AN EVIDENCE INFORMED RESOURCE BY MARK ANDERSON

Pedagogy First. Technology Second.

Six guides exploring the science of learning, and the thinking behind one hundred and forty four strategies to try, with or without technology, because that is how it should be: a cognisant, informed choice.

Mark Anderson
ICT Evangelist

PRAISE

What Others Say About This Guide

“Pedagogy should always be our North Star in education. Learning remains the core business of every classroom, for every student, in every context. Anderson’s guide keeps this principle firmly in view, offering a rich collection of evidence-informed, pedagogy-first strategies that can be applied across classrooms, curricula and systems. Practical, thoughtful and rooted in what matters most, this is a must-read for educators who want technology, strategy and classroom practice to truly and impactfully serve learning.”

Olly Lewis Head of School **Amity International School Abu Dhabi**

“Mark has done the hard thinking, so the rest of us don’t have to. Every strategy here starts with the learning and treats technology as something that has to genuinely add value that can be measured, which is exactly the order schools keep getting wrong.”

Al Kingsley MBE
MAT Chair & EdTech CEO
NetSupport

“This is an excellent and much needed resource for all school staff looking to use technology with care and purpose. It avoids gimmicks and trends, focusing instead on evidence-informed practice across areas such as retrieval, formative assessment, feedback, questioning, modelling and metacognition. Above all, it keeps the focus firmly where it belongs, on learners and learning.”

Emma Darcy
Director of Technology for Learning
Denbigh High School

“This is a really strong, evidence-informed guide that keeps the focus exactly where it should be, on teaching and learning first. The strategies are practical and usable straight away, which makes it particularly helpful as we continue embedding digital across the curriculum in a purposeful and meaningful way. It supports staff to build confidence while developing students’ digital skills with real intent.”

Jacqui Hughes
Head of Digital Innovation
Moulton College

PRAISE

What Others Say About This Guide

“These guides provide an elegant set of evidence-informed design principles. They offer learning experiences that are served by technology, not driven by it. From these first principles, the guide offers a rich and full menu of evidence-informed, easily navigable ideas, all beautifully organised and codified. This guide opens up learning to the rich possibilities that can follow from a pedagogy-first approach for learners and practitioners alike.”

Dr Zoë Elder Director of Education, Research & Innovation **ASDAN**

“This is another strong example of pedagogy led by purpose, grounded in cognitive science and focused on what genuinely supports learning rather than what is fashionable. It reflects a clear commitment to making thoughtful use of whatever tools are available, ensuring the right approach is chosen for the right activity at the right moment in time, helping practitioners make informed, deliberate choices.”

Gemma Gwilliam
Head of Digital Learning, Education and Innovation
Portsmouth: The Digital City

“Each guide Mark has produced is perfect for any teacher to pick and use straight away. The use of evidence-informed pedagogy and practical classroom strategies provides a clear link before any discussion of technology. I will use this guide to support staff development, inspire classroom practice and support teachers to make purposeful decisions about when technology genuinely adds value rather than using it for its own sake.”

Tom Sale
Whole School Assistant Head for Data, Reporting, Edtech and Innovation
North Gate British School, Ajman

“I’m always on the lookout for resources that cut through the noise and get straight to what matters in the classroom. Mark’s Pedagogy First guides are not tool or tech with learning theory bolted on; the pedagogy genuinely leads. Each guide distils a substantial body of research into strategies teachers can actually use on Monday morning. And as ever, Mark is generous with his sharing; no gatekeeping. Thanks, Mark.”

Jo Fletcher-Saxon
Assistant Principal, Teaching & Learning
Ashton Sixth Form College

Mark Anderson. Thirty years in education, and a leading voice on pedagogy and technology.

An award winning author, globally sought after keynote speaker, trainer and strategic consultant in education technology, AI and digital strategy, Mark works independently as ICT Evangelist and part time as Principal Education Consultant at NetSupport. He was the lead education and AI consultant on the BBC Bitesize Guide to AI.

He co-authored the Amazon chart topping The EdTech Playbook with Olly Lewis, and his earlier Perfect ICT Every Lesson topped the Amazon charts too. He is a Founding Fellow of the Chartered College of Teaching, an Independent Thinking Associate, a member of the BCS Schools and Colleges committee, and an Apple Distinguished Educator, Google Certified Innovator and Microsoft Certified Educator.

His blog won UK Education Blog of the Year, he co-founded the Digital Leader Network and the GESS award winning LearnLiveUAE, and he keynotes at the world's major education events, among them BETT and GESS. He works with leading schools and trusts including the British School of Barcelona, Downe House, Dubai College and JESS Dubai, and ACT, Woodland, Black Pear, Stamford Park, Gloucestershire Learning Alliance, Oak Trees and Nova Education Trust.

That work sits alongside long relationships with many of the EdTech companies shaping the sector, among them Microsoft, Apple, Google, ClickView, Now Press Play, IRIS, CENTURY Tech, Adobe and NetSupport. It was this work that first led him to join NetSupport as their Head of Education, and now as their Principal Education Consultant.

That reach is built on decades in the classroom and in a range of middle and senior leadership roles, from head of department to senior leader, alongside a spell as a local authority lead teacher for computing and the teaching and learning lead on Clevedon School's pioneering 1:1 rollout. One idea runs through all of it: good teaching comes first, and technology earns its place only when it serves the learning.

Pedagogy first. Technology second. Always.

Why I made these.

When I work with schools, before I arrive, the pattern is familiar. Technology not making the impact it should be. Tools often chosen for their features rather than careful thinking about how they solve a problem or serve learning. Effort and budget spent, without much impact in the classroom.

What changes the picture is the order. Start with the pedagogy, work out what the learning or teaching actually needs, and then consider whether a technology helps. It sounds obvious, but it is the step most often skipped. When the schools I work with get this right, outcomes improve, for teachers and for students alike. That is the thread running through all six guides here.

A consommé takes far more work than opening a tin of soup, and the result looks deceptively simple. What reads as a single page of strategies in these infographics took a great deal of thinking and practice, refined into something you can use, like an edu-consommé, if you will. Explore the ideas, and see if they're right for your classroom.

> *Pedagogy first. Technology second. Always.*

Technology should enhance teaching and learning, not dictate teaching and learning. When used well, technology helps us go further.

This guide has been a real passion project, combining the ideas of cognitive science with the desire to use technology effectively.

Exploring retrieval practice, formative assessment, feedback, questioning and discussion, explanations and modelling, and metacognition and self-regulation, this guide aims to reinforce the important point that when considering technology use in the classroom, it is a teaching and learning consideration, not a technology consideration. Careful, considered, cognisant choices mean we should choose to use technology when it serves a purpose that helps with learning or teaching. It's important to remember that sometimes, a mini whiteboard beats anything that needs Wi-Fi and/or a battery.

> *Pedagogy first, technology second. Always.*

SIX GUIDES

How to use this guide.

This guide brings together the six Pedagogy First, Technology Second infographics shared through my blog, and adds the thinking behind them. You can download each individual infographic from **ictevangelist.com/blog**.

Use this version to read, search, select from and support professional learning.

1. **Start with the classroom need:** choose the section that matches the problem you are trying to solve.
2. **Use the strategy pages as prompts:** pick one or two ideas, try them deliberately, and adapt them to your context.
3. **Read the thinking pages for the why:** use the evidence-informed ideas to support better professional judgement.

Pedagogy first. Technology second. Always.

THE SIX GUIDES ONLINE

Click or tap any guide to open it on the blog.

01

Retrieval Practice & Memory

The act of pulling knowledge out of memory does more for learning than putting it back in. This chapter is about making that effort happen, on purpose, again and again.

Rooted in the work of Bjork, Roediger & Karpicke, Dunlosky, Agarwal and others

24 Ways to Embed Retrieval Practice in Your Classroom

Evidence-informed strategies, with or without technology · Rooted in the work of Bjork, Roediger & Karpicke, Agarwal, Dunlosky, Cepeda, Kornell, Rohrer, Ebbinghaus, Kapur and Metcalfe

"The act of retrieving knowledge is itself a learning event, not merely a test of what has been learned." — Roediger & Karpicke, 2006

Pedagogy First
24 STRATEGIES TO TRY TODAY

The Testing Effect · Spacing & Interleaving · Desirable Difficulties · Retrieval Formats · Metacognition & Calibration

01 — THE TESTING EFFECT
Retrieval Beats Re-reading

Replace re-reading with retrieval. Instead of reviewing notes, ask students to write down everything they remember, then check. The testing is the learning, not the preparation for it.

