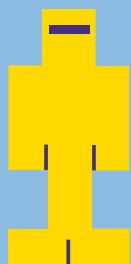


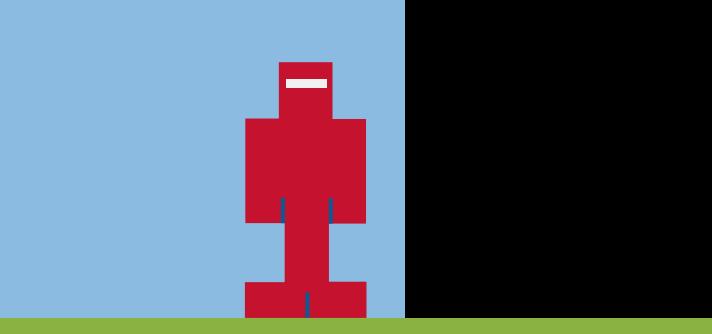
Minds

at Play

Teens gain 21st-century literacy skills designing their own computer games

by Brian Myers





The effects of video games on learning and skill development are being widely studied, and the findings are impacting the way educators envision the shape of the 21st-century classroom. Most research has focused upon the learning behavior of young people as players within the gaming environment, where it has been observed that during play, gamers exhibit intrinsic motivation and a highly exploratory frame of mind—qualities known to optimize the learning experience.

Some studies go even further to suggest that by allowing kids to *design* their own computer games, educators can facilitate deeper learning and promote the acquisition of literacies that will be crucial to success in tomorrow’s professional and social environments. These studies suggest that kids’ best learning experiences come when they are engaged not simply in interacting with materials but in experimenting and inventing with them.

One of the foremost proponents of this approach to learning is Mitchel Resnick, professor of learning research at the Massachusetts Institute of Technology Media Lab. “In the process of designing and creating—making sculptures out of clay or castles out of cardboard—children try out their ideas,” Resnick explained. “If their creations don’t turn out as they’d expected or hoped, they can revise their ideas and try something new. It’s an iterative cycle: new ideas, new creations, new ideas, new creations.

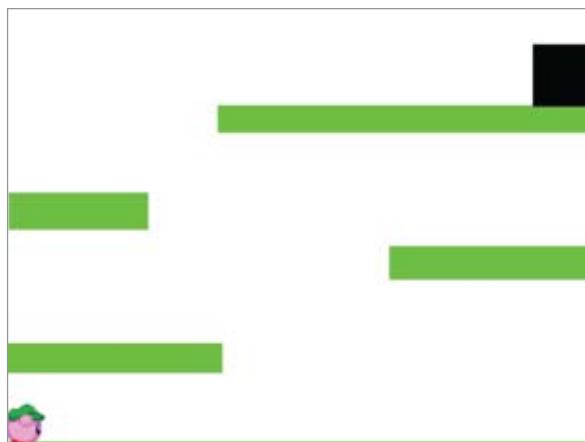
“In design activities, as in play,” he continued, “children test the boundaries, experiment with ideas, explore what’s possible.” Digital design activities, he said, “facilitate learning by combining many of the 21st-century skills that will be critical to success in the future: thinking creatively, analyzing systematically, collaborating effec-

tively, communicating clearly, designing iteratively, learning continuously.”

Promoting 21st-century literacy

Recognizing that our definition of what it means to be literate is changing, some libraries are promoting these new social and technological competencies within an instructional context that is meaningfully engaging to today’s teens. At the Wilmette (Ill.) Public Library, we’ve developed a highly popular program designed to support these skills by allowing teens to design and create their own computer games. The program provides young people with all the tools they need to create digital games or other interactive media, enabling the manipulation of text, graphics, audio, and animation while promoting creativity, logic, collaboration, computational fluency, and effective narrative skills.

