

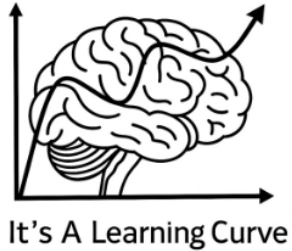
Getting to Grips with the
Research: Lessons from ~~38~~ 47
Book Summaries (and Counting!)



A little bit about how I got here...

- Taught in the UK
- researchED Rugby, and consequences
- Taught in the US

My summaries!



About

For Students... ▾

For Teachers... For Parents...

How Do We Learn?

Why Cognitive Science?

Cogsci In The Classroom ▾

Cogsci Book Summaries

A View From The Mid-Atlantic – Blog

Contact



Cogsci Book Summaries

[illegible]

1. Here is a reading list of **79 books** about **cognitive science** and its **application to the classroom**.

There is a **summary** below for anything highlighted in green.

2. Here are my summaries of a selection of these books.

For each book there is

- a pdf of **my summary**
- a pdf of a summary with **a blank column for your use** as part of professional development.
- I would recommend that you **read all of these books** – they each have their own unique take on the subject, all have which have enriched my teaching enormously.
- It's the interaction in making the summary that is important – **please use the blank columns!**

Do you have suggestions for books you think need a summary? [Contact me](#)



All the summaries are made with **my brain**.

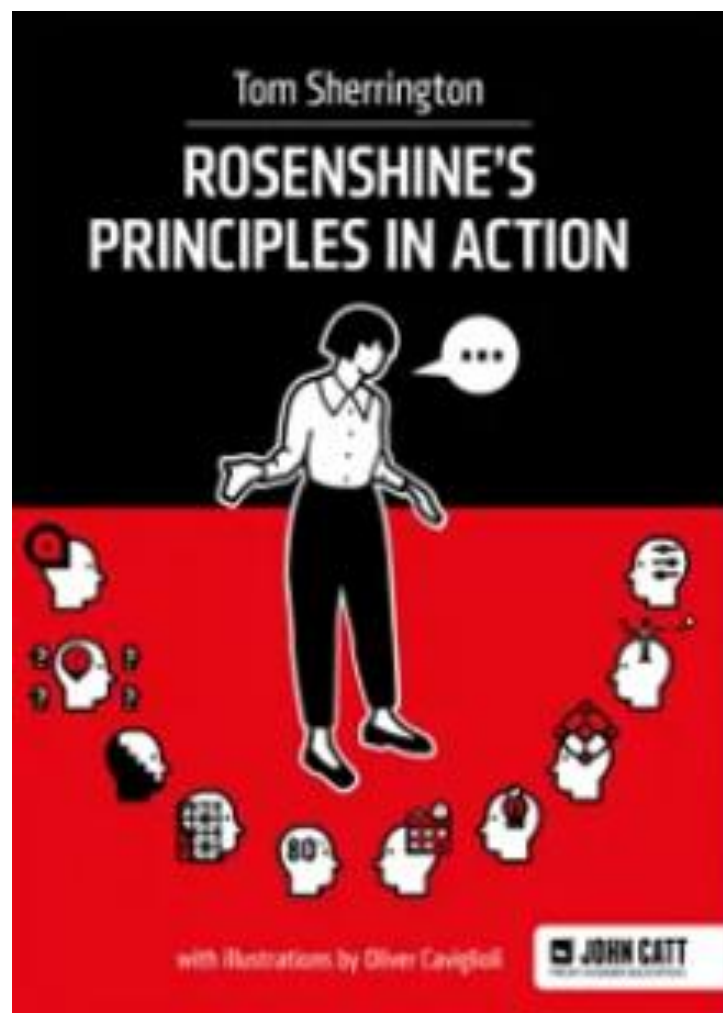
No AI was employed at any stage.

Click on the thumbnail to jump to the summary. Books listed in *alphabetical order by title*.



research  **ED**
St Louis

From this morning!



In Action Series, ed. Tom Sherrington, Summary by Helen Reynolds @literacylearningeducation

Book/Summary	Main points	Be this
Rosenshine's principles (2012) Author: Tom Sherrington, July, 2020 Contribution: The 10 instructions [4]	<ul style="list-style-type: none"> 1. 10 Principles - Each system, small steps, don't rush them, practice weekly, positive practice, check for understanding, high success rate, scaffold difficult tasks, stick to it, don't modify too much 2. 10 Principles - 1. Uncovering a concept and modelling - present material in small steps, give clear scaffolded instructions/explanations, think aloud/model steps, many examples, so much when necessary 3. Questioning - ask a LOT of questions, get them to explain what they've learned, check responses of ALL, provide feedback, feedback and corrections, 2. Learning material - begin with a review of previous learning, re-teach if necessary, 4. Steps of practice - high level of practice, guided at first, then and monitor feedback and practice 	<ul style="list-style-type: none"> 1. 10 Principles - be very clear 2. 10 Principles - be very clear 3. 10 Principles - be very clear 4. 10 Principles - be very clear 5. 10 Principles - be very clear 6. 10 Principles - be very clear 7. 10 Principles - be very clear 8. 10 Principles - be very clear 9. 10 Principles - be very clear 10. 10 Principles - be very clear
Cognitive Load Theory (2012) Author: John Sweller, Oct 2020 Contribution: Cognitive Load Theory concept	<ul style="list-style-type: none"> 1. Cognitive Load Theory - a theory of how we learn, based on the idea of working memory 2. Cognitive Load Theory - a theory of how we learn, based on the idea of working memory 3. Cognitive Load Theory - a theory of how we learn, based on the idea of working memory 4. Cognitive Load Theory - a theory of how we learn, based on the idea of working memory 5. Cognitive Load Theory - a theory of how we learn, based on the idea of working memory 6. Cognitive Load Theory - a theory of how we learn, based on the idea of working memory 7. Cognitive Load Theory - a theory of how we learn, based on the idea of working memory 8. Cognitive Load Theory - a theory of how we learn, based on the idea of working memory 9. Cognitive Load Theory - a theory of how we learn, based on the idea of working memory 10. Cognitive Load Theory - a theory of how we learn, based on the idea of working memory 	<ul style="list-style-type: none"> 1. Cognitive Load Theory - a theory of how we learn, based on the idea of working memory 2. Cognitive Load Theory - a theory of how we learn, based on the idea of working memory 3. Cognitive Load Theory - a theory of how we learn, based on the idea of working memory 4. Cognitive Load Theory - a theory of how we learn, based on the idea of working memory 5. Cognitive Load Theory - a theory of how we learn, based on the idea of working memory 6. Cognitive Load Theory - a theory of how we learn, based on the idea of working memory 7. Cognitive Load Theory - a theory of how we learn, based on the idea of working memory 8. Cognitive Load Theory - a theory of how we learn, based on the idea of working memory 9. Cognitive Load Theory - a theory of how we learn, based on the idea of working memory 10. Cognitive Load Theory - a theory of how we learn, based on the idea of working memory
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The first one...

How Learning Happens 2nd Ed (by Paul A. Kirschner and Carl Hendrick) – Planning Summary

