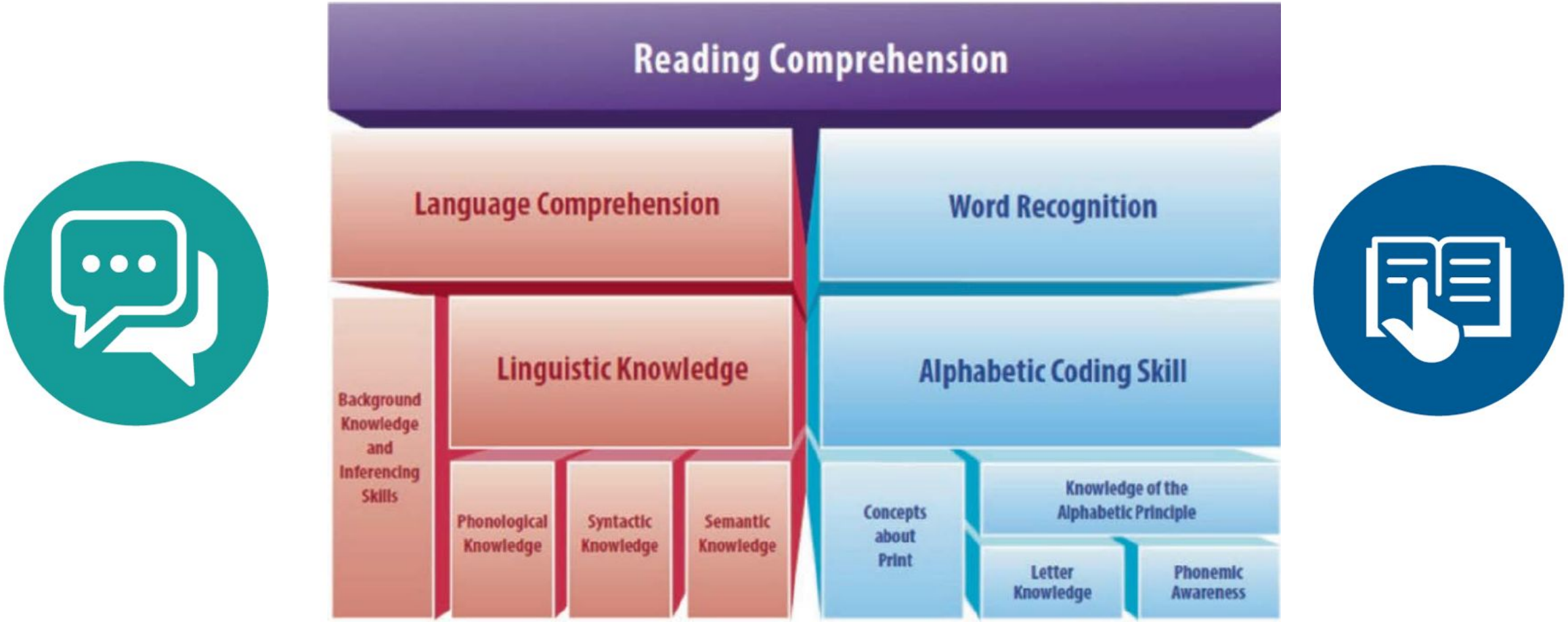
Frameworks are useful because they…

- Increase the likelihood that all of the essential aspects of reading development are included in planning and guidance
- Reduce the likelihood that instruction and assessment might become heavily skewed toward one set of skills or knowledge
- Reassure school leaders and teachers that a policy or professional learning that is focused on one aspect of reading does not mean that others are dismissed or neglected
- Provide a structure that it is understood, accepted and implemented consistently

Simple View of Reading

Gough & Tunmer (1986). Image from Wheldall et al. (2023)

Cognitive Foundations Framework

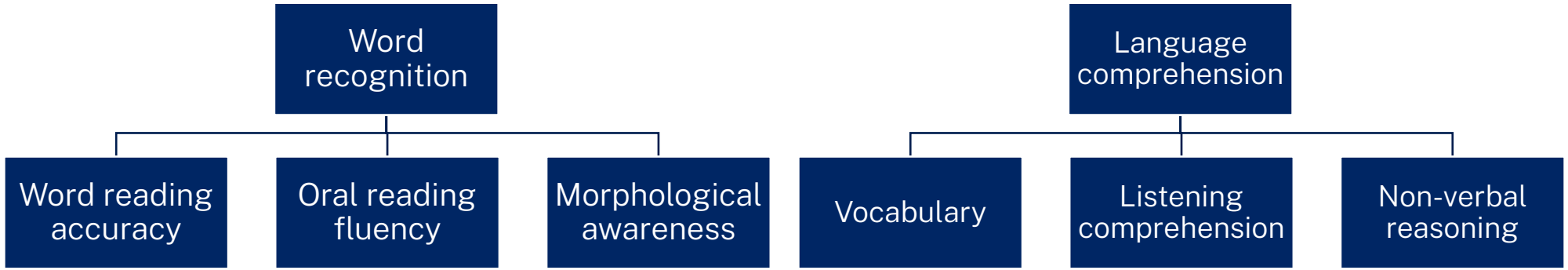


Hoover & Tunmer (2019)

Five ‘Big Ideas’ or components of reading

Component	Description
Phonemic awareness	The ability to identify and manipulate the distinct individual sounds in spoken words.
Phonics	The ability to decode words using knowledge of letter-sound relationships.
Fluency	The ability to read with appropriate speed, accuracy and prosody.
Vocabulary	The ability to understand the meanings of a wide variety of words.
Comprehension	The ability to understand the meaning and intent of a whole text.

