

WIRED TO GROW. ^{2.0}

Harness the Power of Brain Science
to Learn and Master Any Skill



Britt Andreatta, PhD

*Author of *The Neuroscience of Learning*, *Wired to Resist*,
Wired to Connect, and *Leading with Emotional Intelligence**

Discover the science-based secrets for fulfilling your potential by unlocking the power of your brain.

"Britt is masterful in bridging pioneering content with practical application using vulnerable stories from her own leadership experiences. She doesn't share what she's learned; she shares what she's learning. As you read, you will be invited into your own personal and authentic learning journey, rooted in rich and relevant data, and framed in a model that cultivates growth...for you and your organization. *Wired to Grow* is leadership gold."

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We are biologically wired to learn: whether we're simply trying to survive or reaching to fulfill our potential. ***Wired to Grow*** contains the keys to leveraging our natural neurological wiring to help unlock the fullest expression of who we are—to become or develop into something more. This fully revised and expanded second edition, now packed with more than double the original information, draws from the most recent neuroscience research and includes two new sections on creating a growth culture of learning and delivering learning to others. This powerful guide positively transforms lives, habits, and organizations.

Dr. Britt Andreatta is an internationally recognized thought leader who creates brain science-based solutions for today's challenges. She draws on her unique background in leadership, neuroscience, psychology, and education to unlock the best in people and organizations. She has over 25 years of experience consulting with executives from all types of organizations. Learn more at: www.BrittAndreatta.com.



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WIRED TO GROW

Harness the Power of Brain Science
to Learn and Master Any Skill

Second Edition
Revised and Expanded

Britt Andreatta, PhD

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Publishing

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For Chris and Kiana.

You are my heart and soul. You help me learn and
grow every day. I am the luckiest person on the
planet to get to spend this life with you.

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INTRODUCTION

“When you know better, you do better.”

Maya Angelou, poet and author, *I Know Why the Caged Bird Sings*

So, I was wrong. Well, not wrong exactly but some things I wrote in the first edition of this book have shifted so dramatically that they are now out of date. I have written two books since the first edition of *Wired to Grow* and, frankly, I got better at it as I went. So, it felt like a good time to update—but honestly, I thought I would dig into the research and find a handful of things to rework for the revision. Not so. Neuroscience has come far in the past five years. Many more researchers are looking at learning, memory, and behavior change. New tools and big data are shifting what scientists know about the brain, and memory research has undergone radical transformation due to some groundbreaking studies. And medical doctors are leveraging recent findings in neuroscience to create new treatments that are producing astonishing results.

You might not know this, but the rule for a second edition of a book is that at least 20 percent must change. Well, you’re getting a whole new book because this is not only a complete rewrite of the first edition, but I have added 50 percent more content and revised my Three Phase Model of Learning™ as well.

In addition to the science, and perhaps because of it, the learning industry has changed significantly too. New technologies have made learning much more accessible. Thanks to smart phones, people all around the world are following their interests, developing their skills, and learning from peers and experts, many regardless of their circumstances, education, or income. Technology has also made learning more scalable to large groups of people and also more impactful. This has enlivened a new learning hunger in people of every age. Deloitte’s *2019 Global Human Capital Trends* report, a study done with 10,000 participants from 119 countries, found that “people now rate the ‘opportunity to learn’ as among their top reasons for taking a job,” and that “the No. 1 reason people quit their jobs is the ‘inability to learn and grow.’” This has forced organizations to prioritize learning and, in fact, it tops their list of top-10 trends, along with leadership development and reskilling the current workforce for new kinds of work and jobs. Learning has expanded far beyond childhood classrooms to become a lifelong journey on a path to becoming our best selves.

Learning is the most powerful and natural process in the world. It’s at the heart of any transformation we have made or will ever make both as

individuals and a society. I am not talking about education or training but the process of learning: how we start at one level of awareness, understanding, or skill and shift to a different—and better—level. We are biologically wired to learn. Our survival depends on our ability to learn from our environment and experiences. And therefore, intrinsically, several aspects of our central and peripheral nervous system are dedicated to the learning process.

