

**The New York Times** Reprints

This copy is for your personal, noncommercial use only. You can order presentation-ready copies for distribution to your colleagues, clients or customers here or use the "Reprints" tool that appears next to any article. Visit [www.nytreprints.com](http://www.nytreprints.com) for samples and additional information. Order a reprint of this article now.

September 15, 2010

# Learning by Playing: Video Games in the Classroom

By SARA CORBETT

**One morning last winter** I watched a middle-school teacher named Al Doyle give a lesson, though not your typical lesson. This was New York City, a noncharter public school in an old building on a nondescript street near Gramercy Park, inside an ordinary room that looked a lot like all the other rooms around it, with fluorescent lights and linoleum floors and steam-driven radiators that hissed and clanked endlessly.

Doyle was, at 54, a veteran teacher and had logged 32 years in schools all over Manhattan, where he primarily taught art and computer graphics. In the school, which was called Quest to Learn, he was teaching a class, Sports for the Mind, which every student attended three times a week. It was described in a jargony flourish on the school's Web site as "a primary space of practice attuned to new media literacies, which are multimodal and multicultural, operating as they do within specific contexts for specific purposes." What it was, really, was a class in technology and game design.

The lesson that day was on enemy movement, and the enemy was a dastardly collection of spiky-headed robots roving inside a computer game. The students — a pack of about 20 boisterous sixth graders — were meant to observe how the robots moved, then chart any patterns they saw on pieces of graph paper. Later in the class period, working on laptops, they would design their own games. For the moment, though, they were spectators.

Doyle, who is thin and gray-haired with a neatly trimmed goatee, sat at a desk in the center of the room, his eyeglasses perched low on his nose, his fingers frenetically tapping the keyboard of a MacBook. The laptop was connected to a wall-mounted interactive whiteboard, giving the students who were sprawled on the floor in front of it an excellent view of his computer screen. Which was a good thing, because at least as they saw it, Doyle was going to die an embarrassing death without their help. Doyle had 60 seconds to steer a little bubble-shaped sprite — a toddling avatar dressed in a royal blue cape and matching helmet — through a two-dimensional maze without bumping into the proliferating robots.

In order to win, he would need to gobble up some number of yellow reward points, Pac-Man style.

“Go right! Go right! Go right!” the students were shouting. “Now down, down, down, down, down, down!” A few had lifted themselves onto their knees and were pounding invisible keyboards in front of them. “Whoa!” they yelled in unison, some of them instinctively ducking as Doyle’s sprite narrowly avoided a patrolling enemy.

Beauchamp, a round-faced boy wearing a dark sweatshirt, watched Doyle backtrack to snap up more points and calmly offered a piece of advice. “That extra movement cost you some precious time, Al,” he said, sounding almost professorial. “There are more points up there than what you need to finish.”

“How much time do I have?” Doyle asked.

“Nineteen seconds.”

“Thanks,” said Doyle, his eyes not leaving the screen. He added, “See, us older people, we don’t have the peripheral vision to check the time because we didn’t grow up with these games.”

For a few seconds, it was quiet. Doyle pinged through a row of reward points and then, hitting a little cul-de-sac in the maze, he paused. His avatar’s tiny yellow feet pedaled uselessly against a wall. The students began to yowl. A girl named Shianne pressed her hand to her forehead in faux anguish.

“Go! Go! Turn around. Don’t slow down. What are you *waiting for?*” someone called out.

“How much time do I have left?”

“Thirteen seconds!”

Doyle smiled. “All the time in the world,” he said, before taking his sprite on a deliberate detour to get even more reward points. The move, like a premature touchdown dance, put his students in agony.

“To the goal! To the goal! Al, run to the goal!”

And as the clock wound down and the students hollered and the steam radiator in the corner let out another long hiss, Doyle’s little blue self rounded a final corner, waited out a

passing robot and charged into the goal at the end of the maze with less than two seconds to spare. This caused a microriot in the classroom. Cheers erupted. Fists pumped. A few kids lay back on the floor as if knocked out by the drama. Several made notes on their graph paper. Doyle leaned back in his chair. Had he taught anything? Had they learned anything? It depended, really, on how you wanted to think about teaching and learning.

**WHAT IF TEACHERS GAVE UP** the vestiges of their educational past, threw away the worksheets, burned the canon and reconfigured the foundation upon which a century of learning has been built? What if we blurred the lines between academic subjects and reimagined the typical American classroom so that, at least in theory, it came to resemble a typical American living room or a child's bedroom or even a child's pocket, circa 2010 — if, in other words, the slipstream of broadband and always-on technology that fuels our world became the source and organizing principle of our children's learning? What if, instead of seeing school the way we've known it, we saw it for what our children dreamed it might be: a big, delicious video game?