The SVoR in European Portuguese

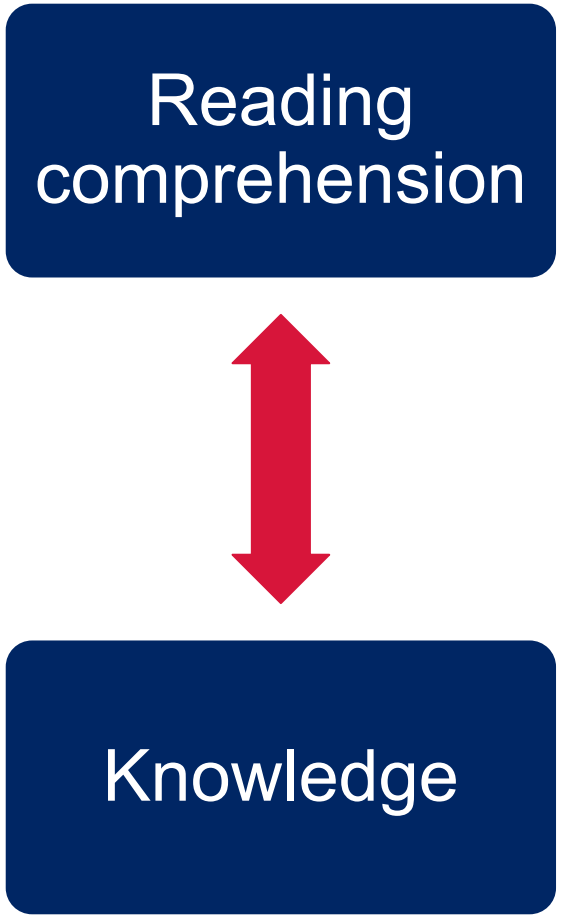


The importance of background knowledge

- The quantity and quality of knowledge that the reader can draw on when reading text is a strong predictor of comprehension.
- Knowledge is thought to be organised into networks of connected facts and concepts, called *schemata* in long term memory.
- Knowledge is essential for inference generation – bridging the gap between what is in the text and what is assumed.
- Knowledge contributes to the development of a mental model/situation model which is built using aspects of the text and the readers' existing knowledge. It changes as more information is integrated.
- A strong mental model facilitates comprehension and encodes information into long term memory enriching the schemata.
- A weak mental model inhibits the ability to make inferences, filter out irrelevant information, identify contradictory information, and overcome text complexity and coherence challenges.

A bi-directional relationship

- Reading comprehension is highly dependent on background knowledge but the relationship is **bi-directional**. Students need comprehension skills to gain knowledge from reading and vice versa.
- In an evidence-based approach to comprehension instruction, skills and strategies are taught explicitly and cumulatively, and gradually integrated..
- Comprehension instruction will be most effective if it is taught along with a **content-rich curriculum** that builds knowledge



Effective instruction

Effective instruction

Effective instruction builds the schemata in long term memory that allow not just reading comprehension but all kinds of learning.

Effective instruction is:

- Based on the science of learning
- Explicit and adaptive
- Non-categorical (MTSS)

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The science of learning

A definition

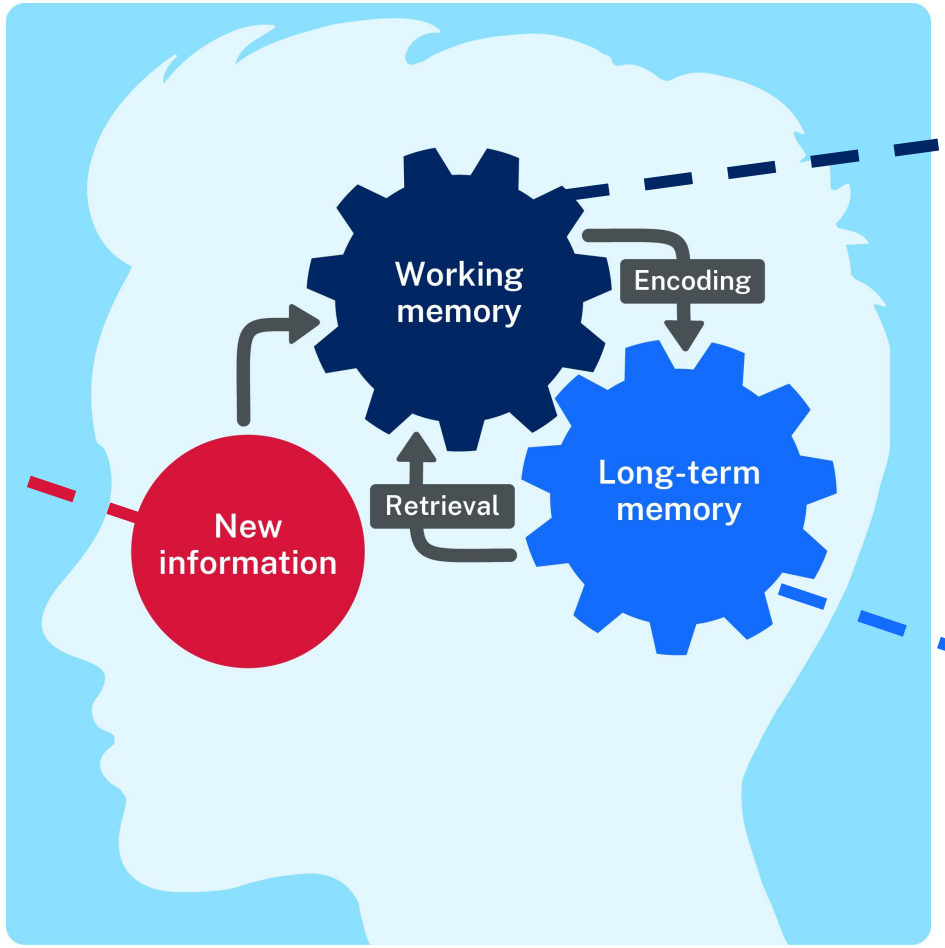
”The scientific study of the underlying bases of learning with the goal of describing, understanding, or improving learning across developmental stages and diverse contexts.”

