

## GAMES

YOU CAN'T GET much more conventional than the conventional wisdom that kids today would be better off spending more time reading books, and less time zoning out in front of their video games. The latest edition of *Dr. Spock*—"revised and fully expanded for a new century" as the cover reports—has this to say of video games: "The best that can be said of them is that they may help promote eye-hand coordination in children. The worst that can be said is that they sanction, and even promote aggression and violent responses to conflict. But what can be said with much greater certainty is this: most computer games are a colossal waste of time." But where reading is concerned, the advice is quite

different: "I suggest you begin to foster in your children a love of reading and the printed word from the start. . . . What is important is that your child be an avid reader."

In the middle of 2004, the National Endowment for the Arts released a study that showed that reading for pleasure had declined steadily among all major American demographic groups. The writer Andrew Solomon analyzed the consequences of this shift: "People who read for pleasure are many times more likely than those who don't to visit museums and attend musical performances, almost three times as likely to perform volunteer and charity work, and almost twice as likely to attend sporting events. Readers, in other words, are active, while nonreaders—more than half the population—have settled into apathy. There is a basic social divide between those for whom life is an accrual of fresh experience and knowledge, and those for whom maturity is a process of mental atrophy. The shift toward the latter category is frightening."

The intellectual nourishment of reading books is so deeply ingrained in our assumptions that it's hard to contemplate a different viewpoint. But as McLuhan famously observed, the problem with judging new cultural systems on their own terms is that the presence of the recent past inevitably colors your vision of the emerging form, highlighting the flaws and imperfections. Games have historically suffered from this syndrome, largely because they have been contrasted with the older conventions of reading. To

get around these prejudices, try this thought experiment. Imagine an alternate world identical to ours save one techno-historical change: video games were invented and popularized *before* books. In this parallel universe, kids have been playing games for centuries—and then these page-bound texts come along and suddenly they're all the rage. What would the teachers, and the parents, and the cultural authorities have to say about this frenzy of reading? I suspect it would sound something like this:

Reading books chronically understimulates the senses. Unlike the longstanding tradition of gameplaying—which engages the child in a vivid, three-dimensional world filled with moving images and musical soundscapes, navigated and controlled with complex muscular movements—books are simply a barren string of words on the page. Only a small portion of the brain devoted to processing written language is activated during reading, while games engage the full range of the sensory and motor cortices.

Books are also tragically isolating. While games have for many years engaged the young in complex social relationships with their peers, building and exploring worlds together, books force the child to sequester him or herself in a quiet space, shut off from interaction with other children. These new "libraries" that have arisen in recent years to facilitate reading activities are a frightening sight: dozens of young children, normally so vivacious

and socially interactive, sitting alone in cubicles, reading silently, oblivious to their peers.

Many children enjoy reading books, of course, and no doubt some of the flights of fancy conveyed by reading have their escapist merits. But for a sizable percentage of the population, books are downright discriminatory. The reading craze of recent years cruelly taunts the 10 million Americans who suffer from dyslexia—a condition that didn't even exist as a condition until printed text came along to stigmatize its sufferers.

But perhaps the most dangerous property of these books is the fact that they follow a fixed linear path. You can't control their narratives in any fashion—you simply sit back and have the story dictated to you. For those of us raised on interactive narratives, this property may seem astonishing. Why would anyone want to embark on an adventure utterly choreographed by another person? But today's generation embarks on such adventures millions of times a day. This risks instilling a general passivity in our children, making them feel as though they're powerless to change their circumstances. Reading is not an active, participatory process; it's a submissive one. The book readers of the younger generation are learning to "follow the plot" instead of learning to lead.

It should probably go without saying, but it probably goes better with saying, that I don't agree with this argu-

ment. But neither is it exactly right to say that its contentions are untrue. The argument relies on a kind of amplified selectivity: it foregrounds certain isolated properties of books, and then projects worst-case scenarios based on these properties and their potential effects on the "younger generation." But it doesn't bring up any of the clear benefits of reading: the complexity of argument and storytelling offered by the book form; the stretching of the imagination triggered by reading words on a page; the shared experience you get when everyone is reading the same story.

A comparable sleight of hand is at work anytime you hear someone bemoaning today's video game obsessions, and their stupefying effects on tomorrow's generations. Games are not novels, and the ways in which they harbor novelistic aspirations are invariably the least interesting thing about them. You can judge games by the criteria designed to evaluate novels: Are the characters believable? Is the dialogue complex? But inevitably, the games will come up wanting. Games are good at novelistic storytelling the way Michael Jordan was good at playing baseball. Both could probably make a living at it, but their world-class talents lie elsewhere.

Before we get to those talents, let me say a few words about the virtues of reading books. For the record, I think those virtues are immense ones—and not just because I make a living writing books. We should all encourage our kids to read more, to develop a comfort with and an appetite

for reading. But even the most avid reader in this culture is invariably going to spend his or her time with other media—with games, television, movies, or the Internet. And these other forms of culture have intellectual or cognitive virtues in their own right—different from, but comparable to, the rewards of reading.

What are the rewards of reading, exactly? Broadly speaking, they fall into two categories: the information conveyed by the book, and the mental work you have to do to process and store that information. Think of this as the difference between acquiring information and exercising the mind. When we encourage kids to read for pleasure, we're generally doing so because of the mental exercise involved. In Andrew Solomon's words: "[Reading] requires effort, concentration, attention. In exchange, it offers the stimulus to and the fruit of thought and feeling." Spock says: "Unlike most amusements, reading is an activity requiring active participation. We must do the reading ourselves—actively scan the letters, make sense of the words, and follow the thread of the story." Most tributes to the mental benefits of reading also invoke the power of imagination; reading books forces you to concoct entire worlds in your head, rather than simply ingest a series of prepackaged images. And then there is the slightly circular—though undoubtedly true—argument for the long-term career benefits: being an avid reader is good for you because the educational

system and the job market put a high premium on reading skills.

To summarize, the cognitive benefits of reading involve these faculties: effort, concentration, attention, the ability to make sense of words, to follow narrative threads, to sculpt imagined worlds out of mere sentences on the page. Those benefits are themselves amplified by the fact that society places a substantial emphasis on precisely this set of skills.