It is a radical proposition, sure. But during an era in which just about everything is downloadable and remixable, when children are frequently more digitally savvy than the adults around them, it's perhaps not so crazy to think that schools — or at least one school, anyway — might try to remix our assumptions about how to reach and educate those children. What makes Quest to Learn unique is not so much that it has been loaded with laptops or even that it bills itself expressly as a home for “digital kids,” but rather that it is the brainchild of a professional game designer named Katie Salen. Salen, like many people interested in education, has spent a lot of time thinking about whether there is a way to make learning feel simultaneously more relevant to students and more connected to the world beyond school. And the answer, as she sees it, lies in games.

Quest to Learn is organized specifically around the idea that digital games are central to the lives of today's children and also increasingly, as their speed and capability grow, powerful tools for intellectual exploration. Salen, a professor of design and technology at Parsons the New School for Design, also directs a research-based organization called Institute of Play, which examines the connections between games and learning. Working with Robert Torres, a learning scientist who is a former school principal, and a small team of curriculum and game designers, Salen spent two years planning Quest to Learn in conjunction with the education-reform group New Visions for Public Schools. Her work was financed by a research grant from the MacArthur Foundation, which is pouring \$50 million into exploring the possibilities of digital media and learning in a variety of settings nationwide. The school

was approved by New York City's schools chancellor, Joel Klein, as one of a handful of "demonstration sites" for innovative technology-based instructional methods and is part of a larger effort on the city's part to create and experiment with new models for schools.

Quest to Learn is now beginning its second year, with about 145 sixth and seventh graders, all of whom were admitted by a districtwide lottery. (The intention is to add a grade level each year until it is a 6th-through-12th-grade school; Quest to Learn recently relocated to a larger but equally unmodern building in Chelsea.) Operating on a public-school budget but powered by additional grants from the MacArthur Foundation and the Bill and Melinda Gates Foundation, among others, it is a well-financed and carefully watched educational experiment concerning children, video games and the thrumming, largely unexplored force field between them.

Salen and Torres are at the forefront of a small but increasingly influential group of education specialists who believe that going to school can and should be more like playing a game, which is to say it could be made more participatory, more immersive and also, well, fun. Nearly every aspect of life at Quest to Learn is thus designed to be gamelike, even when it doesn't involve using a computer. Students don't receive grades but rather achieve levels of expertise, denoted on their report cards as "pre-novice," "novice," "apprentice," "senior" and "master." They are enlisted to do things like defeat villains and lend a hand to struggling aliens, mostly by working in groups to overcome multifaceted challenges, all created by a collection of behind-the-scenes game designers. The principles are similar to those used in problem-based learning, a more established educational method in which students collaborate to tackle broad, open-ended problems, with a teacher providing guidance though not necessarily a lot of instruction. But at Quest to Learn, the problems have been expertly aerated with fantasy.

Once it has been worked over by game designers, a lesson doesn't look like a lesson anymore. It is now a quest. And while students at the school are put through the usual rigors of studying pre-algebra, basic physics, ancient civilizations and writing, they do it inside interdisciplinary classes with names like Codeworlds — a hybrid of math and English class — where the quests blend skills from different subject areas. Students have been called upon to balance the budget and brainstorm business ideas for an imaginary community called Creepytown, for example, and to design architectural blueprints for a village of bumbling little creatures called the Troggles. There are elements of the school's curriculum that look familiar — nightly independent reading assignments, weekly reading-comprehension packets and plenty of work with pencils and paper — and others that don't. Quest to Learn

students record podcasts, film and edit videos, play video games, blog avidly and occasionally receive video messages from aliens.

They also spend significant time building their own games. Sometimes they design board games using cardboard and markers and ungodly amounts of tape. Most of the time, though, they invent games for the computer. Salen's theory goes like this: building a game — even the kind of simple game a sixth grader might build — is equivalent to building a miniworld, a dynamic system governed by a set of rules, complete with challenges, obstacles and goals. At its best, game design can be an interdisciplinary exercise involving math, writing, art, computer programming, deductive reasoning and critical thinking skills. If children can build, play and understand games that work, it's possible that someday they will understand and design systems that work. And the world is full of complicated systems.

Does this educational approach actually work? And is it something that can, or should, find its way into schools in other parts of the country? As we fret about the perils of multitasking and digital distraction in adult life, the question arises: should a school provide practice with or relief from those things? It is still too early to say. But the introduction of Quest to Learn is tied to a continuing and sometimes heated national dialogue about what skills today's learners most need to prepare them for success in a rapidly evolving, digitally mediated world. There is, at least, growing support for experimentation: in March, Arne Duncan, the secretary of education, released a draft National Educational Technology Plan that reads a bit like a manifesto for change, proposing among other things that the full force of technology be leveraged to meet "aggressive goals" and "grand" challenges, including increasing the percentage of the population that graduates from college to 60 percent from 39 percent in the next 10 years. What it takes to get there, the report suggests, is a "new kind of R.& D. for education" that encourages bold ideas and "high risk/high gain" endeavors — possibly even a school built around aliens, villains and video games.

