



Helpful hints for learning:

Perfect for you if:

- You want to learn almost anything more quickly and to make it stick
- You're struggling to find or make time in your day for focussed thought
- You wrestle with procrastination and/or distraction on a daily basis

Though the title promises improvements in math and science, its lessons are applicable to all forms of learning and problem solving.

Barbara explains that **learning begins with creating and internalising small chunks of information**(e.g., starting a car, pressing the accelerator, changing gear). **As we learn we add to and connect these chunks and use them to solve problems in the world around us** (e.g., driving). This is especially useful in analytical problem solving where chunks allow our limited working memory to greatly increase the information we consciously process at once.

She shows that **to efficiently add to and apply these chunks requires learning to use and balance two modes of thought (focussed and diffuse thinking) effectively.**

What follows is an excellent summary of practical tips to improve learning and problem solving as well as some of the common pitfalls we face on the way (and how to overcome them).

Effective learning needs both Focussed and Diffuse thinking

Chunking is at the cornerstone of learning and problem solving...

- Learning = linking information together to create and slowly add to conceptual chunks
- Problem solving = Identifying what chunks to use when (and how) to tackle a specific problem

... and we tackle it with two types of thinking.



- Focussed thinking (requiring active attention) is conscious, analytical and serial in nature.
- Diffuse thinking (requiring passive attention) is subconscious, creative and parallel in nature.

(Diffuse thinking is what's going on when you have that "Aha" moment whilst doing something totally different like sleeping, running errands or enjoying a shower)

Both types of thinking are involved in learning...

- Focused: Gathering information and forming new chunks
- Diffused: Connecting different chunks together

... and both are required in using that learning effectively.

- Focused: Identifying and loading chunks into working memory for analytical problem solving
- Diffused: Big picture and lateral thinking, sense-checking, creative out of the box thinking

The Medici Effect is the name given to creatively linking seemingly totally separate chunks together to create a new and creative solution

We often learn sub-optimally because we fail to set up and/or alternate effectively between both modes.

- We are too distracted or engaged in attentional multitasking to think deeply (focused)
- We fool ourselves into thinking following is the same as understanding
- We over champion analytical (focused) thought and fail to leverage the power of diffuse thinking

Meanwhile almost every single successful scientist, author and artist in recent history used a daily routine that effectively set up and then alternated between focused and diffuse thinking (see the popular book, Daily Rituals).



So, how can we learn effectively?

1. Create the best conditions for focused and diffuse thinking

Focused thinking needs meaningful stretches of undisturbed time to focus and think.

- Prioritise making distraction free time and space to think deeply
- Read effectively ([SQ3R: Survey, Question, Read, Recall, Review](#))
- Practice purposefully (Work the hardest bits, generalise through variation)
- Think on paper, there's magic between the hand and the brain

Diffuse thinking occurs subconsciously by temporarily loosening attention.

- Relax/disengage attention: Sleep, walk, drive, blink, exercise
- Keep information fresh: Recall and test frequently (e.g., spaced repetition techniques)

Both Dali and Eddison used a form of napping in which objects dropping from their hands would wake them up just as they were falling asleep to trigger diffuse thinking¹.

2. Actively build time into each day to alternate between both modes

There are a couple of unavoidable learning barriers that everyone encounters

You can't do anything about these and you're not alone so don't worry!

Robust learning takes a long time (quickly learned = quickly forgotten)

- Learning has a similar gain profile and risks as physical training
- Long-term learning needs long-term physical changes in brain structure
- Be very wary of short term cramming and illusions of confidence

Occasional knowledge collapse is inevitable, natural and temporary



- Information often outgrows initial organising structures and mental models we have built for them
- At this point the brain needs a bit of time to break down and reshuffle chunk/model reshuffle the information we have learned
- This process can last as long as one or two weeks depending on the rate of learning

Think of it a little like defragmenting an old hard drive, or knocking down a house that's been patched together over time to build a new and improved one from the materials.

However many common pitfalls are easily avoidable

The difference between great and average thinkers is the way in which they frame and approach many of the following avoidable pitfalls.

Procrastination (stress also further inhibits learning)

- Focus on process instead of product ([Pomodoro technique](#))
- Use to-do lists (weekly into daily, only add if urgent and important)
- Get organised in advance (make productivity the course of least resistance: lay out clothes, tidy work space etc...)
- [Eat your frogs first](#) (do the hardest task of the day first)
- Set a quitting time (work backwards, avoid [Parkinson's law](#))

Distraction (including multitasking – has big switching costs and depletes limited willpower resources)

- Eliminate cues (disable phone notifications, delete apps, block websites)
- Find a quiet space (early) / buy noise cancelling headphones
- Learn to note and then ignore cues (mindfulness / meditation)

Getting stuck (see [Einstellung effect](#) often as a result of too much focussed thinking)

- Consciously alternate diffuse and focussed thinking within your day



- Work with others who are honest and aligned with your best interests
- Set a quitting time each day (also good for your health!)

Confirmation bias (over confidence in your own solution without checking)
Again, find and work with others who are honest and aligned with your best interests

Illusions of confidence (following as opposed to understanding)

- Work the problem yourself first (avoid solution viewing)
- Recall frequently (at the end of each chapter, how would you teach this)
- Avoid passive re-reading
- Avoid excessive over-learning (working same problem type over and over)
- Test yourself frequently

Fatigue (increasingly proven to be caused by build up of toxins in brain)

- Refuel (short-term, the brain consumes 25% of glucose in our body at rest)
- Exercise (short-term, increases blood flow, promotes diffuse thinking)
- Sleep (mid-term, flushes toxins from brain, promotes diffuse thinking)
- Take holidays (long-term, allows recovery, time for big picture thinking)

Related Reading

“Deep Thinking: What Mathematics Can Teach Us About the Mind”, William Byers: A great use of an experience we all remember (learning basic math) to show the importance of creativity in making cognitive learning leaps.

“The Art of Learning: An Inner Journey to Optimal Performance”, Josh Waitzkin: A superb first hand account showing the overlap of basic deep learning principles in two very different fields (chess and martial arts) from the protagonist of “Searching for Bobby Fisher”.



“Getting Things Done: The Art of Stress-Free Productivity”, David Allen:

A cornerstone and very practical work on productivity from the world renowned David Allen – easily one of my top most life-changing reads.

“Deep Work: Rules for Focused Success in a Distracted World”, Cal

Newport: Another excellent book that emphasises the importance of making (as opposed to just finding) sufficiently long undistracted periods of time to engage in focussed, deep thought.

“Daily Rituals: How Great Minds Make Time, Find Inspiration, and Get to Work”, Mason Currey:

A wonderful book full of examples of the daily routines of some of history’s most famous scientists, authors, poets and artists. Perfect for dipping in and out of and giving great real life examples of how some of our best minds have used the principles explained in Barbara’s book.