The very fact that I am presenting this argument to you in the form of a book and not a television drama or a video game should make it clear that I believe the printed word remains the most powerful vehicle for conveying complicated information—though the *electronic* word is starting to give printed books a run for their money. The argument that follows is centered squarely on the side of mental exercise—and not content. I aim to persuade you of two things:

1. By almost all the standards we use to measure reading's cognitive benefits—attention, memory, following threads, and so on—the nonliterary popular culture has been steadily growing more challenging over the past thirty years.
2. Increasingly, the nonliterary popular culture is honing *different* mental skills that are just as important as the ones exercised by reading books.

Despite the warnings of Dr. Spock, the most powerful examples of both these trends are found in the world of video games. Over the past few years, you may have noticed the appearance of a certain type of story about gaming culture in mainstream newspapers and periodicals. The message of that story ultimately reduces down to: Playing video games may not actually be a *complete* waste of time. Invariably these stories point to some new study focused on a minor side effect of gaming—often manual dexterity or visual memory—and explain that heavy gamers show improved skills compared to non-gamers. (The other common let's-take-games-seriously story is financial, usually pointing to the fact that the gaming industry now pulls in more money than Hollywood.)

Now, I have no doubt that playing today's games does in fact improve your visual intelligence and your manual dexterity, but the virtues of gaming run far deeper than hand-eye coordination. When I read these ostensibly positive accounts of video games, they strike me as the equivalent of writing a story about the merits of the great novels and focusing on how reading them can improve your spelling. It's true enough, I suppose, but it doesn't do justice to the rich, textured experience of novel reading. There's a comparable blindness at work in the way games have been covered to date. For all the discussion of gaming culture that you see, the actual experience of playing games has been strangely misrepresented. We hear a lot about the content of games:

the carnage and drive-by killings and adolescent fantasies. But we rarely hear accurate descriptions about what it actually *feels like* to spend time in these virtual worlds. I worry about the experiential gap between people who have immersed themselves in games, and people who have only heard secondhand reports, because the gap makes it difficult to discuss the meaning of games in a coherent way. It reminds me of the way the social critic Jane Jacobs felt about the thriving urban neighborhoods she documented in the sixties: "People who know well such animated city streets will know how it is. People who do not will always have it a little wrong in their heads—like the old prints of rhinoceroses made from travelers' descriptions of the rhinoceroses."

So what does the rhinoceros actually look like? The first and last thing that should be said about the experience of playing today's video games, the thing you almost never hear in the mainstream coverage, is that games are fiendishly, sometimes maddeningly, *hard*.

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THE DIRTY little secret of gaming is how much time you spend not having fun. You may be frustrated; you may be confused or disoriented; you may be stuck. When you put the game down and move back into the real world, you may find yourself mentally working through the problem you've

been wrestling with, as though you were worrying a loose tooth. If this is mindless escapism, it's a strangely masochistic version. Who wants to escape to a world that irritates you 90 percent of the time?

Consider the story of Troy Stolle, a construction site worker from Indianapolis profiled by the technology critic Julian Dibbell. When he's not performing his day job as a carpenter building wooden molds, Stolle lives in the virtual world of *Ultima Online*, the fantasy-themed game that allows you to create a character—sometimes called an avatar—and interact with thousands of other avatars controlled by other humans, connected to the game over the Net. (Imagine a version of *Dungeons & Dragons* where you're playing with thousands of strangers from all over the world, and you'll get the idea.) *Ultima* and related games like *EverQuest* have famously developed vibrant simulated economies that have begun to leak out into the real world. You can buy a magic sword or a plot of land—entirely made of digital code, mind you—for hundreds of dollars on eBay. But earning these goods the old-fashioned within-the-gameworld way takes time—a lot of time. Dibbell describes the ordeal Stolle had to go through to have his avatar, named Nils Hansen, purchase a new house in the *Ultima* world:

Stolle had had to come up with the money for the deed. To get the money, he had to sell his old house. To get that house in the first place, he had to spend hours crafting vir-

tual swords and plate mail to sell to a steady clientele of about three dozen fellow players. To attract and keep that clientele, he had to bring Nils Hansen's blacksmithing skills up to Grandmaster. To reach that level, Stolle spent six months doing nothing but smithing: He clicked on hillsides to mine ore, headed to a forge to click the ore into ingots, clicked again to turn the ingots into weapons and armor, and then headed back to the hills to start all over again, each time raising Nils' skill level some tiny fraction of a percentage point, inching him closer to the distant goal of 100 points and the illustrious title of Grandmaster Blacksmith.

Take a moment now to pause, step back, and consider just what was going on here: Every day, month after month, a man was coming home from a full day of bone-jarringly repetitive work with hammer and nails to put in a full night of finger-numbingly repetitive work with "hammer" and "anvil"—and paying \$9.95 per month for the privilege. Ask Stolle to make sense of this, and he has a ready answer: "Well, it's not work if you enjoy it." Which, of course, begs the question: Why would anyone enjoy it?

Why? Anyone who has spent more than a few hours trying to complete a game knows the feeling: you get to a point where there's a sequence of tasks you know you have to complete to proceed further into the world, but the tasks

themselves are more like chores than entertainment, something you *have* to do, not something you want to do: building roads and laying power lines, retreating through a tunnel sequence to find an object you've left behind, conversing with characters when you've already memorized their lines. And yet a large part of the population performing these tasks every day is composed of precisely the demographic group most averse to doing chores. If you practically have to lock kids in their room to get them to do their math homework, and threaten to ground them to get them to take out the trash, then why are they willing to spend six months smithing in *Ultima*? You'll often hear video games included on the list of the debased instant gratifications that abound in our culture, right up there with raunchy music videos and fast food. But compared to most forms of popular entertainment, games turn out to be all about *delayed* gratification—sometimes so long delayed that you wonder if the gratification is ever going to show.

