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Focused versus Diffuse Thinking

Introduction: Focused and diffuse modes

- We have two modes of thinking
 - Focused
 - * Concentration intently on something we are trying to learn
 - Diffuse
 - * Relaxed
 - * Related to neural resting states
- Both metaphor and analogy are very useful when trying to learn something new

- Pinball analogy
 - Focused
 - * Pins very close together
 - * Think a thought, bounces around frequently
 - * Misses opportunity to reach thoughts that haven't been thought before
 - Diffuse
 - * Widely spaced bumpers
 - * Thought moves widely across bumpers
 - * Look at things broadly (big picture)
 - * Can't focus in tightly, but can move into the place necessary.
- Neural scientists so far theorize you can only be in one or the other of these thinking modes.

Using the Focused and Diffuse Modes

- Salvador Dali and Edison had methods to switch from Diffuse to Focused modes.
 - Would sit in a chair and hold onto something in a hand. While thinking and inevitably drifting to sleep, they would be in the diffuse mode of thinking at that point. The object would fall, waking them. Then, they'd be able to hone in on the last thoughts they had and be in focused mode with them.
- Our mind needs to be able to switch between focused and diffuse modes in order to learn effectively (and efficiently).
- Similar to bodybuilders, to build neural strength, we need to grow a little bit everyday (as opposed as to say, cramming the night before).
- Note: Metaphors provide powerful techniques for learning.
- Learning something difficult takes time!

What is Learning?

- The brain is the most complex device in the known universe.
- Activities that seem simple to us are actually very complex (seeing, smelling, running, etc.)
- We are not conscience (nor should we be) of the functions our brain is doing at any given moment.
- There are lots of synapses in the brain (million billion).
- Brain connectivity is dynamic.
 - Synapses turnover (create and destroy) often
 - * How do memories stay then?
- During sleep, synapses are “knitted up” and “weaved together” to create strong bonds. New synapses also created. Thus you are “not the same person” after a sleep as you were before sleep.

- Useful site for brain information: brainfacts.org

Procrastination, Memory, and Sleep

A Procrastination Preview

1. When you procrastinate, you get a sensation of uneasiness or pain when you observe or anticipate the thing that causes pain.
 2. Your brain automatically funnels attention to a more pleasant task.
 3. You feel happier (temporarily).
- Pomodoro Technique
 - Proven to be extremely effective
 - Steps
 1. Set a timer to 25 minutes.
 2. Turn off all interruptions
 3. Focus.
 4. Reward for 5 minutes after.

Practice Makes Permanent

- Math and science are often more abstract than humanities
 - Therefore it's more important to often practice these types of studies than other types of study.
- Neurons become linked together through repeated use.
- The more abstract an idea is, the more important it is to practice to link the synapses more concretely.
- e.g. How to solve a problem
 1. Generate a very faint neural pattern.
 2. Take a fresh variation of the problem and it gets a little darker.
 3. Continuing to practice until you really understand it, and it gets very very dark. The pattern is easily recognizable and you don't need to think about it so hard anymore.
- A little practice everyday helps build a very strong foundation (solid brick wall).
- Cramming all night gives poor foundation (crumbling and poorly stacked wall).
- If suffering from procrastination, use the Pomodoro Technique to help focus and tackle to-do items.

Introduction to Memory

- When trying to hold a few ideas in mind to help solve a problem, this is using your working memory (short-term).
- Functionally, two main memories.
 - Working memory
 - Long-term
- You can move long-term memories into working memory.
- Working memory only holds 4 chunks of items at a time.
- Working memory is very similar to an extremely small blackboard
- Repetition is necessary to make sure memories don't escape
- Long-term memory is like a storage warehouse
 - Distributed in different areas
 - A memory is stored, but sometimes hard to retrieve.
 - Necessary to practice and repeat finding older memories.
- Tech.: Spaced repetition
 - Repeat and practice an idea multiple times over several days (think Monday, Tuesday, Wednesday, Friday, and Sunday) or day patterns similar
 - Trying to repeat too many times in a single day doesn't stick as well in long-term memory than multiple, shorter stints over several days.
 - Make sure you let your synaptic connections to form and strength (mortar in a brick wall to dry), otherwise they don't stick long enough.