TECH low-stakes quiz or flashcard tool
INFORMED BY Roediger & Karpicke

02 — THE TESTING EFFECT
Low-Stakes Starter Quizzes

Five questions per lesson on prior content; nothing in the gradebook. Agarwal found routine quizzing reduces test anxiety rather than causing it. The quiz is not the assessment. It is the learning.

TECH quiz or response tool
INFORMED BY Roediger & Karpicke; Agarwal et al.

03 — THE TESTING EFFECT
Brain Dump

A blank page, two minutes, no notes: write everything you remember. The imperfect attempt is the point. What students cannot recall shows precisely where teaching needs to return.

TECH shared doc or whiteboard tool
INFORMED BY Roediger; Karpicke; Agarwal

04 — THE TESTING EFFECT
Test Before You Teach

Quiz students before teaching. Struggling to retrieve primes the brain; students who fail before instruction remember the answer more reliably once taught. Failure is productive.

TECH pre-lesson quiz tool
INFORMED BY Bjork; Kapur

05 — THE TESTING EFFECT
Closed-Book Reconstruction

Students reconstruct key ideas from memory, then open notes and correct in a different colour. Karpicke and Blunt found this outperforms re-reading. The corrections are the data.

TECH document tool; colour annotation
INFORMED BY Karpicke & Blunt

06 — SPACING & INTERLEAVING
Distribute Practice Over Time

Spread retrieval across days and weeks rather than cramming it into one session. Build review points into your medium-term plan. The calendar is part of the pedagogy.

TECH spaced repetition tool
INFORMED BY Cepeda et al.; Ebbinghaus

07 — SPACING & INTERLEAVING
Yesterday, Last Week, Last Month

Three questions per lesson: one from yesterday, one from last week, one from last month. These intervals are a starting point; complex topics may need revisiting more frequently.

TECH quiz tool; lesson slide template
INFORMED BY Rosenshine; Bjork

08 — SPACING & INTERLEAVING
Interleave Topics, Don't Block

Kornell and Bjork found mixing topics produces stronger retention than finishing one before moving to the next. Blocked practice feels organised; it produces weaker retention. Discriminating is the mechanism.

TECH shuffled quiz or random question tool
INFORMED BY Kornell & Bjork; Rohrer

09 — SPACING & INTERLEAVING
The Retrieval Schedule

Dunlosky's review ranked re-reading among the least effective strategies. Teach students the evidence: study, return after two days, then a week, then a month. Many students do the opposite.

TECH spaced repetition or revision planner
INFORMED BY Dunlosky et al.

10 — SPACING & INTERLEAVING
Cumulative Review

Plan retrieval into your medium-term planning, not just lessons. Bring back earlier content in starters and assessments. When it never reappears, students conclude it no longer matters.

TECH question bank or quiz builder
INFORMED BY Bjork; Carey

11 — DESIRABLE DIFFICULTIES
Embrace the Struggle

Bjork coined desirable difficulties for conditions that slow apparent learning but improve long-term retention. Effortful retrieval is the clearest example. Resist the urge to make it easier.

TECH any retrieval tool, hints disabled
INFORMED BY R. Bjork

12 — DESIRABLE DIFFICULTIES
Remove the Scaffolding

Retrieval with notes open is reading, not retrieval. Fade support gradually: notes first, then headings only, then nothing. The transition to unaided retrieval is where consolidation happens.

TECH quiz tool; timed or closed-book mode
INFORMED BY R. Bjork; Kornell

13 — DESIRABLE DIFFICULTIES
Vary the Retrieval Context

Retrieve the same content in different formats and settings, decontextualising knowledge so it is not tied to one context or format. Harder for students; that is precisely the point.

TECH varied formats; multi-modal tools
INFORMED BY Godden & Baddeley; Bjork

14 — DESIRABLE DIFFICULTIES
The Generation Effect

Slamecka and Graf found generating an answer, even a wrong one, before being told it produces stronger retention than passive exposure. The effort of generation drives encoding, not the accuracy.

TECH response tool; pre-teach quiz
INFORMED BY Slamecka & Graf; McDaniel

15 — DESIRABLE DIFFICULTIES
Forget Before You Retrieve

Do not retrieve immediately after teaching. Wait a day, then quiz. Wait a week, then quiz again. The gap between learning and retrieval is where consolidation happens.

TECH spaced quiz tool; lesson timer
INFORMED BY R. Bjork; Roediger

16 — RETRIEVAL FORMATS
Retrieval Beyond Facts

Factual retrieval builds the schema; higher-order retrieval tests whether students can use it. Secure the foundations first, then push beyond them. Retrieval is not a pub quiz.

TECH quiz tool with varied question types
INFORMED BY Agarwal

17 — RETRIEVAL FORMATS
Concept Mapping from Memory

Karpicke and Blunt found concept mapping from memory outperformed re-reading for retention. Not just what students know but how ideas connect. Relational knowledge beats isolated facts.

TECH mind-mapping or diagram tool
INFORMED BY Karpicke & Blunt

18 — RETRIEVAL FORMATS
Retrieval Through Teaching

The learning happens during preparation, not delivery. Preparing to teach demands complete, organised retrieval. Organising knowledge to explain it is where consolidation occurs.

TECH video recording or presentation tool
INFORMED BY Nestojko et al.; Fiorella

19 — RETRIEVAL FORMATS
Cued Recall

Tulving and Thomson showed retrieval depends on available cues. A heading, a keyword, labels removed: each triggers retrieval without doing the work. Builds confidence before unaided retrieval.

TECH cloze quiz or gapped handout tool
INFORMED BY Tulving & Thomson

20 — METACOGNITION & CALIBRATION
Teach the Illusion of Knowing

Show students their own illusion of knowing. Ask them to rate confidence before revealing the answer. When they were certain and wrong, that is the precise moment to intervene.

TECH confidence-rated quiz tool
INFORMED BY Koriat & Bjork; Dunlosky

21 — METACOGNITION & CALIBRATION
Provide Instant Feedback

Metcalfe shows instant feedback is essential for confident errors. For general retrieval, allow a processing gap before revealing answers. Speed matters most when confidence is highest.

TECH quiz tool with instant answer reveal
INFORMED BY Metcalfe

22 — METACOGNITION & CALIBRATION
Confidence Ratings

Dunlosky and Metcalfe showed students are most confident about things most recently read, not things they actually know. Rate confidence after each attempt, then reveal the answer. That gap is the target.

TECH quiz tool with confidence rating
INFORMED BY Dunlosky & Metcalfe

23 — METACOGNITION & CALIBRATION
Retrieval Journals

Zimmerman showed students who monitor their performance make better revision decisions. Log what came back, what did not, and what needs revisiting. It is a map of what to do next.

TECH learning journal or digital notebook
INFORMED BY Dunlosky et al.; Zimmerman

24 — METACOGNITION & CALIBRATION
Study Strategy Audit

Dunlosky's review rated ten strategies: re-reading scored low; practice testing scored highest. Ask students how they revise, then show them the data. That conversation is the intervention.

TECH survey or discussion tool
INFORMED BY Dunlosky et al.

PEDAGOGY FIRST, TECHNOLOGY SECOND. Always.

Rooted in the work of Bjork, Roediger & Karpicke, Agarwal, Dunlosky, Cepeda, Kornell, Rohrer, Ebbinghaus, Kapur, Metcalfe, Nestojko, Fiorella & Mayer, Slamecka & Graf and Godden & Baddeley

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CREATED BY
Mark Anderson

WHY THESE STRATEGIES

Forgetting is not the enemy of learning. It is the condition that makes learning stick.

Robert Bjork's idea of desirable difficulties turned what we considered intuitive on its head. The conditions that make learning feel hard and slow in the moment, spacing it out, mixing it up, testing instead of reviewing, are often the very conditions that make it last. The conditions that feel smooth and productive, rereading and massed practice, mostly produce confidence without retention.

That is why this chapter is built around the testing effect rather than around revision. Roediger and Karpicke showed that students who were tested on material remembered far more, weeks later, than students who restudied it for the same time. Dunlosky's reviews then sorted the techniques that help most.

