From *Digital Game-Based Learning* (McGraw-Hill, 2001)

Digital Game-Based Learning
Chapter 2

The Games Generations: How Learners Have Changed

by Marc Prensky

I've never lived in a house without a computer.
-Michelle Reed, 25-year-old editor of this book

Electronic toys were my first playmates.
-David Bennehum, 33, in *Extra Life*

I'm from the PacMan generation.
-a corporate worker

How Learners Have Changed

I'm not so sure that we really have an appreciation of what this has done to our children.
-Dr. Ray Perez, Cognitive Psychologist, Department of Defense

At the turn of the millennium, the median age of the U.S. workforce is 39.[1] This means that half of all corporate employees were born after 1961. The oldest of this group were 7 years old when men landed on the moon; most were not even born. Most have never used a rotary dial telephone, never known a time when music wasn't totally portable or

digital, never lived without hundreds of thousands of video images a day, never known a world without some kind of computer. (I will discuss older workers in Chapter 14.)

Sesame Street, the great television experiment that changed the way children around the world grow up, celebrated its thirtieth birthday in the year 2000, having begun broadcasting in 1970. Close to fifty percent of corporate employees (yes, we're talking about our colleagues, not our children) grew up with *Sesame Street* as a daily part of their intellectual diet. That program, as Malcolm Gladwell reminds us [2], "was based about a single breakthrough insight: That if you can hold the attention of children, you can educate them." *Sesame Street* held their attention as it taught them, day after day, year after year. How? It *entertained* them. It was *fun*. This connection between fun and learning has been part of half of our workers' consciousness since their earliest days.

Pong, the very first commercial video game, appeared soon after *Sesame Street*, in 1974, just as the first of these 50 percent of workers turned 13. One of them, David Bennehum—then 6—deeply remembers his first encounter with this new phenomenon, which he describes in his book *Extra Life:*

> Holding the knob, I watched as my electronic paddle followed the movement of my hand. *Bonk*. I hit the luminescent ball. *Bonk*. It came back. *Bonk*. Faster now. *Bonk*. Too fast! It shot by. Several rounds later the game was over. I could lose privately. No one to laugh or yell at me for missing. I found another coin and played another game … this was bliss. [3]

He was not alone. Millions of other kids were blissing out too.

Space Invaders, the first true game "hit," followed soon thereafter (in 1978). So the *oldest* employees from this 50 percent cohort—those that are now between 30 and 39—have been able to play, and for the most part *have been* playing, video games since their junior high school days. But the newest employee hires, just out of high school or college, have never known a world *without* video games. As older employees retire and are replaced by younger workers, the next wave of employees will never have known a world without the advanced gaming technologies of Sony PlayStations and multiplayer games on the Internet.

Star Wars, the first of the great, fast, special-effects films, premiered about the same time as *Space Invaders*, in 1977. The film series paralleled the initial growth of the gaming industry, with the next two episodes following at three-year intervals. The two are closely related, and this is not a coincidence, the special effects generated for the movies being the same ones used in the games. "Let's face it," writes J. C. Herz in her book *Joystick Nation*, "[the $100 million special-effects extravaganzas] are big screen video games anyway."[4] Soon after the George Lucas *Star Wars* films came the Lucas video

games. LucasArts, the game producing part of Lucas' empire, produces constant revenue and cash flow in between the big hits of the movies.

Sony's Walkman® made its debut in 1978. As of 2000, over 300 million of them (counting clones) have been sold. [5]

MTV began broadcasting in 1981, introducing a new style of fast-cut video that matched the speed of the games and movies. Recent high school graduates and B.A. hires in the United States *have never known a world without it*. Music videos with over one hundred images a minute have been part of their entire life.

The IBM PC was also introduced in 1981, bringing with it a whole new level of gaming. "When the PC came out and you could really start doing some thinking gaming, that's what hooked me," says Pete Goettner, 36, and now CEO of Digital Think. I wasn't doing that when I was 12 but I was doing it when I was 18 and as more product became available I got hooked on it."[6] One of the oldest of this cohort, he's been playing computer games for half his life.

Need I go on?

With these and many other radical changes and innovations in technology almost too numerous to mention (add the pocket calculator, the Atari, the Apple II, the VCR, the Handicam®, the compact disc and Diskman®, the wireless telephone, the Internet, the MP3 player, etc), young people's growing-up experiences and recreational interests in the last third of the twentieth century shifted radically. Today's schoolchildren, elementary through college, travel with their own personal Game Boys®, Handicams®, cell phones, portable CD and MP3 players, pagers, laptops and Internet connections, most of which are within their own personal budgets.

Each day the average teenager in America watches over 3 hours of television,[7] is on the Internet one-half hour,[8] and plays 1½ hours of video games.[9] By the time these people enter our companies as workers, we can conservatively estimate that they would have watched over twenty thousand hours of television, [10] played over ten thousand hours of videogames,[11] seen hundreds of movies in theaters and on videotape, and been exposed to over four hundred thousand television commercials,[12] adding up to tens of millions of images. They've almost certainly read fewer books than their parents, but even if they were the most voracious of readers, they would not have spent more than three to four thousand hours at it. [13]

Since their earliest years, the workers now coming in to our companies have solved daily mysteries (*Blues Clues, Sherlock Holmes*); built and run cities (*Sim City*), theme parks, (*Roller Coaster Tycoon*), and businesses (*Zillionaire, CEO, Risky Business, Start-up*); built civilizations from the ground up (*Civilization, Age of Empires*); piloted countless

airplanes, helicopters, and tanks (*Microsoft's Flight Simulator, Apache, Abrams M-1*); fought close hand-to-hand combat (*Doom, Quake, Unreal Tournament*); and conducted strategic warfare (*Warcraft, Command and Conquer*)—not once or twice, but over and over and over again, for countless hours, weeks and months, until they were really good at it.

And, of course, there's the Internet. The Internet and email have been an integral part of the lives of many if not most of our newest hires for at least six years, the entire life of the World Wide Web. Instant messaging has already been with them for a year or two, and for each succeeding class of incoming hires, this time will have been longer.

None of this stuff is "technology" for them. As Alan Kay reminds us, "technology is only technology if it was invented after you were born." [14] This is their world, just as much as cars or the telephone was the world of their parents. As Don Tapscott points out in *Growing Up Digital*,[15] "Today's kids are so bathed in bits that they think it's all part of the natural landscape."

So, *half* our current workers, and *all* our future workers (excluding the temporary effect of retirees re-entering our hot labor market) were raised with a very different set—a *digital* set—of key formative experiences. Their environment surrounded and literally "bathed" them in digital media. The members of this generation were assaulted continuously, during almost every waking hour, by multiple new forms of technological stimulation, from MTV to fast action films to the Internet, which was totally absent from previous generations. Anyone born in the United States after 1961 almost certainly grew up with digital games in their life, either at home or at a mall or movie theater.