	What	What to know and what to do	... and not do
Memory and cognition	 1. Working memory	Working memory (WM) is limited, and more like 4 than 7 can be recalled – don't overload BUT struggle can be good. Chunking REALLY helps. Use (unlimited) long term memory (LTM).	Don't overload WM AND (the challenge)... Don't make it too simple
	 2. Opening the black box	Working memory is dynamic and we have at least 5 WM stores. Cognitive overload negatively affects performance – avoid by chunking/organization.	Don't distract with seductive details (e.g. photos of cats)
	 3. Ah yes, I remember it well!	Episodic memory (EM) storage (your 21 st birthday) can change, semantic memory (SM) storage (e.g. times tables) not so much. Get THEM to link to episodic with semantic for a stronger memory/use dual coding/make meaning to capitalize on EM.	Don't use gimmicks (Swiss rolls in maths) - they will remember the event, not the content.
	 4. "What you know, you know"	Everyone has a bunch of schemas (ways info is organised). New information is evaluated against them, schemas adapt. Talk about 'remembering' not 'memories'.	Don't assume they will remember exactly - no one does.
	 5. Do you know what you know? Metacognition	Metacognition (thinking about thinking) is not fairy dust – you can teach it; you can get better at it. We can model it: planning/strategy choice, monitoring, evaluation.	Don't teach it as a 'generic' skill – link to domain knowledge.
How does our brain work?	 6. A novice is NOT a little expert	Children are NOT small adults. They see the world differently. Things that work for experts DON'T work for novices and vice versa, so don't mix them up. Beware the curse of knowledge.	Don't ask them to do things only experts do.
	 7. Take a (cognitive) load off me	You don't learn piano using Rach 2 - break it down. Solving a problem is NOT the same as learning how to solve a problem. Teach steps separately. Head human cognitive architecture.	Don't teach a complex system using complex systems.
	 8. Dancing in the dark	Skills = turning declarative into procedural knowledge. Novices use weak strategies (e.g. trial and error/means-ends), need help to move to expert problem solving (backwards from solution).	Don't engage in applications/problem-solving too soon.
	 9. An evolutionary view of learning	We easily learn things we need for survival (bio primary) BUT reading, writing, science... (bio secondary) need effort (tell them!) Help Ss manage interests, use bio primary to motivate (carefully).	Don't use too many gimmicks/novelities to appeal to bio primary.
Prerequisites for learning	 10. One picture and a thousand words	There are two cooperating memory systems: verbal/non-verbal. Most efficient to use both so e.g. integrate text into diagrams or talk around your diagrams. Use LOTS of examples for abstract concepts.	Don't use unnecessary images/read PowerPoint slides.
	 11. What you know determines what you learn	Prior knowledge is key - be clear about what is needed, reteach it if necessary, give them a framework to work from. Go from general concepts to specific – do comparisons old to new.	Don't assume they know it, don't use what you know as the start point.
	 12. Independent learners	Independent learning is NOT a good way for a novice to become an independent learner. Make sure they have requisite domain knowledge. Modeling/talking helps them learn self-regulation.	Don't say 'do your best', don't set novices independent tasks.
	 13. Beliefs about intelligence can affect intelligence	'Entity' theory of intelligence = fixed, related to performance goals. 'Incremental' theory = changeable, learning/mastery goals – set up mastery through challenges, talk about effort producing gains.	Don't use 'smart' to refer to Ss, don't go on about grades.
Which learning	 14. ... thinking makes it so	Self-efficacy (belief in one's ability to do a task) is key – is boosted by early success, so give them that; success begets motivation. Teacher modelling helps alleviate anxiety. Talk about that.	Don't use nebulous language or encourage mutual competition.
	 15. Perception of achievement is the key	What you attribute your achievement to is more important than achievement. Your perceived locus, stability, controllability is as significant as actual. Point out things THEY control.	Don't attribute success to things outside their control/praise too much.
	 16. Where are we going and how do we get there?	Students can be mastery oriented or performance oriented, both can work, and happen at the same time. Fear of failure inhibits both. Show Ss that mistakes are OK.	Don't use performance to assess mastery (or tell them they're the same).
	 17. Why scaffolding is not as easy as it looks.	... because it's about how the problem appears to them, not you. Help them see the difference by talking out loud. Help them build low level skills + increase difficulty, reduce scaffolding.	Don't think they see it like you see it.
Lethal mutations	 18. The holy grail	1:1 tutoring is 2-sigma better than classes for average students. Can't tutor but can: use advance/knowledge organizers (KOs) at the start, summaries at the end. With mastery learning all can achieve.	Don't use 'hands-up'. Don't give out KOs at the end.
	 19. Problem solving	Students' internal conceptualizations of a problem (problem space) is different to ours. Teach how to selectively search problem space, break it down, know where to start. Practice (with variety) is GOOD.	Don't call it 'Drill and Kill'. Don't keep your mental models secret.

The teacher	 20. Activities that give birth to learning...	... are mathemagenic, will 'make the horse drink'. Learning involves object orientation, selection, translation, processing INSIDE the learner – we have to get conditions right so they DO something inside.	Don't assume they will 'drink' because you led them there.
	 21. Zoom out to zoom in	Elaboration theory says students need contextual understanding of the domain. Start lesson sequence with 'epitome' of topic/task. Sequence: simple-complex, general-detailed, concrete-abstract.	Don't give discrete chunks without big picture, or vice versa.
	 22. Why discovery learning is a bad way to discover things	Human cognitive architecture has possibilities AND limitations; LTM is (virtually) infinite, 'discovery' can overload WM. Learning is a change to LTM. Use explicit instruction that takes architecture into account.	Don't use minimally guided instruction with novices.
	 23. Direct instruction (Rosenshine, who says...)	...begin with review/new stuff in small (limited) steps/detailed instruction/lots of Qs + check for understanding/ SLOP/think aloud, model steps + worked out solutions/ask them to explain/provide feedback + corrections/move to independent practice.	Don't assume 'learner-centred' is better. Don't confute DI with lecturing.
	 24. Assessment for not of learning	Research says assessment of progress must inform you and student on what to do next. Formative assessment = 'responsive teaching'. Give back some work with comments only/use rubrics, peers.	Don't just do summative assessment. Don't always grade.
Learning in context	 25. Feed up, feedback, feedforward	Getting them to act on feedback is key. Feedback continuum: corrective (right/wrong)/directive (how to do it, reteach)/epistemic (think about how to do it better); Ss should work harder than you.	Don't say the equivalent of 'be funnier/praise the student not the work'.
	 26. Learning techniques that really work	Students don't know how to study well; they forget (Ebbinghaus). High impact: practice testing/distributed practice. Med impact: elaborative interrogation/self-explanation/interleaved practice.	Don't assume they know how to learn. Don't assume you do!
	 27. Why context is everything	Students learn from observing others, learning is not context-free. Prior knowledge is a bigger factor to learning than age. Carefully sequenced explicit modelling better than getting them to work it out. Novices need modelling that is complete.	Don't ignore social learning (role play, peer teaching). Don't use age as a gauge.
	 28. The culture of learning	Cognitive apprenticeship is useful structure – teacher as role model. Contextualise tasks to help integrate knowledge/skills. Practice part-tasks first. Discussion can produce shared language of learning.	Don't think you can teach generic skills.
Customary tasks	 29. Making things visible	4 dimensions of apprenticeship: content, method, sequence, sociology. Explicitly describe how you navigate the problem space – think aloud. Put tasks in authentic contexts/multiple situations.	Don't assume they know what you are thinking.
	 30. It takes a community to save \$100 million	Teachers need communities of practice = people coming together. Build one to share domain knowledge, and community (belonging means engagement, imagination, and alignment).	Don't have hard or protected boundaries around your community.
	 31. Did you hear the one about the kinaesthetic learner...?	Digital natives and learning styles do NOT exist. Teach how to find reliable and valid information online, and how to navigate the problem space.	Don't ask them how they learn best – they don't know.
	 32. Activities that give kill learning...	...are mathemagenic. What works for some can be counter-productive for others (expertise reversal effect) – beginners need much guidance, more experienced learners don't. first do no harm.	Don't assume everything works for everyone – check first.
Lethal mutations	 33. The medium is NOT the message	It's not the medium but the instructional method that influences achievement. Select the most appropriate medium – less is more just because they are engaged doesn't mean they are learning.	Don't fall prey to the hype around (multi)media.
	 34. The ten deadly sins	1. The learning pyramid is not correct 2. Learning styles are not correct 3. Young people are not digital natives 4. Children/people can't multitask 5. You can't just Google it	6. You don't learn to solve problems by solving problems 7. Discovery learning is not the best way to learn 8. Motivation does not lead to learning 9. Grit isn't different from perseverance 10. Schools don't kill creativity
	 35. Lethal mutations – AVOID ALL of these:	1. Rosenshine → checklist of must-dos 2. Desirable difficulties → making them fail 3. Retrieval practice → every lesson 4. Constructivism as philosophy → use as pedagogy 5. Biologically primary → instruction isn't needed 6. Dual coding → illustrations for their own sake	7. Interleaving → rotating subjects 8. Cognitive load → striving to minimize load 9. Zone of proximal development → group work 10. Self determination theory → give autonomy 11. Success begets motivation not vice versa 12. Kolb Experiential Learning Theory → learning styles 13. Flipping classrooms → 3 wrongs do/don't make a right.

Made by Helen Reynolds, @heleney

Graphics courtesy of <https://thenounproject.com/>

HOW LEARNING HAPPENS Seminal Works in Educational Psychology and What They Mean in Practice

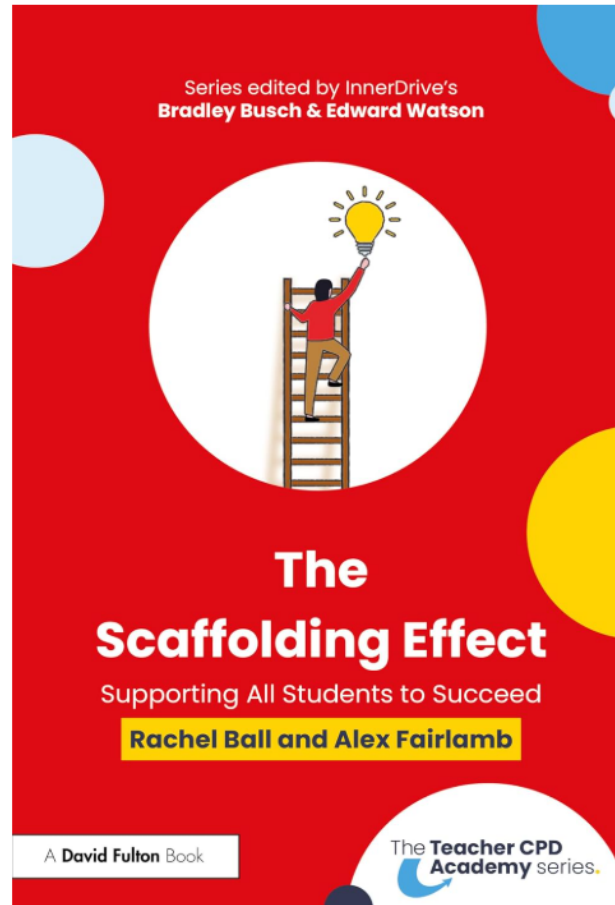
1 SECOND EDITION

PAUL A. KIRSCHNER & CARL HENDRICK
ILLUSTRATED BY OLIVER CAUGUIGLI



A David Fulton Book

The last one!