> *The strategies that feel least efficient in the lesson are often the ones doing the most helpful work; don't discount them.*

WHERE TECHNOLOGY SERVES

A retrieval tool is only as good as the thinking it provokes. The effort has to stay with the learner.

EdTech is genuinely brilliant for retrieval practice when it makes regular recall simple, rather than one which does the thinking for the students. Low-stakes platforms let you run quick, two-minute starters every lesson with zero marking. Spaced repetition tools automatically revisit older topics at the right intervals. This perfectly matches the research, saving you the headache of tracking it manually.

Ultimately, retrieval is not a game show. If a tool feels like a fastest finger first round, giving answers too quickly or valuing speed over deep thought, it removes the desirable difficulty that makes the practice worthwhile.

> *Use technology to help manage the activity, but never the struggle for learners. The retrieval effort is the important part, not the admin around it.*

02 Formative Assessment

“The term formative should apply not to the assessment but to the function that the evidence generated by the assessment actually serves.”

Dylan Wiliam, *Assessment: The Bridge between Teaching and Learning*, 2013

Rooted in the work of Black, Wiliam, Sadler and others

24 Ways to Embed Formative Assessment in Your Classroom

Evidence informed strategies, with or without technology · Rooted in the work of Black, Wiliam, Butler, Sadler, Berger, Hattie, Bjork, Rosenshine, Angelo & Cross and CAST

"We should view technology as a tool to amplify good teaching practices, not replace them." — Mark Anderson, RISE Edu Magazine

Pedagogy First
24 STRATEGIES TO TRY TODAY

Clarify Learning Intentions · Elicit Evidence of Learning · Feedback That Moves Learning Forward · Students as Learning Resources · Students as Owners of Their Learning

🎯 01
CLARIFY INTENTIONS
Separate Intention from Task
The learning intention is what to learn, not what to do. Finishing the task is not the same as achieving the learning. Keep them distinct in your planning and in what you say to students at every stage of the lesson.
TECH presentation or display tool
INFORMED BY Wiliam

🤝 02
CLARIFY INTENTIONS
Build Success Criteria Together
Ask students what excellent looks like before they begin. Their language, not yours, becomes the standard. Criteria they articulate themselves land far more deeply than criteria handed to them.
TECH collaborative document tool
INFORMED BY Wiliam & Leahy

📄 03
CLARIFY INTENTIONS
Exemplars Before Rubrics
Show work at different standards before students start their own. Students spot quality in someone else's work more readily than in their own. A rubric tells students what quality is; an exemplar shows them.
TECH visualiser or document camera
INFORMED BY Sadler, Berger

🔮 04
CLARIFY INTENTIONS
Withhold the Objective
Ask students to name what they learned at the end rather than copy an objective at the start. Generating the answer embeds it far more reliably than copying from the board.
TECH polling tool; whole class response
INFORMED BY Wiliam

🔀 05
ELICIT EVIDENCE
Hinge Questions
A hinge question is a diagnostic question at a lesson turning point. Wrong answers each map to a known misconception. Responses tell you whether to move on or go back. Never improvise it.
TECH polling or quiz tool
INFORMED BY Wiliam

🧩 06
ELICIT EVIDENCE
Plausible Distractors
Engineer wrong answers as carefully as the right one. Each distractor should map to a real misconception. Every wrong answer a student gives tells you something precise. Wrong answers are the diagnostic data.
TECH quiz tool; full response view
INFORMED BY Wiliam, Black

🎙️ 07
ELICIT EVIDENCE
Deliberate Cold Call
Select who answers deliberately, not at random. Track participation so nobody stays invisible across lessons. Where appropriate, target the students whose thinking you most need to hear.
TECH participation tracking tool
INFORMED BY Wiliam, Black

✍️ 08
ELICIT EVIDENCE
Mini Whiteboards
All students write their response and hold it up simultaneously. The teacher reads the room in seconds: full participation, no waiting, no dominant voices. Works across all subjects.
TECH multimodal response tools
INFORMED BY Wiliam

🃏 09
ELICIT EVIDENCE
ABCD Response Cards
Give each student a card: A, B, C and D. Pose a question and all students hold up their answer at once. No hands, no opt-out. The spread of responses shows instantly where misconceptions lie.
TECH multimodal audience response tools
INFORMED BY Wiliam

🌎 10
ELICIT EVIDENCE
Every Voice, Every Time
Eliciting evidence only works if every student can respond. Offer written, verbal, visual and digital means of expression. The method you choose decides who gets to show what they know.
TECH multimodal and anonymous response tools
INFORMED BY CAST

💬 11
ELICIT EVIDENCE
Think, Pair, Share: Disciplined
Individual thinking first; paired discussion second; nominated response third. Nomination makes the report-back evidence, not just the most confident voice. Without it, the share is optional.
TECH timer for paired discussion
INFORMED BY Wiliam

✏️ 12
FEEDBACK
Comment Only Marking
Remove grades from work in progress. Research showed comments alone produced the greatest gains. Adding a score to a comment cancels it out: students read the grade and ignore the feedback
TECH digital annotation or LMS tool
INFORMED BY Butler, Wiliam

🧠 13
FEEDBACK
Feedback Must Cause Thinking
Feedback must be more work for the recipient than the donor. Pose questions rather than writing corrections. If feedback requires no response from the learner, it is not feedback; it is merely information.
TECH annotation tool with reply function
INFORMED BY Wiliam

⏰ 14
FEEDBACK
Build In Time to Act
Feedback with no time to act on it has no value. Begin the next lesson with students reading and responding to feedback before anything new. Time to act is where the learning happens.
TECH LMS; share feedback in advance
INFORMED BY Wiliam & Leahy

📋 15
FEEDBACK
Whole Class Feedback
Record class patterns rather than individual comments: common strengths, recurring errors and two or three next steps. Teach to the gap, not to the individual paper. Workload stays manageable.
TECH shared document or display tool
INFORMED BY Wiliam & Hattie

❓ 16
FEEDBACK
3 Questions, Not Corrections
Return work with three questions rather than corrections. Students must respond before moving on. Cognitive effort belongs with the learner. Feedback that corrects for them removes the struggle.
TECH digital annotation tool or LMS
INFORMED BY Wiliam

👥 17
STUDENTS AS LEARNING RESOURCES
Guided Practice Together
Independence is the destination, not the starting point. Before students work alone, have them practise with peers in structured steps, checking each other's responses at every stage before moving forward.
TECH collaborative document tool
INFORMED BY Rosenshine

💡 18
STUDENTS AS LEARNING RESOURCES
Student Generated Questions
Ask students to write questions that could appear in an assessment on this topic. Collate the best and use them for review. Generating questions demands higher order thinking than simply answering them.
TECH shared doc or quiz builder tool
INFORMED BY Black & Wiliam

🔍 19
STUDENTS AS LEARNING RESOURCES
Structured Peer Assessment
Peer feedback only works when students understand quality. Use exemplars first so students assess against shared criteria. Without shared criteria, peer feedback is opinion, not evidence.
TECH peer assessment tool
INFORMED BY Sadler, Berger

🔁 20
STUDENT OWNERSHIP
Spaced Retrieval Practice
Low stakes quizzing on prior content, not today's lesson. Returning to older material at increasing intervals is one of the most robust findings in memory research. Re-reading notes is not the same as retrieving.
TECH spaced repetition quiz tool
INFORMED BY Bjork

📝 21
STUDENT OWNERSHIP
Test Before You Teach
Quiz students on material before you teach it. Triggering the feeling of not knowing primes attention and improves retention. Students who struggle before instruction remember the answer better.
TECH quiz tool; lesson start
INFORMED BY Bjork, Wiliam

🌧️ 22
STUDENT OWNERSHIP
The Muddiest Point
At lesson close, each student anonymously writes the one thing they are least clear about. The teacher addresses the most common muddy points publicly at the start of the next lesson. Two minutes; high
TECH anonymous response tool
INFORMED BY Angelo & Cross

📅 23
STUDENT OWNERSHIP
Review Little and Often
Begin every lesson with a brief review of prior content: yesterday's, last week's, last month's. The most effective teachers check understanding constantly. If most students cannot answer, adjust the pace of teaching.
TECH low stakes quiz tool
INFORMED BY Rosenshine

🧪 24
STUDENT OWNERSHIP
Spaced Self Quizzing
Teach students to quiz themselves rather than re-read notes. Re-reading feels productive but produces weak retention. Self quizzing feels harder but works. Retrieval effort drives long term memory.
TECH quizzing or flashcard tool
INFORMED BY Bjork

PEDAGOGY FIRST, TECHNOLOGY SECOND. Always.
Rooted in the work of Black, Wiliam, Butler, Sadler, Berger, Hattie, Bjork, Rosenshine, Angelo & Cross and CAST
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CREATED BY
Mark Anderson

WHY THESE STRATEGIES

If it does not change what you do next, it was not formative. It was just a test with a kinder name.