And these experiences have produced *major*, although largely undocumented and understudied, effects on these people. As a result of growing up surrounded by this incredible array of new technologies, the under-40 generation's minds have *literally* been altered. "Rewired" is the popular term often used by many whose frame of reference is technology.

"Kids for the most part are raised on media where everything is so vivid, graphical, fast, and intense," says cognitive psychologist Ray Perez. "I'm not so sure that we really have an appreciation of what this has done to our children."[16] J. C. Herz's wonderfully written history of video games, *Joystick Nation*, has as its subtitle *How Videogames Ate Our Quarters, Won Our Hearts, and Rewired Our Minds*.[17] As we shall see, this phraseology is not very far-fetched.

The "mind alterations" or "cognitive changes" caused by the new digital technologies and media have led to a variety of new needs and preferences on the part of the younger generation, particularly—although by no means exclusively—in the area of learning. Don Tapscott's research shows that these people are "learning, playing, communicating,

working and creating communities very differently than their parents."[18] The result is a huge discontinuity, never before experienced in the history of the world.

Marshall McLuhan, who died in 1980 and never lived to see the Internet, nevertheless understood this discontinuity very well. In *War and Peace in the Global Village* he writes of the "pain and misery that result from a new technology."[19] This pain, he explains, is experienced by only two groups—those totally from the old technology, and those stuck in the middle—not by those who grow up with it. The "older technology" people (he designates people who grew up in a world dominated by print as this group) operate very much like blind people who for some reason regain their sight. "How they shrink, at first from the welter of additional stimulation, longing at times to return to the relative seclusion of their former world."[20] How often have people from today's older generation expressed this feeling of being overwhelmed?

The second group experiencing difficulty are those stuck in the middle—today's "Generation X." Having grown up with each foot in a different technological world, they are often extremely disoriented and depressed, as Copeland portrayed in his book. The *last* group though, those that grew up with the technology—the later genXers, genYers and beyond—are totally comfortable with it, not knowing any other way, and are excited by its possibilities.

The explanation for why those from the older, print-oriented generation don't "get it" is obvious to McLuhan: "The information environment and the effects created by the computer are as inaccessible to literate vision as the external world is to the blind."[21] The psychic and social impact of new technologies and their resulting environment reverses the characteristic psychic and social consequences of the old technology and its environment. In fact, he says, "Every new technology necessitates a new war."[22]

Don't believe me? Check out your kids.

But Do They Really T*hink* Differently?

Different kinds of experiences lead to different brain structures.
-Dr. Bruce D. Berry, Baylor College of Medicine

Baby Boomers, who include the vast majority of today's trainers and teachers, grew up with the clear understanding that the human brain doesn't physically change based on stimulation it receives from the outside, especially after the age of 3. "Ever since the 1950s one of the great themes in neuroscience had been that neurons in the cortex matured during a critical period in the first few years of life, and that the brain's organization did not change much after that," says neurobiologist Michael Merzenich of

the University of California–San Francisco.[23] But it now turns out that that view is, in fact, *incorrect*.

Based on the latest scientific research and evidence in neurology, there is no longer any question that stimulation of various kinds actually changes brain structures and affects the way people think, and that these transformations go on throughout life. The brain is, to an extent not at all understood or believed to be when Baby Boomers were growing up, *massively plastic*. It can be, and is, constantly reorganized**.** (Although the popular term *rewired* is somewhat misleading, the overall idea is right—the brain changes and organizes itself differently based on the inputs it receives.) The old idea that we have a fixed number of brain cells that die off one by one has been replaced by research showing that our supply of brain cells is replenished constantly.[24] The brain *constantly* reorganizes itself *all our child and adult lives*, a phenomenon technically known as *neuroplasticity*. According to Paula Tallal, co-director of the Center for Molecular and Behavioral Neuroscience at Rutgers University, "you create your brain from the input you get."[25]

"It is clear that the brain is far from immutable,"[26] writes Dr. Marion Diamond of the University of California and one of the early pioneers in this field of neurological research. She and her team found that rat pups in "enriched" environments showed brain changes compared with those in "impoverished" environments after as little as two weeks. Sensory areas of their brains were thicker, other layers heavier. Changes showed consistent overall growth, leading to the conclusion that *the brain maintains its plasticity for life*.[27] G. Reid Lyon, a neuropsychologist who directs reading research funded by the National Institutes of Health, concurs. "The brain is malleable and continues to be plastic to and responsive to the environment to a greater degree than people have thought in the past," he says. "This is pretty promising information."[28]

In addition to Dr. Diamond's rats, other experiments leading to similar conclusions include the following:

- In a study done on ferrets, brains were actually physically rewired, with inputs from the eyes switched to where the hearing nerves went and vice versa. The brain changed to accommodate the new inputs.[29]
- Imaging experiments done on blind adults showed that when they learned Braille, "visual" areas of their brains lit up. Deaf people use their auditory cortex to read signs.[30]
- When researchers scanned the brains of people who were tapping their fingers in a complicated sequence that they had practiced for weeks, a larger area of motor cortex became activated then when they performed sequences they hadn't practiced.[31]
- Japanese subjects were trained to "reprogram" their circuitry for distinguishing "ra" from "la," a skill they "forget" soon after birth because their language doesn't require it.[32]

- Dr. Jay Hirsch and Dr. Karl Kim found that an additional language learned later in life goes into a different place in the brain than the language or languages learned as children.[33]
- Carefully designed intensive reading instruction experiments with students aged 10 and up appeared to create lasting chemical changes in key areas of the subjects' brains.[34]
- Harvard neurobiologist Mark Jude Tramano found that a comparison of musicians versus nonplayers using magnetic resonance imaging showed a 5 percent greater volume in the musicians' cerebellums, ascribed to adaptations in the brain's structure resulting from intensive musical training and practice.[35]

Brain plasticity research is being conducted by a large community of scientists. And we are only at the very beginning of understanding the implications of and applying this work. "Ultimately, says Dr. Merzenich, a founder along with Dr. Tallal of the education company Scientific Learning, this strategy will lead to neuroscience-based education."[36] Scientific Learning has created products that seek, based on brain research, to "reprogram" the brains of children with certain types of reading difficulties, with impressive results (see Chapter 7).

As if the news on brain plasticity from the neurologists and neurobiologists were not enough, there is evidence from social psychology as well. Western philosophers and psychologists have long taken it for granted that the same basic processes underlie all human thought. Although cultural differences might dictate what people think *about*, the *strategies* and *processes* of thought, which include logical reasoning and a desire to understand situations and events in linear terms of cause and effect, are the same for everyone. However this, too, appears to be wrong.

