Why Don't Students Like School (2nd Edition – 2021, 1st Edition - 2009) by *Daniel Willingham*

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Content	Do This/Remember This
1 Why Don't Students Like School? Principle: **People are naturally curious but we are not naturally good thinkers; unless the cognitive conditions are right, we will avoid thinking.** Thinking is combining information in new ways. Compared to seeing/ moving thinking is slow + effortful + uncertain (hence they don't like school). Most of the time we use memory to guide behavior/ autopilot/ doesn't require much attention. People are curious but curiosity is fragile. Pleasure is in solving problems not working on them/we have to judge that the effort will pay off. Useful to have model of memory: environment into working memory (WM) transfer back and forth to long term memory (LTM). Needs space in WM to solve problems.	•
2 How Can I Teach Students the Skills They Need When Standardized Tests Require Only Facts? Principle: **Thinking skills depend on factual knowledge.** Not just memorizing; you need things to think about + higher order thinking skills intertwined with knowledge. Knowledge essential for: reading comprehension (provides vocab, fills in gaps, frees up WM by using LTM, allows chunking), cognitive skills (knowing similar problems, chunking skills, generalizations often need background knowledge), improving memory (easier for new things to mean something, make connections, remember cues). Quotes can be unhelpful - 'Knowledge *more important* than imagination'. 'Thinking strategies' helpful but not enough, leisure reading useful but not enough – teacher needs to level playing field.	•
3 Why Do Students Remember Everything That's on Television and Forget Everything I Say? Principle: **Memory is the residue of thought.** We forget because: we didn't pay attention/it didn't get into LTM/you can't get it out of LTM/it's no longer in LTM. Clarifications: emotional connection helpful but not necessary/'repetition' not enough/'wanting to' not enough. Need it to be in WM long enough (attention) AND thought about in the right way. Good teachers are well organized story tellers. Stories because: we know structure/they're interesting/easy to remember. Some material 'meaningless' but still needs to be in LTM – find ways. Always focus on what students will think about.	•
4 Why Is It So Hard for Students to Understand Abstract Ideas? Principle: **We understand things in the context of things we already know, and most of what we know is concrete.** Abstraction is the goal of schooling. We depend on prior knowledge to understand so concrete AND familiar e.g.s help. There are degrees of understanding: Rote knowledge (no meaning) rare, shallow knowledge more common, deep knowledge = can see the whole but barrier = what they already know. Abstract ideas hard to learn as prior knowledge concrete not abstract. New learning initially shallow as deep learning requires more connections; deep structure (functional relationship among components of an idea) hard to see so transfer is hard.	•
5 Is Drilling Worth It? Principle: **It is virtually impossible to become proficient at a mental task without extended practice**. Practicing when learning = more competent + making improvements. Practicing when proficient = reinforces skills for learning advanced material + reduces forgetting + improves transfer. Drilling = factual knowledge = more able to chunk/more automaticity (process of bringing material into WM more efficient or make memory representations) = WM enhanced (without making it bigger). Overlearning/spacing very useful – increased familiarity makes transfer more likely as surface features of a problem are familiar.	•
6 What's The Secret to Getting Students to Think Like Real Scientists Mathematicians and Historians? Principle: **Cognition early in training is fundamentally different from cognition late in training.** Novices know less than experts AND their knowledge is organized differently. Expert thinkers: access the right information with speed and accuracy, know what to ignore, notice subtle aspects novices miss, fail gracefully (usually the wrong answer is close), show better transfer to similar domains, optimize their WM with background knowledge and practice, see through surface features to deep structure and function (which helps with abstract	•

problems), have abstract representations in their LTM, have high levels of automaticity of routines, talk to themselves. Students can think like experts when they practice. 10 year rule – it takes that long to become an expert + needs sustained practice for exceptional achievement, great minds of science work REALLY hard + are tenacious. 3 stages of development of expertise: 1. Understand + appreciate what and why experts achieve 2. Understand their methods 3. Work towards using the methods.	
7 How Should I Adjust My Teaching for Different Types of Learners? Principle: **Children are more alike than different in terms of how they think and learn.** Definitions: cognitive ability = capacity for success in certain types of thought e.g. maths, cognitive style = tendency to think a particular way e.g. sequentially vs holistically. Lots of styles have been proposed by psychologists but no theory (currently): consistently attributes same style to a person, show that different styles learn differently – they have not been found. Visual/Auditory/ Kinesthetic – some people do have better auditory or visual memories BUT they do ***not*** learn better if taught that way. Gardner's multiple intelligences (not abilities or talents) more like talents, panders to 'everyone's good at something', but can't use one to bolster weakness in another.	
8 How Can I Help Slow Learners? Principle: **Children do differ in intelligence, but intelligence can be changed by hard work. '**Intelligent' definition = can understand complex ideas/catch on quickly/use different types of reasoning (not the same as talent). There is general intelligence, g, = probably result of range of high-level cognitive processes, influences range of mental abilities. Intelligence mix of genetics (20 – 50%?) and environment, but result can be direct (genes) or indirect (behaviour of parents, seeking out different environments) AND instances of huge increases in IQ → more about environment than genes. Student (and parent and teacher) attitudes about intelligence matter – can be damaging if a student thinks they're 'smart', particularly attitude to failure. Wholesale programs to change mindsets haven't really worked. Teachers are in it for the long game – catching students up takes time.	•
9 How Can I Know Whether New Technology Will Improve Student Learning? Principle**: Technology changes everything… but not in the way you think.** Two things: 1. tech changes a lot of cognitive processes, but not the way you'd predict 2. tech does not change the way your mind works. Students are NOT 'digital natives', attention hasn't changed much despite screen time (5h/day for tweens, 7h/day for teens) nor ability to multitasking (or switching attention quickly). Interactive whiteboards and laptops for students had little effect. 3 predictions disconfirmed: e-books didn't replace paper, you can't just Google it (it lacks context), taking notes on laptops not better than writing, broad Internet access didn't lead to self-education, hasn't changed teens doing what the have previously done (hang out with friends) though there is opportunity cost (family time), reading hasn't declined further, but phones omnipresent as new, socially relevant information ever likely.	•
10 What about my mind? Principle: **Teaching, like any complex cognitive skill, must be practiced to be improved.** Fitting teaching into the model of the mind (Ch1): teaching very demanding on WM, needs rich subject knowledge, needs rich pedagogical content knowledge. Issue: lots of improvement in first 5 years, then tapers off, get 'good enough' – solution: teaching needs **deliberate** practice e.g. pair up, pick one small thing you want to improve, video yourself, watch alone, watch videos of other teachers with your partner, watch and comment on each other's videos, take it back to classroom, follow up. Or self-management – set aside time to learn and practice something new. Keep track of how it goes.	•
Conclusion: We want to guide the thoughts of students; they don't necessarily have control over their thoughts. Cognitive science gives you ideas about what to do, what to ignore, and helps balance conflicting concerns. All the Principles above always applicable and all supported by data, provide boundaries to educational practice	•