Dylan Wiliam and Paul Black's work were obviously my 'go to' for this chapter, because it answers the only three questions assessment exists to serve: where is the learner going, where are they now, and what closes the gap. The strategies I've shared in this section aim to move assessment out of the marking pile and into the lesson itself, where it can help teaching in the moment.

The most difficult, and this is where technology can often help, is the most powerful: eliciting evidence from every student, not just the confident few.

WHERE TECHNOLOGY SERVES

Technology can make every learner visible at once. That is its real contribution to assessment.

The classic weakness of classroom questioning is that you hear from a handful of pupils and make assumptions about the rest. Polling tools, mini whiteboards and simple response systems help take much of that problem away by gathering a response from everyone at the same time. That turns a rough feel for the room into something much closer to evidence.

But evidence is only useful when you act on it. A tool that shows you a bar chart of misconceptions has done nothing until it changes what you do in the next five minutes because of what it shows.

03

Feedback

Feedback is too often treated as another word for marking. It isn't. Good feedback gives pupils information they can use to improve what they do next, and that is a far higher bar than writing a comment in the margin.

Rooted in the work of Hattie & Timperley, Sadler, Nicol & Macfarlane-Dick and others

24 Ways to Embed Effective Feedback in Your Classroom

Evidence-informed strategies, with or without technology

Rooted in the work of Hattie & Timperley, Sadler, Butler, Nicol & Macfarlane-Dick, Wiliam, Kluger & DeNisi, Shute, Topping, Andrade, Carless and Boud

"Feedback is one of the most powerful influences on learning and achievement, but this impact can be either positive or negative." — Hattie & Timperley, 2007

Pedagogy First
24 STRATEGIES TO TRY TODAY

What Feedback Is · **Timing & Frequency** · **Source & Direction** · **Feedback & the Learner** · **Closing the Gap**

01
WHAT FEEDBACK IS
Feedback Is Not Marking
If a student never reads or acts on your comments, you have marked but not given feedback. Before returning work, plan how students will engage with it. No engagement, no feedback.
TECH audio or digital ink feedback tool
INFORMED BY Wiliam

02
WHAT FEEDBACK IS
Feed Up, Feed Back, Feed Forward
Every comment should answer three questions: where am I going, how am I doing, what next? Most feedback answers only the second. Check yours covers all three before you hand it back.
TECH structured feedback template tool
INFORMED BY Hattie & Timperley

03
WHAT FEEDBACK IS
Four Levels of Feedback
Before writing a comment, ask: am I addressing the task, the process or the person? Task and process feedback improve learning. Self-level praise undermines it. Name your target.
TECH feedback checklist or rubric tool
INFORMED BY Hattie & Timperley

04
WHAT FEEDBACK IS
One Third Makes It Worse
Over a third of feedback interventions decrease performance. Before giving feedback, check: does this comment address the work or the student? If it is about the student, rewrite it.
TECH feedback audit or review tool
INFORMED BY Kluger & DeNisi

05
WHAT FEEDBACK IS
Sadler's Three Conditions
Share the criteria before students begin. Show them how to compare their work against it. Give them time to act on what they find. Without all three steps, feedback cannot function.
TECH success criteria display tool
INFORMED BY Sadler

06
TIMING & FREQUENCY
Immediate for Simple Tasks
For simple or procedural tasks, correct errors immediately. Shute found quick feedback prevents mistakes from embedding. Do not wait until next lesson to fix what can be fixed now.
TECH auto-marked quiz or response tool
INFORMED BY Shute

07
TIMING & FREQUENCY
Delayed for Complex Tasks
For complex work, a short delay before feedback lets the learner process first. Immediate correction on difficult tasks can short-circuit thinking. Let the struggle do its work.
TECH LMS with scheduled feedback release
INFORMED BY Shute; Kulhavy

08
TIMING & FREQUENCY
During, Not Just After
Feedback given while students are still working is formative. Feedback returned weeks later is a post-mortem. Move around the room, intervene in the moment. Proximity is strategy.
TECH live collaboration or monitoring tool
INFORMED BY Wiliam; Black & Wiliam

09
TIMING & FREQUENCY
Comment Only, No Grades
Butler found comments alone produced the greatest gains. A grade cancels the comment: students see the score and skip the words. If grades are mandated, delay until feedback is used.
TECH annotation tool; hide grades option
INFORMED BY Butler

10
TIMING & FREQUENCY
Reduce Volume, Raise Focus
A page of comments overwhelms. One or two precise targets land. Identify the one thing that would make the biggest difference right now and focus entirely on that.
TECH digital highlight or pin tool
INFORMED BY Shute; Wiliam

11
SOURCE & DIRECTION
Peer Feedback with Structure
Give students criteria and a protocol before they assess each other's work. Topping showed peer feedback improves learning for both, but without scaffolding it becomes empty praise.
TECH peer review tool with criteria prompts
INFORMED BY Topping

12
SOURCE & DIRECTION
Self-Assessment as Process
Ask students to assess their work against criteria before you mark it. Andrade found the act of comparing, not the accuracy of the judgment, improves performance. Process is the point.
TECH self-review checklist tool
INFORMED BY Andrade

13
SOURCE & DIRECTION
Dialogic Feedback
Build reply loops into feedback. Let students question and clarify comments over time rather than receive a final judgment. Carless showed uptake rises when feedback is a conversation.
TECH threaded comment or chat tool
INFORMED BY Carless

14
SOURCE & DIRECTION
Technology as Feedback Source
Use automated tools for factual accuracy and procedural correctness; reserve your time for voice, argument and creativity. Match the feedback source to what is being assessed.
TECH adaptive or AI-assisted feedback tool
INFORMED BY Shute; Black & Wiliam

15
SOURCE & DIRECTION
Whole Class Feedback
Read the set and identify patterns: common strengths, recurring errors, one priority next step. Teach to the gap, not to each paper. Sustainable for teachers; precise for students.
TECH shared display or document tool
INFORMED BY Wiliam; Hattie

16
FEEDBACK & THE LEARNER
Task, Not Person
Feedback that threatens self-concept decreases performance. "This paragraph needs restructuring" works. "You need to try harder" does not. Direct feedback at the work, not the person.
TECH annotation tool focused on work
INFORMED BY Kluger & DeNisi

17
FEEDBACK & THE LEARNER
Feedback Must Cause Thinking
Write "why might this be stronger with evidence?" not insert the evidence yourself. If feedback needs no effort from the learner, it is information, not feedback. Thinking is the point.
TECH annotation tool with reply function
INFORMED BY Wiliam

18
FEEDBACK & THE LEARNER
Praise the Strategy, Not the Trait
Butler found task-involving feedback improves performance. Ego-involving feedback shifts attention from learning to self-image. Praise what the student did, not who the student is.
TECH feedback phrasing guide or template
INFORMED BY Butler; Kluger & DeNisi

19
FEEDBACK & THE LEARNER
Build Feedback Literacy
Teach students how to read and act on feedback before you give it. Model with an exemplar: here is the comment, what it means, what to do next. Feedback literacy is taught, not assumed.
TECH worked example or modelling tool
INFORMED BY Carless; Boud

20
FEEDBACK & THE LEARNER
Seven Principles of Good Practice
Audit your practice against Nicol and Macfarlane-Dick's seven principles. Do you clarify criteria? Enable self-assessment? Encourage dialogue? Close the gap? Redesign where you do not.
TECH feedback design checklist tool
INFORMED BY Nicol & Macfarlane-Dick

