



Content	Do This/Remember This
<p>Introduction: Learning occurs in the learner’s brain, result of what learner does + thinks, T’s job = provide optimal circumstances, teaching = most effective way to promote learning (e.g. math, history), some learning happens without teaching (spoken language, face recognition). This book: is not/cannot be a recipe book for classroom practice, cites foundational articles not fads, not about neuroscience/biology, does use cognitive psychology (good empirical evidence, not about goals of education).</p>	<ul style="list-style-type: none">
<p>Section 1. The Science of How We Learn. 1.1 The Scientific Study of Learning and Teaching: Cognitive Biases: Teachers (T) knowledge (K) + beliefs about education + personal experience fuel intuition re. decisions they make (large & small), brain fine-tunes memories + perceptions → cognitive biases, was practical for survival, Confirmation Bias/Cognitive Dissonance: we remember evidence that supports our views/forget or reject the rest, feel attacked when evidence doesn’t support our view, need to free ourselves from biases via scientific method (data collected methodically + analyzed logically = better bet for knowing what works). Levels of Research: neurobiological (molecular/ cellular), cognitive psychological (models learning and memory from obs. of behavior), educational psychological (multi-disciplinary field dealing with real contexts). Experiments in the Classroom: descriptive (observations to form hypotheses), experimental (changing a variable, controlling others + observing effect). Problems with Evidence: SO many (internal + external) variables → need lots of data + statistics, statistically ‘significant’ = unlikely to be due to chance. Correlation ≠ causation: can be third variable, cause/effect direction not clear (e.g. self-esteem + academic results), published replicated peer-reviewed studies = trustworthy, the devil is in the detail – big labels don’t help, use evidence backed principles of learning. Myths = distortion/ misinterpretation of findings, have many costs (time, money, learning).</p>	<ul style="list-style-type: none">
<p>Section 2. The Cognitive Processes of Learning. 2.1 Components of Memory Multiple Memories: sensory memory (SM) = set of systems, gateway, filters + encodes incoming info, working memory (WM) (where info we are paying attention to is held + processed, critical to learning/LTM, long-term memory (LTM) (set of systems, in LTM if we remember it when no longer paying attention, includes motor skills). Explicit LTM: consciously generated through attention/WM, two types: episodic (=autobiographical) + semantic (K of world + how it works). Implicit LTM: unconsciously generated through experience, help modulate automatic responses to stimuli. Procedural memory: learning skills, cannot test without doing it, faster to learn than explicit. Conditioning: indep of explicit learning though interacts, emotional can be due to single intense response, useful for self-preservation, takes a long time to erase.</p> <p>2.2 Organization of Memory Analogies and models: networks not libraries, model: new K + prior K → schemas (organization of K through meaning) = new prior K. Making Connections/ Processing/Active Learning: connections are semantic, need to activate prior K), processing deeply in terms of meaning = stronger memories, active = learning by thinking. Activating/Assessing Prior K: not enough to ask what they know about it, need qs that get them to apply prior K to learning object, assessing ≠ activating – need diagnostic qs. Learning with understanding: rote learning produces inert knowledge, needs delving using variety of contexts. Design of Activities: #1q= ‘what will they think about?’ #2q= ‘how will their thinking be visible?’. 2.3 Memory Processes Retrieval: LTM is effectively infinite, there is a trace of everything we sense but not efficient to keep all of it, 4 levels of remembering: familiarity/recognition/cued recall/free recall, 3 process essential to learning: encoding/storage/retrieval. Retrieval practice (RP) speeds up learning/gives T formative assessment but Ss need to be taught: rereading =illusion of knowing/ (desirable) difficulties are helpful/ memories reconstructed on retrieval. More cognitive effort + application = more beneficial, any tests must be low-stakes. Spaced/interleaved RP even more beneficial. Effective repetition = elaboration + spaced. Forgetting = cannot link to schema. 2.4 Reorganization of Memory conceptual change = fast if adding a new property to schemata), = slow if reorganizing schemata by changing meaning, = can be difficult due to confirmation bias, = works when new= better predictor/explainer + they have chance to try it out. 2.5 Transfer of Learning transfer challenging → needs schemata additional to problem to be activated. Transfer can be near (similar problems, easy) or far (superficial different, same underlying structure, hard). Concrete e.g.s good initially, then needs variety to produce meaningful learning = transfer to new situations. 2.6 Working Memory Limited (cannot be expanded, hard to measure reliably, increases with age/K) needs constant dynamic attention, sensitive to stress/anxiety/emotion/earworms + processing demands. Luckily dual-coding → two channels (verbal/visual). Cognitive Load (CL) Theory: intrinsic/germaine (necessary for learning)/extraneous CL, avoid overload. 2.7 Deep Learning Experts have a lot of K + had a</p>	<ul style="list-style-type: none">

<p>lot of practice = have cognitive flexibility/ability to see through superficial differences/reason better/solve problems faster than novices. K = more creative + better critical thinking. T must break it down then build it up + practice = automaticity when desirable or just in LTM.</p>	