**SALEN IS 43**, reddish-haired, hyperorganized and a quirky dresser. Some would consider her an unlikely prophet when it comes to education. Among Quest to Learn students, she is clearly beloved. Unlike most authority figures they know, she is a gifted player of Guitar Hero and has been spotted playing her Nintendo DSi on the subway. Until a few years ago she knew little about educational pedagogy and was instead immersed in doing things like converting an ice-cream truck into a mobile karaoke unit that traveled around San Jose, Calif., with a man dressed as a squirrel dispensing free frozen treats and encouraging city residents to pick up a microphone and belt out tunes. This was a community-building sort of game — or as Salen describes it, "an interactive play-based experience" — as was the race

she helped design in Minneapolis and St. Paul, in which randomly organized groups of people carried 25-foot-high inflatable playing pieces modeled after those used in the board game Sorry through the streets of the cities.

A game, as Salen sees it, is really just a “designed experience,” in which a participant is motivated to achieve a goal while operating inside a prescribed system of boundaries and rules. In this way, school itself is one giant designed experience. It could be viewed, in fact, as the biggest and most important game any child will ever play. To this end, Quest to Learn has three full-time game designers supporting the work of the school’s 11 teachers — a ratio that reflects a trend more familiar to the business world, where designers and design-thinking have ascended to new and vogueish heights.

Salen, like many designers, views things in terms of their ideal potential and also the physical space they occupy. She is thus less apt to refer to a school as “school” but rather as a “learning space” or a “discovery space” or sometimes as a “possibility space.” She and her colleagues are wrapped up in the idea that technology is doing for learning what it has done for pretty much every other aspect of living, which is to say that it has dismantled the walls between spaces. As anyone who has ever checked e-mail from a bathroom stall or browsed eBay from a chairlift can attest, what once occurred in just one space now happens in practically every space. This has revolutionized design, media, most workplaces and especially the lives of children, who routinely tap into vast social and information pools outside school. Yet, generally speaking, it has hardly touched public education.

The traditional school structure strikes Salen as “weird.” “You go to a math class, and that is the only place math is happening, and you are supposed to learn math just in that one space,” she told me one day, sitting in the small room at the school that served as Quest to Learn’s operational headquarters. She was dressed in a purple skirt with a hot pink scarf knotted around her neck. “There’s been this assumption that school is the only place that learning is happening, that everything a kid is supposed to know is delivered between 8 a.m. and 3 p.m., and it happens in the confines of a building,” she said. “But the fact is that kids are doing a lot of interesting learning outside of school. We acknowledge that, and we are trying to bring that into their learning here.”

**WAITING IN THE HALLWAY LINE** to go into Sports for the Mind class one day last winter, I met a boy named Kai Goree. He was dressed in a red T-shirt, jeans and sneakers. He had a puckish mouth, vivid brown eyes and short dark hair, pieces of which had been dyed in vibrant shingles of blue and green, not unlike what you might expect to find on the roof of a fairy-tale house.

Kai was 11. He sometimes got into trouble with teachers for talking too much. In the next 10 minutes, as we wandered into class and found seats and waited for everybody else to settle in, plus a few minutes beyond that, Kai relayed the following bits of information: he lived with his parents and older brother in an apartment on East 56th Street. He was a huge fan of professional wrestling. At home he sometimes filmed and edited his own wrestling-news commentaries or demonstrated wrestling moves on a giant plush gorilla he had named Green Gangsta. Then he put them on YouTube, where he had several personal channels. At home, his family had a “very awesome big computer.” He also had an Android phone, but at that point was lusting after a Flip camera and a MacBook as well. He preferred OS X, but his dad, alas, was “a die-hard Windows fan,” so the prospects for a Mac were unclear. If I was interested, I could follow him on Twitter. (Sample post from Kai: “I AM SO ANGRY. My mom is not letting me get a coolatta from dunkin donuts...”) He used to have a blog, but it took too much time so he dropped it.

What he cared about most was games. “Games and games and games,” he said. He had been playing games since he was about 18 months old, when his mother, who is a college professor, introduced him to a computer game called Reader Rabbit, intended to teach literacy skills. Like many of his friends, as he grew, he migrated from educational computer games to hand-held games to the Xbox 360.

At the start of middle school, Kai was almost a full decade into his digital life. This might have put him slightly ahead of his peers, but also, arguably, it made him more like the sixth grader of the near future. Research shows that, on average, children who have access to computers have mastered pointing and clicking with a mouse by the time they are 3½. They are also, thanks in part to mobile-phone apps, playing more games earlier in life. According to research by the Joan Ganz Cooney Center, an arm of the Sesame Workshop that explores the educational potential of interactive media, 60 percent of the top-selling iPhone apps on the education store are made for toddlers and preschoolers.