The Scaffolding Effect: Supporting All Students to Succeed (2025) by Rachel Ball, Alex Fairlamb
Teacher CPD Academy - Planning Summary by Helen Reynolds @itsalearningcurve.education



Content	Do This
Introduction: Everything <i>context/student</i> [S] specific, should be <i>response to assessment</i> of learning, means plan for AND adapt in the moment no scaffold (SF) is permanent, shouldn't be labour intensive.	<ul style="list-style-type: none"> Cannot 'pick up and go' as context [S, class, subject] determines strategy You might make mistakes – that's ok
1 Differentiation, adaptive teaching and scaffolding: Differentiation of: learning outcomes/stretch or extension questions [q] → expect more from some S than others – NOT ok. What To Do (WTD): 1. Teach to the Top (adopt mindset, watch your language, no target grades, have <i>challenging curriculum</i>) 2. <i>Adaptive Teaching</i> (anticipate barriers, use AfL, adapt in the moment, SF can be modelling/vocab/ metacognitive strategies/guided practice/checklists) 3. <i>Why is SF 'hard'?</i> [highly complex, implies more work, novice teacher [T] → make it easier/expert T → long-term agency] 4. <i>Check for Understanding first</i> [skilful AND frequent CU needed]	<ul style="list-style-type: none"> Plan for the top, support all to get there via assessment for learning (AfL) Any low expectations will limit Ss Stop saying 'low/high ability' Our job to 'disrupt the bell curve' SF is more than just a worksheet Some Ss will need additional targeted support that SF can't provide
2 Scaffolding of retrieval practice (RP), verbal prompts: Key principles of learning: Model of memory (Willingham) = attention/working memory (WM)/long-term memory (LTM)/forgetting. Cognitive load theory (CLT) = limits to WM, develop schema by generative processes e.g. link to prior knowledge (PK), make meaning. WTD: Retrieval: (Testing effect powerful) 1. <i>Task order:</i> go easy → hard. 2. <i>Hints:</i> after appropriate wait time 3. <i>Model/guide:</i> live model, partially completed concept map/diagram 4. <i>Verbal prompts:</i> trigger cognition [academic knowledge (K)]/metacognition (how to think about thinking).	<ul style="list-style-type: none"> CLT → clear, succinct explanations/ chunking of info/uncoloured visuals Offload WM to written materials helps Memories are recreated when you try to recall, which strengthens them Testing really helps learning Wait times are longer than you think RP can be SF like anything else
3 Scaffolding through modeling: = learning through observation/applicable in all subjects. Models can be: physical (e.g. paragraph), conceptual (e.g. particle model in science), us thinking out loud (e.g. live solving a problem). WTD: 1. Worst examples: with FAME: Fading/Alternating (you do/they do)/add Mistakes/ you Explain, comparative modelling (2 e.g.s which is best) 2. <i>Live modelling:</i> making our invisible thought processes visible = VERY helpful, you can ask qs = interactive 3. <i>Student models:</i> Use student work instead, they talk about their thinking 4. <i>I, We, You prepared, live modeling, indep. practice/needs careful planning.</i>	<ul style="list-style-type: none"> Show them what 'good' looks like Make your thinking visible really helps Get a visualizer/document camera Care they don't copy live modeling Watch out for S work you can show Move them from novice → expert Elicit what they know/don't over-model or be overly prescriptive
4 Scaffolding of explanations (expl): WTD: 1. Chunking: care not to overload WM, chunk the curriculum/chunk the lesson (expl/model/practice several times) 2. <i>Analogies (lower):</i> help connect abstract [target] to familiar/their PK [source], target may not map exactly to source. 3. <i>Pre-teaching of vocab:</i> Unlock Tier 2/3 words → Select/Explain/Explore/Consolidate (Quigley), Frayer model 4. <i>Visual scaffolds:</i> dual coding (picture + text (written or spoken), graphic organizers (GO) (e.g. fishbone/Venn/flow charts), Ss explain use. 5. <i>Storytelling:</i> Stories 'psychologically privileged', easier to comprehend/remember, interesting, but can distract from learning.	<ul style="list-style-type: none"> All new info needs chunking (explanations/videos/text... all) Check the analogy will map well Do no harm with the analogy! More effective to use dual coding Select graphic organizer to achieve a particular purpose Choose stories with care re. attention
5 Scaffolding and reading (rdg): We are ALL Ts of literacy = passport for S success. Secondary/HS Ts know what (word banks) but not why/how to use. Goal: Ss strategic readers/writers/speakers, needs modeling, tell Ss 'why' → prospect of success → motivation. (Phonics = specialized, interventions = local → not in book.) WTD: 1. Get into: rdg ages/additional testing → individual barriers. 2. <i>Find motivated rdg:</i> T reads, students follow/annotate → T shows enjoyment/ models fluency/prosody, show purposeful annotation, goal = fluent → strategic. 3. <i>Reciprocal rdg:</i> choose text, Ss predict what will happen, apply PK, identify new vocab, clarify meaning, summarize, ask qs. 4. <i>Whole class rdg:</i> tricky, better read to partner, ask qs. 5. <i>Repeated rdg:</i> T models re-reading → fluency. 6. <i>Paired rdg:</i> low-stakes, peer feed-back, promotes active listening. 7. <i>Indep. silent rdg:</i> apply chunking/reciprocal rdg/help Ss choose texts, increase time, encourage reading at home. 8. <i>Exam qs:</i> Read/underline/summarize/solve (RUSS), need deliberate practice with SF, applies to all subjects.	<ul style="list-style-type: none"> Many Ss 11 – 18 have a reading age many years below chronological age Literacy is itself a SF for curriculum & domain K Ss can learn to love reading by watching others love reading Teach Ss reciprocal reading toolkit so they can apply it themselves Plan paired reading carefully – see book for strategies, ditto indep rdg Talk to parents/hold workshops on rdg to increase indep rdg at home Knowing RUSS reduces stress
6 Scaffolding and writing (wrt): Barrier: writing is hard work. Needs executive function (plan/sustain effort) + composition (K of topic/organization/vocab) + transcription (write/spell). WTD: activate PK (RP/brain dump/qs), get to crux of q (RUSS above), plan (link PK to crux, structure it), draft (model, use metacognition, teach word/ sentence/ paragraph level skills, kernel sentences, because/but/so, single paragraph outline, DARE develop/add details/reject arguments/end with strong conclusion, writing frames), revise/edit (model review/revision, use peer review + T feedback)	<ul style="list-style-type: none"> Writing is tiring due to cognitive effort Teach structures and systems Ss can apply in all writing Card sorts/GOs etc. help with planning/drafting – see p. 129-133 Elevate writing strategies p. 137-141 Plan removal of writing SF over time

What will I talk about?



... with practical ideas!

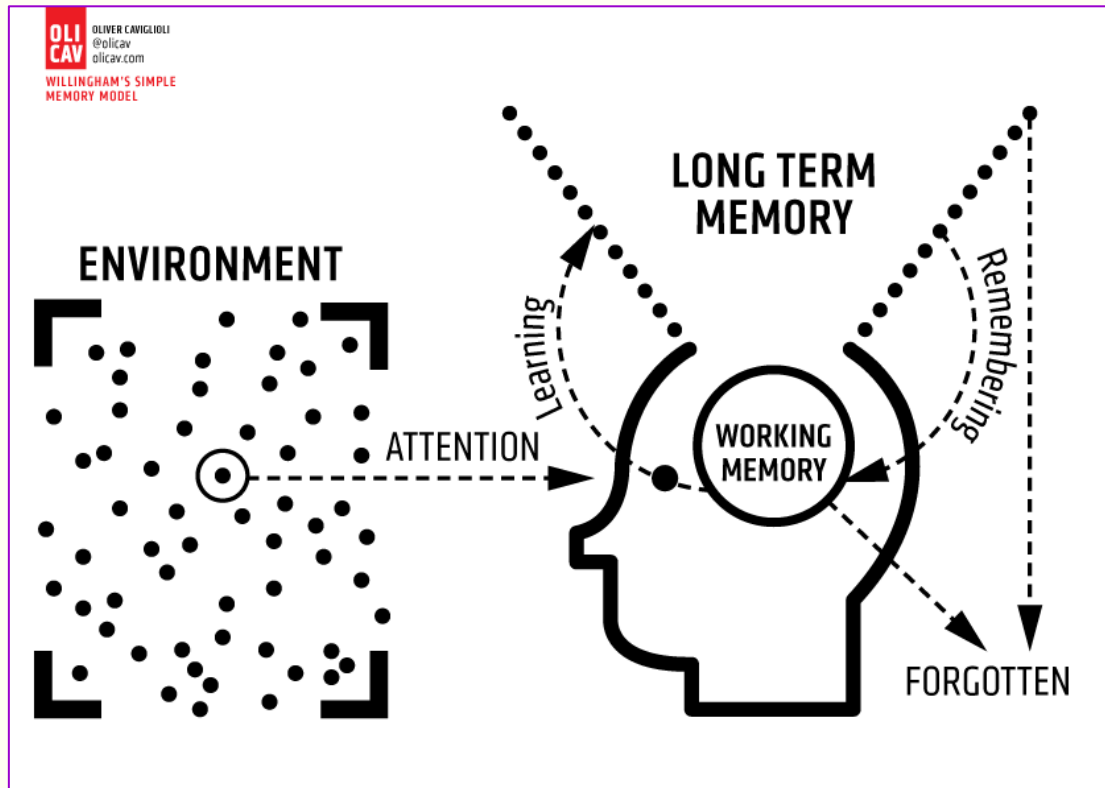
Ideas on your whiteboard!