(Privitera, Ng & Chen 2023)

Cognitive models of learning

"Cognitive" = of or relating to the mental processes of perception, memory, judgment, and reasoning

The learning process starts when **attention** is focused on new information, and it enters working memory



Working memory stores and processes small amounts of information for a short amount time

Long-term memory stores large amounts of information, semi-permanently

Key concepts in the Science of Learning

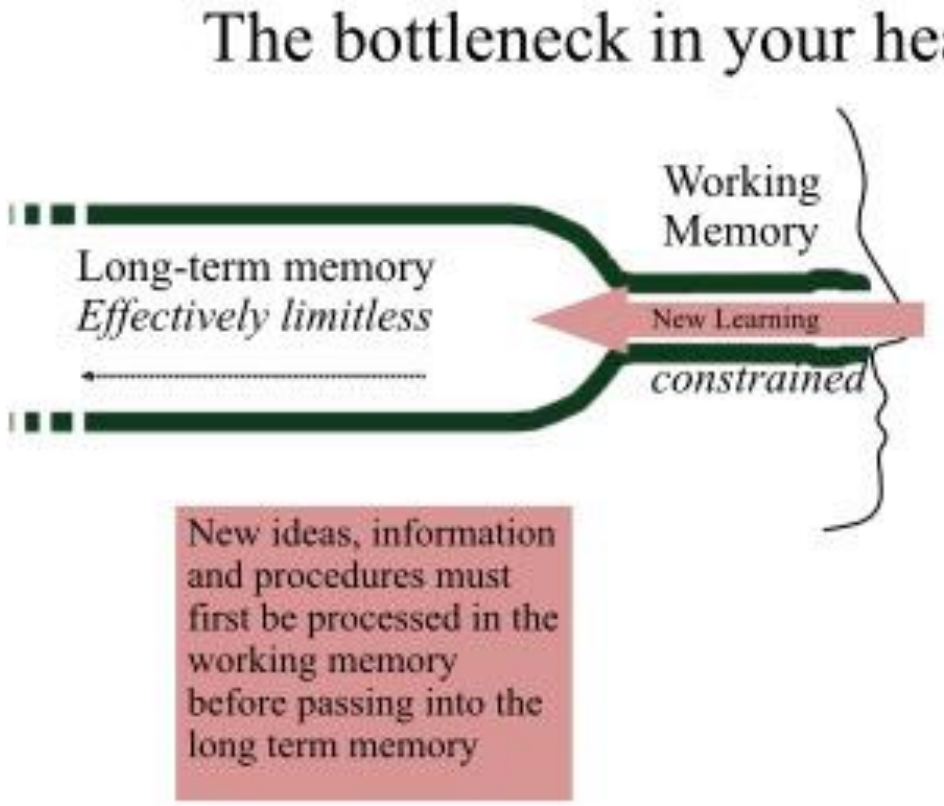
#1
Cognitive Load

#2
Schemas

#3
Forgetting curve

#4
Expertise reversal

#1 Cognitive Load



Picture credit: Greg Ashman https://gregashman.wordpress.com/

Cognitive load theory

Cognitive load refers to the demands of processing information in working memory (CESE 2017)

When cognitive load exceeds the working memory capacity of a student, there is a greater risk of:

- misunderstandings
- misinterpretations or confusion
- ineffective encoding in long-term memory
- learning slowing down.

#2 Schemas

Schemas (also called mental models) "are structures that organise knowledge in the mind." (EEF 2021:31).