21
CLOSING THE GAP
Build In Time to Act
Feedback with no time to act on it is wasted. Begin the next lesson with students reading and responding to comments before anything new. The response is the learning event.
TECH LMS; share feedback in advance
INFORMED BY Wiliam & Leahy

22
CLOSING THE GAP
Questions, Not Corrections
Return work with questions, not corrections. "What evidence supports this claim?" demands more thinking than rewriting it for them. The cognitive work belongs with the learner.
TECH digital annotation or comment tool
INFORMED BY Wiliam

23
CLOSING THE GAP
Sustainable Feedback
Boud argues feedback should build the learner's capacity to judge quality. If students always need you to tell them how they did, the system has failed. Design for independence.
TECH self-assessment or portfolio tool
INFORMED BY Boud

24
CLOSING THE GAP
Feedback as Design, Not Event
Plan feedback into your scheme of work: who gives it, when, in what form, and when students act on it. Feedback designed into learning from the start works. Left to chance, it does not.
TECH curriculum planning or LMS tool
INFORMED BY Boud; Sadler; Carless

PEDAGOGY FIRST, TECHNOLOGY SECOND. Always.
Rooted in the work of Hattie & Timperley, Sadler, Butler, Nicol & Macfarlane-Dick, Wiliam, Kluger & DeNisi, Shute, Topping, Andrade, Carless and Boud
Want to work together? ictevangelist.com

CREATED BY
Mark Anderson

WHY THESE STRATEGIES

Feedback is not what the teacher gives. It is what the learner does with it.

Hattie and Timperley's work showed us that feedback can have a powerful effect on achievement, but it is not automatically useful. Some feedback helps, some does very little, and some can make things worse.

Sadler's work found the important bit that is often missed. Feedback only works when learners understand what quality looks like, can compare their work against it, and know how to close the gap. Nicol and Macfarlane Dick took this further by placing feedback within self-regulation, helping pupils become better at judging and improving their own work.

Butler's study is a useful warning too. When grades sit alongside comments, pupils often look at the grade and miss the guidance.

WHERE TECHNOLOGY SERVES

Technology can make feedback faster. That only matters if pupils use it.

Digital annotation, audio comments and shared documents can shorten the gap between work and response to almost nothing. That matters. Feedback given while the work is still fresh has a far better chance of shaping what pupils do next than feedback returned two weeks later.

Used well, the same tools also make whole-class feedback more manageable. You can spot common patterns, address them quickly, and avoid writing the same comment thirty times.

The trap is automated feedback that gives a score, a tick, or a badge and stops there. That may be useful information, but it is ultimately unhelpful. Feedback earns its keep when pupils have time to think, improve, redraft, correct, compare or try again.

> *The win is not faster feedback. The win is better work because pupils had time to use it.*

04

Questioning & Discussion

The questions a teacher asks, and the talk they allow to follow, shape what thinking happens in a room.

Rooted in the work of Alexander, Rowe, Mercer and others

24 Ways to Embed Effective Questioning & Discussion in Your Classroom

Evidence-informed strategies, with or without technology · Rooted in cognitive and educational research

Rooted in the work of Anderson & Krathwohl, Dillon, Hattie & Zierer, Rowe, Tobin, Lyman, Wiliam, Good & Brophy, Alexander, Mercer, Michaels, O'Connor & Resnick, and King

"Classroom talk is the most pervasive but arguably the least examined tool in any teacher's repertoire." — Robin Alexander

Pedagogy First
24 STRATEGIES TO TRY TODAY

The Quality of Questions · **Wait Time & Thinking Space** · **Participation & Equity** · **Dialogic Teaching & Discussion** · **Student-Generated Questions**

🔍 01
THE QUALITY OF QUESTIONS
Questions That Make Thinking Visible
Anderson and Krathwohl map six levels: remembering, understanding, applying, analysing, evaluating, creating. These are not a hierarchy of worth. Recall is foundational, not inferior.
TECH question bank or lesson planning tool
INFORMED BY Anderson & Krathwohl

📈 02
THE QUALITY OF QUESTIONS
Surface, Deep and Transfer
Hattie and Zierer distinguish surface (what), deep (why) and transfer questions. Each serves a different stage. Reaching transfer before surface is secure sets students up to fail.
TECH discussion prompt or slide display tool
INFORMED BY Hattie & Zierer

❓ 03
THE QUALITY OF QUESTIONS
Open Questions Demand More
Dillon found genuine open questions, where the teacher does not know the answer, produce the most extended student reasoning. Not every question needs a predetermined destination.
TECH shared whiteboard or discussion board
INFORMED BY Dillon

💡 04
THE QUALITY OF QUESTIONS
Plan Questions Before the Lesson
Improvised questions default to recall, not because recall is wrong but because planning stops there. Anderson and Krathwohl works as a planning tool: write questions at every level.
TECH lesson planning or slide preparation tool
INFORMED BY Anderson & Krathwohl

🗣️ 05
THE QUALITY OF QUESTIONS
Alternatives to Questions
Dillon found statements and silence elicit richer responses than questions. Try: Tell me more. I had not considered that. Not every probe needs to end with a question mark.
TECH discussion or annotation tool
INFORMED BY Dillon

⏰ 06
WAIT TIME & THINKING SPACE
Wait Time 1: After You Ask
Rowe found most teachers wait under one second before speaking. Extending to three seconds increases the length and complexity of responses. Silence is thinking, not a gap to fill.
TECH timer or countdown display tool
INFORMED BY Rowe

🕐 07
WAIT TIME & THINKING SPACE
Wait Time 2: After a Student Speaks
Rowe identified a second wait time: the pause after a student responds. Three seconds prompts elaboration and self-correction. Silence after an answer signals that more is expected.
TECH live polling or response capture tool
INFORMED BY Rowe

📝 08
WAIT TIME & THINKING SPACE
Write Before You Speak
Ask students to write before any verbal response is taken. Writing prevents the quickest from foreclosing others' thinking. The pen democratises the room before the voice takes over.
TECH shared doc, whiteboard or response tool
INFORMED BY Tobin; Rowe

👥 09
WAIT TIME & THINKING SPACE
Think-Pair-Share
Lyman's think-pair-share gives every student thinking time before public exposure. Pairs test ideas with a peer first. The result is more considered and more substantive discussion.
TECH partner chat tool or response system
INFORMED BY Lyman

✋ 10
PARTICIPATION & EQUITY
Hands Down
William shows hand-raising distorts who answers. A small group volunteers repeatedly; the rest disengage. Remove hands and direct to named students. Every student should be asked.
TECH random name picker or classlist tool
INFORMED BY Wiliam

🎲 11
PARTICIPATION & EQUITY
Cold Call Without Threat
Good and Brophy showed differential questioning reinforces attainment gaps. Direct questions are equitable only when the climate supports it. Norms: no wrong attempts, only thinking.
TECH random selector or seating plan tool
INFORMED BY Good & Brophy; Wiliam

📊 12
PARTICIPATION & EQUITY
Track Who You Ask
Good and Brophy found teachers direct harder questions to higher-attaining students. Track participation across lessons. Patterns invisible in the moment become visible on paper.
TECH participation tracker or tally tool
INFORMED BY Good & Brophy

🎯 13
PARTICIPATION & EQUITY
Pose, Pause, Pounce, Bounce
William's PPPB: pose the question, pause, direct to one student, then bounce the answer to another. The bounce keeps all students alert and spreads thinking across the whole room.
TECH display timer; random name tool
INFORMED BY Wiliam

💬 14
DIALOGIC TEACHING & DISCUSSION
Five Principles of Dialogic Talk
Alexander identifies five qualities of dialogic talk: collective, reciprocal, supportive, cumulative and purposeful. Most talk meets two or three of these. Audit and start with the gaps.
TECH lesson observation or reflection tool
INFORMED BY Alexander

▶️ 15
DIALOGIC TEACHING & DISCUSSION
Break the IRE Pattern
IRE (Initiation, Response, Evaluation): ask, answer, judge. Alexander shows this pattern limits thinking. Replace evaluation with a follow-up question. What makes you say that?
TECH video reflection or lesson capture tool
INFORMED BY Alexander; Mercer

🗣️ 16
DIALOGIC TEACHING & DISCUSSION
Exploratory Talk
Mercer distinguishes disputational, cumulative and exploratory talk. Only exploratory talk, where students challenge ideas with evidence and build on each thinking, improves outcomes.
TECH collaborative doc or discussion tool
INFORMED BY Mercer