Research by many social psychologists—including work by Alexandr Luria [37] in the Soviet Union, who showed that collectivized versus noncollectivized peasants used different kinds of logic, and work by Dr. Richard Nisbett of the University of Michigan, who compared European Americans and East Asians [38]—shows that people who grow up in different cultures do not just think about different things, they actually *think differently*. The environment and culture in which people are raised affects and even determines many of their thought processes.

"We used to think that everybody uses categories in the same way, that logic plays the same kind of role for everyone in the understanding of everyday life, that memory, perception, rule application and so on are the same," says Dr. Nisbett. "But we're now arguing that cognitive processes themselves are just far more malleable than mainstream psychology assumed." [39]

So, people who undergo different inputs from the media and culture that surround them can, and do, think differently. However a person's thinking patterns do not just change

overnight. A key finding of brain plasticity research is that brains do *not* reorganize casually, easily, or arbitrarily. "Brain reorganization takes place only when the animal pays attention to the sensory input and to the task," writes John Bruer in *The Myth of the First Three Years*.[40] "It requires very hard work," says Lyon.[41] Scientific Learning's Fast ForWard program requires students to spend 100 minutes a day, 5 days a week, for 5 to 10 weeks to create desired changes, because "it takes sharply focused attention to rewire a brain."[42]

Several hours a day, five days a week, sharply focused attention—does that remind you of anything? Oh, yes—video games! That is exactly what children have been doing ever since *Pong* arrived in 1974. They have been adjusting or programming their brains to the speed, interactivity, and other factors in the games, much as boomers' brains were programmed to accommodate television. This may not, in fact, be even the second time this "brain reprogramming" has happened. Some scientists suggest at least two other major "brain programmings" in human history—one dealing with the need to deal with radical change[43] and the other to deal with the invention of written language and reading[44] where the brain had to be retrained to deal with things in a highly linear way. "Reading does not just happen," says University of California–Davis neurology expert Kathleen Baynes. "It is a terrible struggle."[45] Neuroscientist Michael S. Gazzaniga at Dartmouth adds: "reading is an invention that is going to have a different neurology to it than the things that are built into our brain, like spoken language."[46] In fact, one of the main focuses of traditional school for the hundreds of years since reading became a mass phenomenon has been retraining our speech-oriented brains to be able to do reading. Again, the training involves several hours a day, five days a week, and sharply focused attention.

So here is the interesting and important part of the problem. Just when we've figured out (more or less) how to retrain brains for reading, they were retrained again by television. Now things have changed *yet again*, and our children are out furiously retraining their brains to think in newer ways, many of which, as we shall observe, are antithetical to older ways of thinking. This is one of the key tensions at the root of many of today's training and education problems.

"Linear thought processes that dominate educational systems now can actually retard learning for brains developed through game and Web-surfing processes on the computer," says Peter Moore, editor of the human resources newsletter *Inferential Focus*.[47] This may help explain the attitude of the high school student who complains that "every time I go to school I have to 'power down.'"

According to William D. Winn, the director of the Learning Center at the University of Washington's Human Interface Technology Laboratory, children raised with the computer "think differently from the rest of us. They develop hypertext minds. They leap around. It's as though their cognitive structures were parallel, not sequential."[48]

Moore reports that teenagers use different parts of their brain and think in different ways than adults when at the computer. We know now that it actually goes further. Their brains are actually *physiologically* different. But these differences, most observers agree, are less a matter of kind than a difference of degree. For example as a result of repeated experiences, particular brain areas are larger and more highly developed, and others are less so.

Patricia Marks Greenfield, professor of psychology at the University of California–Los Angeles, has been a long-time student of the effects of media on socialization and cognitive development. Greenfield reports that she became interested in this field when she realized that her son, then about 11, was developing thinking skills through playing video games that she didn't have.

Greenfield has studied and published extensively on the effects of video games on players' minds. She was one of the first to study this area, publishing her first book on the subject, *Mind and Media*,[49] in 1984. Many of her original ideas are just now finding wider acceptance. Greenfield has found that skills developed as a result of playing video games go far beyond the hand–eye coordination skills most often cited. "Videogames are the first example of a computer technology that is having a socializing effect on the next generation on a mass scale, and even on a worldwide basis," she wrote in 1984. "What is the person like who has been socialized by the technologies of television and video games? So far it appears that he or she may have more developed skills in iconic representation than the person entirely socialized by the older media of print and radio. The videogame and computer, in adding an interactive dimension to television, may also be creating people with special skills in discovering rules and patterns by and active and interactive process of trial and error."[50]

Among Greenfield's findings are the following:

- Playing video games augments skill in reading visual images as representations of three-dimensional space (representational competence). This is a combination of several competencies, including partnering with the computer in the construction of the representation, using the joystick (or other controller) as a "distanced" representational tool, working in real-time, multidimensional visual-spatial skills, and mental maps.
- Skill in computer games enhances, and is a causal factor in, other thinking skills such as the skill of mental paper folding (i.e. picturing the results of various origami-like folds in your mind without actually doing them.) . What is important, she finds, is this is a *cumulative* skill—there is no effect on mental paper folding from playing the game for only a few hours. These effects were found in other studies as well.
- Because no one tells you the rules in advance, video games enhance the skills of "rule discovery" through observation, trial and error, and hypothesis testing. In Greenfield's words, "the process of making observations, formulating hypotheses and

figuring out the rules governing the behavior of a dynamic representation is basically the cognitive process of *inductive discovery* … the thought process behind scientific thinking." Computer games, she finds, require this skill.

- Video game skills transfer to and lead to greater comprehension of scientific simulations, due to increased ability to decode the iconic representation of computer graphics.
- Playing video games enhances players' skills at "divided attention" tasks, such as monitoring multiple locations simultaneously, by helping them appropriately adjust their "strategies of attentional deployment." Players get faster at responding to both expected and unexpected stimuli.