<p>Section 3. Social and Emotional Factors in Learning. 3.1 The Role of Emotion in Learning 2 impacts of emotion (automatic response to threat/opportunity): intensify memory (if involves surprise/curiosity but may just enhance episodic not semantic memory) or undermine learning process (clogs up WM with unrelated thoughts). 3.2 Motivation = emotional response mediated by cognitive factors, process not a goal. Goals = learning (😊), performance (😞) + approach/avoidance strategies, may vary with age/subject. Motivation = decision based on subjective value + expectations. Value → 2 types: intrinsic (= individual interest OR situational interest), extrinsic (utility/reward/achievement). Expectations → efficacy (can I do it), outcome (will it help me reach my goals). Academic success ↔ motivation (people didn't always think this), but don't dumb down. 3.3 Beliefs self-efficacy beliefs = experience + attributions associated with them. Ss attribute success/failure to things that are: internal/external, fixed/variable, in/out of my control. Attributions can be trained, supported with feedback (about work not student), need to discourage limiting/ stereotypical beliefs about 'ability', but research into 'mindsets' mixed. 3.4 The Social Dimension of Learning T verbal/non-verbal communication establishes environment: supportive/non-supportive, adds to S subjective value/self-efficacy to determine behavior: apathetic/defiant/frustrated/evading/fragile/motivated. Pygmalion Effect: our expectations → our behavior → they fulfil those expectations. Social interaction-based learning effective when S: actively participates, assesses explanations, explore inconsistencies, explain to peers. Cooperative learning: careful structuring + assessment/grading, mixed groups better.</p>	<ul style="list-style-type: none"> •
<p>Section 4. Self-Regulation of Learning: 4.1 Metacognition happens when we reflect on our ideas/beliefs/mental processes/cognitive performance then intervene. Metacognitive (MC) skills = assessing understanding of learning goals/personal strengths+ weaknesses/planning the learning task/selecting strategies/implementing plan+monitoring progress/reflecting on suitability of choices+adjusting. Ts can model these skills. Ss with high levels of self-regulation already use MC skills, elaboration + self explanation, rest need explicit help. Learning to learn = autonomous learner. 4.2 Self-Control – research pointing to underlying skill in suppressing impulsive/automatic responses = part of executive function (higher cognitive function, starts early, necessary for academic/life success, can be nurtured, often linked to delayed gratification). Inhibitory control depletes over time/improves with age i.e. with pre-frontal cortex development. 4.3 Emotional Self-Regulation emotions can be: social or performance related (linked to value + expectations (see 3.2), arise when S anticipates challenge/faces it/see result, can lead to self-sabotage). Can be regulated by modulating: attention (redirecting/focusing on it + expressing emotions e.g. writing), bodily expressions (controlled breathing), cognitive appraisal (of value: e.g. 'this test is not that important', of expectations: e.g. 'I can handle it'), Ts can teach them how. 4.4 Resilience and Grit grit (= perseverance + passion) has a metacognitive element e.g. redirecting efforts, associated with long-term goals, linked to growth mindset. Can be cultivated (genes/twins – perseverance 37%, motivation 20%): through showing strategies produce success, teaching how to deal with failure. Some criticism of concept of 'grit' – it's just 'conscientiousness'.</p>	<ul style="list-style-type: none"> •
<p>Section 5. Teaching Processes: 5.1 Instruction proven effectiveness (academic performance) e.g. using Rosenshine's principles: direct instruction, sequencing/ dosing, modelling, review, asking questions, structuring/guiding practice, 'guided discovery' can be effective for conceptual change 5.2 Feedback (FB) must provide goal + current status + what to do next. Types related to: task (FT)/process (FP)/metacognition (FM)/learner quality (FL). Effectiveness related to: timing + frequency (immediate FT, FP/FM can benefit from delay), way provided (hints good, be precise, FL has little impact), how students interpret FB (affects beliefs→motivation, need to be v.v. careful, use positive FB when learning/negative FB works when high self-efficacy+ investment in learning goal), grades (Ss can interpret grade = ability, grade can be label, given grade→they don't read FB, grade can = extrinsic motivation, good if grade reflects entire learning process). 5.3 Assessment assessments should be: valid (does it measure what it says it measures?), reliable (is it replicable and consistent?), accurate (does the grade reflect the learning we are looking for?), precise (does it distinguish one level of learning from another?). Assessments measure performance not learning, carry margin of error, better if assess transfer (writing those is hard). Formative assessment: provides data to tell decide what to do next that is better than without data, is a process not artifact. Variables: who gets data (T/S/admin...), length of assessment cycle (long - school year, medium - unit of teaching, short - on-the-fly/in lessons), quality of feedback.</p>	<ul style="list-style-type: none"> •
<p>Appendices Neuromyths: learning styles, critical periods / enriched environments, 'we only use 10% of our brains', 'right brain/left brain' and logical/creative.</p>	<ul style="list-style-type: none"> •