1. The Most Common/Important Ideas

a. A model of memory

1a. A model of memory

Daniel Willingham's **memory model**
(Why Don't Students Like School, 2009)

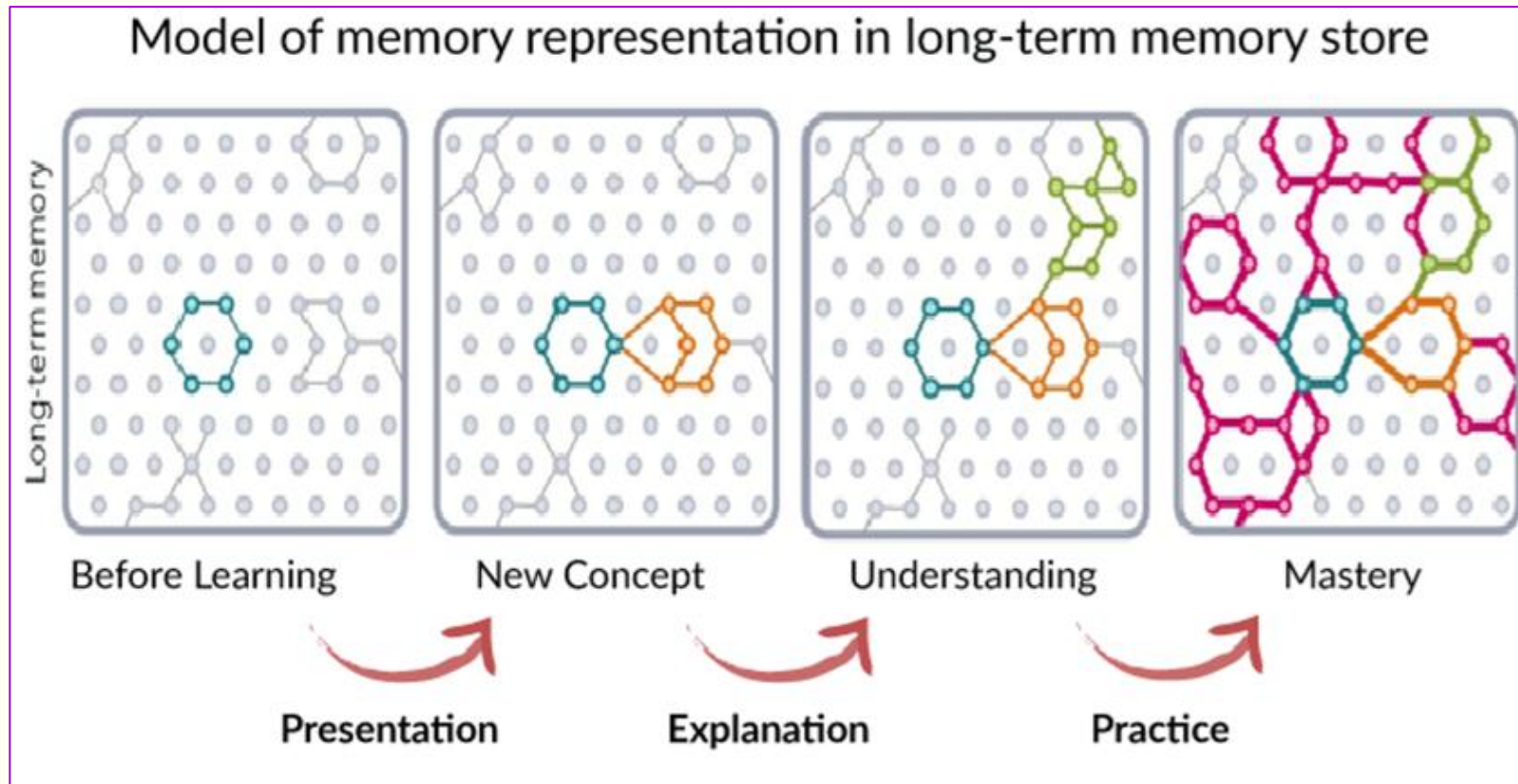


Shiffrin/Atkinson modal model
(1968)

- **sensory register**
- **short-term store**, also called working memory or short-term memory
- **long-term store**, where information is held indefinitely.

1a. A model of memory

Efrat Furst's **schema diagram**

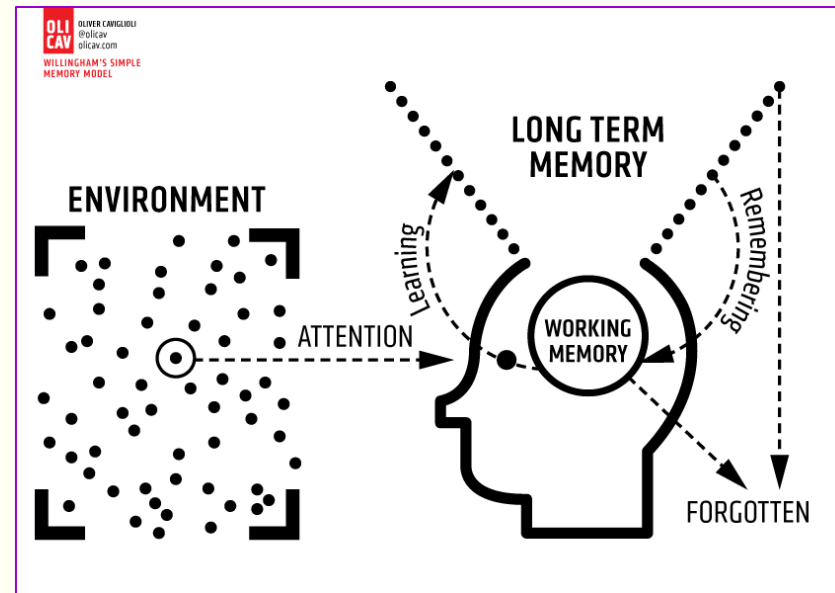


1. The Most Common/Important Ideas

- a. *A model of memory*
- b. Retrieval practice/the testing effect

1b. Retrieval practice/testing effect

- Retrieval practice... pulling it out of your memory helps you learn
- Spaced practice... leave gaps so there is...
... forgetting



1b. Retrieval practice/testing effect

- Ebbinghaus (1885!)
- Roediger, H.L., III, & Karpicke, J.D. (2006) - the testing effect
- Adesope O, Trevisan, D & Sundararajan, N, (2017) – looked at 118 studies

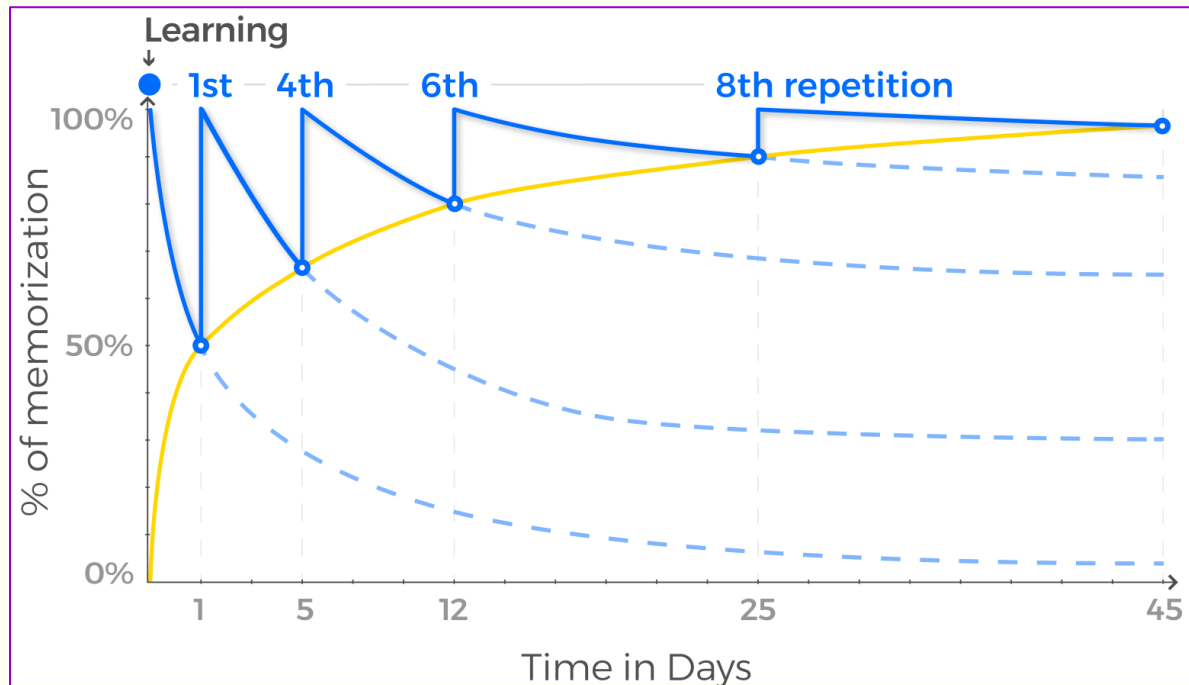
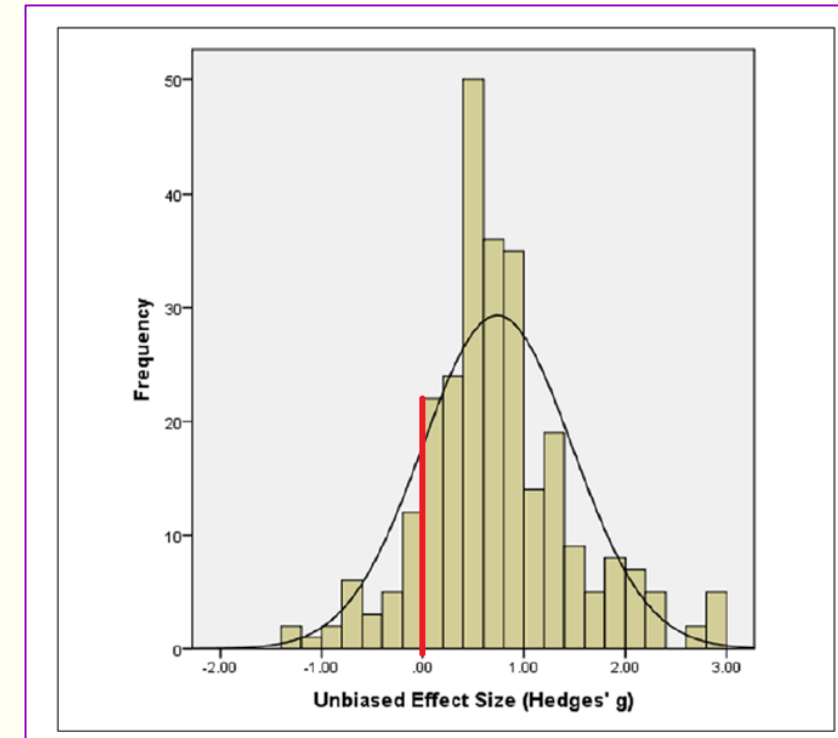