"Are these technologies in the process of creating a new person?" she asks. Her answer is that the cognitive skills are not new, but the particular combination may well be. That observation was made in 1984. Since that time, Greenfield's subsequent research has confirmed and enhanced her earlier findings.[51] It is clear that we now have a new generation with a very different mix of cognitive skills than its predecessors—the Games Generation**.**

Digital Media: A Second Language

Many people have referred to young people's facility with computers as a second language, one that their elders do not speak, or at least not as well as the young people do. "For adults computer skills are a tool, but for teenagers using computers has become a second language," writes Moore. It is an apt metaphor. Citing the experiments of Doctors Hirsh and Kim, mentioned above, Moore suggests that "teenage facility with the computer, like language facility acquired in infancy, may well emerge from a part of the brain that adults do not use while doing the same computer operations."[52]

McLuhan also refers to these facilities in terms of language: "To educate the 'turned-on' teenager in the old mechanical style is like asking a three-year-old who has just learned English to talk pidgin-English or to use a heavy Scottish brogue. These things are not in his environment and therefore not cognizable."[53]

The Games Generations—others use the terms *N*-[for Net]-*gen* or *D*-for digital]-*gen*—are *native speakers* of the digital language of computers, video games and the Internet. Those of us who were *not* born into this world but have, at some later point in our lives, become fascinated by and adopted many or most aspects of the new technology are, and will always be, compared to them, "digital immigrants." (I am indebted to Sylvia Kowal of Nortel for sparking these ideas.) [54] And like all immigrants, as we learn—some better than others—to adapt to our new environment, we always retain, to some degree, our "accent," that is, our foot in the past. The digital immigrant accent can be seen in such things as turning to the Internet for information second rather than first, or in reading the

manual for a program rather than assuming that the program itself will teach us to use it. We older folk have not been "socialized," to use Greenfield's term, in the same way as our children. Remember, a language learned later in life goes into a different part of the brain.

Contest 1: What are other good examples of the "digital immigrant accent?" Email your entries to www.twitchspeed.com . The winner each quarter will receive something related to Digital Game-Based Learning and a mention on the site!

Different from TV: Manipulating Versus Watching

As I mentioned earlier, television performed some "mind programming" of its own on the Baby Boomer generation and beyond. But to understand today's Games Generation learners it is key for us to distinguish and separate those mind changes that come from television from the mind changes of the next generations, influenced as well by *interactive* technologies such as video and computer games and the Internet**.** The key difference is that the Games Generations are *active participants* rather than passive observers. Greenfield calls video games "the first medium to combine visual dynamism with an active, participatory role for the child."[55] "They want to be users, not just viewers or listeners," reports Tapscott.[56] Janet Murray refers to this as "agency;" "the satisfying power to take meaningful action and see the results of our decisions and choices." [57]

While the difference between watching and participating is *very* important, it is, of course, not an either/or proposition. As anyone can observe, many people, children and adults, both play video games and watch television. Even game designers concede this, with some regret. "I don't believe that interactive entertainment will dominate other forms of entertainment this coming century," says Scott Miller of Apogee "I think, for the most part, people prefer passive entertainment, like TV, watching sports, and attending movies, where you can veg out and just enjoy what's in front of you. But there's little doubt that digital gaming will continue to grow."[58] Adds Brett Sperry of Westwood Studios: "We will always have books, movies, magazines, and television. Passive forms of entertainment are here to stay. However, we will see an incredible array of new interactive options, delivered in a few different ways. Everything you do now for entertainment purposes will become interactive in some way."[59] Although they use both active and passive media, Games Generation members often *prefer* video games and the Internet to television because of their interactivity. A 9-year-old girl commented to Greenfield, "in TV, if you want to make someone die, you can't. In PacMan if you want to run into a ghost you can."[60]

The point is that although both forms of entertainment will continue to coexist, the Games Generation now lives much more in an *interactive* world—with the emphasis on

the "active." So when trainers or teachers from the Baby Boomer generation bring in passive video, in any way, shape, or form—as they love to do—they many think they are doing their learners a favor. But what today's learners crave is *interactivity*—the rest basically bores them to death.

So What A*bout* Attention Spans?

When I present the idea at training conferences that the interactive media-influenced Games Generations "think differently," I get a lot of "pushback" (training jargon for disagreement.) The reaction I have heard many times, often with a great deal of anger, is "you're just talking about traditional Myers-Briggs distinctions" (Myers and Briggs created a widely used test of thinking styles). About the only consensus I hear is that younger employees are generally rude and that their attention spans are shorter. In fact "the attention span of a gnat" has become such a common cliché that it just rolls off the tongue. But is this really true? Is it that they *can't* pay attention or that they *don't*?

"I don't buy that these kids have short attention spans," says Dr. Edit Harel, author of the book *Children Designers* and founder of MaMaMedia. "They think in different ways than adults. Sometimes they are multitasking. Other times they can get into something and spend many hours on it if it makes sense to them."[61] "I always believed that kids didn't have short attention spans," says Todd Kessler, Nickelodeon producer of *Blues Clues.*[62]

Older-generation folks often watch younger employees lose patience and tune out to traditional training. Management and trainers may conclude that their attention spans must be short, but it just isn't true. I contend that the people who hold these short attention span views have not been watching or listening to younger people closely enough. In the words of Edward Westhead, a former biochemistry professor at the University of Massachusetts at Amherst,, "Sure they have short attention spans—for the old ways of learning."[63] Their attention spans are *not* short for games, for example, or for music, or for rollerblading, or for spending time on the Internet, or anything else that actually interests them. Traditional training and schooling just doesn't engage them. It isn't that they *can't* pay attention, they just *choose not to.*

Concerning attention spans, there are two relative newcomers to the medical lexicon, widely discussed in the last decade or so: *attention deficit disorder* (ADD) and its sister, *attention deficit hyperactivity disorder* (ADHD). (The whole thing used to be known as *hyperactivity*.) This so-called disease is diagnosed in an enormous number of children, who are often treated with Ritalin and other drugs. Dr. F. Xavier Castellanos, who heads the attention deficit hyperactivity research unit at the National Institutes of Health, says: "Everyone knows people with attention deficit who can concentrate well enough to play computer games for hours."[64] Some researchers say ADD comes from an inability of a

person's brain to produce extended beta, as opposed to theta, waves.[65] Determining whether a child's attention deficit is a result of illness or of boredom is not always easy, and we don't always get it right. But even when we do, interestingly enough, it is video games—the holders of even *these* children's attention—that are increasingly used to retrain children's brains and help them concentrate, as we shall see in Chapter 7.

In his book *The Tipping Point*,[66] Malcolm Gladwell cites research done for *Sesame Street* that revealed that children do not actually watch television continuously, but "in bursts." They tune in just enough to get the gist and be sure it makes sense. The assumption before the research involving sophisticated eye measurements was that children sit there like zombies, attracted by all the "eye candy"—the glitz and glitter of the medium. But that was not what they found. "The idea that kids would sit, stare at the screen and zone out," said Elizabeth Lorch, a psychologist at Amherst College. "But once we began to look carefully at what children were doing we found out that short looks were actually more common. There was much more variation. Children didn't just sit and stare. They could divide their attention between a couple of different activities. And they weren't being random. There were predictable influences on what made them look at the screen, and these were not just trivial things, not just flash and dash."[67]

In one key experiment, half the children were shown the program in a room filled with toys. As expected, the group with toys was distracted and watched the show only about 47 percent of the time as opposed to 87 percent in the group without toys. But when the children were tested for how much of the show they remembered and understood, the scores were exactly the same. "We were led to the conclusion that the 5-year-olds in the toys group were attending quite strategically, distributing their attention between toy play and viewing so that they looked at what was for them the most informative part of the program. The strategy was so effective that the children could gain no more from increased attention." In another experiment, sequences were presented out of order, and the children lost interest, despite the same flash and characters.[68]

This ability to choose selectively what counts for us and to learn through distraction is perhaps not a new phenomenon, but is vitally important in an age of bombardment by digital media. It is the phenomenon that will later be observed in children doing their homework with television, working listening to music, and is a key, as we shall see, to improving and speeding up learning and training.