The clearest measure of the cognitive challenges posed by modern games is the sheer size of the cottage industry devoted to publishing game guides, sometimes called walkthroughs, that give you detailed, step-by-step explanations of how to complete the game that is currently torturing you. During my twenties, I'd wager that I spent somewhere shockingly close to a thousand dollars buying assorted cheat sheets, maps, help books, and phone support to assist my usually futile attempt to complete a video game. My rela-

tionship to these reference texts is intimately bound up with my memory of each game, so that the *Myst* sequel *Riven* brings to mind those hours on the automated phone support line, listening to a recorded voice explain that the lever has to be rotated 270 degrees before the blue pipe will connect with the transom, while the playful *Banjo-Kazooie* conjures up a cheery atlas of vibrant level maps, like a child's book where the story has been replaced with linear instruction sets: jump twice on the mushroom, then grab the gold medallion in the moat. Admitting just how much money I spent on these guides sounds like a cry for help, I know, but the great, looming racks of these game guides at most software stores are clear evidence that I am not alone in this habit. The guidebook for the controversial hit game *Grand Theft Auto* alone has sold more than 1.6 million copies.

Think about the existence of these guides in the context of other forms of popular entertainment. There are plenty of supplementary texts that accompany Hollywood movies or Billboard chart-toppers: celebrity profiles, lyrics sheets, reviews, fan sites, commentary tracks on DVDs. These texts can widen your understanding of a film or an album, but you'll almost never find yourself *needing* one. People don't walk into theaters with guidebooks that they consult via flashlight during the film. But they regularly rely on these guides when playing a game. The closest cultural form to the game guide is the august tradition of CliffsNotes marketed as readers' supplements to the Great Books. There's noth-

ing puzzling about the existence of CliffsNotes: we accept both the fact that the Great Books are complicated, and the fact that millions of young people are forced more or less against their will to at least pretend to read them. Ergo: a thriving market for CliffsNotes. Game guides, however, confound our expectations: because we're not used to accepting the complexity of gaming culture, and because nobody's forcing the kids to master these games.

The need for such guides is a relatively new development: you didn't need ten pages to explain the *PacMan* system, but two hundred pages barely does justice to an expanding universe like *EverQuest* or *Ultima*. You need them because the complexity of these worlds can be overwhelming: you're stuck in the middle of a level, with all the various exits locked and no sign of a key. Or the password for the control room you thought you found two hours ago turns out not to work. Or the worst case: you're wandering aimlessly through hallways, like those famous tracking shots from *The Shining*, and you've got no real idea what you're supposed to be doing next.

This aimlessness, of course, is the price of interactivity. You're more in control of the narrative now, but your supply of information about the narrative—whom you should talk to next, where that mysterious package has been hidden—is only partial, and so playing one of these games is ultimately all about filling in that information gap. When it works, it can be exhilarating, but when it doesn't—well,

that's when you start shelling out the fifteen bucks for the cheat sheet. And then you find yourself hunched over the computer screen, help guide splayed open on the desk, flipping back and forth between the virtual world and the level maps, trying to find your way. After a certain point—perhaps when the level maps don't turn out to be all that helpful, or perhaps when you find yourself reading the help guides over dinner—you start saying to yourself: Remind me why this is fun?

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SO WHY does anyone bother playing these things? Why do we use the word “play” to describe this torture? I'm always amazed to see what our brains are willing to tolerate to reach the next level in these games. Several years ago I found myself on a family vacation with my seven-year-old nephew, and on one rainy day I decided to introduce him to the wonders of *SimCity 2000*, the legendary city simulator that allows you to play Robert Moses to a growing virtual metropolis. For most of our session, I was controlling the game, pointing out landmarks as I scrolled around my little town. I suspect I was a somewhat condescending guide—treating the virtual world as more of a model train layout than a complex system. But he was picking up the game's inner logic nonetheless. After about an hour of tinkering, I was concentrating on trying to revive one particularly run-



down manufacturing district. As I contemplated my options, my nephew piped up: "I think we need to lower our industrial tax rates." He said it as naturally, and as confidently, as he might have said, "I think we need to shoot the bad guy."

The interesting question here for me is not whether games are, on the whole, more complex than most other cultural experiences targeted at kids today—I think the answer to that is an emphatic yes. The question is why kids are so eager to soak up that much information when it is delivered to them in game form. My nephew would be asleep in five seconds if you popped him down in an urban studies classroom, but somehow an hour of playing *SimCity* taught him that high tax rates in industrial areas can stifle development. That's a powerful learning experience, for reasons we'll explore in the coming pages. But let's start with the more elemental question of desire. Why does a seven-year-old soak up the intricacies of industrial economics in game form, when the same subject would send him screaming for the exits in a classroom?

The quick explanations of this mystery are not helpful. Some might say it's the flashy graphics, but games have been ensnaring our attention since the days of *Pong*, which was—graphically speaking—a huge step backward compared with television or movies, not to mention reality. Others would say it's the violence and sex, and yet games like *SimCity*—and indeed most of the best-selling games of all time—have

almost no violence and sex in them. Some might argue that it's the interactivity that hooks, the engagement of building your own narrative. But if active participation alone functions as a drug that entices the mind, then why isn't the supremely *passive* medium of television repellant to kids?

Why do games captivate? I believe the answer involves a deeper property that most games share—a property that will be instantly familiar to anyone who has spent time in this world, but one that is also strangely absent from most outside descriptions. To appreciate this property you need to look at game culture through the lens of neuroscience. There's a logical reason to use that lens, of course: If you're trying to figure out why cocaine is addictive, you need a working model of what cocaine is, and you need a working model of how the brain functions. The same goes for the question of why games are such powerful attractors. Explaining that phenomenon without a working model of the mind tells only half the story.

This emphasis on the inner life of the brain will be a recurring theme in the coming pages. Cultural critics like to speculate on the cognitive changes induced by new forms of media, but they rarely invoke the insights of brain science and other empirical research in backing up those claims. All too often, this has the effect of reducing their arguments to mere superstition. If you're trying to make sense of a new cultural form's effect on the way we view the world, you need to be able to describe the cultural object in some de-

tail, and also demonstrate how that object transforms the mind that is apprehending it. In some instances, you can measure that transformation through traditional modes of intelligence testing; in some cases, you can measure changes by looking at brain activity directly, thanks to modern scanning technology; and in cases where the empirical research hasn't yet been done, you can make informed speculation based on our understanding of how the brain works.

