



Focus & relax – Learn how to improve your learning skills

by Gaelle Piernikarch, July 2019

What neurosciences and psychology tell us about how the brain learns

Some of the latest research in cognitive sciences tells us that we all have two essential thinking modes: the focused mode and the diffuse mode. In their book “Learning How to Learn”¹, Dr. Oakley and Dr. Sejnowski explain that the focused mode “involves a direct approach to solving problems using rational, sequential, analytical approaches. The focused mode is associated with the concentrating abilities of the brain’s prefrontal cortex, located right behind your forehead. (...) Diffuse-mode thinking is what happens when you relax your attention and just let your mind wander. This relaxation can allow different areas of the brain to hook up and return valuable insights.” When we observe small children, we can see how easily they alternate moments of focus and playing.

Another researcher, Dr. Sara Baker from the University of Cambridge Faculty of Education, has been studying the role of the brain’s prefrontal lobe in how young children learn to adapt their understanding to an ever-shifting environment. She explains: “The brain’s frontal lobe is one of the four major divisions of the cerebral cortex. It regulates decision-making, problem-solving and behavior. We call these functions executive skills – they are at the root of the cognitive differences between humans and other animals. My executive functions enable me to resist a slice of cake when I know I’m soon having dinner.”²

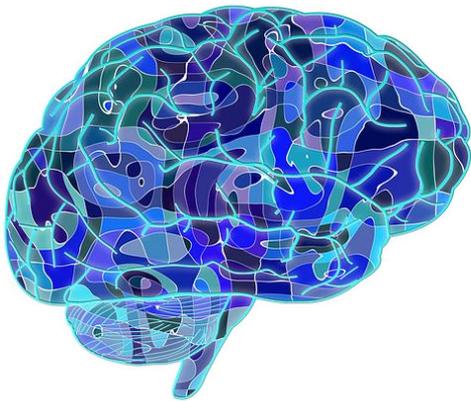
¹ Barbara Oakley, PhD, and Terrence Sejnowski, PhD: “Learning How to Learn”, TarcherPerigee, Penguin Random House LLC, 2018.

² Article from Alex Burton, University of Cambridge: “What happens in the brain when children learn” in Neuroscience News, February 10, 2016.

Self-regulation skills are essential to learning and to the development of our social behavior, and they are deeply linked with our executive functions. “The development of this vital area of your brain happened well before you started formal education and will continue throughout your lifetime,” says Baker.

Changing the brain

For a long time, scientists believed that the brain only grew and changed until it became mature, i.e.; until we became adults. But through new imaging technologies such as functional magnetic resonance (fMR), we can see today that the brain continues to change over the course of our lives. “Cells grow. They form connections with new cells. Some stop talking to others. And it’s not just nerve cells that shift and change as we learn. Other brain cells also get into the act. Scientists have begun unlocking these secrets of how we learn, not only in huge blocks of tissue, but even within individual cells.”³



Based on these recent findings, neurosciences show that learning results in:

- physical changes to the brain in response to stimuli, which is called neuroplasticity,
- the production of new neurons (neurogenesis) that allow to create or rediscover and strengthen neuronal pathways. Cells that fire together, wire together.

Concentrating on the new task, participating in playful activities around it and doing repeated practice are key elements of learning that lead to these changes. As a matter of fact, “the most effective learning involves recruiting multiple regions of the brain for the learning task. These regions are associated with functions such as memory, the various senses, self-regulation (volitional control), and higher cognitive functions.”⁴

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Moderate stress has a positive effect on learning

In his work about the concept of *flow*, psychologist Mihaly Csíkszentmihályi⁵ found that striking a balance between the skills a person has and the challenges they are given creates the most effective learning experience. An experience of complete absorption with the activity at hand and the situation that leads to a state of happiness. If you give a learner with low skill levels a complex task, it is likely to result in anxiety. On the other hand, simple challenges for more skilled learners will likely create boredom. So, we need the moderate “stress” induced by the appropriate level of challenge to learn at our best.

Neurosciences confirm that stress and performance are related. Measured in the level of cortisol, stimulation to learn requires a moderate amount of stress, or challenge. While

³ “Learning rewires the brain” by Alison Pearce Stevens in “Science News for Students”, Sept. 2, 2014.

⁴ “Neuroscience and How Students Learn”, talk by [Daniela Kaufer](#), associate professor in the Integrative Biology department, for the GSI Center’s “[How Students Learn](#)” series in Spring 2011.

⁵ Csikszentmihalyi, Mihaly (2014). Applications of Flow in Human Development and Education: The Collected Works of Mihaly Csikszentmihalyi. Dordrecht: Springer, 2014.

moderate stress proves to be beneficial for learning, mild and extreme stress are both detrimental to learning: “A low degree of stress is associated with low performance, as is high stress, which can set the system into fight-or-flight mode so there is less brain activity in the cortical areas where higher-level learning happens. Moderate levels of cortisol tend to correlate with the highest performance on tasks of any type.”³

Relating these findings to Vygotsky’s “Zone of proximal development” model ⁶, we can see how with the right level of challenge, we can stretch outside of our comfort zone to play in a zone where we can progress and have fun.

In conclusion

Among other things that boost learning performance and which small kids do are good night’s sleep and regular exercise: both help our cells to recharge and rewire, and keep our stress and happiness hormones (cortisol and dopamine) at appropriate levels.

By creating the right learning conditions for yourself and for others, you do not only improve cognitive abilities, you also strongly contribute to produce higher creativity and happiness at work, which leads to greater motivation and engagement.

⁶ Lev Vygotsky: “Zone of proximal development”



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