Mental Models At Work by Jim Heal, Rebekah Berlin

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Introduction: Cognitive science (cogsci) provides a roadmap that can help us be more effective. Mental models are like cognitive blueprints to guide our actions. They are refined over time. There are daily opportunities to learn but most people aren't aware of them.	•
Part 1 The Learning Mind: 1.The Learning Mind Willingham's model of memory: environment, attention, working memory (WM), encoding to long term memory (LTM), retrieval. Having a mental model of the mind helps shape and nudge mental processes. WM is limited/encoding may not LTM/deep processing helps remembering/ LTM is limitless/remembering is moving information from LTM to WM. [MM 1= Willingham's Model of Memory]	•
Part 2 The Ordered Mind: 2. Show and Tell: Pair the Concrete with the Abstract**:** Experts think differently to novices. Both their knowledge and organisation of knowledge are different. The way knowledge is organized is called a schema. Concrete examples help novices to build schema as abstract ideas are hard for novices to grasp /'provide simplicity on the other side of complexity'. Novices see knowledge in isolated units/ experts see knowledge as an interconnected network. Experts differentiate quicker because of larger schemas. [MM 2 = Show and Tell] 3. More is More: Rich Schema via Varied Examples: Schema can be thought of as concepts + examples. Novices need ***many*** varied examples + help understanding relationships between them + help understanding relationships between concepts and examples. Varied examples elicit deep structure of a concept + develop rich nuanced schemas + avoid over generalizing and bias. [MM 3 = Build a 3 Legged Stool] 4. Here's What I Don't Mean: Using Non-Examples: Imprecise language (conversational implicature) can make for faulty conclus3-Leggedn-examples add clarity by showing the boundaries of a concept/show critical features of a new idea/More than one can show the just right zone. [MM 4 = Red Light, Green Light]	•
Part 3 The Wheels of Cognition: Encoding: 5. The Power of Why: Deep Processing via Elaborative Interrogation (EI): Not all 'why's are equal. Elaborate equals add more / interrogate equals dig beneath – adds depth and connection. Meaning made with deeper processing is accessible by a wide range of retrieval cues/shallow processing only by the few related to the encoding. Dig deeper with questions that go beyond surface features/help integrate knowledge. [MM 5 = The Archeological Dig] 6. Climb Higher: Activate Prior Knowledge (PK): PK provides a pre-existing network of ideas into which new knowledge can be assimilated. Needs to be accurate/ relevant otherwise can be a hindrance. Can be completely irrelevant/ partially relevant/relevant but they don't realise. How we assimilate new information impacts the likelihood of getting it into LTM accurately and completely. [MM 6 = The Rock Climber] 7. What's the Story: The Power of Narrative: Humans remember narratives more easily than non-narratives. Narrativity adds causal coherence, adds relationships/ events which are memorable, even better encoding due to making inferences – requires effort/processing in WM and likelier to end up in LTM. [MM 7 = The Goldilocks Principle] **Part 3 The Wheels of Cognition: Encoding:** 8. Managing Growth: How Effective Practice Builds Expertise: Three types of practice are naïve (NP) (no goals or feedback)/deliberate (DP) (goals, instruction, feedback, remediation, progression)/ purposeful (PP) (task with goal, chance to practice, feedback as to accuracy, time for self-adjustment). Both DP and PP need sequencing/chunking, Provide feedback that is corrective/directive/verification/elaborative as needed. Water what works, prune what doesn't [MM 8 = Tending the Garden	•

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Part 4 The Weight of Thought: Working Memory and Cognitive Load: 9. Avoid Overload: Managing the Limitations of Working Memory: Attention and working memory are limited, vary by person and task, information lasts about 30 seconds in WM. Multitasking is rapidly switching attention. Cognitive overload can affect motivation if experienced repeatedly. Cognitive load can be extraneous ECL (irrelevant to task)/ intrinsic ICL (complexity of task itself)/ germane GCL (necessary for knowledge acquisition). Right-size the tasks and remove distractions to minimize the ECL and curate/ space it out helps. [MM 9 = The Museum Curator] 10. Channel Surfing: Processing Information by Verbal and Visual Channels: Two channels for processing information: visual (images diagrams written words), verbal (dialogue, narration). Using both helps with cognitive load e.g. text plus images equals overload, images plus narration good – using both channels is dual coding/ boosts retention+ problem solving + transfer. Signaling to learners what to attend to reduces load. [MM 10 = Channel your inner meteorologist] 11. Recipes For Success: Using Worked Examples WE to Drive New Learning: Worked examples are step by step solutions, provide concrete examples for novices, learner studies each component and stores in LTM. Ineffective users of worked examples are passive explainers and superficial explainers. Effective users engaged in meaning focused reasoning / anticipative reasoning/ encouraged self-explantion/faded support/always give answers and feedback/ [MM 11 = The Baking Show] 12. See What I Did There?: Model to Quickly Build Expertise: Modeling is demonstrating how to do something in real time/help skill acquisition/increases learners self-efficacy/can increase interest. Effective modelling means explaining what you're doing and why/ calling attention to what you're doing/helping learners self-regulate/uses dual-coding as they watch and listen. Worked examples show what it looks like, modelling how you got there by making the implicit expert thinking that you have explicit to the listening novice. Modelling is particularly effective if: you get them to generate rule codes e.g. what did I do first and why/you make mistakes and correct them in real time. [MM 12 = The Bob Ross Effect]	•
Part 5 Journeys of the Mind: What's the Destination, What's the Starting Point, What's the Best Way of Getting There 13. Prepare for Launch: Set Objectives for Learning: Effective objectives direct our activities/ regulate our expenditure of effort forward/ enhances persistence/ promotes the development of new strategies. Best if framed as specific observable outcomes you can measure (include conditions: to whom, where…).Care with confidence measures (Dunning-Kruger), measure should align with outcomes. [MM 13 = Prepare for Launch] 14. Ready Player One: Structuring and Sequencing Ideas: Willingham "understanding is remembering in disguise". PK critical, "memory skill" = being able to access relevant information from LTM in WM, experts good at this. Information generally organized as isolated elements (part-task structure)/ interacting elements (whole-task structure). Best if isolated at the start and interacting later with just-in-time support. [MM 14 = Ready Player One] 15. Finding Your Way: Focussed Attention: Attention is finite. Issues are attention distraction (seductive details, interesting but irrelevant content) and attention diversion (schema interference, learners using PK that is not relevant and distracting from core ideas). You can remove interesting nonessential content and do separately/prime them to attend to what they need. [MM 15 = Herding Sheep]	•