In the evenings, once he met the requirements for parental face time and homework, Kai could be found riding an armored dune buggy around a post-apocalyptic African landscape, blasting his machine gun at squads of alien jackals (Halo 3) or catching and juking for a touchdown (Madden NFL 09) or maybe adding wikki wikki scratches to a Jay-Z tune (DJ Hero). Sometimes he fired up the family Wii and did virtually assisted yoga. I came to learn that Kai could dissect, analyze and recommend video games with the acuity of a French sommelier. He was waiting anxiously, he said, to hear back from “some people at Lucas” who may or may not use him to beta test a multiplayer Star Wars game that wasn’t yet on

the market.

Kai's passion for games was unusual, but only a little. Earlier this year, the Kaiser Family Foundation released the results of a national survey in which 60 percent of children 8 to 18 reported that a typical day included playing games on hand-held or console devices. Their average daily investment was about two hours. According to Kaiser's data, the percentage of children playing digital games has increased by more than 50 percent in the last 10 years, and the amount of time they spend playing games has almost doubled. This follows research showing that the more time children spend playing video games, the less time they spend on homework. For educators, it's a sorry equation and one that mirrors a larger paradox when it comes to the divergent and often competing paths of children and their schools.

Even as technology spending in K-12 public education has risen steadily in the last 20 years, student performance — as measured by test results — has improved only incrementally. Meanwhile, children are proving to be wildly adaptive when it comes to using media outside school. They are fervently making YouTube videos, piloting avatars through complex game scenarios, sampling music, lighting up social networks and inventing or retooling (or purists would say, bludgeoning) language so that it better suits the text-messaging pay plan on their cellphones, only to show up to school to find cellphones outlawed, Internet access filtered and computers partitioned off from the rest of the classroom — at least in many cases.

Michael H. Levine, who directs the Joan Ganz Cooney Center, acknowledges the conundrum. While there may be sound reasons behind limiting things like Internet browsing and social networking at school, he says, it does little to teach students how to live in the 21st century. It also may contribute to a broader relevancy issue. A 2006 study financed by the Bill and Melinda Gates Foundation set out to examine the reasons that almost a third of American public-high-school students fail to graduate with their class. Researchers surveyed high-school dropouts in 25 cities, suburbs and small towns across the country, where they were told again and again that school was boring. The final report recommended, among other things, that educators take steps to “make school more relevant and engaging.”

One way to do this, according to Levine, would be to stop looking so critically at the way children use media and to start exploring how that energy might best be harnessed to help drive them academically. “Kids are literally wearing digital media,” he says. “It's present everywhere in their lives, except for in the learning environment.” A game-based approach like that used at Quest to Learn shows a lot of promise, he says, in part because it capitalizes on something kids already love. He is careful to note that there will be “huge challenges” in



bringing the idea to schools nationally. Clearly, not every community is going to have the money for interactive whiteboards, laptops and PlayStation consoles. Someone will also need to figure out how to train teachers, develop curriculums, establish assessment measures and decide to what extent the focus on systems thinking and design skills used in game-based learning should be tied to common standards — and win over parents. “Odds are it will take a long time,” Levine says. “But I don’t know what the alternative is. My view of it is that we will never get to the holy land in terms of educational performance unless we do something about the engagement factor.”

Often, watching the students and teachers at Quest to Learn, I was struck by how enviably resource-rich the school was, with its game designers and curriculum specialists and a full-time technologist wheeling carts of netbooks up and down the hallway. Salen recently told me that she is hoping to find a corner of the school where she can set up Rock Band — a video game in which users play drums, guitar and bass — “for teachers to unwind around.” The school functioned with the intensity of a high-stakes start-up. It was clear the staff members worked long hours. Still, if Quest to Learn was a “possibility space” — a sort of laboratory for the future of learning — you could also see how those possibilities might feel entirely out of reach to an educator working in a more typically cash-strapped, understaffed school.

Yet with the federal government focusing more on innovation, and given the deep pockets of similarly focused corporate foundations, it may be feasible to implement game-based learning, even modestly, into more schools. But not before it has been proved to work. Quest to Learn students who took federally mandated standardized tests last spring scored on average no better and no worse than other sixth graders in their district, according to Elisa Aragon, the school’s executive director. Valerie Shute, an assessment specialist in the educational psychology and learning systems department at Florida State University, is working on a MacArthur-financed effort to develop and test new assessment measures for Quest to Learn, which are meant to look at progress in areas like systems thinking, teamwork and time management. The federal government is likewise sponsoring an overhaul of standardized tests to be introduced in the 2014-2015 school year, with added emphasis on “higher order” thinking and problem-solving skills.