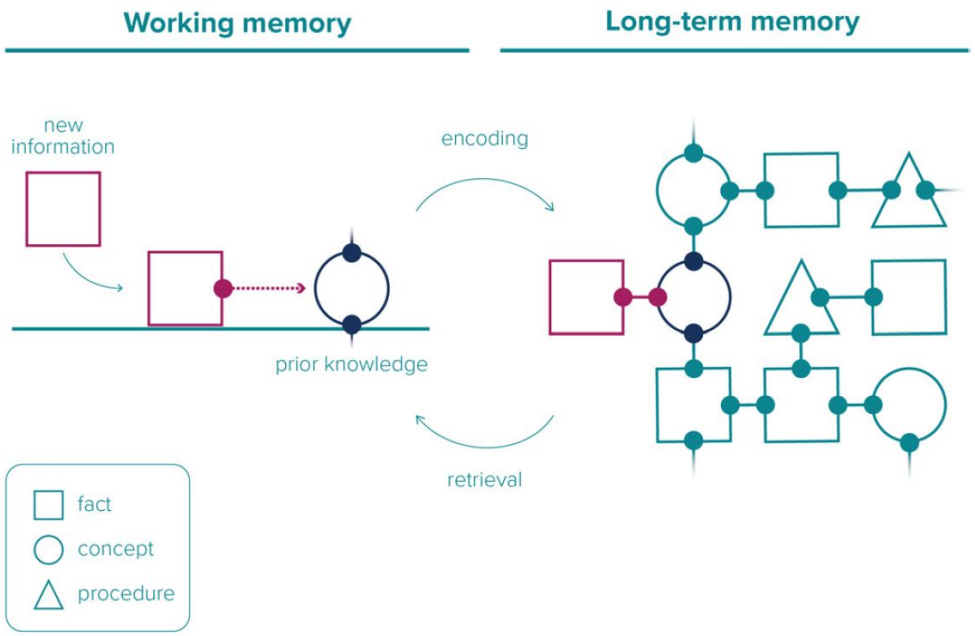
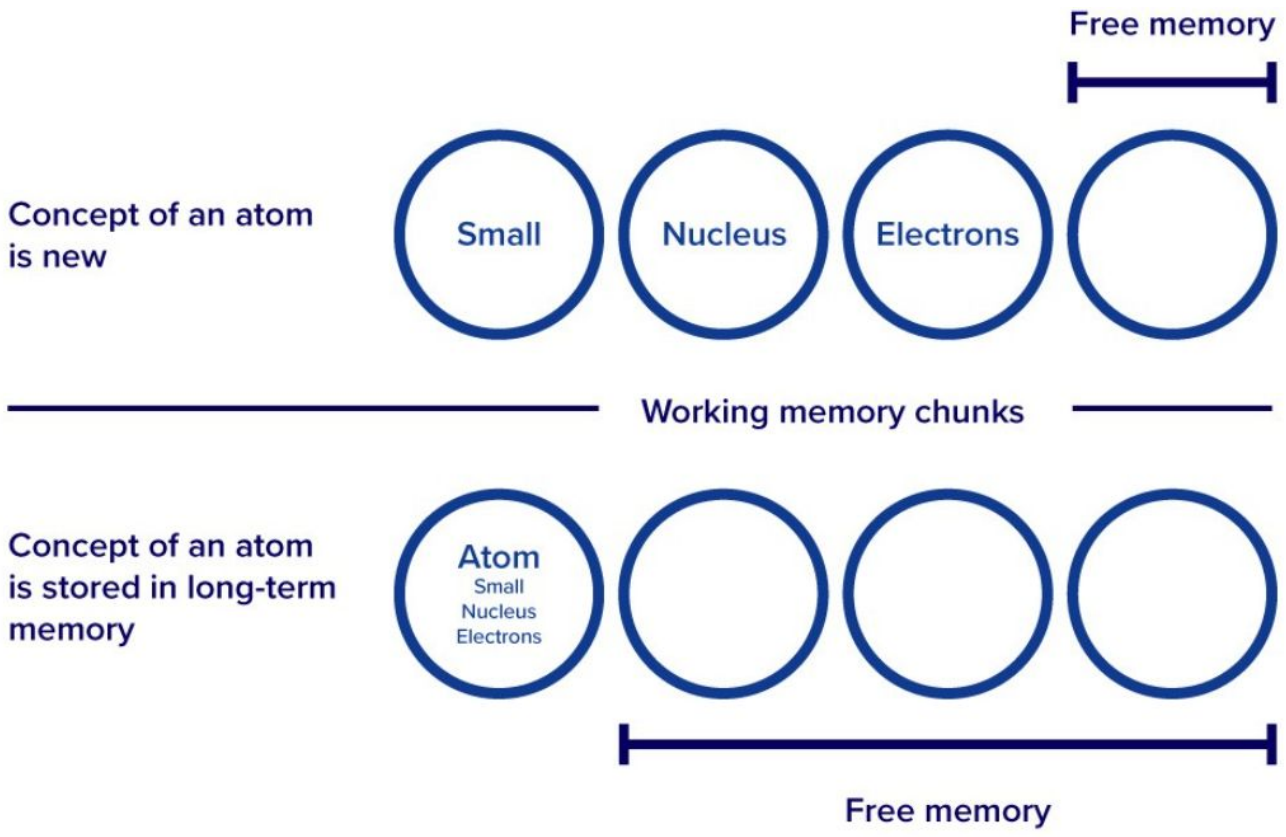


Image adapted from Australian Education Research Organisation Limited (AERO) (2023) How students learn best and licensed under CC BY 4.0.

