

# Why You Are Already a Natural Learner: Growing Dendrites

RECENTLY SCIENTISTS DISCOVERED SOMETHING NEW and amazing about the brain: it continues to change throughout your life as a result of what you do. The brain you have today is not the one you were born with. Even before you were born, your brain began shaping itself to your own environment. It started molding itself according to the early sounds you heard. After you were born, all of your experiences further shaped your brain. This ability of the brain to change as a result of experience is called plasticity because, like plastic, the brain can be molded or shaped. This textbook is going to show you how you can change your brain and become a better learner to learn faster and more effectively.

Think of a tree in winter with many bare branches and twigs (Figure 1.1). This is what our brain cells, called neurons, look like after we have learned something. Each brain cell has one trunk (like a tree trunk), called an axon. Also like trees, brain cells have many branches and twigs. Finally, like trees, our brain cells have many roots, called terminals on the axon.

Figure 1.2 is an artist's drawing of two large brain cells (neurons) with many other neurons behind them. As you can see, the neurons in this figure look a little like trees; the "roots" of the big neuron at the top are

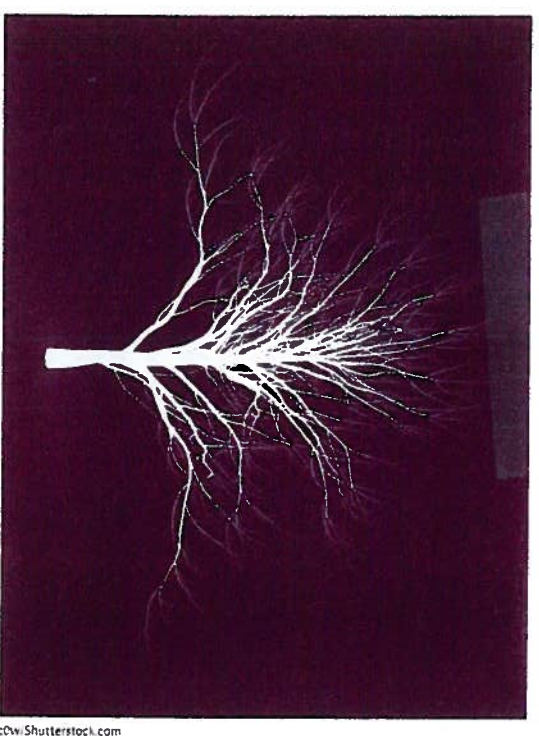


Figure 1.1 A Brain Cell (Neuron) Looks Like This Tree