Quest to Learn’s most innovative piece of technology was set up in a corner of one classroom, looking something like an extremely wired stage set. This was the school’s \$18,000 Smallab, which stands for “situated multimedia art learning lab,” a system now being used in a handful of schools and museums around the country. Created by a team led

by David Birchfield, a media artist at Arizona State University, it is a 3-D learning environment, or in design speak, a “hybrid physical-digital space.”

In Smallab sessions, students hold wands and Sputnik-like orbs whose movements are picked up by 12 scaffold-mounted motion-capture cameras and have an immediate effect inside the game space, which is beamed from a nearby computer onto the floor via overhead projector. It is a little bit like playing a multiplayer Wii game while standing inside the game instead of in front of it. Students can thus learn chemical titration by pushing king-size molecules around the virtual space. They can study geology by building and shifting digital layers of sediment and fossils on the classroom floor or explore complementary and supplementary angles by racing the clock to move a giant virtual protractor around the floor.

As new as the Smallab concept is, it is already showing promise when it comes to improving learning results: Birchfield and his colleagues say that in a small 2009 study, they found that at-risk ninth graders in earth sciences scored consistently and significantly higher on content-area tests when they had also done Smallab exercises. A second study compared the Smallab approach with traditional hands-on lab experimentation, with the group that used mixed-reality again showing greater retention and mastery. As it is more generally with games, the cognitive elements at work are not entirely understood, but they are of great interest to a growing number of learning scientists. Did the students learn more using digital mixed-reality because the process was more physical than hearing a classroom lecture or performing a lab experiment? Because it was more collaborative or more visual? Or was it simply because it seemed novel and more fun?

**HERE ARE SOME DIFFERENCES** between Kai and me: Kai hates Justin Bieber whereas I only dislike him. Kai sends and receives about 50 text messages a day. My average is about 4. My idea of leisure involves wandering aimlessly and anonymously through the local bookstore whereas Kai — “not a fan of books” — can be found hanging around the Apple Store on Fifth Avenue, where he is on a first-name basis with employees. When I am sick with a cold, I sit at home flipping through magazines and not really wanting to be seen by anyone. When Kai is sick with a cold, he sits at home and makes YouTube videos. (“If I sneeze during this video,” he tells the camera, “don’t yell at me.”) We also feel very differently, it turns out, about the game Halo. Kai sees it as having amazing graphics and a great story line and violence, “but only against aliens,” he says. I see it mostly as violent.

One night at Kai’s apartment, we turned on the Xbox and played Halo 3 as teammates. He played the role of Master Chief, the ultimate superwarrior, and I was a friendly alien who

liked to fight. It started like this: I sat on the couch, and Kai sat on the floor in front of the TV. He said, “You get the machine gun, and I’ll drive the car.” I’m not really sure what happened after that. I would call it a nine-minute-long, jackhammering bloodbath, in which we (me poorly, Kai deftly) killed a lot of bad aliens until my lack of experience almost cost our team the game, and — a little sweaty and yes, totally excited — I handed my controller off to Kai’s 14-year-old brother, Sam.

It was, for me, a reminder of how confusing it can be to think about video games and schools in the same frame. Not only has excessive gaming — much like excessive TV watching — been associated with obesity and depression, but playing violent games has been linked in some studies to an increase in aggressive behavior. Advocates of game-based learning concede that these games can be spectacularly gory, amoral and loud, even when they are artful and complicated. They like to point out that the majority of games sold commercially are not particularly violent and are rated “E” — for “everyone.”

And then this: Brain researchers have found that playing first-person shooter games like Call of Duty does seem to have some neurological benefits, including improving peripheral vision and the ability to focus attention. The playing of shooter games has also been shown to enhance something called visual-spatial thinking — for example, the ability to rotate objects in one’s mind — which, it turns out, is a cognitive building block for understanding concepts in science and engineering. Women, who tend to score lower when tested for visual-spatial skills, apparently gain more from virtual machine-gun outings than men: a 2007 study done at the University of Toronto showed that women who played just 10 hours of an action-oriented video game (Medal of Honor: Pacific Assault) not only improved their spatial attention and mental-rotation abilities more significantly than their male counterparts, but the game-play also appeared to substantially reduce any sex-related gaps in visual-spatial thinking abilities. Five months later, the effects still held. (Bad news for pacifists: a control group that played a stimulating but nonviolent 3-D video puzzle game showed no measurable improvement.)

Unsurprisingly, no one I spoke with who works in the field of games and learning says that first-person shooter games are the key to building future scientists and engineers. One topic under discussion is the broader question of “transfer,” whether a skill developed by playing a game actually translates to improved abilities in other areas. They also note that we are only just beginning to tease apart the mechanisms that make game play so powerful. And inside those mechanisms, there is at least potential to advance our country’s educational aims — if only we can sort out how we feel about games. Even the first family has sent mixed

messages: President Obama has criticized video games for displacing family time and physical activity — urging parents, for example, to “turn off the TV, put away the video games and read to your child” — but he has also encouraged the development of new games to bolster the all-important science, technology, engineering and math (STEM) skills in young Americans. In March, Michelle Obama helped introduce a government-sponsored design contest to reward those who create mobile-phone games and apps to combat obesity, lamenting at a national Parent Teacher Association conference that “we know our kids spend way too much time with these games,” but that at least the time could be spent more productively. The cognitive dissonance is likely familiar to any parent: she has also admitted, cheerfully, to owning a Wii.