The Importance of Sleep in Learning

- Being awake creates toxic products in your brain.
- When you sleep, your brain cells shrink. This causes gaps to create to allow toxins to escape.
- Sleep allows your brain to stay clean and healthy.
- Too little sleep over too long time causes many, many health issues and mental issues.
- During sleep, your brain erases less-important memories and strengthens important memories.
 - Brain rehearses certain patterns it noticed during the day.
- Sleep lets portions of your brain to talk to each other.
- You can plant the seed of diffuse mode by doing focused mode first.
 - If you are going over what you are learning right before you sleep, you have an increased chance of dreaming about it.
 - If you set in mind that you want to dream about what you are studying, it goes further.
 - Dreaming about what you study helps you learn better. It helps the information break down into easier-to-grasp chunks.

Interview with Terrence Sejnowski

- Learning by doing is very effective.
- Learn from experts.
- There isn't a simple way to stick with what you aren't interested in.
 - Ask questions to cause something to be more interesting.
- Active engagement > passive engagement.
- Exercise is a great way to disengage from the normal train of thought.
- Taking a notebook along with you is usually a good way to retain thoughts.
- You can't conscientiously do multiple things at the same exact time.
- Multi-tasking is being able to context switch quickly.
- In the hippocampus, new neurons get created even in adulthood.
 - These help develop memories far better.
- Exercise helps actually create new neurons faster.
 - Recess is **extremely** necessary to help our bodies process better.
- Being in a creative environment where others are creative is a way of enhancing creativity.
 - The isolated genius is not for everyone.
 - Usually bouncing ideas off others is very useful and very important to contribute to creativity.
- Tests are like any other skill - you can learn to be a better test taker.
 - Don't get hung up if you can't answer a question - skip to the next and come back later.
 - * Diffuse mode may actually provide that answer later.
- Persistence and passion is often more important than pure intelligence.
 - Most skills and knowledge can be trained and learned.
- Different perspectives go a very long way.

Summary - Module 1

- People have two fundamentally different modes of thinking
 - Focused
 - * Tight spacing to help keep thoughts concentrated.
 - * Pre-frontal cortex.
 - * Related to focusing on tasks you are already familiar with (at least a little bit).
 - Diffuse
 - * Wider spacing to help bigger ranges of thinking.
 - * More related to learning something new.
 - * Representative of the brain's many neural resting states.
- Creative thinkers throughout history have all learned how to access the diffuse mode quickly.
 - We do this by going for a walk or drifting to sleep.

- When stuck on a problem, it's a good idea after focusing on the situation, sit back and drift into a diffuse mode.
 - It takes time for neural structures to build.
- Tackling procrastination is extremely important.
 - Use the pomodoro technique
- Through practice and repetition we help develop our neural structures and patterns to be strongest.
 - More important for more abstract topics
- Memory
 - Working Memory
 - * There are four slots in our working memory.
 - * Like a poorly made blackboard
 - * Ideas can fall out of our slots unless we keep repeating them
 - Long-term Memory
 - * Like a storage warehouse
 - Enough repetition and practice can transfer ideas from working memory to long-term memory
 - * This can be best achieved through spaced repetition.
 - * Don't try cramming information
- Sleep
 - Washes away brain toxins
- Exercise
 - Surprisingly valuable
 - Improves our memory and ability to learn

Optional Interviews

Dr. Robert Bilder on Creativity and Problem Solving

- Something new for yourself, while not necessarily creative for the world, is still useful and helps grow you.
- You require some level of discomfort to work well.
- There are five major factors of personality (OCEAN)
 - Openness
 - * Associated with creative achievement
 - Conscientiousness
 - Extroversion
 - Agreeableness
 - * Less agreeable people are more creative (via correlation)
 - Neuroticism
- Feedback should be encouraged (even bad)
- Bilder likes to go between auditory and graphical
- Powers of 10 video

- Zooming in and zooming out should be actively used as a tool to better understand your problems
- Insights from the subconscious are sometimes invaluable, but should ALWAYS be checked.