Schemas influence cognitive load



#3 Forgetting curve

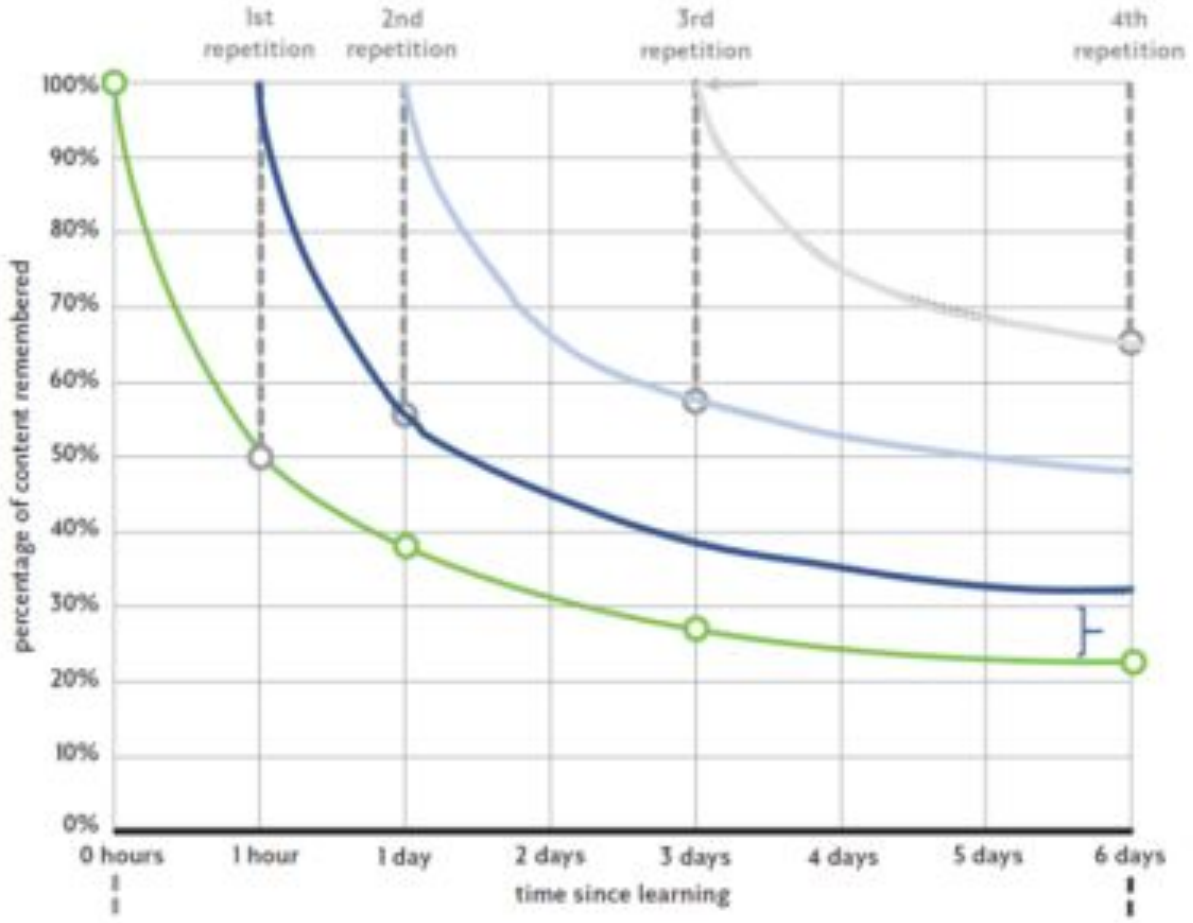


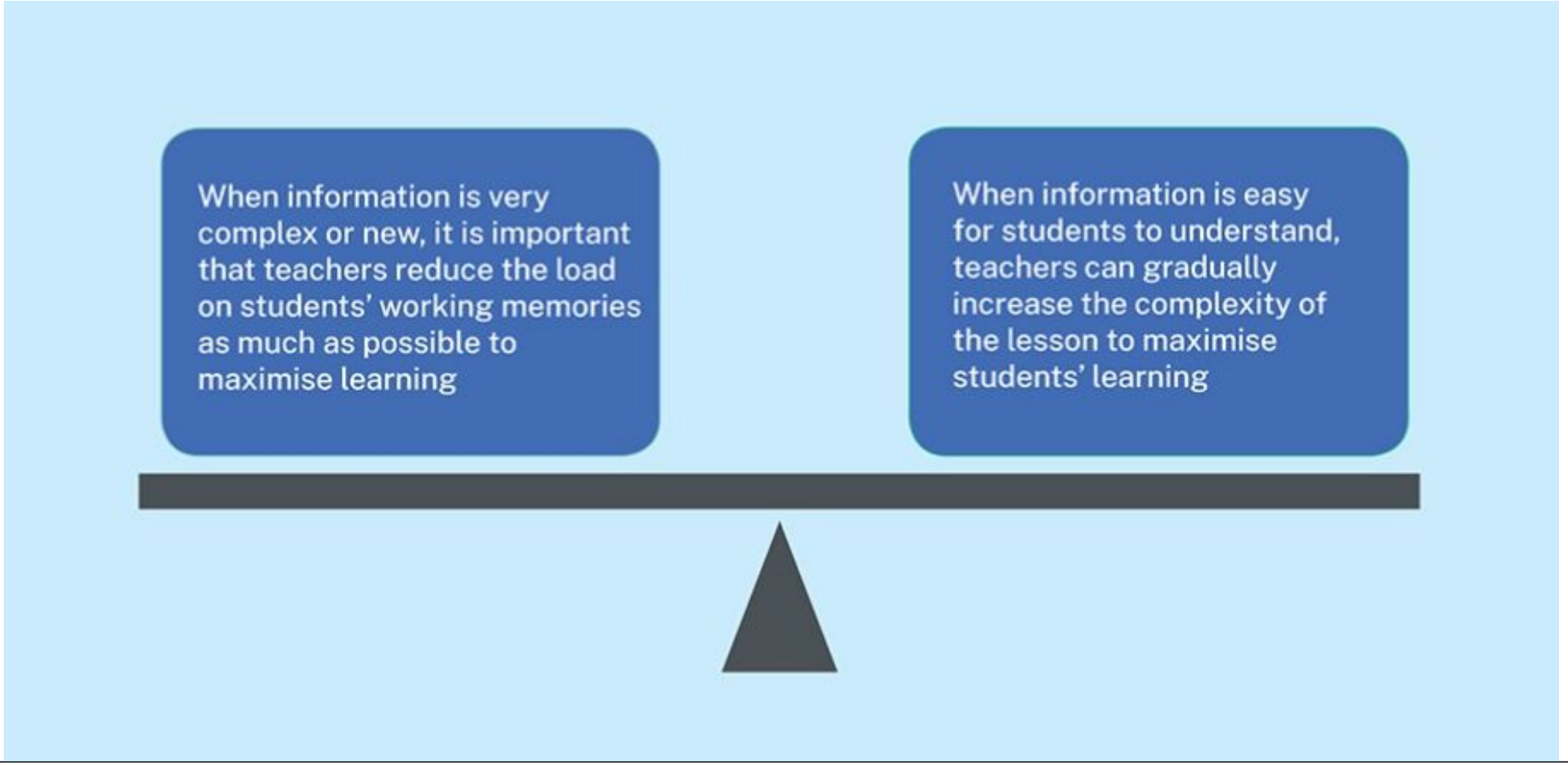
Image credit: Oliver Caviglioli via Doug Lemov https://teachlikeachampion.org/blog/an-annotated-forgetting-curve/