**WHEN IT COMES TO CAPTURING** and keeping the attention of children, game designers appear to be getting something right that schools, in many cases, are getting wrong. James Paul Gee, a professor of literacy studies at Arizona State University who grew interested in video games when his son began playing them years ago, has written several seminal books on the power of video games to inspire learning. He says that in working through the levels of a complex game, a person is decoding its “internal design grammar” and that this is a form of critical thinking. “A game is nothing but a set of problems to solve,” Gee says. Its design often pushes players to explore, take risks, role-play and strategize — in other words putting a game’s informational content to use. Gee has advocated for years that our definition of “literacy” needs to be widened to better suit the times. Where a book provides knowledge, Gee says, a good game can provide a learner with knowledge and also experience solving problems using that knowledge.

Slowly, this idea has won some unlikely converts. The retired Supreme Court Justice Sandra Day O’Connor recently introduced a Web site called iCivics, which features a series of interactive games meant to animate and revive the lost art of learning civics. “She was relatively hostile toward games,” says Gee, who collaborated with her on the project, “and now she’s a fan.” E. O. Wilson, the renowned Harvard evolutionary biologist, has lauded digital games for their ability to immerse and challenge players in vivid, virtual environments. “I think games are the future in education,” Wilson said in an interview with the game designer Will Wright last year. “We’re going through a rapid transition now. We’re about to leave print and textbooks behind.”

In a speech given the day before the start of the 2009 G-20 economic summit, Eric Schmidt, the chief executive of Google, offered his own tacit approval, suggesting that playing video games, especially online multiplayer games, fosters collaboration, and that collaboration, in

turn, fosters innovation — making it good training for a career in technology. “Everything in the future online is going to look like a multiplayer game,” Schmidt said. “If I were 15 years old, that’s what I’d be doing right now.”

All this goes back to the debate over what constitutes “21st-century skills.” How do schools manage to teach new media without letting go of old media? Is it possible to teach game design and still find time for “The Catcher in the Rye”? One afternoon at Quest to Learn, I sat with Al Doyle in an empty office. Doyle had been teaching Sports for the Mind for only a few months — and at the end of the school year, he would end up leaving Quest to Learn to teach game design at a private school elsewhere in Manhattan — but the experience was causing him to think differently about what schools should be teaching. His students were building 3-D computer games and had also just finished a unit on podcasting. “Ten years ago, it would have taken a week to get kids to learn the difference between ‘save’ and ‘save as,’” he said. “Now I show them GarageBand” — a digital audio sequencer produced by Apple — “and five minutes later they’re recording and editing sound.” Doyle made a point that others had also made: whatever digital fluidity his students possessed, it hadn’t been taught to them, at least not by adults.

Here, perhaps, was a paradigm shift. As Doyle saw it, his role was moving from teaching toward facilitating, building upon learning being done outside school. He talked about all the wasted energy that goes into teaching things that students don’t need so much anymore, thanks to the tools now available to them. Why memorize the 50 states and their capitals? Why, in the age of Google and pocket computers, memorize anything? “Handwriting?” Doyle said. “That’s a 20th-century skill.” Realizing this sounded radical, he amended his thought, saying that students should learn to write, but that keyboarding was far more important. He took aim at spelling, calling it “outmoded.” Then he went back to podcasting, saying that after a student has written, revised, scripted and recorded a podcast, “it’s just as valid as writing an essay.”

I must have been wearing the shocked expression of an old-guard English major, because Doyle tried to put a finer point on it. “We feel like we’re preparing these kids to be producers of media — whether they become graphic designers, video designers, journalists, publishers, communicators, bloggers, whatever,” he said. “The goal is that they’re comfortable expressing themselves in any media, whether it’s video, audio, podcast, the written word, the spoken word or the animated feature.” He added: “Game design is the platform that we can hook them into because this is where they live. Video games are more important to them than film, than broadcast television, than journalism. This is their medium. Games are

this generation's rock and roll."

**SPEND TIME AT** a middle school — even a hyperinnovative one like Quest to Learn — and one thing becomes immediately apparent: Being a sixth grader is a timeless art. Kids chew gum when they're not supposed to. They ask for hugs from teachers when they need them. They get rowdy in gym class, dip Oreos in their chocolate-milk cartons at lunch, pick bits of food out of their braces and shout things like, "Hey, your epidermis is showing!" There is little they like to do quietly.