We decided to offer game design classes with several goals in mind: to develop fun and innovative teen-oriented programs, to broaden our existing gaming programs, to support teens’ use of new participatory technologies, and to promote 21st-century literacies by embedding learning activities within a highly motivating context. By facilitating active participation in the design process itself, we hoped to give young people the opportunity to develop skills and knowledge at a much deeper level than if they were merely to attend a class or demonstration. And by situating learning activities within a purposeful context,



An example of a student-created game using the Scratch programming tool.

we hoped to establish a strong basis for self-motivation and integrative reflection.

Our library's ability to offer these classes was made possible by the availability of inexpensive design applications that neither required programming experience nor assumed any extraordinary technological skills on the part of the user. Among those we considered were Alice, Squeak, RPG Maker, Scratch, Game Maker, Stagecast Creator, and others. Our choice of applications was based upon a survey of features, affordability, and necessary skill levels. We looked for those that offered a drag-and-drop programming interface, exposing teens to programming concepts without the time-consuming labors associated with debugging syntax errors.

Ultimately, we settled on two applications—Scratch and Game Maker—and decided to build a separate program around each. Scratch is adaptable for use with kids as young as 8, and although well suited for use as a game design application, it can be used to create all types of interactive media. We elected to use Game Maker—originally developed as an instructional technology for computer programming students—with our older teens and with those who were interested in creating more sophisticated, multi-level games. Both applications are available as free downloads.

Creating from Scratch

Developed by Resnick's research group at the MIT Media Lab, Scratch is a programming tool that allows young people to create computer games, animations, and other forms of interactive media. In Scratch, scripting elements are represented as drag-and-drop graphic blocks that can be snapped together into stacks. When you double-click a stack of scripting blocks, you can see the resulting action in an adjoining staging area on the right side of the screen. Students find Scratch to be highly engaging because it allows them to see the results of their work as they create it; they can even edit their project while it is running.

Creating a Scratch project involves thinking up an idea, breaking the idea up into its parts, and constructing each part using the scripting blocks. Throughout the process, kids engage in a trial-and-error process that encourages creative approaches to all kinds of design challenges. In so doing, they learn to manipulate multiple forms of media, mathematically coordinate interactions and timing between objects, and absorb systems concepts such as sensing and feedback—all while gaining familiarity with foundational programming concepts.

"After just a day of programming in Scratch, they have their own games and media productions," says Resnick. "They're learning about the process of design: what it takes to create something, how to debug it, how to revise the project they've created. That process is important whether you're designing a high-rise building or a short story or an animation on the screen."

Young people can share their creations by posting them to the Scratch community website, where they can also download, edit, and even borrow elements from the work of others who have posted to the site. Scratch's online community reinforces collaborative strategies by facilitating communication and the sharing of projects and project components.

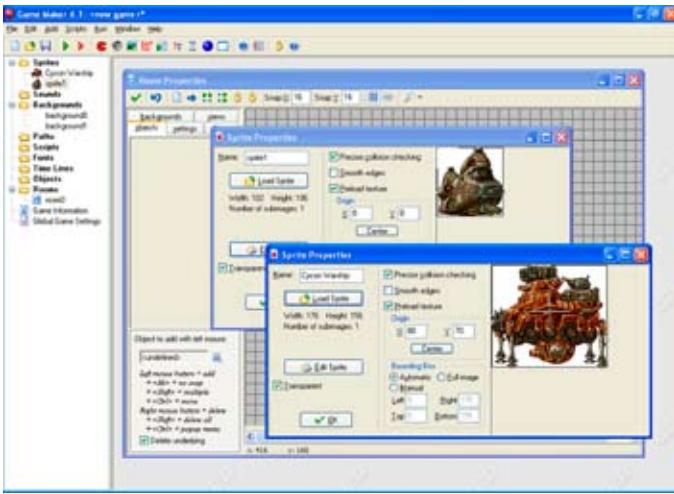
Game Maker Academy

Since its release, Game Maker has been widely used in summer computer camps and after-school programs, and often serves as the platform for university-sponsored game design contests. Game Maker's object-oriented design environment allows the designer to build games by defining objects (characters, walls, platforms, tools, weapons) with visual representations and other properties. An object's properties may be defined using GM's library of more than 100 built-in actions, most of which are highly customizable. Once familiar with GM's simple interface, novice designers can create their own versions of games like Pac-Man or Centipede in less time than it takes to go to the video store. More experienced users can access GM's source code to write advanced functions and even create 3-D effects.