📚 17
DIALOGIC TEACHING & DISCUSSION
Ground Rules for Talk
Mercer found teaching norms of exploratory talk transforms discussion. Norms co-constructed with the class outperform those displayed or modelled. Make the ground rules together.
TECH shared doc or display tool
INFORMED BY Mercer

🗣️ 18
DIALOGIC TEACHING & DISCUSSION
Accountable Talk
Michaels, O'Connor and Resnick hold students to accurate knowledge and rigorous reasoning. Teach moves: I agree because…, The evidence is…, Say more…. Language shapes thinking.
TECH discussion sentence starter display
INFORMED BY Michaels, O'Connor & Resnick

🔁 19
DIALOGIC TEACHING & DISCUSSION
Build on Student Responses
Alexander's EEF programme showed gains when teachers extended rather than evaluated. Return an answer: Aisha says X. Does anyone want to add or challenge? Conductor, not judge.
TECH live display or response capture tool
INFORMED BY Alexander

✍️ 20
STUDENT-GENERATED QUESTIONS
Teach Question Stems
King found students trained to generate questions using stems produce richer discussion than those answering only teacher questions. Generating questions demands deeper processing.
TECH question stem cards or display tool
INFORMED BY King

👥 21
STUDENT-GENERATED QUESTIONS
Reciprocal Peer Questioning
King's reciprocal questioning has students generate and pose questions to each other, with neither knowing the answer. This produces genuine enquiry rather than rehearsal. Aim to think.
TECH pair chat or response tool
INFORMED BY King

🔎 22
STUDENT-GENERATED QUESTIONS
Questions as Evidence of Understanding
A student's question reveals the depth of their understanding. Ask for one written question before leaving. Why does X cause Y? shows far more than What is X?. Questions are windows.
TECH exit ticket or response tool
INFORMED BY King; Wiliam

💬 23
STUDENT-GENERATED QUESTIONS
Interthinking Through Questions
Mercer's interthinking describes shared cognition built through language. Student questions sustain joint enquiry. The goal is thinking in common, not performance for the teacher.
TECH collaborative discussion or writing tool
INFORMED BY Mercer

📄 24
STUDENT-GENERATED QUESTIONS
Questions That Drive Enquiry
King found connecting questions to prior knowledge produces the most powerful learning. Ask students to write what they know and want to know. Their questions become the entry point.
TECH shared doc, padlet or survey tool
INFORMED BY King

PEDAGOGY FIRST, TECHNOLOGY SECOND. Always.
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CREATED BY
Mark Anderson

WHY THESE STRATEGIES

A classroom runs on its questions. Change the questions and you change the thinking.

Robin Alexander's work on dialogic teaching showed us that talk is not the decoration around learning, it is often the medium of it. The problem is that classroom talk can easily become too thin, too quick, and too dependent on the teacher.

Neil Mercer's work on exploratory talk helps here, because it shows what better classroom discussion looks like when pupils reason together, build on each other's ideas and make their thinking public. Mary Budd Rowe's work on wait time adds another important reminder: a few seconds of silence after a question can change the quality of what follows.

The strategies in this section move from better questions to better talk to the routines that help every voice count.

> *Silence after a question is not dead air; it is where better thinking often begins.*

WHERE TECHNOLOGY SERVES

Technology can widen who gets to speak, but the thinking still has to belong to the student.

Anonymous response tools, shared documents and structured digital discussion can bring in students who might never raise a hand. That matters. They also give the class something to come back to, so a useful conversation does not disappear the moment the lesson moves on.

The risk, especially with AI, is that the tool answers the question students should be wrestling with. A good question slows thinking down. It gives students something to try, explain, challenge, refine and improve. When the tool removes that struggle, it can remove the learning too.

> *Use technology to bring more voices into the room, not to take the thinking out of it.*

05

Explanations & Modelling

Telling is not explaining, and showing is not modelling. This chapter is about helping teaching work framed around how attention and memory actually work.

Rooted in the work of Rosenshine, Sweller, Mayer and others

24 Ways to Embed Effective Explanations & Modelling in Your Classroom

Evidence-informed strategies, with or without technology · Rooted in cognitive and educational research

Rooted in the work of Rosenshine, Sweller, Mayer, Paivio, Willingham, Atkinson, and the EEF Digital Technology Guidance (2019)

"To improve learning, technology must be used in a way that is informed by effective pedagogy." — EEF, 2019

Pedagogy First
24 STRATEGIES TO TRY TODAY

Structuring Explanations · **Managing Cognitive Load** · **Multimedia & Dual Coding** · **Modelling & Worked Examples**

01 — Small Steps, Always
STRUCTURING EXPLANATIONS

Rosenshine: present new material in small steps with practice after each. Use animations to chunk information and reveal content gradually. Let students process before continuing.

TECH slide animation; progressive reveal
INFORMED BY Rosenshine

02 — Concrete Before Abstract
STRUCTURING EXPLANATIONS

Willingham: anchor new ideas to concrete examples first. Use images, video or objects to make the abstract visible before naming it. Move to the abstract once the concrete is secure.

TECH visualiser; image or video clip
INFORMED BY Willingham

03 — Connect to Prior Knowledge
STRUCTURING EXPLANATIONS

Rosenshine: connect to prior knowledge before introducing anything new. Use a retrieval starter or concept map on screen to activate what students know. Link before you launch.

TECH concept map or retrieval tool
INFORMED BY Rosenshine

04 — Clarity Over Novelty
STRUCTURING EXPLANATIONS

The EEF found clarity matters more than delivery method. A diagram under a visualiser can outperform a polished video. Choose the tool that makes the idea clearest, not the newest.

TECH any display tool used with purpose
INFORMED BY EEF

05 — Check, Don't Assume
STRUCTURING EXPLANATIONS

Listening is not learning. Use live polls or mini whiteboards to check understanding at every step. Rosenshine: reteach before moving on. The explanation is the start, not the finish.

TECH live polling or mini whiteboard tool
INFORMED BY Rosenshine

06 — Supplement, Never Substitute
STRUCTURING EXPLANATIONS

The EEF: technology works best when it supplements teaching, not replaces it. A screencast works alongside classroom explanation, not instead of it. Supplement, never substitute.

TECH screencast; LMS for replay access
INFORMED BY EEF

07 — Four Slots, No More
MANAGING COGNITIVE LOAD

Sweller: working memory holds about four items. Every screen element competes for those slots. Strip slides to essentials. Press B to blank the screen when you want attention on you.

TECH B/W key; clean slide design
INFORMED BY Sweller

08 — Avoid Split Attention
MANAGING COGNITIVE LOAD

Sweller's split attention: separate text and diagrams force learners to search between them. Integrate labels directly into the image. Use annotation tools to build the diagram live.

TECH annotation tool; integrated diagrams
INFORMED BY Sweller

09 — Say It or Show It, Not Both
MANAGING COGNITIVE LOAD

Sweller's redundancy effect: narrating text on screen forces double processing. Say it or show it, not both. Use the B or W key to blank the slide while you talk through the idea.

TECH B/W key in PowerPoint or Keynote
INFORMED BY Sweller

10 — Remove the Clutter
MANAGING COGNITIVE LOAD

Mayer's coherence: remove every word, image and sound that does not support learning. Strip clip art from slides. Cut background music. Every element on screen must earn its place.

TECH clean slide template; minimal design
INFORMED BY Mayer

11 — Signal What Matters
MANAGING COGNITIVE LOAD

Mayer's signalling: bold, arrows and highlights direct attention to what matters. Use annotation tools to signal live during the explanation. Without it, learners search alone.

TECH annotation; slide highlight features
INFORMED BY Mayer

12 — Chunk and Reveal
MANAGING COGNITIVE LOAD

Mayer's segmenting: break content into chunks. Use slide animations to reveal one idea per click, not auto-play. Let working memory process before the next chunk arrives.

TECH slide animation; click to reveal
INFORMED BY Mayer

13 — Words and Images Together
MULTIMEDIA & DUAL CODING

Paivio's dual coding: the brain processes words and images through separate channels. Design every slide with both: a key visual paired with minimal text. Two routes to the same idea.