Repetition and retrieval reduce the forgetting curve

- **Retrieval practice** refers to learning activities that prompt students to intentionally ‘bring to mind’ (retrieve) previously learnt information
- It is more than just the simple recall or recitation of facts
- Many common, low-cost classroom activities can be used for retrieval practice:

Free writes	Flash cards	Labelling diagrams	Teacher questioning
Brain dumps	Think, pair, share	Exit tickets	Low or no stakes quizzes

#4 Expertise reversal



Explicit teaching

The science of learning points to explicit teaching as being highly effective

The key elements of effective instruction are designed to maximise understanding, retention, and transfer.

Systematic
methodical and planned to a high level of detail

Sequential
the order of content builds skill development

Structured
time is allocated to ensure all content and skills are covered and connected

Clear and concise
content is presented in small amounts with clear explanations and examples

Cumulative
content and skills are built and revisited through repetition, practice, and recall

Mastery
students demonstrate mastery or understanding before new content is taught

Explicit teaching is effective teaching

	Cognitive load	Schema	Forgetting curve	Expertise reversal
Systematic				
Sequential				
Structured				
Clear and concise				
Cumulative				
Mastery				

Principles of instruction

- Begin each lesson with a short review of previous learning
- Present new material in small steps (‘chunks’) with student practice after each step
- Ask questions and check the responses of all students (
- Provide models
- Guide student practice
- Check for student understanding (
- Obtain a high success rate
- Provide scaffolds for difficult tasks
- Set and monitor independent practice
- *Daily, weekly and monthly review*

Principles of Instruction

Research-Based Strategies That All Teachers Should Know

BY BARAK ROSENSHINE

This article presents 10 research-based principles of instruction, along with suggestions for classroom practice. These principles come from three sources: (a) research in cognitive science, (b) research on master teachers, and (c) research on cognitive supports. Each is briefly explained below.

A: Research in cognitive science: This research focuses on how our brains acquire and use information. This cognitive research also provides suggestions on how we might overcome the limitations of our working memory (i.e., the mental "space" in which thinking occurs) when learning new material.

B: Research on the classroom practices of master teachers: Master teachers are those teachers whose classrooms made the highest gains on achievement tests. In a series of studies, a wide range of teachers were observed as they taught, and the investigators coded how they presented new material, how and whether they checked for student understanding, the types of support they provided to their students, and a number of other instructional activities. By also gathering student achievement data, researchers were able to identify the ways in which the more and less effective teachers differed.

C: Research on cognitive supports to help students learn complex tasks: Effective instructional procedures—such as thinking aloud, providing students with scaffolds, and providing students with models—come from this research.

Barak Rosenshine is an emeritus professor of educational psychology in the College of Education at the University of Illinois at Urbana-Champaign. A distinguished researcher, he has spent much of the past four decades identifying the hallmarks of effective teaching. He began his career as a high school history teacher in the Chicago public schools. This article is adapted with permission from Principles of Instruction *by Barak Rosenshine. Published by the International Academy of Education in 2010, the original report is available at www.ibe.unesco.org/fileadmin/user_upload/Publications/Educational_Practices/EdPractices_21.pdf.*

ILLUSTRATION BY JAMES V. KING

Even though these are three very different bodies of research, there is *no conflict at all* between the instructional suggestions that come from each of these three sources. In other words, these three sources supplement and complement each other. The fact that the instructional ideas from three different sources supplement and complement each other gives us faith in the validity of these findings.

Education involves helping a novice develop strong, readily accessible background knowledge. It's important that background knowledge be readily accessible, and this occurs when knowledge is well rehearsed and tied to other knowledge. The most effective teachers ensured that their students efficiently acquired, rehearsed, and connected background knowledge by providing a good deal of instructional support. They provided this support by teaching new material in manageable amounts, modeling, guiding student practice, helping students when they made errors, and providing for sufficient practice and review. Many of these teachers also went on to experiential, hands-on activities, but they always did the experiential activities *after*, not before, the basic material was learned.

The following is a list of some of the instructional principles that have come from these three sources. These ideas will be described and discussed in this article:

- Begin a lesson with a short review of previous learning.[1]
- Present new material in small steps with student practice after each step.[2]
- Ask a large number of questions and check the responses of all students.[3]
- Provide models.[4]
- Guide student practice.[5]
- Check for student understanding.[6]
- Obtain a high success rate.[7]
- Provide scaffolds for difficult tasks.[8]
- Require and monitor independent practice.[9]
- Engage students in weekly and monthly review.[10]