Reflection: The Disappearing Skill?

Maybe, just maybe, I have begun to convince you that many of those new skills and ways of thinking that the Games Generation learned growing up are different, and even that many of them are positive. But what about all the criticisms that we constantly hear from teachers about problems with reading and thinking? What, if anything, has been *lost* in

the "programming" process? This is certainly an area of great importance to us as trainers, teachers, and educators.

As I read and spoke to people during the research for this book, one key word began to come up over and over again—*reflection*. Reflection is what enables us, according to many theorists, to generalize, as we create "mental models" from our experience. It is, in many ways, the *process* of "learning from experience." The ability to stop and reflect is what distinguishes reading a book—where one can pause and think whenever one chooses—from a twitch-speed video game, or an Internet-speed business, for that matter, where if you stop, you die. In our twitch-speed world, there is less and less time and opportunity for reflection, and this development concerns many people.

Says J. C. Herz: "I think that attention spans are shorter in large part because the culture is much less formal than it was, and the idea of sitting down and concentrating is ultimately a spiritual issue among other things, as much as it is a psychological issue. And if you live in a consumerist society where it's about grabbing something new, or acquiring another object, or just being able to toss references back and forth, contemplation is not really valued or valuable in that space—it doesn't do anything for you. Although of course we actually need it to actually ground ourselves. Which is what's ignored."[69]

Clifford Stoll, a self-appointed contrarian from whom we shall hear much more in Chapter 14, thinks that learning games "substitute quick answers and fast action for reflection and critical thinking."[70]Jane M. Healy writes that "fast paced, nonlinguistic and visually distracting television may literally have changed children's minds, making sustained attention to verbal input, such as reading or listening, far less appealing than faster paced, visual stimuli."[71]

One of the most interesting challenges and opportunities in Digital Game-Based Learning is to figure out and invent ways to *include* reflection and critical thinking (either built into the game or through a process of instructor-led debriefing) with the learning *and still make it a fun game*. There are many genres of games that already allow for this (think of chess.) It is something that many users of simulation games, such as the military, have been doing for a while. Some of the Digital Game-Based Learning examples that I will discuss in Chapters 9 and 10 have taken interesting steps in the direction of building reflection and critical thinking into the software. But we can and must do more in this area.

Ten Ways the Games Generation Is Different

Exactly *how* is the Games Generation, who grew up in the last quarter of the twentieth century, different from other generations? Here's one example. Growing up on twitch-

speed video games, MTV (more than 100 images a minute), and the ultrafast speed of action films, the Games Generation's minds have been programmed to adapt to greater speed and thrive on it. Yet when they go to school or go to work, educators and trainers typically give them all the "nontwitch" features of the past: "tell-test" education, boring corporate classrooms, poor speakers lecturing at them, talking-head corporate videos, and, lately, endless "click and fall asleep" courses on the Internet.

Speedwise, we effectively give them depressants, and then we wonder why they're bored! This is no doubt a big part of what the student means when he complains about having to "power down" at school.

Below are ten of the main cognitive style changes that I have observed in the Games Generation, all of which raise a number of important and difficult challenges for education, training, and business in general:

1. Twitch speed vs. conventional speed
2. Parallel processing vs. linear processing
3. Graphics first vs. text first
4. Random access vs. step-by-step
5. Connected vs. standalone
6. Active vs. passive
7. Play vs. work
8. Payoff vs. patience
9. Fantasy vs. reality
10. Technology-as-friend vs. technology-as-foe

Let's examine each of these in turn to see why the change represents a break from the past, and what it implies in terms of new learning needs.

Twitch Speed vs. Conventional Speed

The Games Generation has had far more experience at processing information quickly than its predecessors and is therefore better at it. Scrolling rapidly through a huge genetic database for matches to a gene he believes is involved in diabetes, Dr. Gary Ruvkun, a thirty-ish medical researcher, comments "You learn how to read these as they are ratcheting by. I think MTV is good training."[72] Of course, humans have *always* been capable of operating at faster-than-"normal" speeds, as airplane pilots, racecar drivers, and speed-reading guru Evelyn Wood can attest. The difference is that this ability has now moved into a generation at large and at an early age, as Professor Greenfield noted early on. A big problem the generation faces is that, after MTV and video games, they essentially hit a brick wall (short of piloting a jet, little in real life moves that fast)—

hence the "depressants." In the workplace, we see the Games Generation's need for speed manifesting itself in a number of ways, including a demand for a faster pace of development, less "time-in-grade" before promotions, and shorter lead times to success.

An important challenge for today's business managers is how to speed up their assumptions around how quickly things can be done, while still keeping sight of other key objectives, such as quality and customer relationships. They need to create training and other experiences that maintain the pace and exploit the facility of twitch speed while adding content that is important and useful. Digital Game-Based Learning is one of the ways they can do this.

Parallel Processing vs. Linear Processing

The mind can actually process many tracks at once. Much of the Games Generation grew up doing homework while watching television and doing almost everything while wearing a Walkman. They often feel much more comfortable than their predecessors when doing more than one thing at the same time.. Although some argue that parallel processing limits attention to any one task, this is not necessarily the case—the mind typically has quite a bit of "idle time" from its primary task that can be used to handle other things. "There is no question that people can learn to do quite a bit of parallel processing in certain job situations, such as a lot of military jobs," says Dr. Susan Chipman, a researcher at the Office of Naval Research. Whether parallel processing is what is going on when one focuses on homework, televisions and Walkmen® all at the same time still, she thinks, needs to be proved: "One would have to do experimental testing to determine that."[73] Nonetheless, today it is common to see young computer artists creating complex graphics while listening to music and chatting with co-workers, young businesspeople having multiple conversations on the phone while reading their computer screens and email, and securities traders managing multiple screens of information simultaneously. Professor Greenfield cites parallel processing as a "cognitive requirement of skillful video game playing."[74]

In fact, as we saw previously, non-parallel thought processes may actually *retard* learning for brains developed through computer games and Web-surfing .[75]

This growth of parallel-processing ability appears to have been acknowledged by Michael Bloomberg in creating his *Bloomberg TV News*, in which the anchorperson takes up only one-quarter of the television screen, the remainder being filled with sports statistics, weather information, stock quotes, and headlines, all presented simultaneously. It is quite possible, and even fun, for a viewer to take in all of this information and receive much more "news" in the same amount of time.