To date, there has been very little direct research into the question of how games manage to get kids to learn without realizing that they're learning. But a strong case can be made that the power of games to captivate involves their ability to tap into the brain's natural reward circuitry. Because of its central role in drug addiction, the reward circuits of the brain have been extensively studied and mapped in recent years. Two insights that have emerged from this study are pertinent to the understanding of games. First, neuroscientists have drawn a crucial distinction between the way the brain seeks out reward and the way it delivers pleasure. The body's natural painkillers, the opioids, are the brain's pure pleasure drugs, while the reward system revolves around the neurotransmitter dopamine interacting with specific receptors in a part of the brain called the nucleus accumbens.

The dopamine system is a kind of accountant: keeping track of expected rewards, and sending out an alert—in the form of lowered dopamine levels—when those rewards don't arrive as promised. When the pack-a-day smoker de-

prives himself of his morning cigarette; when the hotshot Wall Street trader doesn't get the bonus he was planning on; when the late-night snacker opens the freezer to find someone's pilfered all the Ben & Jerry's—the disappointment and craving these people experience is triggered by lowered dopamine levels.

The neuroscientist Jaak Panksepp calls the dopamine system the brain's "seeking" circuitry, propelling us to seek out new avenues for reward in our environment. Where our brain wiring is concerned, the craving instinct triggers a desire to explore. The system says, in effect: "Can't find the reward you were promised? Perhaps if you just look a little harder you'll be in luck—it's got to be around here somewhere."

How do these findings connect to games? Researchers have long suspected that geometric games like *Tetris* have such a hypnotic hold over us (longtime *Tetris* players have vivid dreams about the game) because the game's elemental shapes activate modules in our visual system that execute low-level forms of pattern recognition—sensing parallel and perpendicular lines, for instance. These modules are churning away in the background all the time, but the simplified graphics of *Tetris* bring them front and center in our consciousness. I believe that what *Tetris* does to our visual circuitry, most video games do to the reward circuitry of the brain.

Real life is full of rewards, which is one reason why there

are now so many forms of addiction. You can be rewarded by love and social connection, financial success, drug abuse, shopping, chocolate, and watching your favorite team win the Super Bowl. But supermarkets and shopping malls aside, most of life goes by without the potential rewards available to you being clearly defined. You know you'd like that promotion, but it's a long way off, and right now you've got to deal with getting this memo out the door. Real-life reward usually hovers at the margins of day-to-day existence—except for the more primal rewards of eating and making love, both of which exceed video games in their addictiveness.

In the gameworld, reward is everywhere. The universe is literally teeming with objects that deliver very clearly articulated rewards: more life, access to new levels, new equipment, new spells. Game rewards are fractal; each scale contains its own reward network, whether you're just learning to use the controller, or simply trying to solve a puzzle to raise some extra cash, or attempting to complete the game's ultimate mission. Most of the crucial work in game interface design revolves around keeping players notified of potential rewards available to them, and how much those rewards are currently needed. Just as *Tetris* streamlines the fuzzy world of visual reality to a core set of interacting shapes, most games offer a fictional world where rewards are larger, and more vivid, more clearly defined, than life.

This is true even of games that have been rightly cele-

brated for their open-endedness. *SimCity* is famous for not forcing the player along a preordained narrative line; you can build any kind of community you want: small farming villages, vast industrial Coketowns, high-centric edge cities or pedestrian-friendly neighborhoods. But the game has a subtle reward architecture that plays a major role in the game's addictiveness: the software withholds a trove of objects and activities until you've reached certain predefined levels, either of population, money, or popularity. You can build pretty much any kind of environment you want playing *SimCity*, but you can't build a baseball stadium until you have fifty thousand residents. Similarly, *Grand Theft Auto* allows players to drive aimlessly through a vast urban environment, creating their own narratives as they explore the space. But for all that open-endedness, the game still forces you to complete a series of pre-defined missions before you are allowed to enter new areas of the city. The very games that are supposed to be emblems of unstructured user control turn out to dangle rewards at every corner.

"Seeking" is the perfect word for the drive these designs instill in their players. You want to win the game, of course, and perhaps you want to see the game's narrative completed. In the initial stages of play, you may just be dazzled by the game's graphics. But most of the time, when you're hooked on a game, what draws you in is an elemental form of desire: the desire to *see the next thing*. You want to cross that bridge to see what the east side of the city looks like,

or try out that teleportation module, or build an aquarium on the harbor. To someone who has never felt that sort of compulsion, the underlying motivation can seem a little strange: you want to build the aquarium not, in the old mountaineering expression, because it's there, but rather because it's not there, or not there *yet*. It's not there, but you know—because you've read the manual or the game guide, or because the interface is flashing it in front of your eyes—you know that if you just apply yourself, if you spend a little more time cultivating new residents and watching the annual budget, the aquarium will eventually be yours to savor.

In a sense, neuroscience has offered up a prediction here, one that games obligingly confirm. If you create a system where rewards are both clearly defined and achieved by exploring an environment, you'll find human brains drawn to those systems, even if they're made up of virtual characters and simulated sidewalks. It's not the subject matter of these games that attracts—if that were the case, you'd never see twenty-somethings following absurd rescue-the-princess storylines like the best-selling *Zelda* series on the Nintendo platform. It's the reward system that draws those players in, and keeps their famously short attention spans locked on the screen. No other form of entertainment offers that cocktail of reward and exploration: we don't "explore" movies or television or music in anything but the most figurative

sense of the word. And while there are rewards to those other forms—music in fact has been shown to trigger opioid release in the brain—they don't come in the exaggerated, tantalizing packaging that video games wrap around them.

You might reasonably object at this point that I have merely demonstrated that video games are the digital equivalent of crack cocaine. Crack also has a powerful hold over the human brain, thanks in part to its manipulations of the dopamine system. But that doesn't make it a good thing. If games have been unwittingly designed to lock into our brain's reward architecture, then what positive value are we getting out of that intoxication? Without that positive value the Sleeper Curve is meaningless.