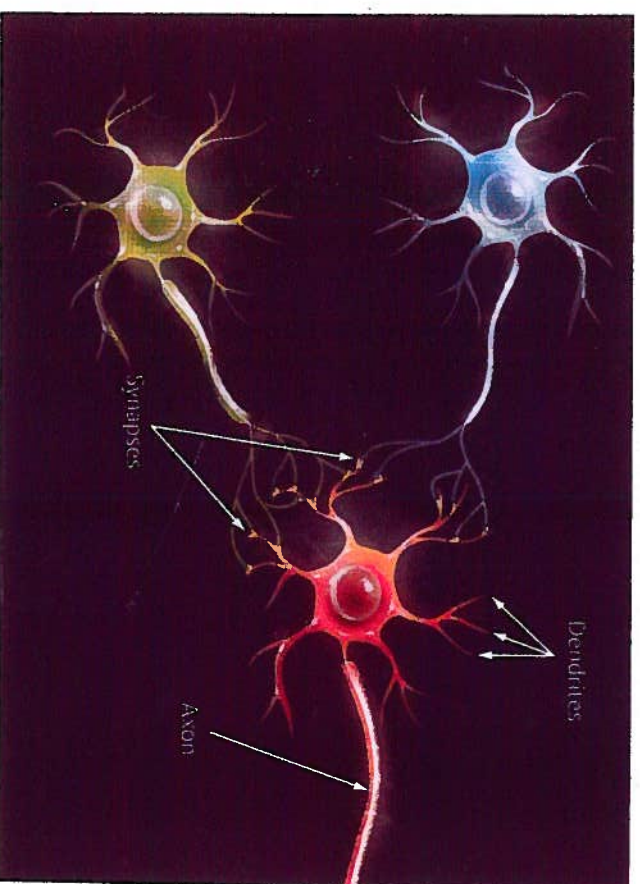


Figure 1.2 Brain Cells Connect to Form a Neural Network

touching, connecting to the “branches” or “twigs” of the big neuron next to it. Where neurons connect is called a synapse. Look at all the neurons in the background, and notice that they are also connecting to one another to form a network of neurons (a neural network). Scientists call the branches and twigs that grow from a neuron dendrites, which, in fact, means “tree-like.”

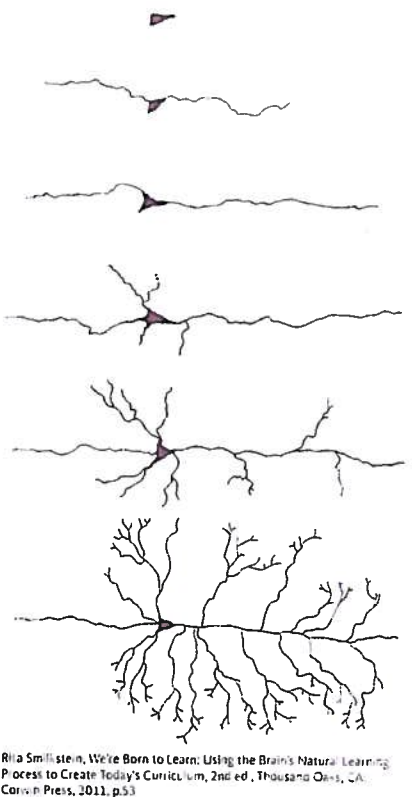
As you work with, experience, explore, examine, think about, try to figure out, and practice a specific skill or concept, brain cells (neurons) in your brain grow new branches and twigs (dendrites) that connect that new knowledge, concept, or skill (Figure 1.3). The more we know, the more we grow. The more we grow, the more we know.

The neuron at the right in Figure 1.3 is an illustration to represent how dendrites might grow before and after learning. The more you think about, work with, and practice a specific new skill, concept, or area of knowledge, the more the dendrites can grow.

## Synapses

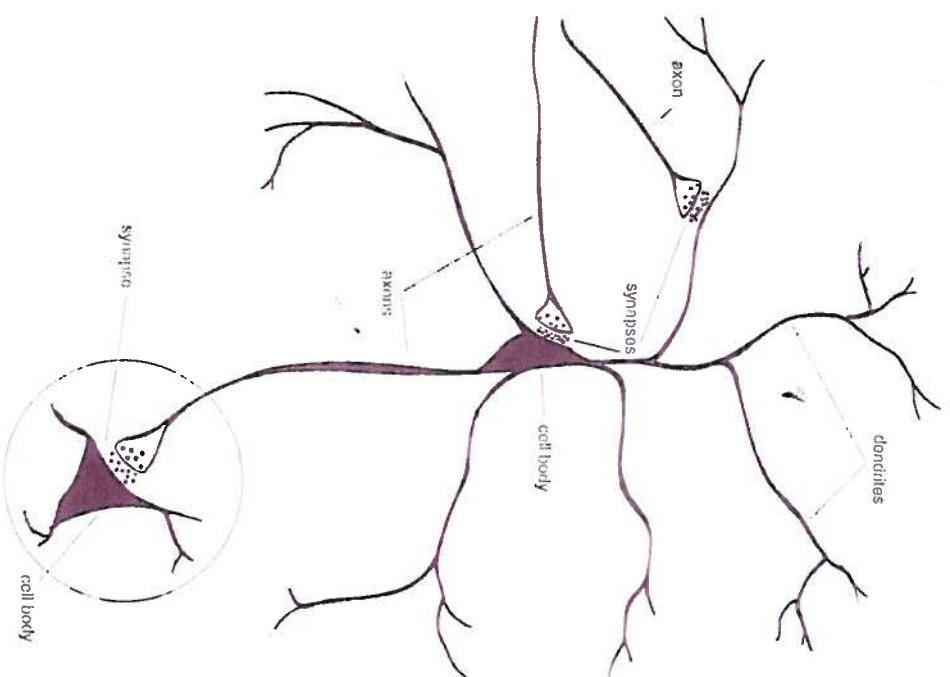
**SYNAPSES CONNECT RELATED** neurons to create a neural network, which is what we have practiced, learned, and know about a skill or area of knowledge (Figure 1.4). Learning involves growing dendrites, connecting them at related synapses, and constructing stable neural networks.

