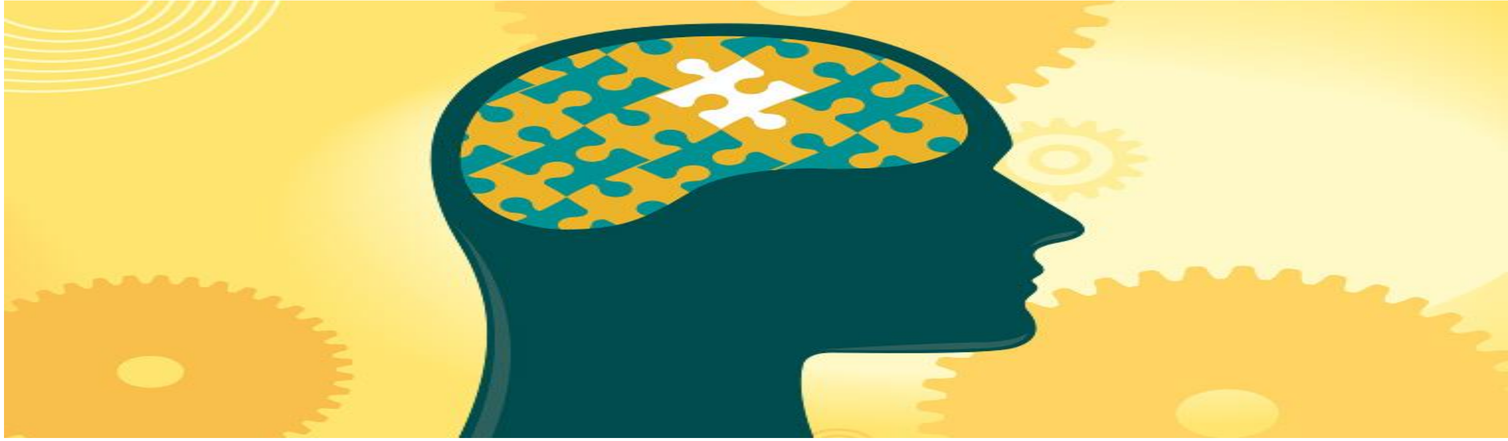
Brain Plasticity

The operation of these basic programs of the mind and body generates "ikiru chikara" which in Japanese means "**the ability to grow and adapt**."

EngineeringLens



Scientists have historically believed that once a person reaches adulthood, their cognitive abilities are immutable. But beginning in the early twentieth century, that theory has been contested by evidence suggesting that the brain's abilities are in fact malleable and plastic. According to this principle of neuroplasticity, the brain is constantly changing in response to various experiences. New behaviors, new learnings, and even environmental changes or physical injuries may all stimulate the brain to create new neural pathways or reorganize existing ones, fundamentally altering how information is processed.

Based on the works of:

- Carol Dweck, Ph.D
- Claude M. Steele Ph.D

- Life Sciences is a health-science magnet school with high aspirations but 700 students whose main attributes are being predominantly minority and low achieving.
- Blackwell split her kids into two groups for an eight-session workshop. The control group was taught study skills, and the others got study skills and a special module on **how intelligence is not innate.** These students took turns reading aloud an essay on how the brain grows new neurons when challenged.

Effort:

The only difference between the control group and the test group were two lessons, a total of 50 minutes spent teaching not math but a single idea: that the brain is a muscle. Giving it a harder workout makes you smarter. That alone improved their math scores.

Results

It didn't take long. The teachers—who hadn't known which students had been assigned to which workshop—could pick out the students who had been taught that intelligence can be developed. They improved their study habits and grades. In a single semester, Blackwell reversed the students' longtime trend of decreasing math grades.

Craft two classes on Brain Plasticity

http://www.positscience.com/brain-resources/what-is-brain-plasticity

Carol Dweck

http://mindsetonline.com/

Intro & Unit 1: Brain Basics

- Intro: an introduction to the characters, purpose of the program, structure and tools available
- Unit 1: basics of brain structure & function, particularly what is required to maintain readiness to learn
- Sample takeaways:
  - the brain needs certain things in order to function well (e.g. sleep & certain foods)
  - the brain is the body’s control center: it gets information from all your senses, and is in charge of all of the body’s voluntary and involuntary movement
  - different areas of the brain do different things
  - your senses serve as different “pathways” to the brain: using more than one sense to learn about something lets you use more of your brain and aids learning and memory
  - using different complementary modes of learning helps focus attention and increase learning
  - in contrast, competing pathways can interfere with learning
  - active learning approaches are best

Unit 2: Brain Behavior

- brain behavior, how it functions, effect of emotions and strategies to manage emotions
- Sample takeaways:
  - the brain is made up of nerve cells, called neurons, in a network of many connections
  - neurons communicate with each other through these connections
  - the branching parts, called dendrites, receive messages, and the long part, called the axon, transmits a signal through the neuron
  - thinking is influenced by the emotions, especially anxiety
  - when facing any type of threat, the brain sets off a fight-or-flight response that causes physical signs of anxiety and interferes with thinking
  - many students have performance anxiety—stress related to taking tests, giving presentations, or other performance-oriented situations—that can interfere with performance even when they know the material
  - you can lower your anxiety level by being prepared, thinking positively, and calming your breathing

Unit 3: Brain Building

- how learning changes the brain and what sort of activities promote learning
- Sample takeaways:
  - the brain and intelligence are not fixed—they both change when you learn
  - the brain grows more new cells and connections when you learn
  - you get smarter by exercising your brain, much the same way that you get stronger by exercising your muscles
  - how can you exercise the brain?
    - by exploring new information, learning new concepts, and practicing skills.
    - practice is the key to learning—only by practicing can you grow new connections in that area of your brain responsible for learning that thing
    - the more connections you make, the easier it gets to make new ones
  - different environments can influence brain growth--active learning is the key
  - you are never too old to learn and develop your brain!

Unit 4: Brain Boosters

- how memory works and study strategies to apply the Brainology® lessons in real life.
- Sample takeaways:
  - memory is stored in the new connections your brain makes between neurons when you have a new experience
  - there are different stages in memory, each lasting different amount of time: sensory memory, working memory, and long-term memory
  - memory is a process, and if you skip one stage, the memory will not last
    - all information enters through sensory memory
    - things you pay attention to go on to working memory, which can only hold 5-7 separate pieces of information at once
    - information moves from working memory to long-term memory through a process called encoding. In order for encoding to happen, you must pay attention, attach new information to existing information that supports it and repeat the information
  - other mnemonics (memory strategies) include connecting information together by chunking, visual images and acronyms
  - most good study strategies are those that reinforce this memory process, helping your brain to make many strong connections between neurons and build a strong network of knowledge

A growing body of literature has demonstrated that neural systems are modifiable networks and changes in the neural structure can occur in adults as a result of training.

For example, longitudinal studies have shown task-specific increases in brain gray matter as an effect of acquisition of abstract information (Draganski et al., 2006), motor skills (Draganski et al., 2004), aerobic training (Colcombe et al., 2006), and cognitive skills (Ilg et al., 2008).

Cross-sectional studies have established that differences in regional gray matter are associated with performance abilities (Mechelli et al., 2004; Milad et al., 2005), suggesting that an increase in gray matter corresponds to improved functioning in the relevant area.

Studies of experienced meditators have also suggested the possibility of structural plasticity, but their cross-sectional designs did not exclude the possibility of pre-existing group differences, precluding causal conclusions.