TECH dual coded slide design
INFORMED BY Paivio

14 — Narrate, Don't Label
MULTIMEDIA & DUAL CODING

Mayer's modality: people learn better from images with narration than images with text. Record a narrated screencast over a diagram. Let the voice do what text would overload.

TECH screen recording with voiceover
INFORMED BY Mayer

15 — Keep Words Near Images
MULTIMEDIA & DUAL CODING

Mayer's spatial contiguity: place words near the images they describe. Labels sit beside the diagram, not in a separate list. Use slide design to keep related information together.

TECH integrated slide layout
INFORMED BY Mayer

16 — Progressive Reveal
MULTIMEDIA & DUAL CODING

Use animations to reveal content one step at a time. One idea per click, building the full picture gradually. Progressive reveal aligns the display to the pace of your explanation.

TECH slide animation; appear on click
INFORMED BY Mayer; Sweller

17 — Short Screencasts
MULTIMEDIA & DUAL CODING

Record short screencasts with narration over visuals. Mayer: images plus voice outperforms text-heavy slides. Keep each video to one idea. Brevity beats completeness every time.

TECH screen recording tool; Loom or similar
INFORMED BY Mayer

18 — Pre-Train the Vocabulary
MULTIMEDIA & DUAL CODING

Mayer's pre-training: teach key terms before the main explanation. A vocabulary slide or pre-lesson video builds familiarity first. Learners who know the words can focus on the ideas.

TECH vocabulary slide; pre-lesson video
INFORMED BY Mayer

19 — Think Aloud
MODELLING & WORKED EXAMPLES

Rosenshine: model the process, not the product. Use a visualiser or screen share to think aloud live. Narrate your decisions as you work. Make invisible expertise visible to all.

TECH visualiser; screen share with narration
INFORMED BY Rosenshine

20 — The Visualiser as Stage
MODELLING & WORKED EXAMPLES

A visualiser turns any desk into a modelling stage. Show handwriting, annotate text, build diagrams under the camera. The EEF found this among the most promising classroom technology.

TECH visualiser or document camera
INFORMED BY EEF; Rosenshine

21 — Worked Examples on Replay
MODELLING & WORKED EXAMPLES

Sweller and Cooper: students learn more from worked examples than equivalent problems. Record a screencast of the example so students can pause and study the method at their pace.

TECH screen recording; LMS for sharing
INFORMED BY Sweller & Cooper

22 — Alternate Examples and Practice
MODELLING & WORKED EXAMPLES

Atkinson: alternate worked examples with practice. Display an example on screen, then set a parallel task. Example, try. Example, try. Interleaving builds understanding faster.

TECH display and task alternating on screen
INFORMED BY Atkinson; Sweller

23 — Fade the Scaffolds
MODELLING & WORKED EXAMPLES

Rosenshine: begin with full support, then fade. Show a complete example, then a partial one with gaps, then independent practice. Use fillable templates to structure the fading.

TECH fillable template or shared doc
INFORMED BY Rosenshine; Sweller

24 — Simulations Beyond Physical Limits
MODELLING & WORKED EXAMPLES

The EEF found simulations let students manipulate variables and see consequences beyond physical limits. Use to extend your explanation, not replace it. Technology serves pedagogy.

TECH simulation tool; interactive model
INFORMED BY EEF

PEDAGOGY FIRST, TECHNOLOGY SECOND. Always.
Rooted in the work of Rosenshine, Sweller, Mayer, Paivio, Willingham, Atkinson, and the EEF Digital Technology Guidance (2019)
Want to work together? **ictevangelist.com**

CREATED BY
Mark Anderson

WHY THESE STRATEGIES

Telling is not explaining. An explanation has to be built for the mind that receives it.

Telling is not explaining. We've learned through Rosenshine's principles of instruction that distilled decades of research on effective teaching into a sequence that small steps, worked examples, checks for understanding, and scaffolds are removed as competence grows, helps. Sweller's cognitive load theory explained why this works, because working memory is narrow and easily overwhelmed, and good explanation manages that load rather than ignoring it. Mayer's multimedia principles then show how words and images should be combined, and how they should not.

I've integrated technology throughout the various categories, sharing ideas on how it can be used, when appropriate. Technology can often help, but it isn't always the answer. You'll always know your students better than anyone else, so keep them and your classes, front and centre in your thinking.

> *Working memory can overload. When explaining things with your class, it's important to remember your role is often an act of load management.*

WHERE TECHNOLOGY SERVES

Explanations and modelling are key to learning. Done well, the impact is significant, but it isn't as simple as just showing content and talking about it...

Visualisers, screen recording and well-designed slides can help you model thinking step by step and replay it, which suits the way novices need to see a process unfold. Paivio laid it all out for us with dual coding theory, Sweller gave us cognitive load theory, and Mayer took these to give us the cognitive theory of multimedia learning. From this, we know to narrate a diagram rather than captioning it, cut the decorative extras, and never make the eye choose between competing sources at once.

The commonest mistake is the busy slide that feels rich but teaches little, because it forces split attention precisely when the explanation needs space. Design the explanation for how attention works. Pedagogy sets the rules; tech supports and enhances but doesn't replace or offload.

> *Use technology to support explanation and modelling, never to replace or become the process. Pedagogy informs the approach; technology enhances and supports.*

06 Metacognition & Self-Regulation

Students who can orchestrate their own thinking processes consistently outperform those who cannot. This chapter explores how to cultivate that ability explicitly, ensuring self-regulation is a taught skill rather than a fortunate byproduct. It involves empowering learners to dissect the challenge, select the right cognitive tools, evaluate their ongoing progress, and pivot effectively when obstacles arise.

Rooted in the work of Zimmerman, Flavell, Winne and others

24 Ways to Embed Metacognition & Self-Regulation in Your Classroom

Evidence-informed strategies, with or without technology · Rooted in cognitive and educational research

Rooted in the work of Zimmerman, Flavell, Winne, Butler, and Willingham

"As children should learn about metacognition and how best to learn, they should also be taught how to use technology to support their learning." — Anderson & Lewis, The EdTech Playbook, 2025

Pedagogy First
24 STRATEGIES TO TRY TODAY

Forethought & Planning · **Performance & Monitoring** · **Self-Reflection & Evaluation** · **Strategy Knowledge & Use** · **Digital Cognition**

01
FORETHOUGHT & PLANNING
Set the Goal First
Zimmerman: planning begins with a specific, proximal goal, not a vague aim. Have students state what a good answer to this question looks like before they start writing it.
TECH shared success criteria on screen
INFORMED BY Zimmerman

02
FORETHOUGHT & PLANNING
Knowledge Comes First
Willingham: you cannot plan or monitor a task you know nothing about. Teach the content first; metacognition works on knowledge, never instead of it. Build the base, then regulate.
TECH retrieval starter to check the base
INFORMED BY Willingham

03
FORETHOUGHT & PLANNING
Analyse the Task First
Zimmerman: strong learners break a task into its demands before starting. Ask students what this question is really asking and which prior topics it draws on before they answer.
TECH annotate the question on a board
INFORMED BY Zimmerman

04
FORETHOUGHT & PLANNING
Pick a Strategy on Purpose
Flavell: planning means selecting an approach, not defaulting to one. Have students name which method they will use for this problem and why, before the first line goes down.
TECH strategy menu in a shared doc
INFORMED BY Flavell

05
FORETHOUGHT & PLANNING
Build Realistic Confidence
Zimmerman: self-efficacy drives effort, but it must be earned by past success, not pep talks. Point students to a recent task they mastered to set a credible expectation for this one.
TECH portfolio of prior work to revisit
INFORMED BY Zimmerman

06
PERFORMANCE & MONITORING
Check, Don't Just Feel
Winne: a novice's sense of understanding is unreliable. Pair every self-check with an external test, a quiz or worked answer, so monitoring rests on evidence rather than confidence.
TECH self-marking quiz with feedback
INFORMED BY Winne

07
PERFORMANCE & MONITORING
Scaffold Focus, Then Fade
Zimmerman: monitoring needs a low-distraction environment first. Use classroom.cloud to scaffold focus while students are learning, then withdraw it as they manage attention themselves.
TECH classroom.cloud
INFORMED BY Zimmerman