The more we work on, think about, and practice a specific skill or area of knowledge, a larger, thicker neural network of specific connected neurons will grow. The neural network in Figure 1.4 shows four neurons



Rita Smillstein, *We're Born to Learn: Using the Brain's Natural Learning Process to Create Today's Curriculum*, 2nd ed., Thousand Oaks, CA: Corwin Press, 2011, p.53

Figure 1.3 Growing Dendrites = Learning



Source: This is a drawing by Lewis D. Edge, used with permission for *We're Born to Learn: Using the Brain's Natural Learning Process to Create Today's Curriculum* (2nd ed., Thousand Oaks, CA: Corwin Press).

Figure 1.4 A Neural Network of Four Neurons

connecting at synapses. It is important to know how the synapses work because synapses are how our brain connects related neurons to create neural networks. The more we know and learn, the larger, fuller, and thicker that network will become.

## Synapses and Emotions

When your synapses work well, your neurons are able to connect, which is what makes it possible for you to remember and use the knowledge and skill that you have learned. Synapses are affected by emotions, either helping

them work well or shutting them down, so you need to know how to control your emotions so that your synapses will work well. When brains are learning, feel-good chemicals cause you to feel pleasure, which may make you feel confident that you can accomplish something or learn something. You feel good about what you are doing. Your brain does this all on its own, and you should say, "Thank you, brain!"

On the other hand, too much anxiety or stress creates chemicals that make thinking harder. Now you can't think or remember or learn. You need to say to your brain, "I just need to learn how to do this. It takes time and practice to grow the new dendrites and neural networks for this new knowledge and skill, but I can do it." Calmer, more positive emotions can give you the confidence to be able to learn—and you will be able to learn. Think of learning as challenging and not stressful.

# The Natural Human Learning Process (NHLP)

CAN YOU GUESS HOW MANY NEURONS you have in your brain? Brain scientists say that the human brain has one or two hundred billion nerve cells (neurons) and approximately 40 quadrillion connections (synapses) among them. They say this makes the human brain, which is a three-pound, soft, squishy organ, "the most complex object in the universe."<sup>\*</sup>

The human brain, through human history, has created and made everything human beings have ever invented and produced. Fortunately, you do not need to know about all the vast complexities of the brain to learn well. You can learn some things about your brain that will help you be a more confident, successful learner and creator. Your brain was born to learn; therefore, you are a natural-born learner. It is important to know these major points about learning:

1. Your brain was born to learn, loves to learn, and knows how to learn.
2. You learn what you practice.
  - ▶ Practice is making mistakes, correcting mistakes, learning from them, and trying over, again and again.
3. You learn what you practice because, when you are practicing, your brain grows new fibers (dendrites) and connects them (at synapses) into neural networks.
4. Learning takes time because your brain needs time to grow and connect dendrites, synapses, and neural networks.
5. If you don't use what you learn, you can lose the new learning. Newly formed dendrites, synapses, and neural networks can begin to disappear if you don't use them—if you don't practice or use what you have learned. They just get absorbed into the brain tissue and are not stabilized.
6. Your emotions affect your brain's ability to learn, think, and remember.
  - ▶ Self-doubt, fear, and other negative emotions can prevent your brain from learning, thinking, and remembering.
  - ▶ Confidence and interest help your brain learn, think, and remember.

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<sup>\*</sup>Ratcy, J. *A User's Guide to the Brain: Perception, Attention, and the Four Theaters of the Brain*. New York: Pantheon, 2001, p. 9.