Thousands of years ago, when all humans were living in tribes and subsisting off the land, our ancestors who survived were the ones who learned how to recognize when predators were nearby, to know which foods were poisonous, and to read signs of hostility in others. Today, our survival instinct still drives much of our learning but the context is vastly different. Instead of learning how to forage for food, we must successfully navigate our work environments. Survival is still the goal, since we use our paychecks to buy food, water, and shelter. But rather than learning to build fires and huts, we now need to know how to drive a car and use a computer.

Socially, we still need to learn how to read signs of hostility in others, as well as kindness, curiosity, and a host of other complex emotions, the process known as emotional intelligence. While that need hasn't changed, technology has connected the world, so we now need to do it beyond the familiarity of a shared language, culture, or geographic region. And we might even use emotional intelligence to understand words on a monitor, a voice on a device, or a face on a two-dimensional screen.

In addition to being the key to our survival, learning is also the path to fulfilling our potential—our capacity to become or develop into something more. Within each of us is unrealized ability waiting to blossom into the fullest expression of who we are. As individuals and as a species, we yearn to realize the highest and best version of ourselves. It's in our DNA, the strands of which even visually model the journey of an ever-upward climb. It's about transforming ourselves across the course of our lifetime.

And now, these advances in neuroscience have helped us identify the most effective way to learn. Instead of stumbling along, we have the ability to maximize our learning abilities, allowing us to more intentionally shape our growth and development. Transformative learning is a three-dimensional approach to learning that drives real behavior change. This means a person's understanding shifts through experiences and information about the “why” of things (psychological); their belief systems irrevocably shift through epiphanies, flashes of insight, and “aha!” moments (convictional); and their actions shift through observation, application, experimentation, and practice (behavioral). We'll learn more about how this fits in the bigger picture in section V, but for now just know that each dimension of

transformative learning helps create and groove neural pathways and habits of the desired behaviors in yourself or others.

This revised and expanded edition of *Wired to Grow: Harness the Power of Brain Science to Learn and Master Any Skill* is designed to help you fully unlock your potential, incorporating recent discoveries in neuroscience to give you new ways to maximize your ability to learn and grow. You can apply this material to your own life immediately, starting today. If you have a role where you help others learn and grow, you will also gain new tools for unlocking their potential and becoming a more effective manager, parent, leader, educator, or health care worker.

This book is organized into six sections:

- I. We'll begin by looking at the big developments of the last five years in the neuroscience of learning.
- II. Next, we'll dive into the new findings about memory (there are nine types!) and how the type of memory determines how you set up learning.
- III. We'll explore new research about skills, habits, and behavior change.
- IV. Next, we'll look at how to set up learning to maximize its effectiveness from the start.
- V. We'll turn our attention to the latest brain-based best practices in learning design and delivery.
- VI. We'll end with specific tips and strategies for creating a growth culture of learning in your organizations.

My Research Process

This book focuses on new developments since 2014 and, boy, there have been a lot of them. As a learning professional seeking cutting-edge information in learning and development, I have immersed myself in neuroscience research, which has forever changed how I approach learning design and delivery. Sadly, there is currently no centralized place to look for how brain science might inform learning professionals, so I began by diving deep into the latest studies.

I first focused on neuroscience, reading journals like *Neuron*, *The Journal of Neuroscience*, *Trends in Neuroscience and Education*, *Social Cognitive and Affective Neuroscience*, and *The Year in Cognitive Neuroscience*. Inevitably, these studies led me to other disciplines and recent studies in biology, psychology, business, and education. I also reached out and interviewed thought leaders in the field, like Dr. Mike Miller at the DYNs lab at the University of California, a coeditor of *The Year in Cognitive Neuroscience*, and Dr. Robert Clark, the