Here again, you have to shed your expectations about older cultural forms to make sense of the new. Game players are not soaking up moral counsel, life lessons, or rich psychological portraits. They are not having emotional experiences with their Xbox, other than the occasional adrenaline rush. The narratives they help create now rival pulp Hollywood fare, which is an accomplishment when measured against the narratives of *PacMan* and *Pong*, but it's still setting the bar pretty low. With the occasional exception, the actual *content* of the game is often childish or gratuitously menacing—though, again, not any more so than your average summer blockbuster. Complex social and historical simulations like *Age of Empires* or *Civilization* do dominate

the game charts, and no doubt these games do impart some useful information about ancient Rome or the design of mass transit systems. But much of the roleplay inside the gaming world alternates between drive-by shooting and princess rescuing.

De-emphasizing the content of game culture shouldn't be seen as a cop-out. We ignore the content of many activities that are widely considered to be good for the brain or the body. No one complains about the simplistic, militaristic plot of chess games. ("It always ends the same way!") We teach algebra to children knowing full well that the day they leave the classroom, ninety-nine percent of those kids will never again directly employ their algebraic skills. Learning algebra isn't about acquiring a specific tool; it's about building up a mental muscle that will come in handy elsewhere. You don't go to the gym because you're interested in learning how to operate a StairMaster; you go to the gym because operating a StairMaster does something laudable to your body, the benefits of which you enjoy during the many hours of the week when you're not on a StairMaster.

So it is with games. It's not *what* you're thinking about when you're playing a game, it's *the way* you're thinking that matters. The distinction is not exclusive to games, of course. Here's John Dewey, in his book *Experience and Education*: "Perhaps the greatest of all pedagogical fallacies is the notion that a person learns only that particular thing he is studying at the time. Collateral learning in the way of

formation of enduring attitudes, of likes and dislikes, may be and often is much more important than the spelling lesson or lesson in geography or history that is learned. For these attitudes are fundamentally what count in the future."

This is precisely where we need to make our portrait of the rhinoceros as accurate as possible: defining the collateral learning that goes beyond the explicit content of the experience. Start with the basics: far more than books or movies or music, games force you to make *decisions*. Novels may activate our imagination, and music may conjure up powerful emotions, but games force you to decide, to choose, to prioritize. All the intellectual benefits of gaming derive from this fundamental virtue, because learning how to think is ultimately about learning to make the right decisions: weighing evidence, analyzing situations, consulting your long-term goals, and then deciding. No other pop cultural form directly engages the brain's decision-making apparatus in the same way. From the outside, the primary activity of a gamer looks like a fury of clicking and shooting, which is why so much of the conventional wisdom about games focuses on hand-eye coordination. But if you peer inside the gamer's mind, the primary activity turns out to be another creature altogether: making decisions, some of them snap judgments, some long-term strategies.

Those decisions are themselves predicated on two modes of intellectual labor that are key to the collateral learning of playing games. I call them *probing* and *telescoping*.

MOST VIDEO GAMES differ from traditional games like chess or Monopoly in the way they withhold information about the underlying rules of the system. When you play chess at anything beyond a beginner's level, the rules of the game contain no ambiguity: you know exactly the moves allowed for each piece, the procedures that allow one piece to capture another. The question that confronts you sitting down at the chessboard is not: What are the rules here? The question is: What kind of strategy can I concoct that will best exploit those rules to my advantage?

In the video game world, on the other hand, the rules are rarely established in their entirety before you sit down to play. You're given a few basic instructions about how to manipulate objects or characters on the screen, and a sense of some kind of immediate objective. But many of the rules—the identity of your ultimate goal and the techniques available for reaching that goal—become apparent only through exploring the world. You literally learn by playing. This is one reason video games can be frustrating to the non-initiated. You sit down at the computer and say, "What am I supposed to do?" The regular gamers in the room have to explain: "You're supposed to figure out what you're supposed to do." You have to probe the depths of the game's logic to make sense of it, and like most probing expeditions,

you get results by trial and error, by stumbling across things, by following hunches. In almost every other endeavor that we describe using the language of games—poker, baseball, backgammon, capture the flag—any ambiguity in the rules and objectives of the game would be a fatal flaw. In video games, on the other hand, it's a core part of the experience. Many game narratives contain mysteries of sorts modeled after Hollywood plotlines—Who murdered my brother? Who stole the plutonium?—but the ultimate mystery that drives players deeper into the gameworld is a more self-referential one: how is this game played? Non-gamers usually imagine that mastering a game is largely a matter of learning to push buttons faster, which no doubt accounts for all the "hand-eye coordination" clichés. But for many popular games, the ultimate key to success lies in deciphering the rules, and not manipulating joysticks.

Probing involves a nuanced form of exploration as well, one that often operates below conscious awareness. Video games obviously differ from traditional games like chess or basketball in that the entire game environment is created by a computer. Explicit rules are a crucial part of that environment: you learn that you have only three lives, or that you can't build a marina until you have fifty thousand residents, or that you can't open the gate on the third level until you find the key on the second. Some of these rules you can learn just by reading the manual; others have to be discovered by playing. But the computer is doing more than just

serving up clearly defined rules; it's concocting an entire world, a world with biology, light, economies, social relations, weather. I call this the *physics* of the virtual world—as opposed to the rules of the game—though this kind of physics goes well beyond acceleration curves and gravity.

You're probing the physics of a world when you start detecting subtle patterns and tendencies in the way the computer is running the simulation. Sometimes these have to do with mass and velocity: you can't jump across the canyon if you're wearing your armor; the rocket launcher is the only weapon that can shoot far enough to attack from the rear of the fortress. Sometimes they have to do with physiology: you'll lose more blood if you're wounded in the chest than in the legs; you can jump from any height without injuring your character. Sometimes it's collective behavior: your neighbors stay longer at the party if you have a jukebox and a Lava lamp; the invading robots tend to swoop in from the right when you first land on the planet. When my nephew suggested lowering the industrial tax rate during my demo of *SimCity*, he was probing the game's physics. I had explained the official rules to him: players are allowed to alter the tax rates for different zones. The physics were fuzzier, more intuitive: if you lower the rate in a given area, you'll usually see some growth there, assuming the other variables—power, water, crime—aren't impeding development.

