Learning Begins/Grows by Andrew Watson

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Learning Begins (The Science of Working Memory (WM) and attention)	Do This/Remember This
PART I WM: 1.Memory at Work: Table analogy – selecting photos for an album: STM = small table, LTM = box of photos, processing = shuffling/sorting photos. Declarative = knowing that, procedural = knowing how. STM now called WM a. Uses - where we hold info to rearrange/ combine/ essential for academic learning b. Limitations – capacity, duration c. Development – increases (a bit) with age, **cannot** deliberately increase capacity with artificial practice (analogy – volleyball players on stilts)	• Use phone number backwards to illustrated WM overload • Find strategies to work within Ss WM limits • Anticipate then identify then solve WM problems Ss might have
2.Two Burning Questions: 1. How can we anticipate it? WM overload = like too many photos on the table, maximum overload with too much unrelated material that needs to be manipulated/ combined in a creative way: Dark Force analogy – by being creative/ expansive we can CAUSE the overload e.g. when giving many instructions, giving them choice, getting them to use technology, so projects need planning so they have expertise/vocab/connections/patterns 2. What does WM overload look like when it happens? Can fail at holding and/or at processing, how they can't do things tells you which, + their behaviour – atypical distractibility, catastrophic failure (unable to do normally simple things) – it will bounce back	• Control amount of NEW information • Moderate in terms of relatedness • Make choice a choice! • Remember: tech distracts • Don't do projects with novices • Monitor if they can't remember things • Notice distractibility • Pause if you've caused catastrophic failure
3.Solving Working Memory Problems: #0 – Adopt a WM Perspective – notice WM demands #1 Solve WM problems with LTM – connecting new info to LTM info dramatically reduces WM demand, deliberately chunk new info, establish routines. #2 Redistribute WM demands – choose what to tell them first (the majority), save exceptions for later, use both visual and verbal channels, they can take in twice as much, remember listening+processing+deciding+writing =WM overload #3 Reduce WM demands -choose #examples/types/work that maximize learning without risking WM overload #4 Normalize struggle – tell the smart people do NOT learn without struggle, get them to talk to each other about struggle #5 Reduce pressure – pressure (grades, group working/depending on others, supervision) can convert a high-WM-capacity student to a low-WM capacity-student	• Keep WM in mind (all the time) • Build up LTM stores including routines • Remember they don't know what you know • Do rules first, exceptions later • Use diagrams judiciously • Avoid them listening while note taking • Cut extraneous material that increases WM load without increasing learning • Tell them to expect/enjoy struggle • Manage the pressure mindfully
4. Working Memory Review with FAQ 1. Multitasking – increases demand, 2. 7+/-2 in WM – not a hard and fast rule, 3. increasing WM – no proven methods, 4. students with WM deficits – benefit from solutions in part 3, 5. New to teaching – be systematic in trying solutions above, protect your own WM overload, 6. kinesthetic channel – there isn't one	• Use of LTM increases curriculum coverage • All students benefit from solutions in part 3 • Teachers can get WM overload too
PART II ATTENTION: 5. Redefining Attention 1. What is attention? – not a single thing = alertness (how awake), orienting (what stimuli are they attending to), executive function (what are they putting effort into) = AOE 2. What can we do? – watch for examples of attention issues in the classroom and categorise using AOE, see when 'pay attention!' might work, look for examples with our own attention	• Attention isn't one thing • Care with 'pay attention!' • Look at the attention issues using AOE
6. Alertness There's a threshold - high or low alertness precludes learning 1. Mind the Leopard – we are alert to visual novelty evolutionarily, 2. 10 minutes, and Beyond… – no support for fixed lengths of attention by age, changing activity can halve inattention, 3. Justice is Blind and Tired – human brains can't be alert for hours on end, 4. Movin' On (Waking Up) – physical movement (or watching you move) can increase alertness	• Use videos/changes to visual stimuli to increase alertness in teen-age brains • 10 minute rule is not a rule • Breaks (jokes, comments etc.) increase alertness • Movement (theirs AND yours) help