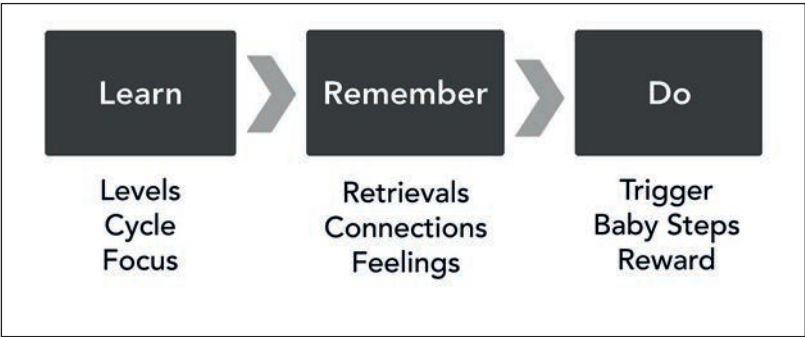
co-author of *Behavioral Neuroscience of Learning and Memory*. I read books, watched TED talks, and listened to podcasts. Inevitably, key themes emerged as I connected dots between studies, disciplines, and scientists that are rather siloed from each other.

Another important part of my research process is mapping what scientists find in their labs to issues that impact today’s workplaces. I leverage research by data giants like Gallup, Deloitte, and McKinsey as well as professional associations like the Association for Talent Development (ATD) and the Society for Human Resource Management (SHRM). To be clear, I am not a neuroscientist; my PhD is in education, leadership, and organizations, and I have done my own research on the science of success. Because I am an active practitioner, designing and delivering learning experiences out in the field, I can see where lab studies do and do not translate to how people experience learning in the real world.

Some of the studies confirmed things I had found through trial and error long ago; others completely shifted how I approach my craft. What I found not only changed how I design and deliver learning for others but also how I approach my own transformation. Now that I know and truly understand the neuroscience of learning, I have unlocked more of my own potential and the potential of participants in my sessions.

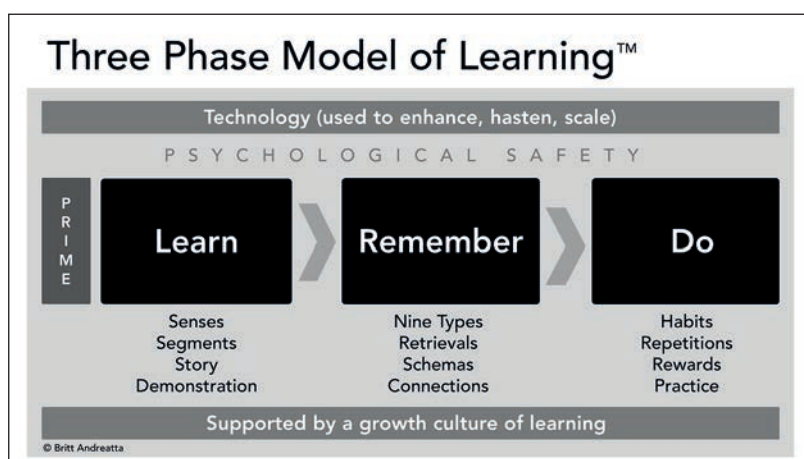
In addition, I used this research to build several new brain science-based training programs that are proving to be exceptionally effective in all kinds of organizations and industries. If you want to learn more, visit BrittAndreatta.com/Training.

In the first edition, I introduced my Three Phase Model of Learning and just five years ago, it looked like this:



The first (and now outdated) version of the Three Phase Model of Learning

Enriched by new research and data, the revised model looks like this:



The new version of the model

It still includes the core phases of Learn, Remember, Do, but the elements within them have shifted. And in addition to the critical component of fostering psychological safety, this new version explores the importance of properly priming for learning, as well as technology's role in aiding learning, all of which rest upon a growth culture of learning.

I am eager to share with you my exciting discoveries on the many new developments in the neuroscience of learning. So, let's take a journey together. I'd like to introduce you to the fascinating miracle that happens inside you every day: learning. Once you understand this brain-based process, you'll be able to use it more effectively and efficiently in your own life. You'll also have the keys to help others learn better and faster.

Let's get started!



Take a Learning Journey

Before I wrote this book, I taught this content through workshops, keynote presentations at conferences and corporations, and in online courses. In a live presentation, I model these concepts so participants get the most out of the experience. I'd like to replicate that for you here, so before you read on, pick something that you'd like to learn. It could be something you are

currently learning, or something you want to learn in the near future. It could be a new professional skill, like public speaking or mastering unfamiliar software. Or it could be something personal like playing an instrument, speaking a new language, or dancing the tango.