Over the course of five to six weekly sessions, WPL's Game Maker Academy provides design projects that combine multiple levels of play and media platforms, introducing various classic game genres by leading the student through the creation of examples such as Pong, Asteroids, Tetris, and platform or role-playing games based on Super Mario and Sonic. Instruction is organized in a scaffolded structure, challenging students to invest techniques and experience acquired while working on earlier projects. In



Wilmette Public Library game designers work out a coding problem.



Details of the Scratch coding panel with stackable coding blocks (top) and the Game Maker editing screen.

the process, students gain an understanding of mathematical concepts necessary to coordinate animated objects, and of programming concepts necessary to trigger events. They also gain basic competencies in the use of graphic and sound-editing tools such as Photoshop, GIMP, Audacity, and Anvil Studio. Over the course of the program, students combine storytelling, digital graphic and audio editing, logic, and mathematics while participating in a process that is both richly engaging and personally rewarding.

So far we've received only positive feedback about these programs from participating teens and their parents. "This age group—especially the boys—seems to be perpetually lost in the shuffle," noted one parent. "As [my son] gets older, I don't want him to lose sight of the library as a very valuable and important resource, and things like the game programming classes will keep him walking in the door. Super ideal!"

Interest in the programs has been so great that we've had to increase class sizes and double the number of classes offered. Our "graduates" have become active participants in online learning communities, exchanging

information and accumulating skills as members of a global community of practice. WPL's Head of Adult Services Betty Giorgi noted, "It's invigorating to see both our teens and staff involved with these programs connecting at such a collaborative and creative level."

Scratch and Game Maker programs are now hosted at a number of Chicago-area libraries, and the North Suburban Library System—a consortium of over 650 academic, public, school, and special libraries in nearby suburban counties—is currently offering professional development programs that teach young adult and teen librarians to host Game Maker Academy at their own institutions.

The library as "possibility space"

Game designer Will Wright has famously described games and simulations as "possibility spaces" that allow us to experience hypothetical worlds in intuitive and experimental ways. The role of the game designer, he says, is to sculpt these worlds for players to explore, experiment with, master, and transform.

We believe this metaphor extends to libraries and other informal learning spaces that support the acquisition of emerging literacies among young adult and teen populations. Through a partnership with the Science Museum of Minnesota, Hennepin County Library hosts the Open Game Lab, a program that allows young people to design and produce interactive digital media using Scratch and other applications. Studio i at the Public Library of Charlotte and Mecklenburg County in North Carolina is a space where teens design and produce digital video, games, animation, and music. This year's Teen Tech Week saw Scratch programs offered at libraries from Houston to Camden, New Jersey, to Park Ridge, Illinois. To the teens who participate in these programs and experience themselves not only as consumers but as designers and producers of digital media, the library represents more than a mere box of books. It represents a possibility space.

Both school and public libraries alike have important and distinctive roles to play in helping young people acquire the social, cognitive, and technological competencies they'll need to lead fully participatory lives in the years ahead. "Access alone is no longer enough," noted Resnick. "Our goal must be fluency for everyone. That will require new attitudes about computing, and new perspectives toward learning. If computers are to truly transform our lives in the future, we must treat computational literacy on a par with reading and writing."

Programs that offer game design instruction to teens, integrating storytelling, art, digital media, logic, and other elements, offer a highly effective—and fun—context in which to promote these competencies and enhance the library's traditional role as an important provider of literacy education. ■