12 AMERICAN EDUCATOR | SPRING 2012

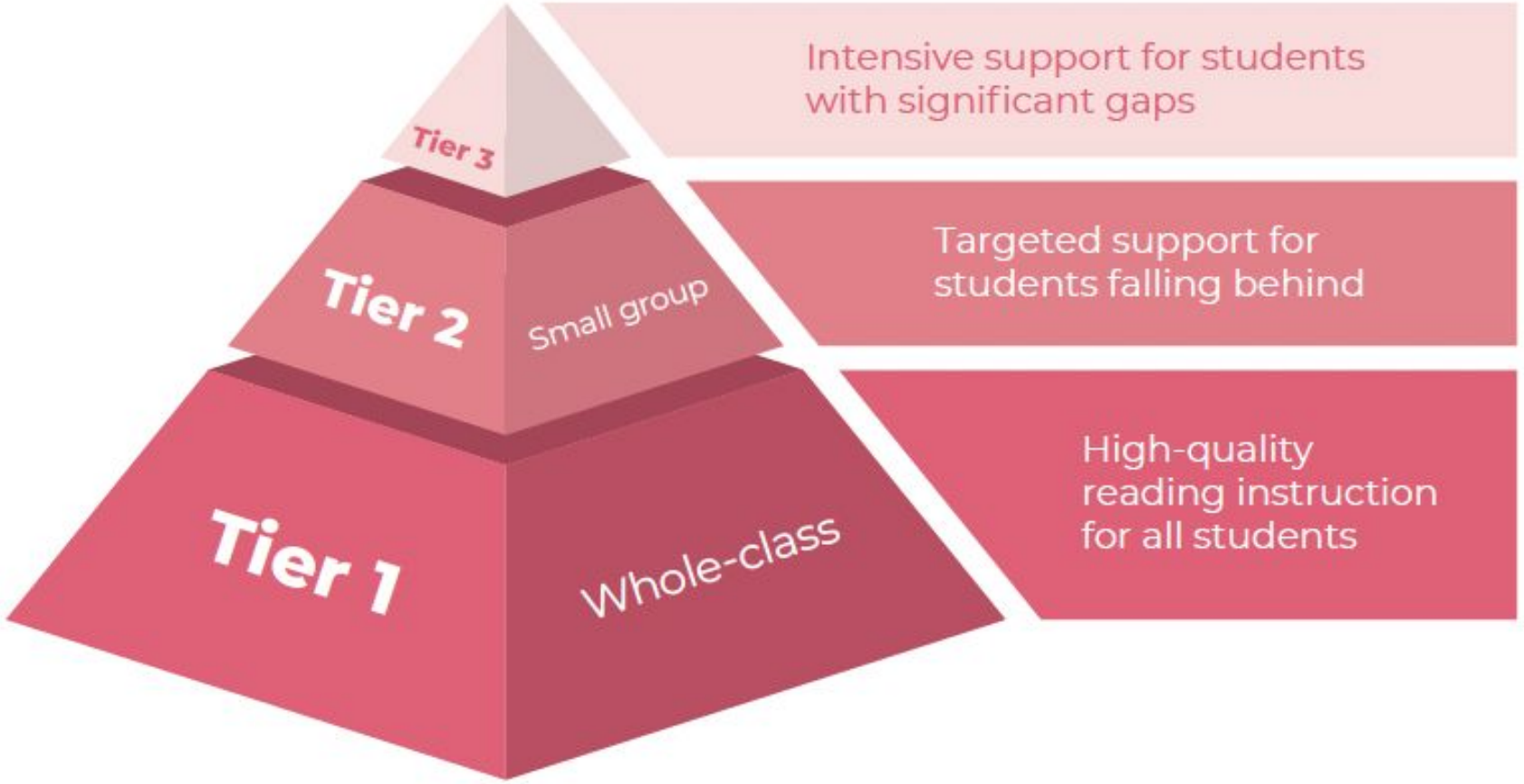
(Rosenshine, 2012)

A non-categorical approach

A non-categorical approach to teaching reading

- When students begin school, there is no conclusive way of knowing which students will have difficulties learning to read. Therefore, all students should have evidence-based explicit teaching from the first weeks of school.
- Any student who does not make good progress in reading should be offered a targeted intervention, irrespective of a diagnosis of disability or a learning difficulty.
- This is an efficient, equitable, and child-centred approach.
- Intervention is tailored to the specific educational need of the child, not the perceived needs of a ‘category’ of diagnosed difficulty or disability.
- Intervention is more effective if it is a more intensive form of classroom instruction.

Response to Intervention



Tier 1 + Tier 3

Tier 1 + Tier 2

Wheldall, Wheldall & Buckingham (2023). *Effective instruction in reading and spelling.*

How to be sure students are learning: Assessment and progress monitoring

Modes of assessment

Less formal
- Assessed frequently
- Fewer outcomes assessed (targeted)

More formal
- Assessed infrequently
- More outcomes assessed (broad)

Modes	Unstructured General classroom observation	Slightly structured Pre-planned observation opportunities	More structured Pre-programmed class assessment	More structured Large-scale standardised assessment
Examples	For example: • unplanned observations and questioning of: ◦ skills ◦ dispositions ◦ content understanding	For example: • quizzes • hinge questions • planned observations • reviewing student work • peer and self-assessment	For example: • scheduled in-school assessments • on-demand assessments • practical assessments • reviewing work samples against criteria	For example: • NAPLAN • Check-In Assessments • VALID Science • HSC examinations

Embedded timely, effective feedback

Assessment decision criteria

A research-informed assessment schedule is one that

1. aligns with an evidence-based theoretical framework (e.g., the Simple View of Reading) and pedagogical framework (e.g., Response to Intervention).
2. has a clear purpose for each assessment used
3. uses assessments that have strong psychometric attributes, based on research that the test publishers (or others) have conducted.

Purpose of assessment determines the type

Type of assessment	Purpose
Screening	Identify students requiring more intensive support in an area of learning.
Curriculum-based assessment	Determine how far students have progressed according to a program or curriculum's scope and sequence.
Progress monitoring	Monitor a student's response to instruction over time.
Norm-referenced assessments	Determine the level at which a student is performing, compared with the wider population of their similarly aged peers.
Diagnostic assessments	Identify students' strengths and weaknesses in a specific area of learning.