The only requirement: it should be truly meaningful to you. As you work through the book, apply each concept to this thing you want to learn—your learning goal—and by the end you will have a robust and exciting plan to help you realize your potential in this area. To help, I created a free downloadable PDF for you to print and fill out as you explore each concept (www.BrittAndreatta.com/Wired-to-Grow).

Tip: If you really want to maximize your experience, find a partner to share with. As you will discover in chapter 13, social learning actually boosts long-term retention. So, find a friend interested in chatting with you about what you learn in this book and your progress on your learning goal. Perhaps they might want to take this journey with you, comparing notes as they learn something new themselves.

3. New Understanding of Creativity

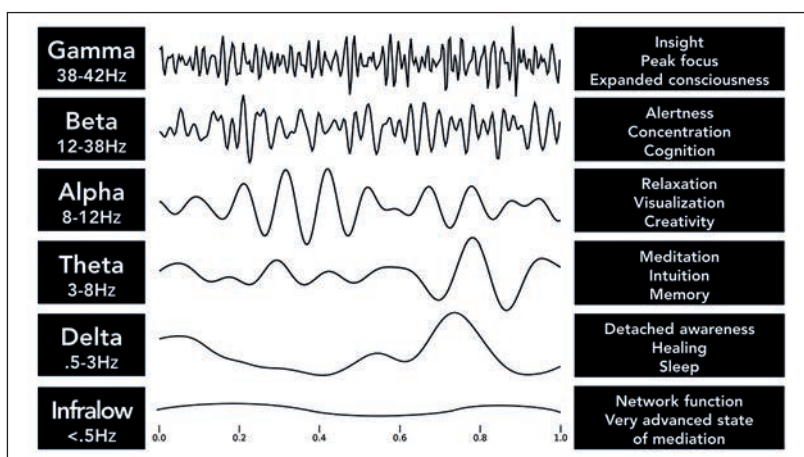
This is another significant development since the first edition of this book: understanding creativity and how it happens in the brain. The old belief of the left brain being analytical and the right brain being creative has been debunked. Creativity, it turns out, is a networked activity simultaneously involving many regions of the brain and is a four-phase process:

1. **Preparation.** This is the time a person spends trying to solve an issue or come up with an idea. It includes things like researching, prototyping, and tinkering.
2. **Incubation.** This phase, also called percolation, starts when you have exhausted your options and set it aside for a bit, intentionally not working on it. Taking a break lets the preparation stew.
3. **Illumination.** This phase is the actual “aha!” moment, when the solution suddenly appears.
4. **Verification.** The final phase when you make sure that your insight actually works and solves the problem.

Dr. Scott Kaufman, a researcher at Columbia University and coauthor of *Wired to Create: Unraveling the Mysteries of the Creative Mind*, identified three networks involved with creative cognition. The first is the executive attention network, which gets involved when you’re concentrating on something and trying to figure it out through focused attention. This network includes the prefrontal cortex along with posterior parietal lobe. The second is the imagination network or default mode network (DMN), which activates when we engage in considering alternative perspectives or outcomes, like musing about the present and daydreaming about the future. This involves deeper regions of the prefrontal cortex as well as the medial temporal lobe and post cingulate. Finally, there is the salience network, which Kaufman states, “constantly monitors both external events and the internal stream of consciousness and flexibly passes the baton to either the executive attention or imagination network depending on whatever information is most salient to solving the task at hand.” The salience network involves the anterior insula and the anterior cingulate cortices.

Doctors John Kounios and Mark Beeman, neuroscientists at Drexel University, have captured images of the “aha!” moment in action. Neural imaging shows that one-third of a second before the “aha!” moment, there is a burst of gamma waves above the right ear in the anterior temporal gyrus, as well as a rush of blood into that part of the brain. Gamma waves are the highest brain waves, oscillating at 38 to 42Hz and are affiliated with insight,

peak focus, and expanded consciousness. Even more surprising, the MRI showed a burst of alpha waves in the right occipital cortex one full second before that. Alpha waves oscillate at 8 to 12Hz and are associated with relaxation, visualization, and creativity. Essentially, the brain is suppressing vision right before the “aha!” moment occurs. Scientists call this a “brain blink.”



