

Learning How To Learn (How to learn difficult and  
Powerful Mental tools to help you master  
tough subjects)

[McMaster Uni and Uni of California (San Diego)]  
[Barbara Oakley]

## Introduction to Focused and Diffuse Modes

Week 1: What is Learning?

Diffuse Mode

Focused Mode → Opening our mind

→ Getting in deep concentration to grasp new things  
grasp a particular thing

\* Both things are necessary

(Using the focused and Diffuse Modes (Or a Little))

Dali will do? you have to go back and forth between these two modes

• When learning something new, our mind needs to go back and forth between these two modes

## What is learning?

Our brain and neural connections are dynamic.  
There are so many links formed and so many links cut off in one single day that we sleep with a brain and wake up with another. When we learn something, new connections are formed and there are still many things unknown about how brain works.

## Procrastination:

Reason: when are doing something, we are not doing a lot of other things.

- ① Feeling unhappy for some painful work
- ② funnel attention onto a more pleasant task
- ③ feel happy (temporarily)

(and by young man Cirillo, early 1980s)

## Pomodoro: (Italian for tomato)

## Pomodoro technique

→ 25 minutes

→ no interruption

→ focus

→ reward (after 25 mins) [5 mins]

Practice makes Permanent

The more we practice the abstract things of the brain. We need to learn little by little and let the learnt things sink in and form connections for a long lasting effect.

## Memory:

Long-term memory → like a storage warehouse

Working memory (immediate and consciously processing)

[pre-frontal cortex]

something like an inefficient mental blackboard

we need to revisit the long term memory portions

so that we can find them easily when needed

To set something in long-term memory we need to perform spaced repetition. We should plan to do spaced repetition without repeating at the same time at the same time for a long-term effect.

### Importance of Sleep:

- Sleeping removes the toxins from the brain by relaxing our neurons
- While sleeping the neural connection of our learning task gets strengthened.
- Sleeping allows our brain a chance to rehearse difficult material-going over and over the tougher aspects of what we are trying to learn.
- There is a high possibility that we will dream about the things we are learning if we read about them just before sleep.

Dr. Terrence Sejnowski: (leading father figure of modern neuroscience)

build linking principles, from brain to behavior using computational models

learning by doing and learning by osmosis from people who are experts

(active learning)

- ask questions
- context switching so multitasking is better
- that we can think and explore different things at different times.

exercise is important for generation of neurons and getting into diffuse mode.

- Don't give up, be persistent

## Benny about Learning Languages

Worst reason for learning language is showing off.

- make mistakes while learning languages
- "Whether you think you can, or you think you can't, you're right." — Henry Ford

spaced repetitions

- mnemonics

(U. of California)  
Interview with Dr. Robert Bilder on Creativity and Problem Solving:

"No pain, no gain."

Five personality traits [OCEAN]

- i) Openness
- ii) Conscientiousness
- iii) Extraversion
- iv) Agreeableness
- v) Neuroticism

- \* Openness to new experience is associated with great achievement
- \* People with lower agreeableness tend to show higher achievement [science]

\* finding the fine line between agreeableness and being disagreeable is hard  
• trying to go back and forth between word and images (graphs, flows, etc.)

Interview with Daphne Gray Grant: [Writing Coach]  
[publicationcoach.com](http://publicationcoach.com)

- writing ← diffuse → don't edit while writing
- editing ← focused

Mindmapping: ① Take a page and vomit the ideas (horizontal view) [link the events]

Memorizing helps understand things deeply

## Week 2

(continued to 3)

### Chunking:

Mental leap that helps you unite bits of information through meaning

- unite scattered bits of information

through meaning

Once you chunk an idea, a concept, or an action, you don't need to remember all the little underlying details

→ Chunking is the mental leap that helps us unite scattered bits of information through meaning and understanding.

### How To Form a Chunk:

→ When we're first trying to understand how to work a problem, we have a huge cognitive load.

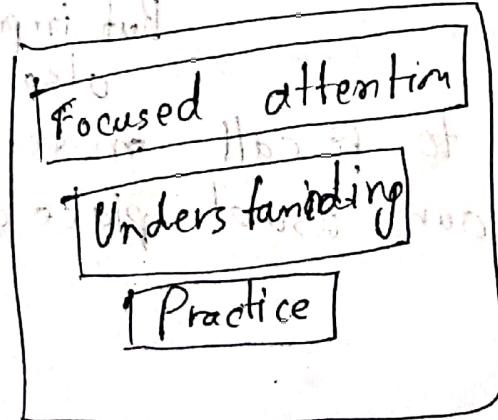
→ working out with a work-through example is a nice way to start

Don't follow a mindless example technique to solve a problem.

our each step

Steps

- focus ~~on~~ undivided attention on the information we want to learn chunk
- when we are learning something new, & we are forming new neural connection with our pre-existing connections
- Understand the basic idea we're trying to chunk
- we understand something well when we do it by ourselves
- Graining context → how to use that chunk  
when (big picture) (chunking)
- Both top-down and bottom-up learning is necessary to grasp anything. Context is where these two meet.



