

Content	Do This
Introduction: 3 ways NOT to do it: 'OK?'/ 'Do you understand?'/ 'Does anyone have any questions?'. Learning is <i>invisible/can't</i> be measured → teachers (Ts) generate <i>formative</i> (informing next steps) <i>inferences</i> via <i>checks for understanding</i> (CfUs) that: involve ALL students (Ss)/retrieving helps consolidate = part of learning. Care: not all CfUs are equal.	- It's ok, we've all done the 'ways NOT to do it'... so here's what to do instead 'Memory is the residue of thought' - Willingham - CfU is diagnostic NOT evaluative
Section 1: CfU and Prior Knowledge (PK): 1. PK and Schema Theory: PK key → shapes perception/thinking, = foundation for learning, essential T checks: all have requisite PK, no misconceptions. <i>PK is Velcro:</i> Ausubel quote re. factor →. When PK activated Ss <i>connect</i> new material (NM) to PK (assimilate)/<i>modify</i> existing K (accommodate). PK unevenly distributed → in-school/out-of-school factors. <i>Schema theory:</i> model of <i>how K is organized</i>, generalized & abstract/networked & interconnected/adaptive & predictive, NM <i>more easily integrated</i> into an existing (well-organized) schema = learning.	'The most important single factor influencing learning is what the learner already knows' - Unactivated PK is inert – does not help learning - PK determined by many factors (including access to resources out of school) - We're in the schema-building business - Integrating means connecting meaningfully
2. PK and Meaning-making: Weak/inaccurate connections of NM → schema = fragile learning. <i>Knowing isn't enough</i> → meaning-making: novice (N)/expert (E) <i>schemas differ</i>, progression: N (superficial features) → more structure (via making it visible) → E (deep structure). <i>Using advance organizers (AO):</i> ≠ summary, = scaffold/<i>anchor</i>. Types: expository (short descriptive texts, can CfU for PK), + narrative/skimming/ graphic AOs.	- Not just about K, it's about organisation of K - Beware 'curse of K' – Ss see things differently - Can't assume N schema will develop as desired - AOs can elicit/plug gaps in PK/develop schema - Make your cognitive architecture visible too
3. PK and Consolidation: Memory formation: 1. Knowing (no connections) 2. Early consolidation (connect to meaning) 3. Understanding (transferable K) <i>Making Thinking Visible:</i> use <i>elaboration</i>/probe (why? how? etc.)/<i>3Cs</i> (categorise/compare/contrast → reasoning/reflection). <i>PK that backfires:</i> <i>vocab</i> (different meanings)/<i>analogies</i> (over-extended)/<i>cross-curricular links</i> (may not transfer well)/<i>misconceptions</i> (can be <i>VERY resistant</i> to correction, takes time, can even be retained alongside NM).	- Need Ss to deeply process to 'see' thinking (which is effortful) - Watch for PK issues – anticipate & plan for them - To break down misconception: explain/model/contrast – many times - Correct answers (As) may <i>not</i> show U
Section 2: CfU and the Science of Learning (SoL): 4. The Illusion of Learning: What is taught ≠ what is learned, learning not instantaneous. <i>Poor proxies</i> = Ss busy/engaged/ getting feedback (FB)/calm classroom, curriculum covered, a few correct A. Performance (visible) ≠ learning, need to Cf <i>misU</i>. <i>Curse of expert</i> → without data T fills in gaps for Ss, check/design with contextual variation/take N view/check for misconceptions	- Be aware of what you are using to CfU/learning - Ss can be correct for the wrong reason - Never assume; collect data → plan - Dunning-Kruger: those who know least are least aware of what they know, beware Ss confidence
5. Desirable Difficulties: The Paradoxical Nature of Learning: If it <i>hinders performance</i> it can <i>benefit learning</i>. <i>Desirable difficulties</i> → <i>durable + flexible</i> learning, cognitive struggle/making mistakes & correcting/spaced practice → more durable memory traces. Forgetting part of learning via act of retrieving. <i>Spacing:</i> need strong initial encoding/effortful retrieval/spacing (depends on complexity/changes over time), mapped onto curriculum at macro (over years)/micro (during year) levels. Interleaving + contextual interference: = Ss can contrast (3Cs), need secure K, avoid cognitive overload.	- S smooth success/confidence may be a bad sign - Not all difficulties are desirable – check/plan for - Retrieval part of learning (not just testing) - Spaced practice/interleaving needs planning for - Make making mistakes a welcome event - They'll never transfer without practice in transferring (switch up contexts)