Wheldall, Wheldall & Buckingham (2023). *Effective instruction in reading and spelling.*

Attributes of high-quality assessments

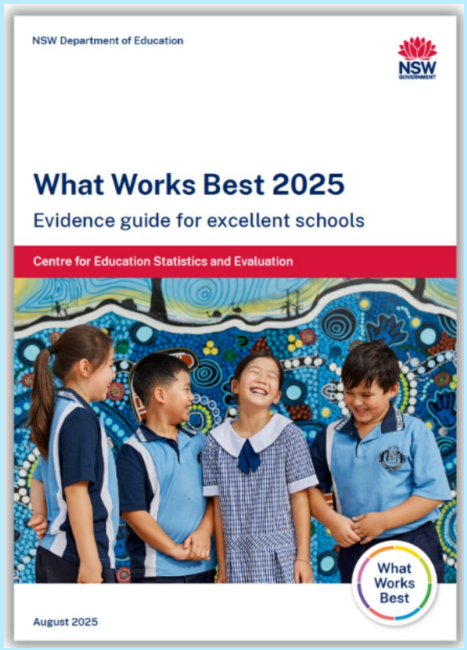
- ✔ Validity: accurately measures those things the teacher is attempting to measure.
- ✔ Reliability: produces stable and consistent results over time, and with different learners and assessors.
- ✔ Sensitivity: correctly identifies all students with difficulties
- ✔ Specificity: correctly identifies all students without difficulties
- ✔ Objectivity: the conclusions are dependent on which specific assessment task is used or who does the assessing.
- ✔ Inclusiveness: does not underestimate nor overestimate achievement or progress because of student gender, physical ability, cultural background, socioeconomic status or geographical location.

Planning for teaching and assessment

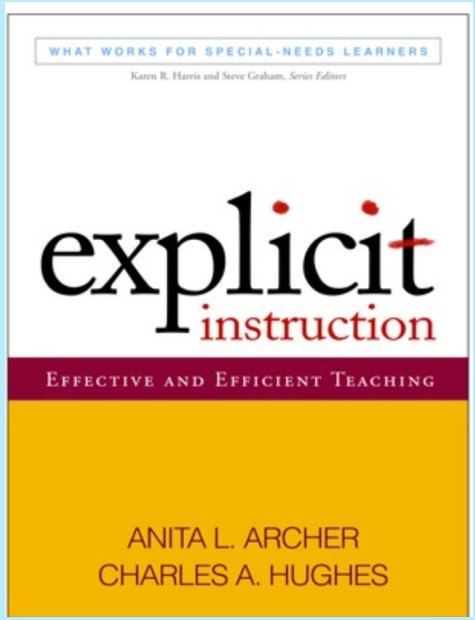
Planning for teaching and assessment

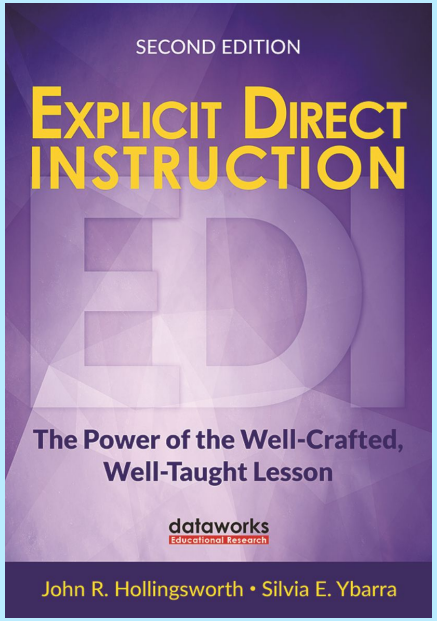
- Ideally there will be a **scope and sequence** that extends across the **whole school** for each of the components of reading, spelling and writing as well as knowledge building.
- Instruction time will be allocated to ensure all components are taught, assessed and mastered to the appropriate level.
- Instruction time should include ample time for practice and consolidation.
- The sequence and instruction time allocations will shift from an emphasis on foundational to complex skills as students move through school.
- Assessment will be planned at critical decision points for intervention and reporting.

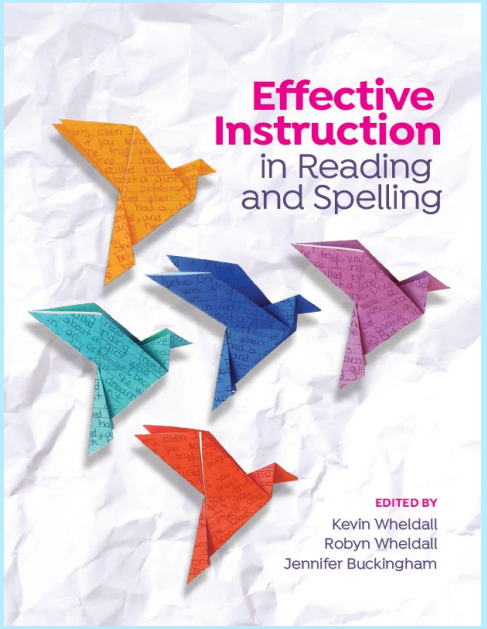
Resources


NSW Department of Education
What Works Best 2025
Evidence guide for excellent schools
Centre for Education Statistics and Evaluation
What Works Best
August 2025


Australian Education Research Organisation
How students learn best
An overview of the learning process and the most effective teaching practices
September 2023


WHAT WORKS FOR SPECIAL-NEEDS LEARNERS
explicit instruction
Effective and Efficient Teaching
ANITA L. ARCHER
CHARLES A. HUGHES


SECOND EDITION
Explicit Direct Instruction
EDI
The Power of the Well-Crafted, Well-Taught Lesson
dataworks
John R. Hollingsworth • Silvia E. Ybarra


Effective Instruction in Reading and Spelling
EDITED BY
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Thank you

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