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Introduction

IT IS NOW KNOWN that the brain can generate new neurons and create new connections until the day we die. And if the latest research is any indication, human beings are capable of intentionally altering their own brain, sometimes by way of changed behavior, through meditation, and by use of devices that literally retrain the brain.

It is also clear that the role of technology is growing exponentially. No longer do teachers and students and content need to be in the same place at the same time. Sophisticated video games are showing the way of the future, where three-dimensional learning, alternate realities and universes, and an expanding cornucopia of fact and expert knowledge will be available for anyone wanting to find them.

So how do we deal with learning in this age of almost limitless potential? And how can today's education, frozen in a model created for another time, transform into something that is relevant?

This book is not about the latest in technology nor does it focus on the latest brain research, although it includes both. Instead, it sets out to show that if we look at learning in a new way, it may just be possible to reconcile what is occurring all around us and find a way through to a radically different and expanded type of education.

This book provides evidence for the fact that public education is at the center of an immense number of competing forces and that the center cannot hold. And we have few illusions about the daunting shift that is needed. We have worked with countless schools and programs and have tested these ideas in programs we have conducted in our own center in Idyllwild, California. Our work with schools and districts in the United States became increasingly difficult with the U.S. effort to standardize teaching. While our workshops and courses, as well as our work in Australia, often reaped rich rewards and true transformation, the current U.S. emphasis on making test scores the primary and often only criterion for learning, all too often left great education further and further behind. Again and again we have witnessed the ways in which mandated procedures, enforced by sometimes draconian regimes of re-

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wards and punishments, and implemented by top-down management policies and practices, have led to compliance driven by fear and helplessness.

Happily, for those who can master the way human beings naturally learn and also manage to transform the systems in which learning takes place, "teaching" can morph into a process that is much more exciting, meaningful, and coherent. The answers are waiting to be understood, but they are very challenging. However, armed with the amazing contributions from technology, psychology, and neuroscience, we have remained optimistic about the future.

The shift can be excruciating for anyone involved in education at this time. The reason is that educators have to let go of much of the control that comes with being the content expert in a classroom and being responsible for everything that happens. What is needed is the very opposite of what is happening. Teachers need to be empowered with new skills and knowledge about how human beings learn—knowledge that is now available. The information age requires educators who can lead learners into *their* unique interests, talents, understandings, and expertise, while simultaneously embedding and dealing with the academic, social, and emotional capacities that students have and will need for the future they will face.

Fortunately, there are solutions. At the core lies an instructional approach grounded in a capacity to learn that is biologically built into every human being from birth. The challenge we therefore face, individually and collectively, is to implement what is known to be possible. Our goal in writing this book is to contribute to that possible future.

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A BRIEF SUMMARY OF THE BOOK

We have had to literally create new vocabulary in order to make clear what is initially immensely complex, is documented across multiple disciplines, and is grounded in physiology. At times we have shortened or abbreviated these terms.

The book is divided into four major parts. Part I looks at what is happening to students in and out of school. Chapter 1 describes the ubiquitous use of electronic media by today's youth and demonstrates the great divide that exists between traditional education and what we call *videotech*. As the average student in the United States spends more than 50 hours per week being engaged and entertained by electronic media of one type or another, schools are rapidly being left behind. Chapter 2 takes a closer look at the degree to which technology is actually impacting education and how educators are

attempting to protect themselves from what is certainly here to stay, using firewalls, banning cell phones, and employing other means for keeping technology out. Chapter 3 takes a hard look at the beliefs that are at the heart of current education. It suggests that these beliefs constitute what is known as a *meme*—an idea that keeps replicating itself. We call it the *transmission/direct instruction meme*. Chapter 4 summarizes the skills and capacities required of students working and living in a technologically connected world or what is sometimes called the "knowledge age." It relates those skills and capacities to what psychologists call *higher order functioning* and what neuroscientists call the *executive functions* of the human brain.

Part II introduces a new approach to learning and teaching—one that emerges out of biology and is supported by psychology and neuroscience. Chapter 5 introduces a more organic and natural approach to learning grounded in biology, and framed in terms of the dance between perception and action. We suggest that understanding the perception/action dynamic (which is always operating) and the perception/action cycle (which is the foundation of natural learning) is essential to shifting the current and prevailing view of learning and teaching in order to accommodate knowledge age education. Chapter 6 introduces the science that explains how perception/action is fundamental to learning from life. It also introduces an approach to the organization of the brain, based on the parallel functions of perception and action, and highlights the critical nature of learner- or actor-centered adaptive questions in natural learning. It also shows how video games and much of technology take advantage of this process already. Chapter 7 introduces what we call *Perception/Action Learning*, and shows how video games and much of technology take advantage of this process. It unpacks the critical phases of Perception/Action Learning and lays the foundation for how to teach to how the brain/mind learns naturally. Chapter 8 looks at outcomes in a new way. It describes how the brain organizes experience and knowledge in terms of *knowledge networks,* and shows that creating rich knowledge networks needs to be the goal of education. It spells out the differences between rich knowledge networks and the relatively impoverished knowledge networks created during traditional education. Chapter 9 contrasts two approaches to teaching using the topic of digestion. One approach is a traditional lesson; the other approach models Perception/Action Learning. The two examples are followed by an introduction to the various phases that are needed for effective instruction, drawn from the phases of the Perception/Action Learning Cycle introduced previously.