6. Assessment: The Bridge Between What is Taught and What is Learnt: Many classes CfU too infrequent/superficial. <i>Formative assessment (FA)</i> → data to make <i>better - founded decisions</i> what to do next (probabilistic, can operate on many time-frames, Ss & peers can do FA, FA = both domain-general & domain-specific → think: core principles / adapt to subject matter/collaborate across & within subjects). <i>Summative assessment</i> → current level/predict future, same tool can be both- depends on purpose.	- Assessment linked to <i>not</i> distinct from pedagogy, type defined by inferences made not structure 'better-founded' is key phrase in FA - Plan FA at 'moments of contingency' (when lack of K or U is pivotal to progress) - Use table on Page 84
Section 3 CfU in Action: 7. Ratio: Involving All the Students All the Time: CfU gives T info AND helps Ss → more fluent. <i>Graph: Thinking ratio (TR)</i>  <i>Participation ratio (PR)</i> TR = how hard Ss think (depends on K, varies), PR = how many/for how long (need to build routines/expectations), goal = <i>high TR AND high PR (max. learning)</i>, high TR/low PR = few thinking hard, high PR/low TR = 'shallow-land' (can be useful stepping stone).	- Bloom's Taxonomy  erroneous, more  K foundational to comp/eval/synthesis etc. - Plan Qs (not off the cuff) to maximise TR - Use chart Page 101 for types of TR/PR - Aim for high (80%) success rate → increases PR
8. Cold Calling (CC) : = an invitation to Ss to join conversation. <i>CC is: 1. ...NOT random:</i> clear sequence: <i>Stimulus/T asks to think/T asks Q/T pauses/T asks S/T bounces</i> (better equity, increase PR, increases confidence → no one is bypassed/everyone matters, embeds retrieval throughout lesson (in their heads as well as paper), maintains pace. <i>2.... NOT a tool for catching Ss out:</i> T <i>explain use of CC/</i> reasons, T uses <i>supportive</i> tone/ language/body language, models good listening, responds constructively to mistakes, ensure success → helps with motivation. <i>3. NOT 'No hands up':</i> just means T may call	- Use Pages 104 – 105 as summary Ch. 8-11 - Use the sequence/never name first - Cold calling is warm and inviting - use inclusive language, never use CC to catch Ss out - Establish 'safe' space (to make mistakes/speak up/ask questions)

on you, make sure sufficient wait time, scaffold with pair work/mini-whiteboards/warm-calling/group calling/sentence-starters/probing for depth. Also avoid: moving too quickly through Qs/asking the same Ss/waiting for 'right' answer.	• Ts typical wait time between 0.7 – 2 seconds – should be 3-5 sec or longer even (15-30!) • Explaining rationale of CC to Ss really helps
9. Mini-whiteboards (MWBs): Benefits: 1. Participation: increases PR to 100%, low stakes, versatile (can do diagrams/text/calculations/drafts/pair work/comparative judgement) 2. Data: vastly increases the number of responses per lesson, instant FB for T, can spot patterns in mistakes/misconceptions, promotes responsive teaching, easy to probe/clarify (after pause). Solutions to issues: 1. Routines: for distributing boards/pens/erasers, getting new pens when needed, when to show answers (3-2-1 go), write big, question mark if they don't know, when to put board down/erase work, routines stifle misuse. 2. Only give Qs they can answer on MWB: not essays/too complex or vague, MCQ/True or False/short answer. 3. Still do work in exercise books (as required)	• I (Helen) would NEVER be without MWBs • Amount & quality of data you get VASTLY outweighs any issues with them • Yes, it's worth the cost of them + pens • Routines are ESSENTIAL for their use, train Ss • Focus Qs on misconceptions/hinge Qs • Use the feedback: if >80% correct can move on, else re-teach/clarify • MWBs not <i>just</i> about participation – it's data.