Image: <https://www.taalammer.com/the-forgetting-curve-hermann-ebbinghaus/>



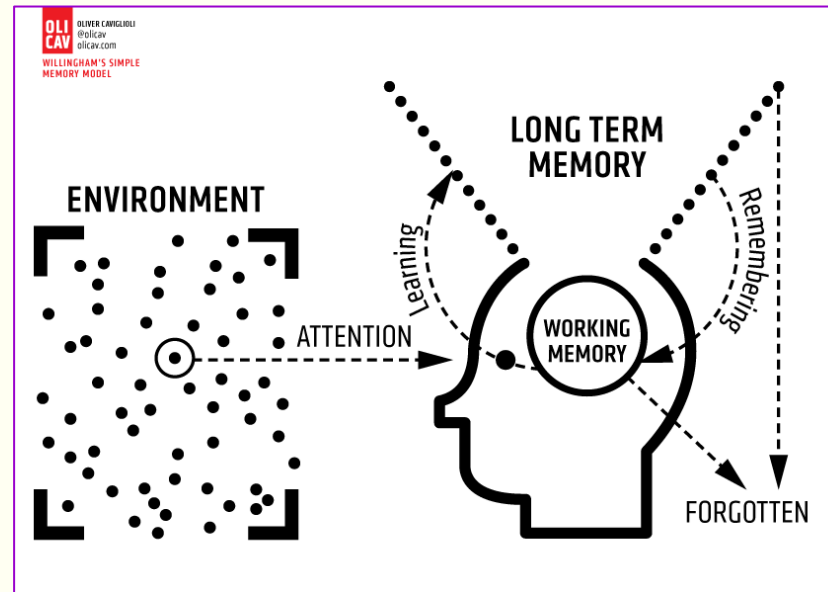
1. The Most Common/Important Ideas

- a. A model of memory*
- b. Retrieval practice/the testing effect*
- c. Cognitive load theory

1c. Cognitive Load Theory

Working memory is limited:

- ... depends on number of **elements** and their **interactivity**
- ... **can't be increased** (by any reliable means that we know)
- ... we can **mitigate** this by **offloading** and using LTM



1c. Cognitive Load Theory

How long does it take for you to say

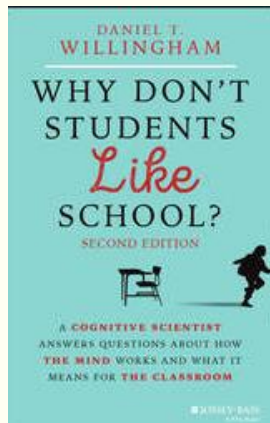
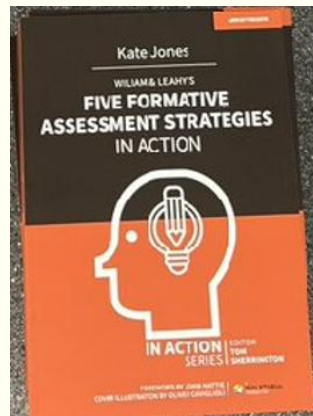
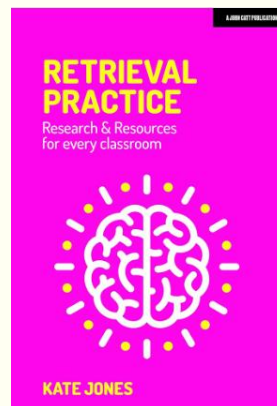
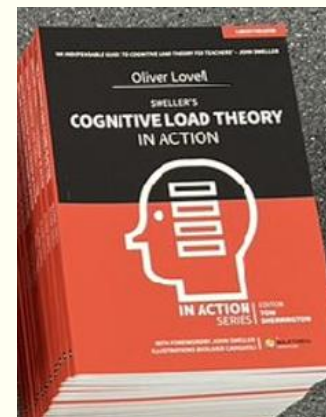
1. the alphabet?
2. the numbers 1 – 26?
3. A1, B2... Z26?

On your whiteboard...

- What was the **name** of this section of the presentation?
- What were the **three ideas**?

1. Most Important Ideas –the resources

- Daniel Willingham: <http://www.danielwillingham.com/articles.html>
- Efrat Furst (schema diagram): <https://sites.google.com/view/efratfurst/home>
- Lovell, O. (2020). Sweller's cognitive load theory in action. John Catt Educational
- Jones, K. (2021). Wiliam and Leahy's Five Formative Assessment Strategies in Action. John Catt Educational.
- Jones, K. (2020). Retrieval practice: Resources and research for every classroom. John Catt Educational.



What will I talk about?

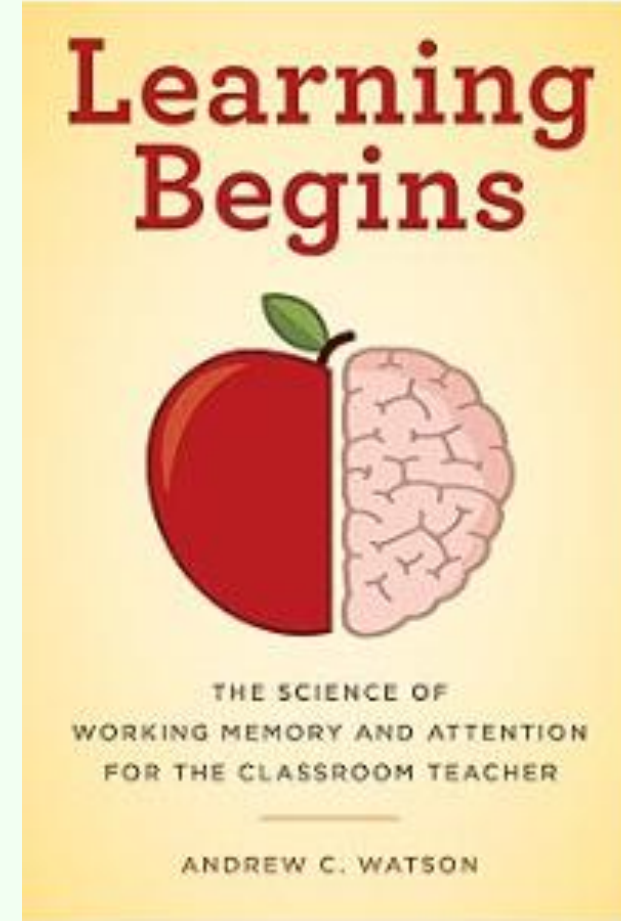


... with practical ideas!

Ideas on your whiteboard!