# Illusions of Competence, Importance of Recall

## Mini-testing and Making Mistakes.

→ Recall: after we've read the material, simply look away and see what you can recall from the material

→ This process helps to build neural tracks that we can hang our thinking on.

→ Illusions of Competence: Glancing at a solution and thinking we truly know & know it is one of the most common illusions of competence in learning.

• be careful of highlighting and underlining

• Testing our learning to not fool ourself into illusions of competence (Making mistakes is fine)

But improving from them is also necessary

• We should try to recall materials when we are outside our usual place of study

## Seeing the Bigger Picture

### What Motivates You?

Neuromodulators are

chemicals that influence how a neuron responds to other neurons.

• Acetylcholine ← important for focused learning

• Dopamine ← our motivation is controlled by it

• Serotonin ← affects social life and risk-taking behavior

Severe loss of dopamine neurons causes resting tremor, slowness, rigidity ← Parkinson's disease [catatonia → complete lack of any movement]

\* Emotions are intertwined with perception and attention and interact with learning and memory.

## The Value of Library of Chunks: Compaction, Transfer, Creativity, and the Law of Two

### Serendipity

Compaction → The more we practice the subject we are learning the better our chunks get.

Transfer → Concepts in one field can be used in another.

If we have compact chunks we can just listen to our diffuse mode and find ideas.

Two ways to figure something out.

Sequential (Focus)

Holistic (Diffuse)

Solutions from diffuse mode should be very carefully verified using focused mode

Law of Serendipity: (Lady luck favors the one who tries)

Overtaking, Choking, Einstellung, Chinking, and Interference

② Continuing to practice after we've mastered what we can in a session is called overlearning.

Overlearning can produce automaticity when we choke in something overlearning and automaticity can be especially valuable.

• Repetitive overlearning can be a waste of learning time.

Repeating something we already know can bring to illusion of competence.

Deliberate Practice is deliberately focusing on what we find more difficult.

Einstellung: (Mindset) installing a roadblock because of the way we were initially looking at it.

→ Mastering a new subject means learning not only the basic chunks, but also learning how to select and use different chunks.

Interleaving: Jumping back and forth between problems that require different techniques.

starts building flexibility and creativity

Most paradigm shifts in science are brought about by young people or people who were originally trained in a different discipline

- Learning can come from anywhere.

## Dr. Norman Fentonberry - Learning at MIT,

- Engineering is a team sport.
- get the things you want to learn in different ways
- what you think you know, you find out when you try to explain it to somebody else that's why teaching is one of the best ways to learn [Active Learning]

## Scott Young, "Marco Polo" of learning:

- test yourself as often as possible
- take a blank paper and try to teach someone else explain like you're teaching

Feynmann → It's very important that the first rule is not to fool yourself. But you know the easiest to fool

- use analogies to learn

new ideas by analogy testing  
difficult to do. If you put really  
difficult things in to start learning

## Week 3 - Procrastination

### Procrastination and Memory

#### Tackling Procrastination

It's easier and more valuable than we think

- Pomodoro

The higher we go in our studies, the more important it is to take control of procrastination

→ Procrastination is not an innate behavior

→ Even if we look healthy with procrastination we're not. We're gonna face long term problems

#### Zoombies Everywhere!

Once we chunked our learning, it gets easy to do the same thing

#### 4 parts of habit

- 1) The cue (what starts it)
- 2) The routine (the habitual mode)
- 3) Reward
- 4) The Belief

## Surf is Up: Process vs Product

### Process

habits and actions associated with that

flow of time

~~This helps us~~

We need to focus on processes like going through the 25-minute Pomodoro method most part of the day. For now, Harnessing habitual powers

### Product

### outcome

we need to concentrate on avoid this for tackle procrastination

### 1) The cue

- location

- time

- feeling

- reaction

### 2) The Routine

- plan

### 3) The reward

### 4) The belief

## Juggling Life and Learning

- Weekly list of key tasks
  - Daily to-do list
- Make the to-do list before sleep
- Keep break time and leisure

## Memory:

Deep Dive: Our mind is built to retain general

information about a place

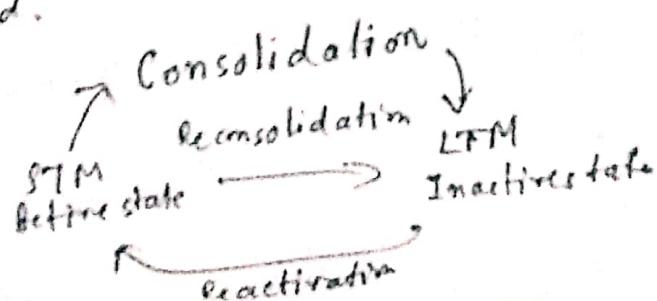
\* Writing something out deeply encodes the information into our memory

Build flashcards on the things you're learning.

This helps interleaving

## Long Term Memory: (hippocampus)

Without long-term memory system, we cannot store the new things we learned.