Properties of gamma and alpha brain waves affiliated with creativity and insight

Kounios and Beeman, authors of *The Eureka Factor: Aha Moments, Creative Insight, and the Brain*, think this is why we get so many good ideas in the shower—there is not a lot of visual stimulation and you have the white noise of the water, which essentially replicates this brain blink and sets us up for insight. They have gone on to research different forms of creativity, finding that some people get to their “aha!” moments somewhat intuitively while others get there through an analytical process. They found a person’s resting brainwaves predict which she or he uses more, indicating this is actually a neurological trait, not a choice.

Collectively, this research is giving us a playbook for enabling creativity in ourselves and in others. Studies suggest that if you want to boost creativity, remember Kaufman’s process:

- **Preparation:** Prepare your brain by exposing yourself to information outside of your primary sources. When you want to have an idea about something, seek out the new and different, and even the uncomfortable as you explore or study your area of interest. Think of it as reading lots of books in the library and from different subject areas—this sets your brain up to connect the dots and have those “aha!” moments.

- **Incubation:** Next, give your brain a break. Let your mind wander and do a little daydreaming. Some find it helpful to take that shower or be near water in nature, like a stream, lake, or ocean. This is called the resting neocortex and is part of how you induce insight.
- **Illumination:** Revisit the problem while you engage in what scientists call sensory gating. You intentionally shut down some of the five senses so you can toggle your focus between the topic and awareness of your environment. Close your eyes, or meditate for a bit and see what comes to you.
- **Verification:** Finally, check that your insight works.

As I read that, I realized this is exactly the process I follow when I write a book (this one included) or build a presentation or training. I first expose myself to research across a wide range of disciplines and different sources. After I've exhausted all the sources I can think of, I let it all stew around in my head. This is when I take lots of walks on the beach, swim at my gym, and just try to trust the process because, inevitably, something starts to take shape. Because of the nature of this research, I am increasingly intentional with the process. Before, I would take breaks when I felt stuck but felt guilty about slacking off when I had work to do. But now, when I'm stuck, I happily take a break knowing that insight will eventually follow.

Few of us reach adulthood with our innate sense of creativity intact. In his book *Orbiting the Giant Hairball*, Gordon MacKenzie, a cartoonist at Hallmark, describes visiting schools and asking children, "How many artists are there in the room? Would you please raise your hands?" He saw this consistent pattern, "First grade: en masse the children leapt from their chairs, arms waving wildly, eager hands trying to reach the ceiling. Every child was an artist. Second grade: about half the kids raised their hands, shoulder high, no higher. The raised hands were still. Third grade: at best, 10 kids out of 30 would raise a hand. Tentatively. Self-consciously. And so on up through the grades. The higher the grade, the fewer children raised their hands. By the time I reached sixth grade, no more than one or two did so and then only ever-so-slightly—*guardedly*—their eyes glancing from side to side uneasily, betraying a fear of being identified by the group as a 'closet artist'."

In her research on shame and vulnerability, Dr. Brené Brown has seen the impact this has on adults, "I found that 85 percent of the men and women who I interviewed remembered an event in school that was so shaming, it changed how they thought of themselves for the rest of their lives. But wait—this is good—fifty percent of that 85 percent, half of those people: those shame wounds were *around creativity*. It was shut down in them as children.

For those folks, when I say ‘*unused creativity is not benign*,’ what I really mean is it metastasizes into resentment, grief, heartbreak.”

Creativity matters, especially in today’s organizations where “thinking outside the box” and innovation often distinguish the top performers from the rest. Training in creative thinking can make a big difference. One study by Dr. Trisha Stratford and Corinne Canter found that 80 percent of participants in a creative thinking training improved their creative thinking and nearly two-thirds (63 percent) generated more viable solutions to problems. All participants showed an increase in gamma waves in their brain scans.

Finally, I want to introduce you to a view of creativity that’s a bit unusual, so please hang in there with me.