10. Hinge Questions (HQs): = diagnostic question designed to CfU that is required to move on. Can be well-crafted MCQs. HQ design principles: Only one concept (doesn't need essay or extended response)/ unambiguous (both Q & A)/includes plausible distractors (incl. misconceptions)/ can't answer correctly or guess easily with wrong reasoning / quick & easy to do & assess (<1min to answer, <30 sec to interpret). Follow up: most correct = move on, most incorrect = re-teach/address, split = probe further	• All HQs require careful planning/scripting, incl. timing in teaching sequence • Design carefully: see design principles ←, these apply to design of any diagnostic Qs • What you do next depends on distribution of correct answers
11. Exit Tickets (ETs): Teaching changes Ss. ET & their design: short (MCQ/short answer/T&F/fill in gaps, low-stakes (or none), linked to lesson objectives, not about closure, can be efficiently administered/collected, help to shape what happens next. Issues to fix: must be done independently, not rushed, quick to analyse/analysed before next lesson (either all or sampled). Follow up: see HQs, can plan discussion using some S answers.	• Our lessons should make an impact but don't confuse learning and performance (on ET) • Purpose of ETs is to take snapshot, informs short term planning (next lesson) • Use variety of techniques/intelligent sequencing
Section 4 CfU and...: 12. CfU and Special Educational Needs & Disabilities (SEND): FA comes from SEND; what's good for Ss with SEND is good for all. Graduated Approach/cycle = Assess → Plan → Do → Review. CfU = front line, frequent CfU enable effective proactive adaptive teaching earlier than testing (reactive). WM can be bottleneck for Ss with SEND: minimal guidance doesn't work/overloads WM, transient effect bigger issue, smaller chunks needed, effect of extraneous load bigger, more CfU needed. Schema: can be fragmented, scaffold with vocab/visual representations. LTM: retrieval very important → consolidates + gives T FB. CC/MWB need thought – pages 231 – 234.	• CfU is a pedagogical AND a moral act → inclusive • Well executed frequent CfU = more agile response to Ss needs than formal assessment • = action before needs → long-term difficulties • Inquiry-based learning disproportionately disadvantages Ss with SEND – don't do it • Routines disproportionately advantage Ss with SEND, reducing WM demands
13. CfU and Adaptive Teaching (AT): Used to be 'differentiation': all/most/some LOs, did not work: less motivation/effort. AT same unless: before lesson = proactive AT, plan for all, scaffold, deal with barriers, during = reactive AT, respond to moments of contingency, after = reflection, use data from CfU → short-term/long-term planning. Scaffolding: not designed to be permanent, gradual release of responsibility → independence, too long → expertise reversal effect, too much → shallower learning, Model e.g. I do/we do/you do. Learning isn't linear, meaningful learning takes time, CfU essential for progress.	• If we set easier work for struggling students how will they ever catch up? • AT works in the short-term for long-term goals • Zone of Proximal Development (Vygotsky) is development NOT about teaching • Remove calibrated scaffolds in timely fashion • Teaching/practice ↔ CfU is the norm (↔ not →)
14. CfU and Early Years (age 4-5) by Rachel Ashfield: Same principles/slightly different. First years: rapid brain development/learning/SEL, fragile, needs building, dealing with misunderstanding/gaps. CfU → embedded in everyday practice (not testing). Strategies: 1. Link PK to provision: essential to link NM to PK explicitly & intentionally/analyse gaps. 2. High Quality Interactions: conversations/responsive questioning = CfU → data, can respond in the moment, inclusive, child-centred. 3. Targeted Adult Placement: ensure all children have access to adult, adults can recognize gaps/issues & address/scaffold.	• Frequent CfU essential, lots more through real-time interactions than on paper/MWB etc. • K and connections will be fragile and need strengthening in EY • Adults should be present, purposeful, responsive, not static/on the margins • Different starting point ≠ different potential
15. CfU and Oracy by Nikki Sullivan: Oracy often overlooked. MWBs → each student, doesn't allow for reasoning, may be range of correct responses. Partner Talk: = diagnostic tool, e.g. Turn & Talk/Think-Pair-Share (Lemov), can use MWB to offload WM while talking, T circulates & listens for: errors/misconceptions/partial U/incorrect use of language AND strong explanations T can use to model, follow up: pause class to address misconception/use model answer/collate responses. The Third Turn: as in 'your turn/my turn/third turn', probes encourages deeper thinking , e.g. can you say more about ...? Common Pitfalls: empty talk (talk must be based on PK/K/stimulus, need to establish norms), unchecked misconceptions (S talk must be monitored), transience of talk (talk is transient, decide when it needs to be permanent).	• Paired work = 100% PR – 50% + 50% • Requires cognitive demand on both speaker and listener • Follow up by asking Ss to explain/justify/respond to others' ideas • Learn to bounce (ideas/probes/follow ups) to rest of class • Ss <i>can't</i> talk their way to new content • You MUST circulate – listening in to S talk is the point of S talk.