"Does this mean we are taking in more but at a lower depth?" ask some. Maybe. But it's a fact of life that this is how information is presented and received and we have to find new ways to get depth. This may be one reason why more and more people get their news from the Web. More depth, if and when you want it, is only a click away.

Managers, trainers, and educators need to be thinking of additional ways to enhance parallel processing for the Games Generation to take advantage of this now more highly enhanced human capability. We can, whether in training or elsewhere, feed them much more information at once than has been done in the past. Watch any of them surf the Net—they'll have dozens of windows open simultaneously. Having all the information needed to do their job at their fingertips—numbers, video feeds, links, simultaneous meetings, and the ability to move seamlessly between them—is the Games Generation worker's nirvana.

Random Access vs. Step-by-Step

The Games Generation is the first to experience hypertext and "clicking around," in edutainment, in CD-ROMs, and on the Web. The result is the "hypertext minds leaping around" that William Winn speaks of [76]. Tapscott reports that the N-gen child takes in and outputs information differently. It typically comes from multiple sources and occurs in a less sequential manner.[77] This new, less sequential information structure has increased the Games Generation's awareness and ability to make connections, has freed them from the constraint of a single path of thought. In many ways it is an extremely positive development.

At the same time, some argue, with justification, that unbridled hyperlinking may make it more difficult for these workers to follow a linear train of thought and to do some types of deep or logical thinking. "Why should I read something from beginning to end, or follow someone else's logic, when I can just 'explore the links' and create my own?" they might, and do, say. Although following one's own path often leads to interesting results, understanding someone else's logic is also very important. A difficult challenge is how to create experiences that allow us to link anywhere and experience things in any order yet still communicate sequential ideas and logical thinking.

Yet what has been lost in linearity may have been made up for by a greater ability to perceive, and think in, structure and patterns. Says Marshall McLuhan: "Our electronically configured world has led us to move from the habit of data classification to the mode of pattern recognition. We can no longer build serially, block-by-block, step-by-step, because instant communication insures that all factors of the environment and of experience coexist in a state of active interplay."[78] At least one young person interviewed reports that because of his experiences with today's technology he thinks in terms of structures and sees conceptual structures very quickly.[79]

Graphics First vs. Text First

In previous generations, graphics were generally illustrations, accompanying the text and providing some kind of elucidation. For today's Games Generation, the relationship is almost completely reversed: The role of text is to elucidate something that was first experienced as an image. Since childhood, these people have been continuously exposed to television, videos, and computer games that put high-quality, highly expressive graphics in front of them with little or no accompanying text.

The result has been to acutely sharpen their visual sensitivity. They find it much more natural than their predecessors to begin with visuals, and to mix text and graphics in a richly meaningful way. A well-known exploiter of this capability is *Wired* magazine, whose intensive use of graphics makes it highly appealing to Games Generation readers yet difficult for many older folks to digest. "Why can't they just give us the plain text?" is a complaint I heard often from colleagues, particularly at the magazine's inception.

Professor Greenfield has documented these increases in representational skill and iconic understanding, citing a worldwide rise of "performance" or "nonverbal" IQ, which she terms *visual intelligence*.[80] Technology, and particularly video games, figures importantly in her explanation for this phenomenon. It is linked to other changes we are discussing as well, since, in her words, "pictorial images, in general, tend to elicit parallel processing."

This shift toward graphic primacy in the younger generation does raise some extremely thorny issues, particularly with regard to textual literacy and depth of information. The challenge is to design ways to use this shift to enhance comprehension, while still maintaining the same or even greater richness of information in the new visual context. Computer and video games designers are specialists in this area, which is a great advantage of Digital Game-Based Learning.

Another potential opportunity to use this heightened visual perception is to speed up learning by allowing the user to take in a great deal of information at once. Already, as we have seen, makers of MTV-style videos often include hundreds of images a minute, showing each image for a few tenths of a second. But a few *thousandths* of a second is all it actually takes for an image to register. In an experiment at Massachusetts General Hospital (MGH), Paul Whelan, Dr Scott Rauch, and co-workers found that humans could perceive images that activate their fear circuitry without even being aware of it. The MGH researchers used an approach known as *masking*; they showed subjects in an magnetic-resonance imaging (MRI) machine photographs of fearful faces for a mere 33 milliseconds, followed by a longer, masking exposure to expressionless faces for 167 milliseconds. The subjects had no conscious memory of seeing the fearful faces, yet their

brains unequivocally did; the amygdala lighted up even during the brief flash of a fearful face but not during the similarly brief exposure of a happy face. Whelan feels this super-quick exposure is a "very fast and preferential way" to get information.[81]

Connected vs. Standalone

The Games Generation has been raised with, and become accustomed to, the worldwide connectedness of email, broadcast messages, bulletin boards, usegroups, chat, multiplayer games, and instant messaging. Although the previous generation was linked by the telephone, that system is basically synchronous and expensive. The Games Generation's connectedness is *both* synchronous and asynchronous—anytime, anywhere, at almost no cost. The asynchronous part—email, newsgroups, bulletin boards—is now their preferred means of communication in many cases. The synchronous part—multiplayer games, instant messaging, voice telephony—use of which is now increasing because of bandwidth, is different because cost is no longer a factor. People can be contacted, spoken to and played with—somewhere in the world—24 hours a day.

Some argue that this leads to "depersonalization," because people meet, chat, play, and even work on the Web without ever seeing one another or knowing the other people's names or genders. But people who do this often find it enormously liberating and fun to be freed of all the effects of "lookism" (a term discussed by William Safire in his New York Times column "On Language"[82]) and other prejudices. Clark Aldrich of Gartner Group cites the situation of *Star Trek* fans banding together on the Web to create new types of spaceships for the game *Starfleet Command* in order to get around a licensing agreement between the maker of the game and Paramount which limited the number of ship types in the game. Teams self-organized over the Internet and created all the necessary parts: wireframe models, outside "skins," specifications and armaments, and even the stories around these ships, without ever meeting in person at all. Says Aldrich, "people say classrooms are great because people can see each other. That's sort of a characteristic of our [i.e. the older] generation but not the next one, who are very comfortable working with people they've never met, frankly never even knowing how old they are, not knowing or caring about their background, just nothing. Its simply what can you produce, and if you're not producing something good than I'll move on to the next person."[83] It's a different world, and you'd better get used to it.