2. The books I've used most

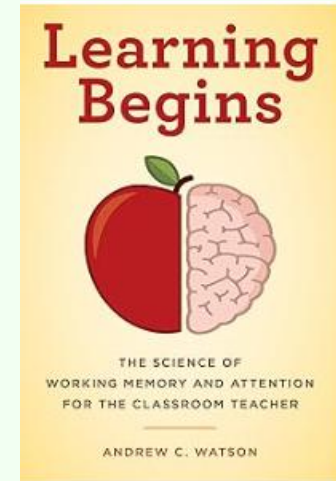
- a. **Learning Begins** by Andrew Watson



2. The books I've used most

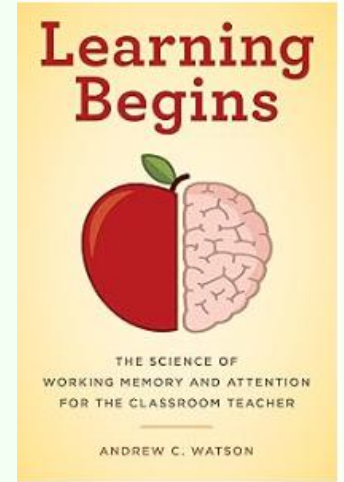
Learning Begins by Andrew Watson

- Anticipate... think about it from their point of view
- Adopt... a 'working memory perspective'
- Adapt... to avoid 'catastrophic failure'



2. The books I've used most

- a. Learning Begins by Andrew Watson
- b. Cognitive Apprenticeship In Action by John Tomsett



2. The books I've used most

Cognitive Apprenticeship In Action by John Tomsett

... is about **cognitive architecture**

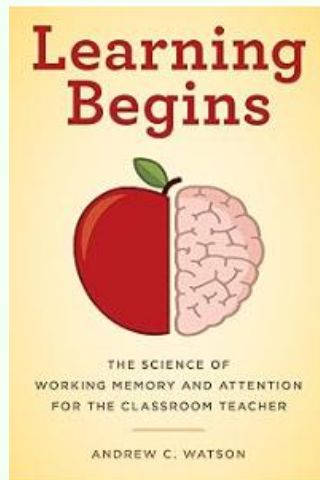
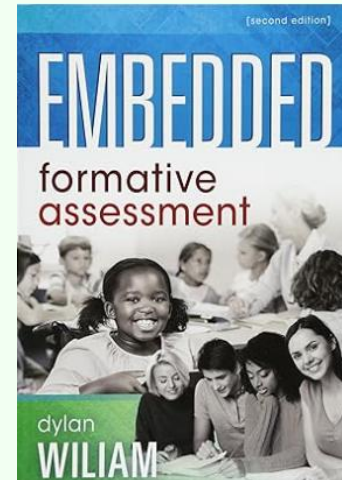
... means **making thinking visible**

... **zooming** in and out



2. The books I've used most

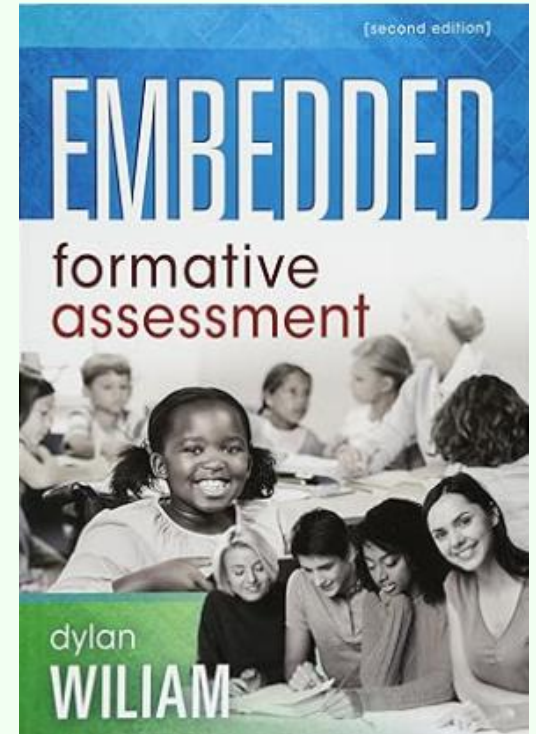
- a. Learning Begins by Andrew Watson
- b. Cognitive Apprenticeship In Action by John Tomsett
- c. Embedded Formative Assessment by Dylan Wiliam



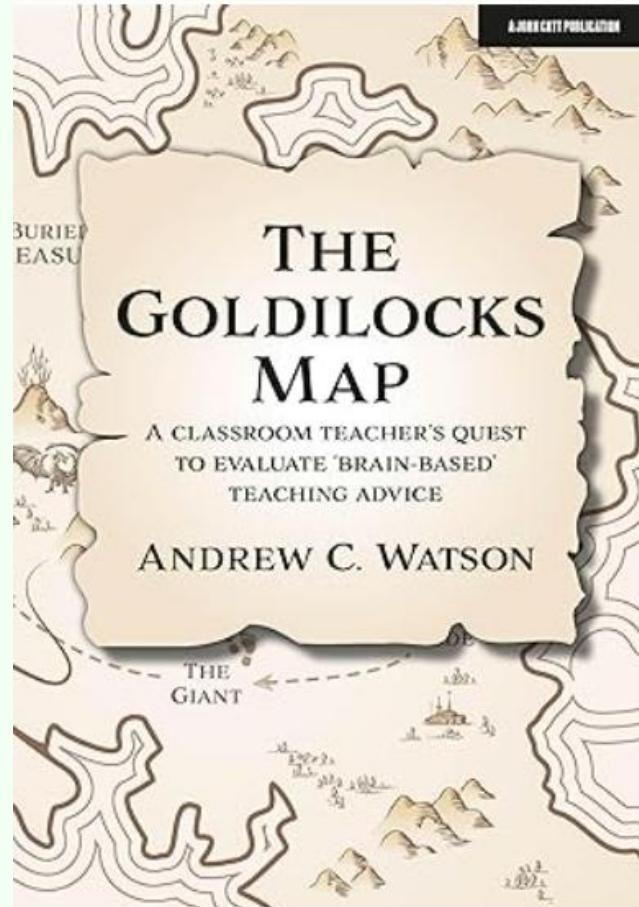
2. The books I've used most

Embedded Formative Assessment by Dylan Wiliam

- Dylan Wiliam and Paul Black **defined the term**
- What is **not**... a worksheet, a test, anything before the 'big' assessment
- What it **is**... what a teacher does to elicit **data** to **inform the next steps** in instruction, and **change** it up!



... and if you want to know how to read the research...



On your whiteboard...

- What was the name of the first section?
- It named 3 things... what were they?
- What was the last section called?
- It named 3 things... what were they?

What will I talk about?



... with practical ideas!

3. How my teaching has changed

a. Before teaching a class...

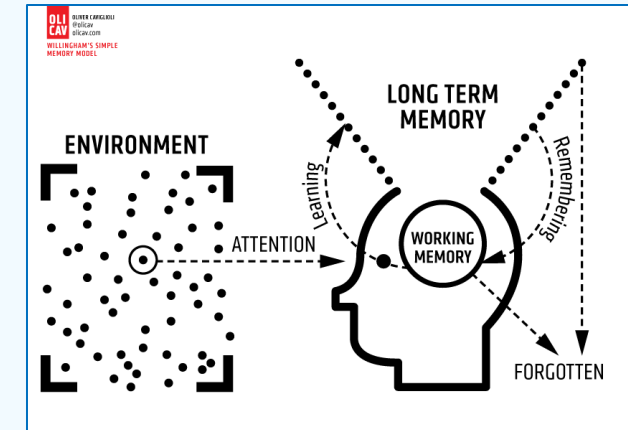
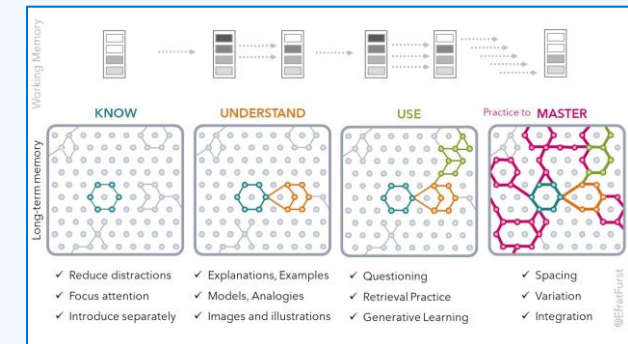
3. How my teaching has changed

Before we start the course:

- I teach them about **learning, memory and meaning making, i.e. Daniel Willingham's memory model, Efrat Furst's schema diagram**
- There's a **video** on my website:

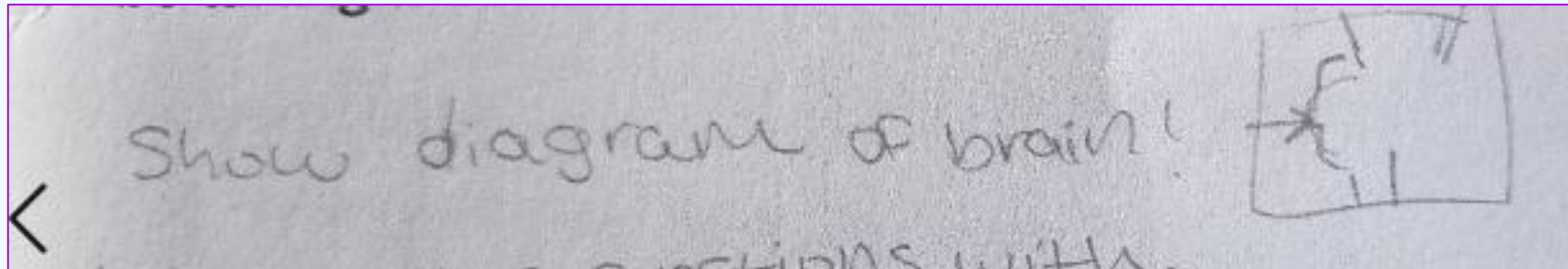
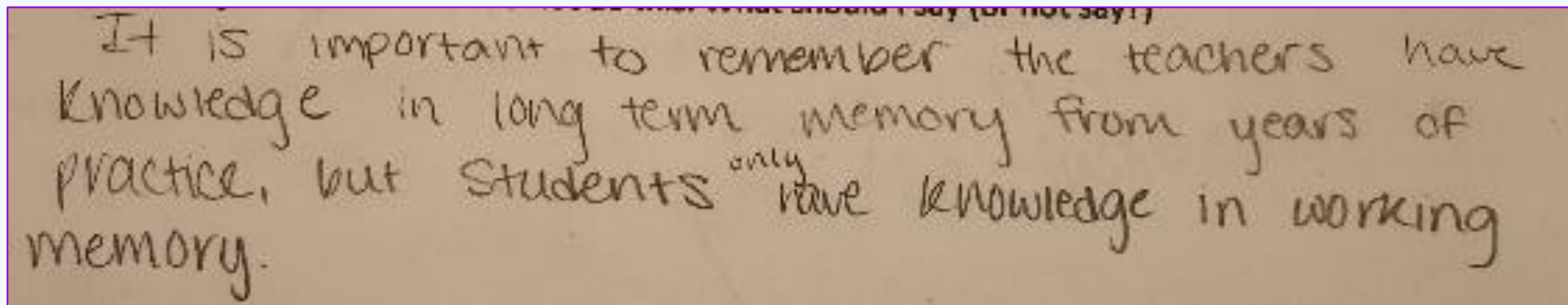