Part III explores the body-mind connections that influence learning. Chapter 10 introduces the notion of motivation and the distinction between

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intrinsic and *extrinsic motivation*. It shows intrinsic motivation to be the primary force that keeps the *perception/action cycle* functioning, and identifies some powerful aspects of intrinsic motivation. The interaction between learning and motivation is explored in some depth, with a look back to how behaviorism "sideswiped" education and is still having an impact. Chapter 11 deals with mind states and introduces *Relaxed Alertness* as the optimal state of mind for learning. It does so by drawing on the distinction between the *high road* and *low road* of the brain, and explains how the high road supports deep learning and the low road suppresses it. The chapter also introduces research from a wide variety of fields to support the distinction between the two roads. Chapter 12 shows how many of the features of education today, ranging from standardized instruction to an obsession with standardized test results, work together to induce the low road, and so suppress and undermine deep learning and great teaching. Chapter 13 introduces what we call *biological predispositions* that explain natural behaviors that are largely reflexive and outside of the field of awareness. It shows how they are always operating in schools and explains that they must be acknowledged and worked with rather than suppressed. It then suggests ways to elevate these more basic behaviors into awareness where they can be managed via higher order thinking. Chapter 14 focuses on the intrinsically social nature of learning. It introduces recent research on what are called *mirror neurons*. This research suggests that children, students, and adults alike learn much from watching others and from the social context in which they find themselves. It discusses some of the relevant factors and describes the importance of imitation and modeling in great education. This makes sense of the adage "action speaks louder than words."

Part IV presents what we call the Guided Experience Approach to learning and teaching, and demonstrates how two schools implement the approach. Chapter 15 introduces three elements that are essential to mastering the Guided Experience Approach—*Relaxed Alertness*, *Immersion in Complex Experience,* and *Active Processing of Experience*. Chapter 16 provides a closer look at how two schools (one in the United States and the other in Australia) have created a climate of Relaxed Alertness. Chapter 17 takes a closer look at many of the procedures and processes that both schools use to insure that learners are immersed in complex experience and that all the phases of Perception/Action Learning are implemented. Chapter 18 describes the process that is essential to consolidating learning by way of continued challenge and questioning. Chapter 19 provides a brief but critical look into the future of learning, and into the immense importance of implementing Perception/Action Learning and the Guided Experience Approach.

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CHAPTER 1

Who and What Are Educating Our Children?

When you lose your mobile, you lose part of your brain.

—A Japanese student (Prensky, 2006, p. 128)

The future has arrived. We are the beneficiaries of a revolution in the understanding of the brain and of human potential.

—Sharon Begley (2007, p. 243)

IMAGINE THAT SOMEONE told you we could have an outstanding kind of education, one compatible with a world deeply steeped in technology, innovation, academic excellence, global communication, and cultural diversity—what would you think? And suppose that we could finally educate almost all citizens to live successfully in a society infused with healthy relationships as well as instant messaging and instantaneous access to information—what would you do?

Ultimately, this vision could become reality provided that cultural forces permit it. One way to begin is with what science is revealing about how people learn naturally. When we take the brain research seriously, for example, and synthesize it with developments in cognitive psychology and other fields, we find that children learn from just about everything around them. The division between learning in school and learning from life outside of school was always artificial, but this new understanding helps us to recognize learning as something that consumes kids all the time. We can acknowledge what most gifted educators have always known, that learning in school, as most of us recollect from our own school experience, is artificially limited by a lens fabricated for another time. When we replace and update that lens and honor research and technology now available, we have the opportunity to recognize and take advantage of a miracle in action.

In the following pages and throughout the book we will be adding our voice to all those who are calling for a new and different kind of education. One chapter at a time we will lay out the critical shift that educators and policy

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makers need to embrace if public education is to survive as an essential platform for the ways in which we prepare our children for the future.

TWO COMPETING WORLDS

The journey begins with the fact that most of our children are being educated by at least two competing worlds.

One of those worlds, the world of television, technology, and video gaming—which we call *videotech*—is not generally perceived as a system of education. It is digital, media driven, exciting, challenging, inviting, and "fun," and is largely disconnected from what many educators would call school. The other, the world recognized as school, *is* perceived to be a system of education, but it largely suppresses the dynamic, interactive, creative, exciting, and social aspects that videotech engages.

The time has come to grasp the essence of each world—to see what each does, to test the assumptions upon which each is built, and to come to terms with how education needs to function if it is going to meet the goal of preparing our children adequately for the knowledge age into which they are being born.

How Does the Videotech World Educate Our Children?

Let's look at two students, typical of those found in most elementary and middle schools today. Jake and Dan are 9 and 11 years old respectively. Their parents have come to us because both boys are worried about their grades. Each one is failing at least one subject. These are good kids who are popular and are well liked by other students and their teachers. In many ways they are like their classmates, articulate and frank. Their main problem is that they cannot grasp some of their subjects. They literally feel that they can't learn, and they both tell us that they don't listen well and fail to pay attention.

And yet, like so many kids their age, they seem to have no trouble mastering the world of digital technology. They have grown up with computers, video games, cell phones, and all the most recent "toys" that represent the information age. Jake in particular tells us that his favorite thing to do is to play video games, and Dan has a gadget that he holds in his hands and "plays with" continuously all through our interview. Both boys have a TV and video game setup in their respective bedrooms. They represent thousands of middle-class kids in this country. They are immersed in a digital, media-driven world, which presents some revealing data.

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