7. Orienting - A: reduce internal distraction, 1. We're having a Heat Wave – temperature matters, affects orientation, 2. Euphemism, Please – adolescents are sensitive to bathroom needs 3. Don't Be Hangry – hungry students don't learn 4. Hormones – choose **B: reduce external distraction**. 1. Beyond Noise Pollution – noise/smells/posters etc. can distract 2. This Does Not Compute – distinguish exotic tech = tech that has no place from domestic tech = useful tech (laptops, sensors etc) **C: increase salience of material**. 1. Reality Check – students don't think about salience in the same way 2. This is only a quiz – quizzes cut mind-wandering 3. "Tribal Classrooms" – classes can have their own identity/esprit de corps	• Keep classroom temperature conducive to learning • Attend to bathroom needs • Remember when lunch is/have snacks • Control noise/smells/displays as you can • Plan what you do and what they do • Quiz increase focus… don't overdo it • Use your personality
8. Executive attention (EA) What does an EA mistake look like? 1. Chocolate cake – prudent vs impulsive students – impulsive + high WM demand = answers that make no sense 2. Measuring a reservoir – EA requires willpower, all acts of willpower drain the same reservoir, 3. Tick Tock – time pressure impacts performance on high WM demand tasks 4 Motivating Environments – feeling of relatedness, autonomy and choice enhance EA, improve situation model (picture in your head)	• Don't always think they are thinking the wrong way; scrambling may be overload • Reduce ways they have to exert willpower • Choose time pressure OR WM demand not both • Engender atmosphere of relatedness
9. Attention Review with FAQ 1. Class period – key variable is teacher, start earlier if possible (biology) 2. ADD/ADHD – find ways to stimulate that don't distract others 3. Distinct or combined – can have more than one AOE problem 4. Is it always bad? – inattention affects learning 5. Training? – A and O probably not, E possibly (Tools of the Mind – Diamond) 6. Emotion – WM + emotion + LTM + motivation always interacting	• Work to an earlier start (biologically better) • Work to limit inattention • Cut yourself slack… it may not work, keep the goal in mind – we want them to learn.

Learning Grows (The Science of Motivation)	**Do This/Remember This**
We already know a lot about motivation, Mind, Brain, Education (MBE) advice should have research and be surprising. MBE Principles: 1st – Don't just DO this thing, THINK this way, 2nd – Don't obey or imitate, translate, 3rd – Averages matter, but no individual is average. **PART I MINDSET: 1.Starting at the Fourth Step (what we see):** In the face of struggle some students charge (excited, stimulated, undaunted), some students retreat (gloomy, go backwards, give up) 1. The Motivation Paradox – why do strategies designed to motivate not work? What makes some students retreat? Is not related to capability, but to the **Third Step**: their explanation - if struggle = insufficient ability -> retreat, if struggle = insufficient effort -> charge, 2. Classroom Strategy 1 using praise of effort not ability shifts students' perceptions of their enjoyment, makes them more strategic, less likely to lie about their grade. 3. Classroom Strategy 2 focusing down using praise of precise strategy not person because praise for effort alone can look like a consolation 4. Classroom Strategy 3 decouple praise from self-esteem – don't give person praise to students with low self-esteem, comforting feedback can make students focus on ability, 5. Classroom Strategy 4 Adding 'yet' changes hints at a more successful future	• The 3 principles of MBE • Remember charge/retreat students vary emotionally/ cognitively/behaviorally, • You can start at step 1 – you don't know what the problem is • Aim to convert retreat! Into charge! • Be explicit about learning taking effort • Don't use the 'smart/gifted/intelligent' • Praise effort instead • Be precise about what was good about what they did • Beware comforting feedback – it can imply lack of ability • Remember 'The Power Of Yet'.