"I am *really sorry* it is taking you so long to sit in your chairs today," an aggrieved Doyle was calling over the din one morning at the start of class. In the brief quiet that followed, he announced that, connected to work they were doing on ancient architecture, each student was to design a game that took place inside either a labyrinth, a pyramid or a cave. This would happen using an online game-making platform called Gamestar Mechanic, which was developed by Katie Salen and a team and is soon to be sold commercially. The platform allows users to learn game-making skills without being versed in programming language.

A hand shot up. It was Ellisa, a diminutive girl who wore her hair in a giant ponytailed puff on one side of her head. "Al, can I do a game with a cave, a pyramid and a labyrinth?"

"Sorry, you may not."

Another hand. "What about a pyramid with a labyrinth inside of it?"

Doyle shook his head. "Just one," he said.

Sitting in front of laptops, the students started in on their game-building, each one beginning with a blank screen. They created borders, paths and obstacles by dragging and dropping small cubes from a menu. They chose an animated sprite to serve as a game's protagonist. They picked enemy sprites and set them marching in various patterns around the screen. They wrote the text that introduced the game and the text that flashed when a player reaches a new level. ("If the entrance to your cave is being guarded by a bear or a woolly mammoth," said Doyle, sounding teacherly, "you have to tell us it's a bear or a woolly mammoth.") They added a variety of rewards and punishments. If the game seemed too easy, they made it harder. If the game seemed too hard, they made it easier. Earlier that day, I watched a girl named Maya make a game. She created a labyrinth, changed all the colors, swapped enemies in and out, changed the background, changed the music and finally set the game's timer to 90 seconds. Then she played her game and finished it in 75. She adjusted the timer to 75 seconds and played again, this time losing. Finally, she set the timer

at 80 and beat the game, but only just barely, at which point she declared the whole thing perfect.

The work appeared simple, but the challenge was evident. Twenty minutes in, the Sports for the Mind classroom was hushed but for the sound of keyboards being pounded and a faint arcadelike cacophony of poinging and bleeping over the syncopated pulse of game music. That night for homework, they would play one another's games and write up constructive critiques.

The gold standard in class, I was told by nearly every student I spoke with, was to create a game that was hard to beat but harder still to quit. Kai was sitting in one corner working on a game he named What the Cave. It was teeming with robot enemies. "The whole point," Kai said, "is you want your game to be hard, but you want it to be good." He studied his screen for a moment. Then using his mouse, he deftly deleted a row of enemies. "What you want," he said finally, "is good-hard."

**The language of gamers** is, when you begin to decipher it, the language of strivers. People who play video games speak enthusiastically about "leveling up" and are always shooting for the epic win. Getting to the end of even a supposedly simple video game can take 15 or more hours of play time, and it almost always involves failure — lots and lots of failure.

This concept is something that Will Wright, who is best known for designing the Sims game franchise and the 2008 evolution-related game Spore, refers to as "failure-based learning," in which failure is brief, surmountable, often exciting and therefore not scary. A well-built game is, in essence, a series of short-term feedback loops, delivering assessment in small, frequent doses. This in the end may be both more palatable and also more instructive to someone trying to learn. According to Ntiedo Etuk, the chief executive of Tabula Digita, which designs computer games that are now being used in roughly 1,200 schools around the country, children who persist in playing a game are demonstrating a valuable educational ideal. "They play for five minutes and they lose," he says. "They play for 10 minutes and they lose. They'll go back and do it a hundred times. They'll fail until they win." He adds: "Failure in an academic environment is depressing. Failure in a video game is pleasant. It's completely aspirational."

It is also, says James Paul Gee, antithetical to the governing reality of today's public schools. "If you think about kids in school — especially in our testing regime — both the teacher and the student think that failure will lead to disaster," he says. "That's pretty much a guarantee that you'll never get to truly deep learning." Gee and others in the games-and-learning field

have suggested that someday, if we choose to channel our resources into developing more and better games for use in classrooms, the games themselves could feasibly replace tests altogether. Students, by virtue of making it through the escalating levels of a game that teaches, say, the principles of quantum physics, will demonstrate their mastery simply by finishing the game. Or, as Gee says: “Think about it: if I make it through every level of Halo, do you really need to give me a test to see if I know everything it takes to get through every level of Halo?”

One day last spring, Jan Plass, a professor of educational communication and technology at New York University, and I were sitting in a classroom at the Urban Assembly Institute of Math and Science for Young Women, a girls-only public middle school in Brooklyn, where he and several graduate students were conducting research. Plass works at an organization called the Games for Learning Institute, directed by Ken Perlin, an N.Y.U. computer-science professor, that is dedicated to exploring the granular details of what makes games so mesmerizing and effective for learning.