The game scholar James Paul Gee breaks probing down

into a four-part process, which he calls the “probe, hypothesize, reprobe, rethink” cycle:

1. The player must *probe* the virtual world (which involves looking around the current environment, clicking on something, or engaging in a certain action).
2. Based on reflection while probing and afterward, the player must form a *hypothesis* about what something (a text, object, artifact, event, or action) might mean in a usefully situated way.
3. The player *reprobes* the world with that hypothesis in mind, seeing what effect he or she gets.
4. The player treats this effect as feedback from the world and accepts or *rethinks* his or her original hypothesis.

Put another way: When gamers interact with these environments, they are learning the basic procedure of the scientific method.

Probing often takes the form of seeking out the limits of the simulation, the points at which the illusion of reality breaks down, and you can sense that's all just a bunch of algorithms behind the curtain. The first celebrated instance of this arrived in the early eighties with the hugely popular arcade game *PacMan*. The game had its rules, which were so simple you could express them in three sentences: gobble all

the dots to finish a level; avoid the monsters unless you've eaten one of the large dots, at which point you can eat the monsters; eat the prizes for extra points. But experienced *PacMan* players soon discovered that the monsters roamed the maze in predictable ways, and if you followed a certain course—literally called a “pattern”—you'd complete the level without losing a man every time you played. Patterns weren't built into the official rules of the game; they were a legacy effect of the limited computational power of those arcade machines, and the predictable way in which the monsters' behavior had been programmed. To detect those limitations, you had to probe the *PacMan* game by playing it hundreds of times, experimenting with different strategies until one sequence revealed itself.

Probing the limits of the game physics is another oft-ignored facet of gaming culture. I suspect most hard-core gamers would acknowledge that part of the pleasure of their immersions comes from this kind of pursuit, searching out the points where the system shows its flaws—partially because those flaws can be exploited, as in *PacMan*'s patterns, but also because there's something strangely satisfying about defining the edges of a simulation, learning what it's capable of and where it breaks down. Some people find this kind of exploration appealing in ordinary life: they're the sort that actually enjoys looking under the hood of the car, or memorizing UNIX commands. But video games *force* you to speculate about what's going

on under the hood. If you don't think about the underlying mechanics of the simulation—even if that thinking happens in a semiconscious way—you won't last very long in the game. You have to probe to progress.

I didn't have a word for it at the time, of course, but I now realize that my tour through the universe of dice-baseball was a way of probing the physics of those early games. I'd learn the explicit rules for each simulation, but the really fascinating moment came when I'd start rolling the dice and generating results. Only by playing the simulations could you get a sense of their realism. Usually, you had to work through a quarter of a season before the imperfections would reveal themselves: batters would strike out too frequently in one simulation; another would allow sluggers to average an implausible two home runs a game. I was detecting flaws in these systems, but there was nonetheless something profoundly satisfying about the experience. Bringing these imperfections to light felt like solving a mystery, looking past the surface illusion of player cards and charts to the inner truth of the system.

\* \* \*

ONE OF the best ways to grasp the cognitive virtues of gameplaying is to ask committed players to describe what's going on in their heads halfway through a long virtual adventure like *Zelda* or *Half-Life*. It's crucial here not to ask



what's happening in the gameworld, but rather what's happening to the players mentally: what problems they're actively working on, what objectives they're trying to achieve. In my experience, most gamers will be more inclined to show rather than tell the probing they've done; they'll have internalized flaws or patterns in the simulation without being fully aware of what they're doing. Certain strategies just *feel* right.

But if the gamers' probing is semiconscious, their awareness of mid-game *objectives* will be crystal clear. They'll be able to give you an explicit account of what they need to do to reach the goals that the game has laid out for them. Many of these goals will have been obscure in the opening sequences of the game, but by the halfway point, players have usually constructed a kind of to-do list that governs their strategy. If probing is all about depth, exploring the buried logic of the simulation, tracking objectives is a kind of temporal thinking, a looking forward to all the hurdles that separate you from the game's completion.

Tracking objectives seems simple enough. If you stopped playing in the early nineties, or if you only know about games from secondhand accounts, you'd probably assume that the mid-game objectives would sound something like this: Shoot that guy over there! Or: Avoid the blue monsters! Or: Find the magic key!

But interrupt a player in the middle of a *Zelda* quest, and

ask her what her objectives are, and you'll get a much more interesting answer. Interesting for two reasons: first, the sheer number of objectives simultaneously at play; and second, the nested, hierarchical way in which those objectives have to be mentally organized. For comparison's sake, here's what the state of mind of a *PacMan* player would look like mid-game circa 1981:

1. Move the joystick in order to . . .
2. Eat all the dots in order to . . .
3. Get to the next level in order to . . .
4. Reach level 256 (the final one) or a new high score.

Those objectives could be mildly complicated with the addition of one subcategory, which would look like this:

1. Your ultimate goal is to clear all the boards of dots.
2. Your immediate goal is to complete the current maze.
3. To do this, you must move the joystick through the maze and avoid the monsters.
- 3a. You may also clear the board of monsters by eating large dots.
- 3b. You may also eat the fruit for bonus points.

A real-world game like checkers would generate a list of comparable simplicity:

1. Your goal is to capture all of your opponent's pieces.
2. To do this, you must move one piece each turn, capturing pieces where possible.
- 2a. You may also revive your own captured pieces by reaching the other side of the board.

A map of the objectives in the latest *Zelda* game, *The Wind Waker*, looks quite different:

1. Your ultimate goal is to rescue your sister.
2. To do this, you must defeat the villain Ganon.
3. To do this, you need to obtain legendary weapons.
4. To locate the weapons, you need the pearl of Din.
5. To get the pearl of Din, you need to cross the ocean.
6. To cross the ocean, you need to find a sailboat.
7. To do all the above, you need to stay alive and healthy.
8. To do all the above, you need to move the controller.

The eight items can be divided into two groups, each with a slightly different purchase on the immediate present. The last two items (7 and 8) are almost metabolic in nature, the basics of virtual self-preservation: keep your character alive, with maximum power and, where possible, flush with cash. Like many core survival behaviors, some of these objectives take quite a bit of training—learning the navigation interface and mapping it onto the controller, for instance—but once you've mastered them, you don't necessarily have to think about what you're doing. You've internalized or automated the knowledge, just as you did years ago when you learned how to run or climb or talk.