08
PERFORMANCE & MONITORING
Build in Stop Points
Winne: monitoring fades without prompts. Insert planned pauses where students ask whether the approach is still working, before sunk effort makes a wrong method hard to abandon.
TECH timed checkpoint prompts
INFORMED BY Winne

09
PERFORMANCE & MONITORING
Ask Yourself As You Go
Flavell: monitoring means questioning your understanding mid-task. Teach students to pause and ask "do I actually understand this?", so gaps surface in time to fix them.
TECH self-check prompts mid-task
INFORMED BY Flavell

10
PERFORMANCE & MONITORING
Make Thinking Visible
Flavell: regulation you cannot see, you cannot coach. Have students leave a brief trace of their reasoning as they work, so you and they can inspect the process, not just the product.
TECH shared doc showing working e.g. OneNote
INFORMED BY Flavell

11
SELF-REFLECTION & EVALUATION
Judge Against a Standard
Zimmerman: self-judgement needs a reference, not a hunch. Give students the mark scheme or an exemplar to compare their work against, so evaluation is anchored to a real standard.
TECH exemplar shown beside own work
INFORMED BY Zimmerman

12
SELF-REFLECTION & EVALUATION
Credit the Method, Not the Gift
Zimmerman: how students explain a result shapes the next attempt. Steer attribution toward the method used, which they can change, rather than fixed ability, which they cannot.
TECH reflection prompt after results
INFORMED BY Zimmerman

13
SELF-REFLECTION & EVALUATION
Turn Reflection Into a Plan
Butler: feedback only regulates learning if it changes the next action. Have students convert each reflection into one concrete adjustment they will make on the very next task.
TECH action log carried forward
INFORMED BY Butler

14
SELF-REFLECTION & EVALUATION
Compare Predicted to Actual
Winne: calibration improves when students see the gap between expected and real scores. Have them predict a mark, then compare, so monitoring is corrected by evidence over time.
TECH prediction logged before marking
INFORMED BY Winne

15
SELF-REFLECTION & EVALUATION
Reflection Feeds Teaching
Butler: self-regulation and instruction are a loop. Use what students notice about their own errors to decide what you reteach, so their reflection shapes the next lesson.
TECH exit poll of common errors
INFORMED BY Butler

16
STRATEGY KNOWLEDGE & USE
Know the Strategy Itself
Flavell: students cannot deploy a strategy they have never been taught. Teach retrieval, spacing or self-explanation explicitly as named methods before expecting independent use.
TECH strategy reference sheet
INFORMED BY Flavell

17
STRATEGY KNOWLEDGE & USE
Know When to Use Each
Winne: conditional knowledge, knowing which strategy suits which task, is what separates skilled learners. Teach not just the method but the cues that signal when it is the right one.
TECH worked cases matched to methods
INFORMED BY Winne

18
STRATEGY KNOWLEDGE & USE
Fade the Scaffold
Zimmerman: support must be withdrawn for self-regulation to develop. Move from modelled to guided to independent use, removing prompts as students show they no longer need them.
TECH prompts gradually removed
INFORMED BY Zimmerman

19
STRATEGY KNOWLEDGE & USE
Keep What Works, Drop the Rest
Winne: learners refine an approach by checking whether it worked. Have students trial a study method, judge it against results, and keep only what the evidence supports.
TECH method log with outcomes
INFORMED BY Winne

20
STRATEGY KNOWLEDGE & USE
Tie Strategies to Content
Willingham: strategies do not float free of subjects. Teach each one inside the content it serves, so students learn to self-regulate this topic, not metacognition in the abstract.
TECH subject-specific strategy banks
INFORMED BY Willingham

21
DIGITAL COGNITION
Schedule Your Own Spacing
Regulating when you study is a planning act. Teach students to set their own calendar reminders to revisit topics over time, owning the spacing rather than waiting to be told.
TECH calendar reminders for review
INFORMED BY Zimmerman

22
DIGITAL COGNITION
Make Your Own Questions
Writing a good question forces you to judge what matters. Have students build low-stakes quizzes and flashcards from their own notes, so the tool supports retrieval they have authored.
TECH self-built quizzes; flashcard app
INFORMED BY Winne

23
DIGITAL COGNITION
Regulate the Device Too
Self-regulation now includes the screen. Teach students to use focus modes and silence alerts as a deliberate choice, regulating the tool so it serves attention instead of stealing it.
TECH focus mode; app limits
INFORMED BY Zimmerman

24
DIGITAL COGNITION
Partner, Not Substitute
Willingham: memory is the residue of thought. Offload the thinking to AI and nothing is learned. Have students use it to check and challenge their reasoning, not to do it for them.
TECH AI as a critic of own work
INFORMED BY Willingham

PEDAGOGY FIRST, TECHNOLOGY SECOND. Always.
Rooted in the work of Zimmerman, Flavell, Winne, Butler, and Willingham

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CREATED BY
Mark Anderson

WHY THESE STRATEGIES

Self-regulation is not something pupils simply pick up by being told to reflect. It has to be taught, modelled, practised and gradually handed over.

Zimmerman's work showed us that self-regulation is a cycle, not a fixed trait. Learners look ahead, choose a strategy, monitor how it is going, then use what they notice to improve the next attempt. Flavell's work gave us the language of metacognition, helping us see that pupils can become more aware of their own thinking. Winne took this further by showing how learners should monitor and adjust while the work is happening, not just after it is finished.

This is where technology can help, when it is used intentionally (and that's the point). Digital tools can help pupils plan, track, reflect and improve. Used poorly, students can offload their thinking, weakening the very capacity we are trying to build.

> *Reflection only earns the name metacognition when it changes what the learner does next.*

WHERE TECHNOLOGY SERVES

Technology can scaffold self-regulation, or it can quietly do the regulating for the student.

Learning journals, planning tools and progress dashboards can make invisible thinking visible, prompting students to set goals, check progress and adjust, which is the Zimmerman cycle made concrete. Used deliberately, these supports are scaffolds: present while the habit forms, then faded as the learner takes over.

The risk is a tool that monitors and corrects so smoothly that the student never has to, removing the very work that builds the capacity. A guide that hands you the answer makes you dependent on the guide.

> *Scaffold the regulation, then fade the scaffold. The goal is a learner who no longer needs the tool.*

Six resources, grounded in the cognitive science of teaching and learning.

Each guide is built around what the research actually says, not what happens to be trending. The aim was never to show off what technology can do. It was to start with the teaching, work out what genuinely helps learning, and only then ask where a tool might serve that purpose. Sometimes it does, and sometimes the best thing in the room has no battery in it at all.

What looks like a single page of strategies sits on top of decades of classroom practice, leadership, research reading and applied work. That is the point of a distillation: the simplicity on the surface is earned by the depth underneath. Use these ideas, adapt them, argue with them, and make them your own.

> *Pedagogy first. Technology second. Always.*

Bring this thinking to your school or trust.

Keynotes, INSET, workshops and strategic consultancy on pedagogy, AI and digital strategy, tailored to where your team is and built on a relationship over time.

"Don't just book a one off. The magic comes from building a relationship over time where he can understand your needs and help you develop digital strategy in a sustainable way."

Robbie McGrath · School Improvement Director, Nova Education Trust

"Mark is an excellent communicator who delivers a clear and meaningful message. He exudes confidence and brings people with him."

Paul Rickeard · CEO, DND Learning Trust

"He used his wide scope of knowledge and expertise to support and train, as well as write up, publish and share. His values are clear and shine through in all his interactions."

Julie Carson · DoE and DCEO, Woodland Academy Trust

"Mark was a great addition to our conference and would definitely be a positive addition to other trusts for a keynote, CPD or twilight session."

Helen Lloyd · Marches Academy Trust

"Mark is a true edtech pioneer and a constant source of innovation, inspiration and support. The response from our staff was universally positive."

Steve Bambury · Head of Digital Learning, JESS Dubai

"He presented a wealth of ideas and personalised the session. I highly recommend Mark to any organisation looking to begin, extend or refine their use of technology to impact learning."

Martha McCleary · Head of Digital Literacy, Foremarke Dubai

"Mark is one of those truly genuine people who inspire and support in equal measure. I cannot recommend him highly enough."

James Donaldson · Assistant Principal, Cardiff and Vale College

Pedagogy First.
Technology Second.

Work with Mark, or just say hello.

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