As a result of their "connected" experience, Games Generation people tend to think differently about how to get information and solve problems. For example, if I need a question answered, I'll typically call the three or four people I think might know. It might take me time to get to them, and take them a while to get back to me. When my 32-year-old programmer wants to know something, he immediately posts his question to a bulletin board, where three or four thousand people might see it, and he'll probably have

a much richer answer more quickly than I would get via the phone. It took me a while to get used to using the Net for research, but the quantity and variety of material I found available was staggering. The Games Generation takes this availability for granted—just as I took the Forty-Second Street library for granted growing up in New York.

The challenge for all business managers, trainers, and teachers who are *not* from the Games Generation is to invent ways of taking advantage of this connected mode in their interactions with those people, as the Games Generation people do among themselves. (How many trainers, for example, instant message with their trainees, particularly outside of formal training?) The more we help connect all employees "mentally" as well as physically to one another—and to customers—the quicker *they* will invent positive ways to take advantage of this cognitive change. Digital Game-Based Learning is one way to do this.

As we saw, the "connectedness" of the Games Generation has also made them much less constrained by their physical location and more willing to work in the so-called virtual teams that are becoming more useful in a variety of businesses and industries. Workers who have grown up online tend to be much more comfortable with seeking out and working with the best, most knowledgeable people, wherever they may be. Such virtual teams often recruit one another via messages on the Internet, operate smoothly from widely scattered parts of the world, and many never physically meet their clients or one another. As they finish their day, software developers around the globe often electronically forward their work to a colleague in another country who is just waking up. Trainers, teachers, and managers need to become more adept at managing these connected capabilities and directing the acquisition, enhancement, and appropriate deployment of information, knowledge, and intellectual capital in schools and companies and around the world.

Active vs. Passive

One of the most striking cross-generational differences can be observed when people are given new software to learn. Older folks almost invariably want to read the manual first, afraid they won't understand how the software works or that they'll break something. Says Joanne Veech of PricewaterhouseCoopers: "The 40 and 50 year old group that have seen *In$ider* ask how to use it. They are very afraid to push the buttons on the [virtual] elevators. You know how much more careful our generation is when we turn the computer on, whereas my 12 year old just goes zing, zing, zing, zing, zing—fearless. So that generation of newcomers to PricewaterhouseCoopers, those 20-somethings that have grown up over 20 years with this fearless environment, when they get to this, it's very natural for them. It's a gaming environment—it becomes second nature, they don't think twice about clicking on a plant or clicking on an elevator or seeing what the buttons do."[84]

Games Generation workers rarely even *think* of reading a manual. They'll just play with the software, hitting every key if necessary, until they figure it out. If they can't, they assume the problem is with the software, not with them—software is *supposed* to teach you how to use it. This attitude is almost certainly a direct result of growing up with Sega, Sony, Nintendo, and other video games where each level and monster had to be figured out by trial and error, and each trial click could lead to a hidden surprise. Games are almost all designed to teach you as you go..

We now see much less tolerance in the workplace among the Games Generations for passive situations such as lectures, corporate classrooms, and even traditional meetings. As the Games Generation progresses up the managerial ranks, it is likely that such old-fashioned managerial standbys will be replaced by more active experiences such as chat, posting, surfing for information, and Digital Game-Based Learning, where employees not only more are active but also have more control over what happens. The processes of "designing for doing," and "designing for learning" (i.e., designing systems and experiences that employees can actively use to learn, instead of things they need to listen to or be afraid of doing wrong) may become the new generational equivalent of the industrial "designing for manufacture," where making the product is an important consideration in the design process. Nike's "Just do it"" slogan (which began in 1988!) hits this generational change squarely on the head.

Play vs. Work

Members of the Games Generation are often derided in the press as intellectual slackers, but in reality they are very much an intellectual-problem-solving-oriented generation. Many types of logic, challenging puzzles, spatial relationships, and other complex thinking tasks are built into the computer and video games they enjoy. Their spending on such electronic games has surpassed their spending on live movies, and PCs are now used more for running entertainment software than for anything else, including word processing. Although some have argued that play and games are simply preparation for work, I think that, for today's Games Generations, play *is* work, and, as we shall see in Chapter 5, work is increasingly seen in terms of games and game play. The fact that the real-life games are very serious does not make the player's approach any different than the way he or she approaches game software. Achievement, winning, and beating competitors are all very much part of the ethic and process.

As the Games Generations enter the workforce, their preference for the computer as the medium of play is already beginning to have a profound impact on how work gets done. Game interfaces are appearing in work software. Financial companies are inventing gamelike trading interfaces in which winning the game means making an actual profit.

And more and more workers are learning to do their jobs through Digital Game-Based Learning.

One difficult challenge for managers and trainers is to be willing to let the younger generation's play attitude enter the "real" world of business as quickly and smoothly as possible. Instead of resisting play by removing or banning all games in the workplace, for example, they could be supporting and funding the development of new game interfaces that help the younger generation work and learn in their own cognitive style. Managers and trainers should reconsider their resistance to such changes carefully.

As we shall see in Chapter 9, the Games Generation's play preference has resulted in Digital Game-Based Learning being used for a great many functions in the workplace beside training, including employee recruiting, strategy communication, and customer support.

.

Payoff vs. Patience

One of the biggest lessons the Games Generation learned from growing up with video games is that if you put in the hours and master the game, you will be rewarded—with the next level, with a win, with a place on the high scorers' list. What you do determines what you get, and what you get is worth the effort you put in. Computers excel at giving feedback, and the payoff for any action is typically extremely clear.

A key outcome of this feedback is a huge intolerance on the part of the Games Generations for things that don't pay off at the level expected. Why, they ask, should I finish college when elementary school kids can design professional Web sites, 20-year-olds can start billion-dollar companies, and Bill Gates, who left Harvard to do something with more payoff, is the world's richest man?

Games Generation people make these payoff-versus-patience decisions every minute and sometimes in ways that are counterintuitive. For example, it was at first strange to me that the same people who prefer twitch games often have great patience with slow Internet connection speeds and the sometimes long waiting times in games like *Myst* or *Riven*. I suspect it is because they have decided, or realized, that the payoff is worth the wait. The challenge for managers, trainers, and teachers and is to understand just how important these payoff-versus-patience tradeoffs are to younger people, and to find ways to offer them meaningful rewards *now* rather than advice about how things will pay off "in the long run."

One clear business manifestation of this requirement for payoff is the increasing demand for a clearer link between what employees do and the rewards they get, leading to the

growing trend toward pay for performance. Another result is the increasing use of equity as a component of compensation, along with the replication of equity-like compensation structures to reward workers with a "piece of the action" for their own initiatives and efforts. The growing realization that this generation wants its payoff now has also led to an increased willingness on the part of many businesses to provide seed capital and to spin off internal startups, allowing workers to potentially cash in more quickly and allowing the firm to benefit long term through an equity position.