If you like to **read**, here's the same information**:



3. How my teaching has changed

My students said (when asked what I should tell other teachers)



3. How my teaching has changed

- a. Before teaching a class...
- b. While teaching a class...

3. How my teaching has changed

During lessons I make sure I

- Use **explicit Instruction**: chunk it, explain, practice
- Use **check for understanding**: use that data to inform decisions in real time/for planning

3. How my teaching has changed

I liberally use

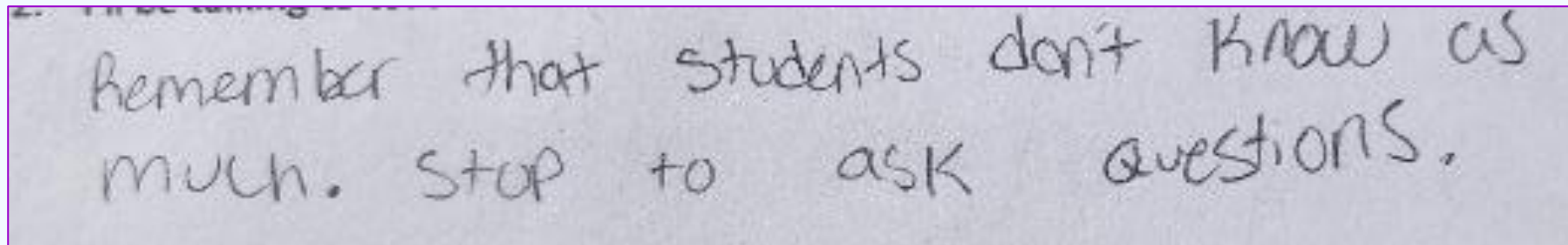
- A document camera: to talk it through in real time, make my thinking visible
- Mini-whiteboards: what do they know/brain dump, think/pair/share
- Guided ramped practice: comparative judgement, moving from concrete → abstract, familiar → unfamiliar
- Elaboration: turn/talk feedback, self-elaboration

and

- Remember working memory limitations so max out use of WM by removing distractions
- Remember novices are not little experts

3. How my teaching has changed

- Retrieval practice = weekly review quizzes
- Low stakes – ALL can be corrected for 100%
- Questions that:
 - are spaced: last lesson, last week, a long time ago
 - get progressively harder/more abstract/unfamiliar contexts/connecting topics...



Remember that students don't know as much. Stop to ask questions.

3. How my teaching has changed

- a. Before teaching a class...
- b. While teaching a class...
- c. After teaching a class...

- repetition is the most valuable strategy

SLOP - Active recall

- Talk about the necessity of SLOPS

- 3x to get into long term memory

SLOP

SLOP
and

the whole idea of SLOP

- Emphasize different kinds of retrieval practice, most other teachers don't do it

Retrieval practice - always revisiting topics to keep them on the brain

SLOP

SLOP converts what you learn in short term to long term memory

Repetition ! ! ! !

3. How my teaching has changed

- Independent practice – **SLOP!** (Shed Loads Of Practice)
- They have the answers, grade it, reflect on it...
- Write a paragraph

3. How my teaching has changed

done by something external on the system and the arrows going out are supposed to be work done by the system on something external, but when energy exits the system due to air resistance or sound, it doesn't seem right to put "work done on air resistance," for example. Otherwise, though, I feel confident with the LOL diagrams and they make a lot of sense in visually understanding energy! I was capable of completing the Gravity Assessment SLOP but have one question—how you know whether gravity does positive or negative work on an object? Finally, I did the AP questions. The Atwood question was great review because I could tell that if I didn't practice that skill for only a little longer it would have started to slip from my memory. Perfect timing! I think I did the Conical Pendulum question correctly, but I am not certain as using variables is always a bit more difficult for me than using numbers, and knowing what to substitute can sometimes be tricky to figure out. (I will see next week!) Overall, this SLOP was very good for review and to help me figure out what questions/uncertainties I have!

Yay!

often true

Excellent.

On your whiteboard...

- What is your **biggest takeaway** from this session?

What will I talk about?



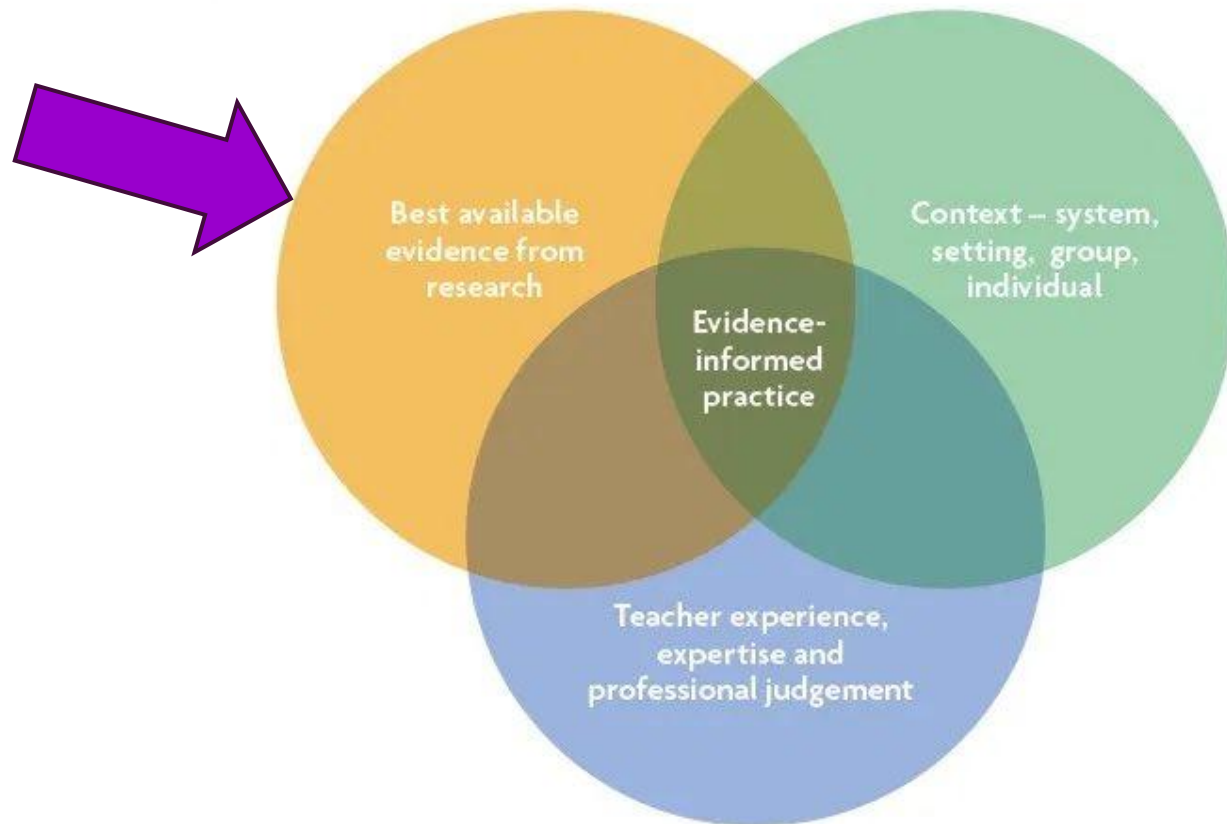
... with practical ideas!

Useful lenses to shape our thinking

- To 'see it like I see it' is **why** we are here
- The '**curse of the expert**' is a real thing
- Novices are **not** little experts; they learn differently.
- Working memory is **limited**; load it wisely
- Learning involves a change to a learner's **long-term memory**
- Having a **model of memory** and learning (Willingham) is extremely helpful if you are trying to learn anything as it helps you **choose strategies** that are likely to **work well**.

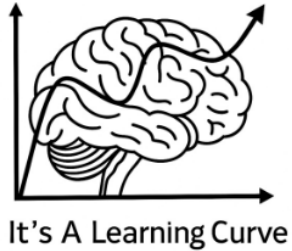
Another useful model:

FIGURE 1:
EVIDENCE-INFORMED PRACTICE



https://my.chartered.college/impact_article/addressing-the-challenges-of-using-evidence-in-education/

My summaries!