2.Second Step: Rehearsing, Not Performing: 1. Why do students come to school? Some have performance goals PG (show off how much they know), some have learning goals LG (learn more than they already know) 2. How does that affect their response to struggle? PG students say effort is bad/failure/means you are not smart/fear mistakes/focus on test scores, LG students see effort as good, mistakes as necessary, people can have PG/LG in different situations	• Normalize struggle- no mistakes = no learning • Get older students to mentor/discuss struggle • Tell stories of others' struggles • Tell stories of our struggles • Get them to compare them to themselves to see progress
3.The First Step (at Last): 1. Mindsets – fixed = intelligence is innate and cannot change, growth = intelligence can increase over time, mindsets predict response to struggle, GM means more learning/more processing of wrong answers, FM get hung up on wrong answers 2. Strategy 1 - Messaging - explicit messages do affect mindset, also indirect messaging through mentoring, and what we teach them about the brain and learning 3. Strategy 2 - Grading – if students can correct work they talk more about learning and less about test scores 4. Strategy 3 – Disciplines change -growth disciplinary mindset (no research), schools subjects in expanding fields.	• Tell them intelligence can change with effort • Tell them brains rewire with learning • Encourage peer mentoring, use of siblings • Use language of struggle rather than mindsets • Let them do corrections • Use grading strategically • Discuss how academic disciplines change
4. The Mindset Controversy with FAQ 1. GM doesn't mean people are equally smart – there are some limits 2. Is FM/GM subject specific? – there are distinct mindsets around broad categories (academics/social/sport), 3. What about grit? – grit = charge, 4. Is it FM to say WM is limited? – GM says learn to use it better, 5. What about success? – GM sees success as confirmation effort has worked, FM that they are smart, failure is diagnostic – shows limitation (FM) or limitlessness (GM) of intelligence 6. Are there age limits? – no 7. Are mindsets culturally specific? – no research	• Discuss how we can think differently in different arenas • Think about how you celebrate success
PART II STEREOTYPE THREAT: 5. (De)Motivation and Sterotypes 1. What is the problem? – perception that others judge you based on stereotypes = stereotype threat ST in race, gender, sexuality, age, socioeconomic status, can affect: cognitive performance and more, can both impede/enhance performance, culturally specific (different stereotypes), ST is a response to conditions (like mindset), teachers can change the conditions 2. Mapping ST paradoxes – four preconditions that lead to ST: #1 Salience (relates to student e.g. ST about swimming affects the swim team), #2 Second-hand belief (believing the teacher believes the stereotype affects the student even if the student doesn't believe it) #3 Skill and interest (being good/interested makes you more vulnerable to ST because you care, does NOT protect you) #4 Heavy lifting (ST makes easy work easier and difficult work more difficult) 3. Effects of ST internal and external hypervigilance + stress = distracts/clutters WM	• Remember students with skill and interest are not immune to ST • Care recommending demanding courses to students with skill and interest • Monitor your language • Consider how ST is affecting WM and how to reduce it • Remember it's about what they think that you think
6. Changing the Motivational Climate Strategy 1 Addition by Subtraction – reduce salience by not having it there/not displaying it/producing that environment Strategy 2 stereotypes applies FM to groups to extremes, GM largely makes ST irrelevant (brains change, normalize struggle) Strategy 3 avoid 'solos' – being the 'only one' can increase salience	• Change the environment to reduce salience • Use GM strategies to reduce ST • Beware 'pink elephant', focus on strategy not S • Beware 'solos'
7. Assessment and Stereotype Threat FAQ 1. Is there a ST controversy? – yes, but research suggest there are strategies that work, 2. Do stereotypes ever benefit people? Yes, but don't use it – can backfire . 3. What about students with LD? No research as yet 4. What should these strategies look like in my classroom? You can/should work that out! No one can tell you what will work. Try it! 5. Would students benefit from know about ST? Tricky language – frame as 'negative stereotypes that are widely known but have nothing to do with how well you will do on this test/in this subject'.	• Frame assessments as helpful practice/challenge • Make tests with different sections so they start with their strengths • Give 'wise feedback – high standards + support • Re-frame hard topics as 'I know you like a challenge – you will enjoy this!