Fantasy vs. Reality

One of the most striking aspects of the Games Generation is the degree to which fantasy elements, both from the past (medieval, *Dungeons & Dragons* imagery) and the future (*Star Wars*, *Star Trek*, and other science-fiction imagery), pervade their lives. Although young people have always indulged in fantasy play, the computer has by its nature made this easier and more realistic, in many ways bringing it to life.

Sociologists might say that some or all of this fantasy play is due to a desire to escape the realities of today's life: fewer good jobs, more alienation, and a degrading environment. Whatever its cause, the fantasy phenomenon has certainly been encouraged by technology. Network technology allows people not only to create their new fantasy identities but also to express them to others and join in fantasy communities and games such as *EverQuest*. The fantasy card game *Magic, the Gathering*, according to J. C. Herz, "is one of the largest closeted communities in America,"[85] with national and worldwide tournaments offering tens of thousands of dollars in prizes.

Some people distinguish between the genders in this area, claiming that many of these fantasies are more "male" oriented (although there are plenty of women at *Star Trek* conventions and many avid female *Dungeons & Dragons* and fantasy game players). The whole gender area is hot topic that will be discussed later in this book. Fantasy is a large part of the adult Games Generation's lives in ways that Disney, for example is not part of the Boomers' lives.

So rather than admonish Games Generation workers to "grow up and get real" and abandon their rich fantasy worlds, trainers, educators, and managers might be better off searching for new ways to combine fantasy and reality to everyone's benefit. One place this is happening already is in the design of workspaces. Spaces designed by the younger generation are very different from those of their predecessors and from those designed for them by the older generation. Companies already run by Games Generation individuals generally have much more informal settings, and often have special rooms for games, miniature golf, and "fun" activities. Microsoft's "campus" is full of indoor and outdoor play opportunities.

The younger generation's fantasy preferences can also be seen in the growth of new off-the-wall job titles, such as Yahoo's Chief Yahoo or Gateway 2000's chief imagination officer. Young workers may be willing to go a lot further with their imaginations—Gateway decorates its shipping boxes as cows. We are also seeing an increasing debureaucratization of systems and procedures in many organizations. Perhaps it is not too far off when some companies will sport their own Klingon, Borg, or Wookee divisions doing serious business while decked out appropriately. Fantasy-based Digital Game-Based Learning is another opportunity for this, particularly if both genders are taken into account.

Technology as Friend vs. Technology as Foe

Growing up with computers has engendered an overall attitude toward technology in the minds of the Games Generation that is very different from that of their predecessors. To much of the older generation, technology is something to be feared, tolerated, or at best harnessed to one's purposes. Some, no matter how easy we make it, don't ever want to program their videocassette recorders or surf the Net. [86]

There is, of course, an increasingly large segment of the non–Games Generation workers and retirees who have learned to adopt many of the tools, technologies, and even attitudes of the Games Generation. Whether these "digital immigrants" come to the new shores willingly or are forced by circumstances to learn and accept a new, changing culture (i.e., digital technology), they will never be as entirely comfortable and trusting of the new environment as are their native-born children.

To the Games Generation, the computer is a friend. It's where they have always turned for play, relaxation, and fun. For many in this generation, owning or having access to a computer feels like a birthright. Being connected is a necessity. The huge generational reversal in technical skill, where parents must turn to their children for help in using their expensive equipment, is now legendary—Don Tapscott refers to it as the *generation lap*, as in "lapping" competitors in a race.[87] The answers to the questions, "What kind of computer will I have?" and "Will I have my own high-speed Internet connection?," are very often key factors in a young worker's decision about what job to accept.

How can an older generation of trainers, educators, and managers relate to and help employees who see computers and related technology in this way? One way is to empower them to create *their own* new business elements—computer applications, structures, models, relationships, Web pages—that make sense for their generation, or at the very least, enlist them as part of the teams creating these things. An additional approach is to continually seek ways to communicate, transfer needed information, and

build desired skills via the media the younger generation willingly engage in, such as computers and games, that is, via Digital Game-Based Learning. This was the approach of Sylvia Kowal at Nortel (see Chapter 9).

"Attitude"

In addition to all of the above, a defining characteristic of the Games Generation is "attitude"—an irreverent, often sarcastic, tell-it-like-it-is, don't-try-to pull-the-wool-over-my-eyes way of looking at things. It is probably best captured by Jellyvison's wildly successful game series *You Don't Know Jack*, in which the announcer berates you quite personally for not knowing the answers. ("What were you *thinking?*"). This may be a reaction to all the "bullshit" commercials and other television that kids grew up with. In any case "attitude" is certainly now part of their language ("Duh!") and almost a *sine qua non* for communicating with them effectively, even in—or especially in—in training. "It's got *lots* of attitude," says Paula Young proudly of *In$ider*. In fact, *not* having attitude—or, worse, doing it wrong—is definitely part of the "digital immigrant accent" and is sure to be mocked.

So in all these ways—and I'm sure there are many others—the native Games Generation is *cognitively different* from its predecessors, whether digital immigrants or not. With this in mind, let us return once more to the "attention span" question and ask "What has happened?"

To a huge, underappreciated extent in our training and education we offer the Games Generations *very little* worth paying attention to from their perspective, *and then we blame them for not paying attention.* Many of the people accustomed to the twitch-speed, multitasking, random-access, graphics-first, active, connected, fun, fantasy, and quick payoff world of their video games, MTV, and Internet feel *bored* by most of today's approaches to training and learning, well meaning as it may be. And, worse, the many skills that new technologies *have* actually enhanced (e.g., parallel processing, graphics awareness, and random access)—which have profound implications for their learning—are almost totally ignored by education and training.

So, in the end, it is *all these cognitive differences*, resulting from years of "new media socialization" and profoundly affecting and changing the generations' learning styles and abilities, that cry out for new approaches to learning for the Games Generation with a better "fit." And while certainly not the only way, computer games and video games provide one of the few structures we currently have that is capable of meeting many of the Games Generation's changing learning needs and requirements. This is the key reason why Digital Game-Based Learning is beginning to emerge and thrive.

Marc Prensky is an internationally acclaimed thought leader, speaker, writer, consultant, and game designer in the critical areas of education and learning. He is the author of Digital Game-Based Learning (McGraw-Hill, 2001), founder and CEO of Games2train, a game-based learning company, and founder of The Digital Multiplier, an organization dedicated to eliminating the digital divide in learning worldwide. He is also the creator of the sites <www.SocialImpactGames.com>, <www.DoDGameCommunity.com> and <www.GamesParentsTeachers.com> . Marc holds an MBA from Harvard and a Masters in Teaching from Yale. More of his writings can be found at <www.marcprensky.com/writing/default.asp>. Contact Marc at marc@games2train.com.