Beyond the horizon of those immediate needs lie the six remaining master objectives. These are forward projections that color the immediate present. They're like constellations guiding your ship through uncertain waters. Lose sight of them and you're adrift.

But those master objectives are rarely the player's central focal point, because most of the game is spent solving smaller problems that stand in the way of achieving one of the primary goals. In this sense, our list of eight nested objectives is a gross simplification of the actual problem-solving that goes on in a game like *Zelda*. Zoom in on just one of these objectives—finding the pearl of Din—and the list of objectives running through the player's mind would look something like this:

To locate the items, you need the pearl of Din from the islanders.

To get this, you need to help them solve their problem.

To do this, you need to cheer up the Prince.

To do this, you need to get a letter from the girl.

To do this, you need to find the girl in the village.

With the letter to the Prince, you must now befriend the Prince.

To do this, you need to get to the top of Dragon Roost Mt.

To do this, you must get to the other side of the gorge.

To do this, you must fill up the gorge with water so you can swim across.

To do this, you must use a bomb to blow up the rock blocking the water.

To do this, you must make the bomb plant grow.

To do this, you must collect water in a jar that the girl gave you.

Once on the other side, you must cross lava.

To do this, you must knock down statues on either side of the lava.

To do this, you must throw bombs into holes in the statues.

To do this, you must pull up bombs and aim them.

Once past the lava, you must get into the cavern.

To do this, you must pull statues out of the way.

Once in the cavern, you must get to the next room.

To do this, you need to kill the guards in your way.

To do this, you need to fight with the controller.

To do this, you need to obtain a key to the locked door.

To do this, you must light the two unlit torches in the room.

To do this, you must obtain your own source of fire.

To do this, you must pick up a wooden staff and light it.

I'll spare you the entire sequence for this one objective, which would continue on for another page unabridged. And remember, this is merely a snapshot of an hour or so of play from a title that averages around forty hours to complete. And remember, too, that almost all of these objectives have to be deciphered by the player on his own, assuming he's not consulting a game guide. These local objectives make up the primary texture of the game; they're what you spend most of your time working through. Gamers some-

ies talk about the units formed by these steps as a “puzzle.” You hit a point in the game where you know you need to do something, but there’s some obstruction in your way, and the game conventions signal to you that you’ve encountered a puzzle. You’re not lost, or confused; in fact, you’re on precisely the right track—it’s just the game designers have artfully deposited a puzzle in the middle of that track.

I call the mental labor of managing all these simultaneous objectives “telescoping” because of the way the objectives nest inside one another like a collapsed telescope. I like the term as well because part of this skill lies in focusing on immediate problems while still maintaining a long-distance view. You can’t progress far in a game if you simply deal with the puzzles you stumble across; you have to coordinate them with the ultimate objectives on the horizon. Talented gamers have mastered the ability to keep all these varied objectives alive in their heads simultaneously.

Telescoping should not be confused with multitasking. Holding this nested sequence of interlinked objectives in your mind is not the same as the classic multitasking teenager scenario, where they’re listening to their iPod while instant messaging their friends and Googling for research on a term paper. Multitasking is the ability to handle a chaotic stream of unrelated objectives. Telescoping is all about order, not chaos; it’s about constructing the proper hier-

archy of tasks and moving through the tasks in the correct sequence. It’s about perceiving relationships and determining priorities.

If telescoping involves a sequence, by the same token the feeling it conjures in the brain is not, I think, a *narrative* feeling. There are layers to narratives, to be sure, and they inevitably revolve around a mix of the present and future, between what’s happening now and the tantalizing question of where it’s all headed. But narratives are built out of events, not tasks. They happen *to* you. In the gameworld you’re forced to define and execute the tasks; if your definitions get blurry or are poorly organized, you’ll have trouble playing. You can still enjoy a book without explicitly concentrating on where the narrative will take you two chapters out, but in gameworlds you need that long-term planning as much as you need present-tense focus. In a sense, the closest analog to the way gamers are thinking is the way programmers think when they write code: a nested series of instructions with multiple layers, some focused on the basic tasks of getting information in and out of memory, some focused on higher-level functions like how to represent the program’s activity to the user. A program is a sequence, but not a narrative; playing a video game generates a series of events that retrospectively sketch out a narrative, but the pleasures and challenges of playing don’t equate with the pleasures of following a story.

There is something profoundly *lifelike* in the art of probing and telescoping. Most video games take place in worlds that are deliberately fanciful in nature, and even the most realistic games can't compare to the vivid, detailed illusion of reality that novels or movies concoct for us. But our lives are not stories, at least in the present tense—we don't passively consume a narrative thread. (We turn our lives into stories after the fact, after the decisions have been made, and the events have unfolded.) But we do probe new environments for hidden rules and patterns; we do build telescoping hierarchies of objectives that govern our lives on both micro and macro time frames. Traditional narratives have much to teach us, of course: they can enhance our powers of communication, and our insight into the human psyche. But if you were designing a cultural form explicitly to train the cognitive muscles of the brain, and you had to choose between a device that trains the mind's ability to follow narrative events, and one that enhanced the mind's skills at probing and telescoping—well, let's just say we're fortunate not to have to make that choice.

Still, I suspect that some readers may be cringing at the subject matter of those *Zelda* objectives. Here again, the problem lies in adopting aesthetic standards designed to evaluate literature or drama in determining whether we should take the video games seriously. Consider this sequence from our telescoping inventory:

With the letter to the Prince, you must now befriend the Prince.

To do this, you need to get to the top of Dragon Roost Mt.

To do this, you must get to the other side of the gorge.

To do this, you must fill up the gorge with water so you can swim across.

To do this, you must use a bomb to blow up the rock blocking the water.

To do this, you must make the bomb plant grow.

To do this, you must collect water in a jar that the girl gave you.

