Coursera – Learning How to Learn

"*Learning How to Learn* is meant to give you practical insight on how to learn more deeply and with less frustration. The lessons in this course can help you in learning many different subjects and skills. Whether you love language or math, music or physics, psychology or history, you'll have a lot of fun, and learn a lot about how to learn"

Intro

- There are two general methods of learning - focused and diffuse
    - Focused learning is concentration for extended periods of time
    - Diffuse thinking allows one to think broadly in big picture perspectives, allowing one to think new thoughts
        - The power of naps - Dali, Edison, Einstein would take naps while holding something in order to enter diffuse thinking mode but once they fell asleep whatever they were holding would fall and they would wake up. This would allow them to remember and act upon the new connections made while in this state and translate it into the focused mode
        - Those who can learn effectively are those who can go back and forth between both states
        - Like with working out, must do daily work on building up your "neural scaffold" to hang your thinking on
    - Can't be in both thinking modes at the same time
- Metaphor and analogy are incredibly helpful when trying to learn something new
- Learning changes the physical structure of the brain by changing dendrites and synapses
- 10 Rules of Studying
    - Good techniques
        - Use recall
        - Test yourself - on everything. All the time
        - Chunk your problems
        - Space your repetition - daily practice just like athletes do for their sport
        - Alternate different problem solving techniques during your practice
        - Take breaks - power of naps and diffuse thinking
        - Use explanatory questioning and simple analogies - be able to explain to a 10 year old, say it out loud or in writing
        - Focus - no interruptions for 25 minutes at a time followed by a small break and reward (Pomodoro Technique)
        - Eat your frogs first - do hardest things at the beginning of the day
        - Make a mental contrast - imagine where your studies will lead you and come back to this dream when motivation is lagging
    - Bad techniques
        - Passive re-reading - waste of time
        - Letting highlights overwhelm you

        - Merely glancing at a problem's solution and thinking you know how to do it
        - Waiting until the last minute to study
        - Repeatedly solving problems of the same type that you already know how to solve
        - Letting study sessions with friends turn into chat sessions
        - Neglecting to read the textbook before you start working the problems
        - Not checking with your instructors or classmates to clear up points of confusion
        - Thinking you can learn deeply when you are constantly distracted - every distraction pulls out tiny neural roots before they can grow
        - Not getting enough sleep - brain practices and repeats whatever you think about before going to sleep
- Suggested Readings on Focused vs. Diffused Thinking

Procrastination, Memory and Sleep

- One can overcome procrastination with the Pomodoro Technique - 25 minutes of deep work with no distractions followed by 5 minutes of a break/relaxation with a mini reward
    - Practice makes permanent - hard, intense focus followed by a break. The rest is crucial as it helps your "diffuse" mode incorporate and think about what you just learned
- Chunking is grouping different thoughts or memories in order to recall larger amounts of information
    - Repeating or drilling information is necessary in order to move something from your working memory to your long-term, retained memory
    - Spaced repetition - doing these drills during increasingly spaced out repetitions until you can recall it at whim
- Sleep is incredibly helpful to consolidate memories and remove toxins. The brain cells shrink during sleep, allowing water to more easily flush out toxins
    - Go over new skills or learnings just before falling asleep. Will be better consolidated and may even dream about it
- Never underestimate learning by doing and by osmosis - surrounding yourself with knowledgeable people in the field you're trying to learn more about
- Learn a lot more from active engagement than passive listening
- Having a rich environment is vital to life-long learning - surround self with stimulating events, people, music, exercise, etc.

Chunking

- Chunks are pieces of information which are bound together through meaning or use. A network of neurons which are used to firing together so you can think a thought or perform an action smoothly and effectively
- Focused practice and repetition helps you to create chunks. The path to expertise is built little by little as small chunks become larger and larger
- Chunking helps your brain run more efficiently
- The best chunks are the ones which are so deeply ingrained that you don't even have to think about connecting the neural pattern together
- The first step in chunking is to focus your undivided attention on the information you want to chunk
- The second step in chunking is to understand the basic idea you're trying to chunk. Understanding is like a super glue which helps to hold together the underlying connections, allowing you to access relevant memories. You often realize that the first time you truly understand something is the first time you actually can do something yourself. Only doing it yourself helps create the neural patters that underlie true mastery
- The third step in chunking is gaining context so you can see not just how, but when to use this chunk. Context means going beyond the problem and seeing more broadly, allowing you to understand when and when not to use the chunk
    - Both top down (big picture) and bottom-up (chunking) are vital in gaining context and mastery
- Recall - after finishing reading some material, rather than rereading, simply look away and see what you remember from what you just read
    - Recalling material outside your usual place of study can help you better remember the material
- Illusions of competence - occurs when you have the book or Google right in front of you and you fool yourself to thinking that you know the material when you really don't
- Mini-testing allows you to avoid the illusions of competence and this is what recall actually allows you to do
- The value of making mistakes - allows you to see what you truly know and what you don't
- Transfer - skills, problem solving techniques or other experiences transfer from one context to another
- Reading, experience, teaching, etc. help build up your neural library of chunks, allowing you to quickly and effectively transfer these chunks to new areas
- Two broad ways to think and solve problems - sequential or step-by-step and holistic or more intuitive
- Law of Serendipity - lady luck favors the one who tries
- Continuing to practice after you've hit your capacity during a session is hurtful. This type of overlearning can be helpful at times if the stakes are high
- Einstellung (mindset) - a previous thought or conception prevents a better thought or belief system to form. You must unlearn these previous thoughts even while you're learning new ones
- Interleaving - One of the best ways to chunk is by studying various topics which require different methods of learning
- Suggested Readings