- Astrocytes are brain cells that
- provide nutrients to neurons
  - maintain extracellular ion balance
  - Are involved to repair after injury
  - Have a role in learning

## Creating Meaningful groups and the Memory Palace

- If we want to remember something in a large chunk, it's better to group them in a easier way to remember them.
- Memory Palace Technique:
  - Pick a favorite place to you and try building neural hooks to the place so that you can remember the thing whenever you remember the place.

# Interview with 4 time US Memory Champion [Nelson Dellis]

Memory techniques involves two things

- i) Visualization
- ii) Attach the image to some location
- Interact with people to remember the names
- 4 kind of key dimensions in brain health to stick to
- i) keep the brain active
- ii) learn new skills
- iii) physical activity
- iv) be social

Dr. Robert Gramache (Award winning Bilingual Scientist)  
↳ dyslexic

- practise every for a short time
- hardwire your brain to solve problems by repetitive practice
- if you're stuck with a problem, get to diffuse mode

Keith Devlin from Stanford, the "Math Guy"

If you're stuck with a math problem

• Don't panic

→ What are you trying to do?

→ What do you want to achieve?

→ What information do you have?

If you're stuck on problem for a long time,

get away to diffuse mode. go to lunch

(writing down problems)

(talking to yourself)

(advised by Prof. Dr. Jürgen Tietz)

and break up the work

in different & smaller sizes of which may be solved.

Show partial or temporary solutions directly, even if not

correct. This will help you to find the right solution.

## Week 4: Renaissance Learning and Unlocking Potential: How to Become a Better Learner

- Physical Exercise
- Practice makes perfect when brain is prepared
- Prefrontal cortex influence
  - human social behavior
  - people's ability to make decisions
  - people's ability to do complex analysis
  - people's ability to plan

### → Create a Lively Visual Metaphor or Analogy

#### No need for genius envy

- people learn by trying to make sense out of the information they perceive
- having a somewhat smaller working memory means we can more easily generalize our learning into new, more creative combinations

psychological term referring to feelings of self-doubt

Imposter Syndrome:

doubting our abilities and feeling like fraud.  
↳ ~~psychological disorder~~ impostor syndrome.

It is highly common

↳ ~~amongst it more noticeable among women~~

Change your thoughts, change your life.

Santiago Ramon y Cajal [got to gall in 11 years old]

Nobel Prize Winner

Father of Modern Neuroscience

• we can make significant changes in our brain by how we think

• persistence, virtue of less brilliant

two sense of growth vs. most strong

→ being with intention all the

practice until you attain feedback is given

→ listening, giving more and more time

→ pushing, allowing more space than planned and

## The Value of Teamwork

- The right hemisphere serves as a sort of devil's advocate to question the status quo and look for global inconsistencies.
- The left hemisphere tries to tenaciously hold onto the way things were.
- "The first principle is that you must not fool yourself and you are the easiest person to fool."
- ④ friends and teammates can serve as sort of larger scale diffuse mode outside our brain that can catch what we missed, or what we just can't see, or fail to learn with others is also important in career building.

## ④ Indicator that your group is going well

- Your group meets on time.
- Your group keeps attention to the subject until you've gotten your work done.

## A test checklist

- Did you make a serious effort to understand the test?
- 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 of your homework problem solutions when they were handed in?

- Did you ask in class for explanation of homework problem solutions that weren't clear to you?
- Did you have a study guide? If so, share it.
- Did you attempt to outline lots of problem solutions quickly? If so, grab a sheet of paper and do it.
- Did you go over the study guide and problems with classmates and quiz one another?
- A review session
- Did you get a reasonable night's sleep before the test?

### Hard start - Jump to Easy:

- when a test is handed out to us, take a look at what it involves
- start first with what appears to be the hardest - steel yourself to pull away within the first minute or two.
- Move to an easy problem and then again to harder ones.

## Is yesterday's test still on your mind? Find Helpful Hints for Tests

This test has  
made me afraid

This test has got  
me excited to do  
my best

Take a deep breath if you're anxious

Face your fears

Study hard up until the day of the test  
and then let it go

Before the test day have a quick final  
look over the materials to brush up on them

Double check your answers during  
the test

Teach others to understand more  
about the test material

or review math from years ago

## ~~How Not to take a test~~ - Dr. Richard Felder and Dr. Rebecca Brent

→ How Not to prepare

→ reading books and homeworks like a novel  
(will → reading other stuff much harder)

→ How to prepare

→ set up for homework again and

→ try to ~~do~~ solve them from scratch

→ work with other people (to understand)

→ When you get into test

## Learning Something New

→ Learn by doing

→ If you're stuck consult with experts

→ best way to get rid of illusion of competence by doing it.

→ try to explain it (learn by teaching)

# The Imposter Syndrome and Dealing with Procrastination

→ break down into pieces (set small deadlines)  
keep doing the portions that are manageable

## Importance of Putting Objects in your Writing

John R. Maguire

- start to be clear
- then try to be impressive
- don't write and edit at the same time
- Things to notice in academic papers
  - short sentences
  - short
- Opening
- Underlining words of choice
- sentence length
- study what you admire

\* Ideas are not valuable if we cannot put them in words