Writing Coach Daphne Gray-Grant

- Diffuse mode (creative/writing mode)
- Focused mode (editing brain)
- When writing, you want the diffuse mode to be active
- Mind-mapping is a great tool for this
 - Your brain will eventually remember the most interesting information for your research or writing
- For inspiration, you don't need 100% accuracy - just the idea.
- Memorization is very useful in understanding an idea much more deeply.
- Editing while writing is a huge mistake of writers
- writeordie.com
 - tool to stop editing while writing
- Cover monitor and just type!

Benny Lewis “the Irish Polyglot” about Learning Languages

- Fluent in 3 Months book
- Wrong reasons to learn language
 - To show off
 - Just to get a grade
- You need a passion for the language and culture
- Embrace the culture
- Try to practice with other human beings
- Children are not perfectionists and are okay with making mistakes
 - Very useful tip to consider
 - Adults are too perfectionist about language
- Don't worry too much about the language but keep trying to perfect along the way. Be okay with making mistakes.
- The cut-off age of language is false.
- “Whether you think you can, or think you can't, you're right.”
- Skype-based practice
- Listen to other-language radio
- Burning out is very real
 - 5-6 days a week before a day or two break
 - 6 weeks of intense before a much longer break
- Mnemonics
- <http://www.memrise.com>

- Anki
 - Spaced repetition flashcards

Readings

Chapters 1-3 of *A Mind for Numbers* are especially helpful in providing helpful information and additional exercises related to the materials of Module 1.

Worthwhile Additional Popular Works

- Scott Young, “I was wrong about speed reading: Here are the facts,” January 2015. This excellent blog post nicely summarizes what is known in relation to speed reading.
- John Dunlosky, “Strengthening the Student Toolbox: Study Strategies to Boost Learning,” *American Educator*, Fall, 2013. This excellent, comprehensive article is written by one of the top researchers in learning.
- Michael Friedman, “Note-taking tools and tips,” (October 15, 2014), Harvard Initiative for Learning and Teaching. This article, and an article embedded within it, (“Notes on Note-Taking: Review of Research and Insights for Students and Instructors”), have very useful insights into how to improve your note taking.
- Maria Konnikova. (January 11, 2014), “Goodnight. Sleep Clean,” *The New York Times*.
- John Hamilton. (October 17, 2013). “Brains Sweep Themselves Clean of Toxins During Sleep.” *NPR All Things Considered*.
- Mind Tools, “The Pomodoro Technique® Staying Focused Throughout the Day.”
- Anne Trafton. (July 21, 2014), “Try, try again? Study says no: Trying harder makes it more difficult to learn some aspects of language, neuroscientists find.” *Science Daily*.
- Richard C. Mohs. “How Human Memory Works.” *How Stuff Works*. Notice that what Dr. Mohs calls “short term memory” in his excellent article is almost the same as “working memory.” Also, Dr. Mohs retains the “seven slots” theory of working memory—researchers still differ in their perspectives about this.
- James Morehead (June 19, 2012). “Stanford University’s Carol Dweck on the Growth Mindset and Education.” *OneDublin.org*.
- Gretchen Reynolds. (April 30, 2014). “Want to be More Creative? Take a Walk.” *The New York Times*.
- Ferris Jabr, (September 3, 2014). “Why Walking Helps Us Think.” *The New Yorker*.
- Brigid Schulte, (May 16, 2014). “For a more productive life, daydream.” *CNN Opinion*.

- Robert Wright, (April 21, 2012). “How to Break the Procrastination Habit” The Atlantic. (Charles Duhigg’s book, *The Power of Habit*, which is mentioned in the article, is also great!)
- Daniel J. Levitin, (August 9, 2014), “Hit the Reset Button in Your Brain,” The New York Times.
- Charlie Tyson, (August 14, 2014), “Failure to Replicate,” Inside Higher Ed. This is a very interesting overview article about the state of affairs in education research.
- Pam Harrison, (September 8, 2014), “Sleep on It: Sleep Consolidates Memory of New Motor Task,” Medscape. Although this article deals with motor tasks, there are obvious implications related to the importance of sleep in consolidating other areas in learning. (You’ll need to join to read the article, but it’s free.)
- National Numeracy. A website by an independent charity that is devoted to helping every person in the UK to reach a level of numeracy skills that allow them to meet their full potential.

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Video: The Importance of Sleep in Learning

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