Reading: Procrastination and Memory

- Procrastination is important to overcome because building accessible chunks for your short term memory takes time, you do it bit by bit and cramming is not conducive
- The Pomodoro technique is useful to help with procrastination
- It is important to save limited willpower to the truly important tasks
- Habits (both good and bad) have 4 parts - the cue (the trigger which puts you into "zombie mode" and triggers the routine), the routine (the zombie mode or habitual response your brain is used to falling into), the reward, the belief (habits have power because of your belief in them - to change a habit you must change your underlying beliefs). When changing a habit, the only place you must use your willpower is in changing your reaction to the cue
- Habits are powerful because they create neurological cravings
- Focusing on process rather than product helps reduce procrastination as you focus on the habits which help you accomplish your task rather than the outcome (Pomodoro). When the inevitable distraction arises, train self to just let it flow by
- Keeping a weekly list of key tasks and a daily to-do list is helpful to keep you on track. Create the daily task list the evening before as this gives your subconscious time to work on how to grapple with your tasks
- Planning your quitting time is as important as planning your working time. Rewarding yourself and taking mini-breaks to celebrate a task completed is important to longevity and high quality work
- "Eat your frog first thing in the morning" - do the hardest or most unpleasant task first thing
- The funnier and more emotive and evocative the images you use to remember things the better they will stick. It must be memorable and repeatable. Repeating sporadically and writing by hand helps solidify further.
- Anki is a great index card learning tool
- It is much easier to remember numbers by associating them with significant events
- Memory palace technique - get to intimately know a house or other structure which you can use to "place" lists or other things you want to recall and associate each item on this list with a room or item in the house. Again, the more emotional or unique the easier you will be able to recall the information
- Suggested Readings

Renaissance Learning and Unlocking Your Potential

- The best gift you can give your brain is exercise. Exercise helps encode memories and helps neurons survive and thrive
- Perfect practice makes perfect but only if your brain is prepared (there are critical periods where it is much easier to learn certain skills)
- Learning doesn't progress linearly. Sometimes you bump up against walls and information that made sense earlier is now confusing and sometimes you can make great cognitive leaps. Staying the course during the periods of temporary frustration allows you to take surprising leaps forward

- Creating lively, emotive metaphors and analogies to better remember. It often helps to place yourself within the metaphor to help you better understand the concept. Metaphors and analogies help you get a physical understanding of the central idea behind the process or concept you are trying to understand. Metaphors help you overcome einstellung or thinking about problems in the wrong way because of previously held beliefs. Metaphors help glue ideas into your mind as they rely on ideas and neural structures which are already in place
    - Continuously ask yourself, "what does this remind me of?" and "why does it remind me of it?"
- Doing the work so that you come to your own understanding of a topic will make it stick much more than merely having it taught by someone else
- The Impostor Syndrome is common among the highest performers in all fields. The feeling that you aren't worthy or as good as other people believe you are
- People can enhance the development of their neuronal circuits by practicing thoughts that use those neurons
- The virtue of the non-genius - it is easy to be jealous of those who are naturally very intelligent but they often become lazy because of this gift. Those who have to work hard and persevere to achieve often surpass those with natural abilities
- Testing is important as it is has a wonderful way of concentrating the mind
- Test taking checklist
    - Did you make a serious effort to understand the text?
    - Did you work with classmates on homework problems?
    - Did you attempt to outline every homework problem solution?
    - Did you participate actively in homework group discussions?
    - Did you consult with the instructor?
    - Did you understand all your homework problem solutions?
    - Did you ask in class for explanations of homework problems that weren't clear to you?
    - Did you make and review a study guide?
    - Did you attempt to outline lots of problem solutions quickly?
    - Was there a review session and did you attend?
    - Did you get a reasonable night's sleep before the test?
- Hard start, jump to easy - on a test, they recommend starting with the hard problems but switching quickly to easier ones if you get stuck. This allows the diffuse mode to begin operating in the background while you move onto easier problems
- Everyone gets stressed but the story you tell yourself about why you're stressed makes all the difference
- You have not truly learned something unless you can teach it to others
- Suggested Reading