If you approach this description with aesthetic expectations borrowed from the world of literature, the content seems at face value to be child's play: blowing up bombs to get to Dragon Roost Mountain; watering explosive plants. A high school English teacher would look at this and say: There's no psychological depth here, no moral quandaries, no poetry. And he'd be right! But comparing these games to *The Iliad* or *The Great Gatsby* or *Hamlet* relies on a false premise: that the intelligence of these games lies in their content, in the themes and characters they represent. I would argue that the cognitive challenges

of videogaming are much more usefully compared to another educational genre that you will no doubt recall from your school days:

*Simon is conducting a probability experiment. He randomly selects a tag from a set of tags that are numbered from 1 to 100 and then returns the tag to the set. He is trying to draw a tag that matches his favorite number, 21. He has not matched his number after 99 draws.*

*What are the chances he will match his number on the 100th draw?*

- A. 1 out of 100
- B. 99 out of 100
- C. 1 out of 1
- D. 1 out of 2

Judged by the standards employed by our English teacher, this passage—taken from the Massachusetts Comprehensive Assessment exam for high-school math—would be an utter failure. Who is this Simon? We know nothing about him; he is a cipher to us, a prop. There are no flourishes in the prose, nothing but barren facts, describing a truly useless activity. Why would anyone want to number a hundred tags and then go about trying to randomly select a favorite number? What is Simon's motivation?

Word problems of this sort have little to offer in the way of moral lessons or psychological depth; they won't make students more effective communicators or teach them technical skills. But most of us readily agree that they are good for the mind on some fundamental level: they teach abstract skills in probability, in pattern recognition, in understanding causal relations that can be applied in countless situations, both personal and professional. The problems that confront the gamers of *Zelda* can be readily translated into this form, and indeed in translating a core property of the experience is revealed:

*You need to cross a gorge to reach a valuable destination. At one end of the gorge a large rock stands in front of a river, blocking the flow of water. Around the edge of the rock a number of small flowers are growing. You have been given a jar by another character. How can you cross the gorge?*

- A. Jump across it.
- B. Carry small pails of water from the river and pour them in the gorge, and then swim across.
- C. Water the plants, and then use the bombs they grow to blow up the rock, releasing the water, and then swim across.
- D. Go back and see if you've missed some important tool in an earlier scene.

Again, the least interesting thing about this text is the substance of the story. You could perhaps meditate on the dramatic irony inherent in bomb-growing flowers, or analyze the gift economy relationship introduced with the crucial donation of the jar. But those interpretations will go only so far, because what's important here is not the content of the *Zelda* world, but the way that world has been organized to tax the problem-solving skills of the player. To be sure, the pleasure of gaming goes beyond this kind of problem-solving; the objects and textures of the worlds offer rich aesthetic experiences; many networked games offer intriguing social exchanges; increasingly the artificial intelligence embedded in some virtual characters provides amazing interactions. But these are all ultimately diversions. You can't make progress in the game without learning the rules of the environment. On the simplest level, the *Zelda* player learns how to grow bombs out of flowers. But the collateral learning of the experience offers a far more profound reward: the ability to probe and telescope in difficult and ever-changing situations. It's not *what* the player is thinking about, but the *way* she's thinking.

At first glance, it might be tempting to connect the complexity of video games with the more familiar idea of "information overload" associated with the rise of electronic media. But a crucial difference exists. Information overload is a kind of backhanded compliment you'll often hear about today's culture: there's too much data flowing into our lives,

but at least we're getting better at managing that data-stream, even if we may be approaching some kind of threshold point where our senses will simply be overwhelmed. This is a quantitative argument, not a qualitative one. It's nice to be able to watch TV, talk on the phone, and read your e-mail all at the same time, but it's a superficial skill, not a deep one. It usually involves skimming the surface of the incoming data, picking out the relevant details, and moving on to the next stream. Multimedia pioneer Linda Stone has coined a valuable term for this kind of processing: continuous partial attention. You're paying attention, but only partially. That lets you cast a wider net, but it also runs the risk of keeping you from really studying the fish.

Probing and telescoping represent another—equally important—tendency in the culture: the emergence of forms that encourage participatory thinking and analysis, forms that challenge the mind to make sense of an environment, not just play catch-up with the acceleration curve. I think for many people who do not have experience with them, games seem like an extension of the rapid-fire visual editing techniques pioneered by MTV twenty years ago: a seismic increase in images-per-second without a corresponding increase in analysis or sense-making. But the reality of MTV visuals is not that the eye learns to interpret all the images as they fly by, perceiving new relationships between them. Instead, the eye learns to tolerate chaos, to experience disorder as an aesthetic experience, the way the ear learned

to appreciate distortion in music a generation before. To non-players, games bear a superficial resemblance to music videos: flashy graphics; the layered mix of image, music, and text; the occasional burst of speed, particularly during the pre-rendered opening sequences. But what you actually *do* in playing a game—the way your mind has to work—is radically different. It's not about tolerating or aestheticizing chaos; it's about finding order and meaning in the world, and making decisions that help create that order.

## TELEVISION

THE INTERACTIVE NATURE of games means that they will inevitably require more decision-making than passive forms like television or film. But popular television shows—and to a slightly lesser extent, popular films—have also increased the cognitive work they demand from their audience, exercising the mind in ways that would have been unheard of thirty years ago. For someone loosely following the debate over the medium's cultural impact, the idea that television is actually improving our minds will sound like apostasy. You can't surf the Web or flip through a newsstand for more than a few minutes without encountering someone complaining about the surge in sex and violence

on TV: from Tony Soprano to Janet Jackson. There's no questioning that the trend is real enough, though it is as old as television itself. In Newton Minow's famous "vast wasteland" speech from 1961, he described the content of current television programming as a "procession of . . . blood and thunder, mayhem, violence, sadism, murder"—this in the era of Andy Griffith, Perry Como, and Uncle Miltie. But evaluating the social merits of any medium and its programming can't be limited purely to questions of subject matter. There was nothing particularly redeeming in the subject matter of my dice baseball games, but they nonetheless taught me how to think in powerful new ways. So if we're going to start tracking swear words and wardrobe malfunctions, we ought to at least include another line in the graph: one that charts the cognitive demands that televised narratives place on their viewers. That line, too, is trending upward at a dramatic rate.

Television may be more passive than video games, but there are degrees of passivity. Some narratives force you to do work to make sense of them, while others just let you settle into the couch and zone out. Part of that cognitive work comes from following multiple threads, keeping often densely interwoven plotlines distinct in your head as you watch. But another part involves the viewer's "filling in": making sense of information that has been either deliberately withheld or deliberately left obscure. Narratives that require that their viewers fill in crucial elements take