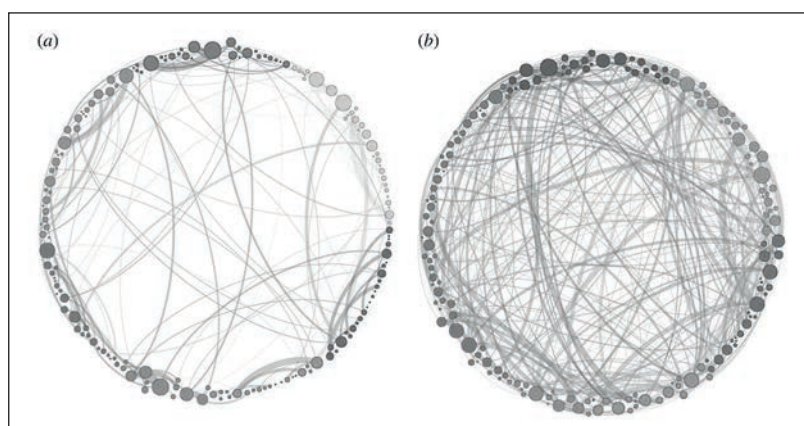
I’m a bit of a foodie, so I have read all of Dr. Michael Pollan’s best-selling books on the subject, including *Food Rules*, *In Defense of Food*, *The Omnivore’s Dilemma*, and *Cooked*. This is my pleasure reading, so when his new book came out last year, I immediately got a copy without even really looking at the subject, expecting another wonderful foodie journey. While the book does feature mushrooms, it was certainly not at all what I expected. Titled, *How to Change Your Mind: What the New Science of Psychedelics Teaches Us about Consciousness, Dying, Addiction, Depression, and Transcendence*, Pollan takes the reader into a deep exploration of the medical and neuroscience research on psychedelics (namely mushrooms and LSD) and it blew my mind.

Pollan delves deep into all the numerous studies on the therapeutic benefits of psychedelics, as well as exploring the natural and political history, and botanical properties of these substances. He includes a deeply researched section on the neuroscience of psychedelics, which are nontoxic and nonaddictive. Because so many people who use them describe similar experiences, neuroscientists wanted to see what is happening in the brain. Enter the default-mode network (DMN). First discovered in 2001 by Dr. Robin Carhart-Harris, DMN is seen as the seat of our ego or sense of self. It’s involved in a host of activities like metacognition and self-reflection, and it lights up when our mind wanders.

Most importantly, the DMN serves as an orchestra conductor, filtering and controlling thousands of neural activities in the brain. There are so many neurons firing at any one time, and the DMN’s role is to contain that so we don’t feel constantly overwhelmed. The DMN comes online during childhood, which is why babies and young children have that sense of wonder and awe. Dr. Alison Gopnik, an expert on the cognitive development of children, states, “... babies and children are basically tripping all the time.”

Neuroscientists like Carhart-Harris and doctors Mendel Kaelen and David Nutt have discovered that when adults take psychedelics the DMN

goes offline, allowing all kinds of data from the different parts of the brain to surface. This is responsible for the merged sensations (called synesthesia) that people describe on psychedelics, where they can taste color or see music. It also allows for a flood of creativity as diverse parts of the brain connect and talk with each other in ways that don't happen without the substance. According to research by Pollan, many Silicon Valley engineers participated in the acid trip culture of the 1960s and credit the invention of the microchip to the new insights they had while taking psychedelics. Even today, several Bay Area companies have “microdosing Fridays” to support and expand innovation. Pollan himself tried psychedelics as part of his research process and says, “A psychedelic experience has the power to shake the snow globe, disrupting unhealthy patterns of thought and creating a space of flexibility.”



Usual lines of communication in the brain (a) expand when DMN goes offline (b)

The DMN going offline is also what creates that sense of “oneness” or spiritual experience that is part of the overwhelming majority of psychedelic trips, where people see the connectedness of all living things. And it's this aspect that creates the astounding therapeutic results for people with addiction and depression as well as those with terminal diagnoses like late-stage cancer. Numerous and convincing studies demonstrate the benefits of psychedelics, which is why as of this writing two states in the US, Oregon and Colorado, have ballot initiatives legalizing the use of psychedelics for therapeutic use.

As we consider the ways of promoting or enhancing creativity and innovation, it appears we can add psychedelics to the box of possible tools. It's certainly not for everyone, and I'm not promoting this practice, but I do encourage you to read Pollan's book and consider the evidence and its implications.