About

For Students... ▾

For Teachers... For Parents...

How Do We Learn?

Why Cognitive Science?

Cogsci In The Classroom ▾

Cogsci Book Summaries

A View From The Mid-Atlantic – Blog

Contact



Cogsci Book Summaries

[illegible]

1. Here is a reading list of **79 books** about **cognitive science** and its **application to the classroom**.

There is a **summary** below for anything highlighted in green.

2. Here are my summaries of a selection of these books.

For each book there is

- a pdf of **my summary**
- a pdf of a summary with **a blank column for your use** as part of professional development.
- I would recommend that you **read all of these books** – they each have their own unique take on the subject, all have which have enriched my teaching enormously.
- It's the interaction in making the summary that is important – **please use the blank columns!**

Do you have suggestions for books you think need a summary? [Contact me](#)



All the summaries are made with **my brain**.

No AI was employed at any stage.

Click on the thumbnail to jump to the summary. Books listed in *alphabetical order by title*.



Edited by John Tomsett

COLLINS ET AL'S
**COGNITIVE
APPRENTICESHIP
IN ACTION**



**IN ACTION
SERIES** | EDITOR
TOM
SHERRINGTON

WITH ILLUSTRATIONS BY OLIVER CAVIGLIOLI



In Action Series, ed. Tom Sherrington, summary by Helen Reynolds @itslearningcurve.education

Book/theory	Main points	Do this
<p>Rosenbline's Principles – Rosenbline (1982)</p> <p>Author: Tom Sherrington, July 2020</p> <p>Contributors: Direct Instruction (dI)</p>	<ul style="list-style-type: none"> • 10 Principles: Daily review, small steps, ask questions, provide models, provide practice, check for understanding, high success rate, scaffold difficult tasks, indep. Practices, weekly/monthly review • 4 strands: 1. Sequencing concepts and modelling – present material in small steps, give clear/detailed instructions/explanations, think aloud/model steps, many examples, re-teach when necessary 2. Questioning – ask a LOT of questions, get them to explain what they've learned, check response of ALL, provide systematic feedback and corrections, 3. Reviewing material – begin with a review of previous learning, re-teach if necessary, 4. Stages of practice – high level of practice, guided at first, prep and monitor independence practice 	<ul style="list-style-type: none"> • link abstract to concrete/tact • use writing frames/scaffolds • anticipate errors/misconceptions • plan questions and answers to check for the understanding you want • revisit list of 'probes' often • 'what have you understood' • review in different formats • craft the transition to independent practice/work
<p>Generative Learning – Rorella & Meyer (2013)</p> <p>Authors: Zoe & Mark Esser, Oct 2020</p> <p>Contributors: Generative learning concept</p>	<ul style="list-style-type: none"> • Generative learning involves 'making sense' of our experience by testing it against what we already know (constructing schema). • SOL = Select, Organize, Integrate (Mayer's model of memory) = generating learning, but taking into account cognitive load • Mighty 'Ms' = metacognition and motivation, to promote self-efficacy and independence/motivation • Use SOL to structure all the strategies w/effect size/e.g.: 1. Teaching/0.77, get them to teach others 2. Imagining/0.65, actively try to make a mental model 3. Mapping/ 0.62, use half-filled in maps, 3. Self-testing/0.62, make flash cards, SLOP 5. Self-explaining/0.61, self-Socratic questioning 6. Enriching/ 0.51, concrete models to help concrete-abstract 7. Summarizing/0.5, Cornell notes 8. Drawing/ 0.4, turn text into drawings • Make sure they have the requisite background knowledge to implement the strategies to avoid misconceptions • (from my reading of original P & M) notice the Boundary Conditions of any study that is cited 	<ul style="list-style-type: none"> • make the metacognition explicit as they're working • introduce SOL • teach effective note taking • use video clips as opportunities to practice summarizing • longer infrequent summaries > short and often • use concept maps, knowledge maps, graphic organizers (@oliver book) • prefill maps to reduce cl • use as spaced learning • use gesturing/encourage enacting • try structured self-explaining • try structured Imagining
<p>Cognitive Load Theory - John Sweller (1988)</p> <p>Author: Oliver Lovell, Oct 2020</p> <p>Contributors: Cognitive load theory</p>	<ul style="list-style-type: none"> • CLT is the single most important thing for teachers to know – Daniel Willingham (• Maximize learning: reduce extraneous load, optimize intrinsic load • Purpose of instruction is to increase knowledge in long-term memory • Think about cognitive load (CL) in terms of: <ul style="list-style-type: none"> ○ Architecture – environment = unlimited external store of info, LTM = unlimited internal store, WM is limited, new info takes lots of WM ○ Riskier – bio primary = speaking, faces etc. is automatic (can't be taught), bio secondary = reading, math etc is not (has to be taught), ○ Calibration – of load into intrinsic CL, ICL (due to nature of task) – reduce by keeping as simple as possible, extraneous CL, ECL (not to do with the task), monitor WM overload due to both ○ Domains – domain-general skills = bio primary, domain-specific skills = bio secondary, experts have domain-specific knowledge that novices don't have, so can't use same strategies for novices as for experts, expertise-reversal effect – novices need worked examples not problem solving (or they're slowed down), experts need the opposite, can learn with/from more ECL/more variation ○ Elements – element interactivity = source of CL associated with elements = level of complexity of interactions • In reducing ECL, redundancy will mean ECL (more for experts than novices), use modality effect - brain uses parallel visual/auditory channels in parallel which helps WM = dual-coding when in LTM 	<ul style="list-style-type: none"> • use practice to move to LTM • don't confuse bio primary and bio secondary • optimize id through <ul style="list-style-type: none"> ○ good curriculum sequencing ○ pre-teaching weak/ context/skills ○ chunking/learn down skills (part-whole) ○ overview first (whole-part) ○ chaining forwards – teach skills in order they will meet them, or backwards ○ scaffold – pick up previous stuff ○ manipulate the complexity to suit task • reduce cl <ul style="list-style-type: none"> ○ stop talking when they're reading ○ integrate text with images ○ remember split-attention effect ○ remember transient effect ○ remember modality effect ○ do an example then get them to do similar one immediately so they 'borrow' from an expert ○ make worksheets that include with explanation of how to solve problems ○ use more goal-free problems with restricted actions, rapid feedback to reduce element interactivity, focus on learning

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COLLINS ET AL'S
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WITH ILLUSTRATIONS BY OLIVER CAVIGLIOLI



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Turn one idea from today into practice



Fill out your half sheet.

Jot down one idea that's sharpening your thinking and why it matters in your classroom right now.



Join Mastery's Momentum Map™ pilot.

Build a habit around one evidence-informed teaching move that meets a need in your classroom right now.



Hear more at the end of the day!

Scan to learn more and get further details at the closing session.

Scan to learn more



MasteryEducator.com/pilot

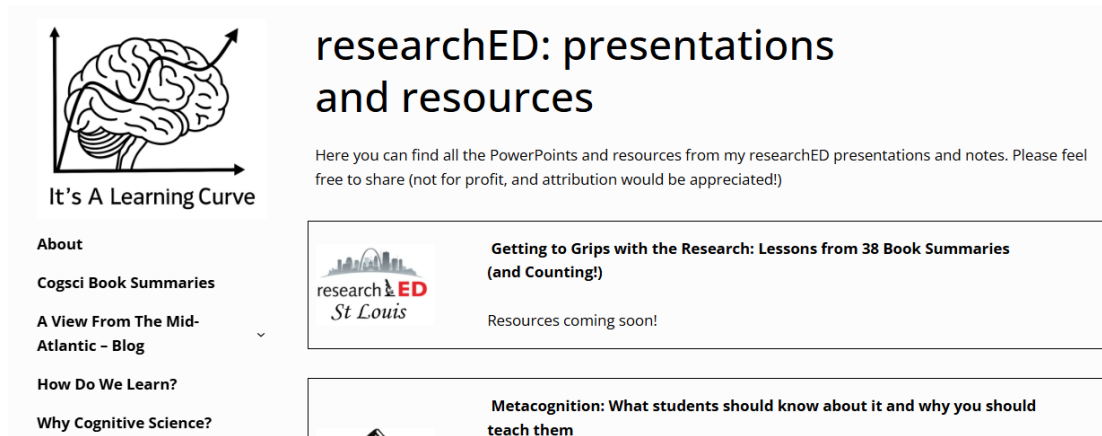


Mastery™

THE INTENTIONAL EDUCATOR

Feel free to contact me!

- @helenrey on X
- helen.reynolds@itsalearningcurve.education
- **Presentation** and **handout** are here:



The screenshot shows the researchED website. On the left is a sidebar with a brain icon and the text 'It's A Learning Curve'. Below this are links: 'About', 'Cogsci Book Summaries', 'A View From The Mid-Atlantic - Blog', 'How Do We Learn?', and 'Why Cognitive Science?'. The main content area is titled 'researchED: presentations and resources'. Below the title is a paragraph: 'Here you can find all the PowerPoints and resources from my researchED presentations and notes. Please feel free to share (not for profit, and attribution would be appreciated!)'. There are two featured items: 'Getting to Grips with the Research: Lessons from 38 Book Summaries (and Counting!)' with a 'researchED St Louis' logo and 'Resources coming soon!', and 'Metacognition: What students should know about it and why you should teach them'.

... and **thank you** very much for listening!