We were watching a small group of sixth-to-eighth-grade girls play a relatively low-tech math game on a series of laptops. The girls played in pairs, solving equations to score points. All the while, the laptops’ built-in cameras recorded their voices and faces, while an imbedded piece of software tracked their movements inside the game. What Plass and his research team were hoping to find inside this data — which was being collected at 12 New York schools — were answers about whether children learn more when playing individually or collaboratively. (In order to measure progress, researchers gave the students tests before and after the game playing.)

Two of the girls were talking and pointing at the screen. “They’re spending time discussing how to solve the problem,” Plass said in a low voice. “They might not solve as many problems. But the question for us is whether the conversation adds to the learning, versus if they spent their time on more practice. Does discourse result in deeper processing?”

A question like this is, of course, as old as Socrates and not at all limited to game-oriented learning. But given that digital games like those designed by Plass and his colleagues allow researchers to capture and examine a student’s second-by-second decision-making, they offer what seem to be uniquely refined opportunities to peer into the cognitive process. What they are studying, Plass said, is the science behind focused engagement — a psychological phenomenon known as “flow.”

Much of this work is still in its infancy. Neuroscientists have connected game play to the



production of dopamine, a powerful neurotransmitter central to the brain's reward-seeking system and thought to drive motivation and memory processing (and more negatively, addictive behaviors) — all of which could have implications for how, when and what type of games should be used to advance children's learning. But as it is with just about everything involving teaching and learning, there are no simple answers. Games, for example, appear to trigger greater dopamine releases in men than women, which could mean that game-based learning is more effective with boys than girls. Or, says Plass, it could be a matter of design: ideally, games can be built in such a way that they adapt to the individual learning styles of their players.

Paul Howard-Jones, a neuroscientist who teaches in the graduate school of education at the University of Bristol in Britain and coordinates the NeuroEducational Research Network, says that dopamine sends a "ready to learn" signal to the brain, essentially priming it to receive new information pleurably. His research has shown that children's engagement levels are higher when they are anticipating a reward but cannot predict whether they will get it — or, as Howard-Jones put it to me, "when you move from a conventional educational atmosphere to something that more resembles sport." He is careful to add that games are not meant to supplant teachers nor undermine the value of more traditional learning. "Children need to learn how to read a book," he says. "They need to learn how to ask questions." But as our understanding of both cognitive science and game design continues to advance, he says that game play will find a central place inside schools. "I think in 30 years' time," he says, "we will marvel that we ever tried to deliver a curriculum without gaming."

**One day last winter**, I watched students at Quest to Learn playing with a different sort of technological tool — a newly introduced online social network for the school that had been built by Salen and her team of designers and was open to students, staff members and parents. The network, called Being Me, looked like a starter Facebook. In the coming weeks, mostly through the school's wellness class, students would work on learning things like how to tag photos, update their status, credit the work of others, comment meaningfully on blog posts and navigate the complex politics of "friending." It was another effort on the school's part to look at the things kids are already doing — social networking, playing video games, tinkering with digital media — and try to help them do it with more thought and purpose, to recognize both their role and their influence inside a larger system.

Being Me had been online for just one day, but it was already zinging with activity, as most of the students seemed to have logged on overnight. Isabel posted a video of herself riding a

horse. Clyde put up a survey querying everyone on whether PlayStation 3 was better than Xbox 360. Charles blogged about a new restaurant he tried. (“I had the Caprese pizza. The tomato had a lot of flavor.”) Kai posted a video — now being watched by practically everyone in the class — of himself dressed in a pink wig and a red raincoat, pretending to be a girl he called “Heather.” Comments began to pile up. “Cool beans,” a girl sitting nearby wrote. Then another from a boy named Nuridin: “Dude, stop making me die over here. LOL.”

Seeing this as learning required a kind of leap — the same way it required a leap to watch students build digital mazes and load them with plinking cartoon sprites and imagine it might make them more successful as future adults — that it would possibly help them untangle and rebuild whatever broken systems we will have left for them. The electric pencil sharpener buzzed from a corner.

I watched a long-haired kid named Akahr pull up his profile on Being Me and spend a moment pondering what he would do for his first official status update. By design of the network, every status update began with the words “I am . . .” after which students could choose from an array of designated verbs and objects listed on drop-down menus. Most of the sixth graders were mixing and matching with a kind of frenzied abandon, playfully testing every last variation, posting their updates and waiting for a peal of laughter from somewhere in the classroom — a sign their status had been read. There was, “I am dancing Godzilla” and “I am hugging my bed.” Akhar clicked on his menu and pondered his options. Around the classroom, there were students respecting eggs and creating soy sauce and reading glitter and looking for Paris. Was this learning or a distraction from learning? Serious or not serious? Or was it possible, somehow, that it was both? Word by word, Akahr made his choices: “I am . . . imagining . . . the future.”

*Sara Corbett is a contributing writer for the magazine. She wrote about the publication of Carl Jung’s “Red Book” last year.*