No doubt the Internet has had a profound effect on our lives, our work and play, our politics, and our business. But in the middle of a revolution that seems so profound, no one is yet quite certain what the landscape will look like when the electronic dust settles. Some believe that schools have come late to the revolution; some would say late is good. For better or worse, though, the Internet is beginning to liberate education from the confines of traditional time and space.

According to the U.S. Department of Education (DOE), during the 2002–03 school year (the last data available), 36 percent of U.S. school districts (5,500 out of 15,040) had students enrolled in distance-education programs, and 38 percent of public high schools offered distance-education courses. The DOE study had 328,000 students in 8,200 public schools enrolled in distance-education courses. As of November 2005, the North American Council for Online Learning (NACOL) listed 157 unique online learning programs in 42 states in its database, including 32 virtual charter schools, 3 online home-school programs, and 53 public, non-charter virtual schools that offer programs. The DOE’s 2004 National Education Technology Plan predicted that with the “explosive growth in the availability of online instruction and virtual schools … we may well be on our way to a new golden age in American education.” Virtual schools have arrived—and with them, a host of challenges to our notions about school and schooling.

What will the new landscape look like? Will it be one without class periods, grade levels, six-hour school days, or 180-day school years? Will it even need school buildings, classrooms, or district boundaries?

Those questions are no longer the stuff of education science fiction.

BY RANDALL GREENWAY AND GREGG VANOUREK

ILLUSTRATION BY ANDY LACKOW
Our Virtual Ancestors
Most accounts of the history of schooling take us from fee-based schools in ancient Athens, to the first tax-funded public schools in our land in Boston in 1635, to the compulsory education of Horace Mann’s “common school” in the mid-19th century.

The modern mail-based “correspondence school” is said to have been invented at the University of Chicago in 1891. The delivery mechanism subsequently evolved from mail-based correspondence courses and radio programs to television and satellite broadcasts to today’s Internet-based virtual schools, which were launched in the 1990s. There were a couple of important precursors. The federal Star Schools program began in 1988, with a focus on serving small rural schools through grants to advance distance-education technologies via telecommunications partnerships. In August 1993, Horizon Instructional Systems established a charter school in Lincoln, California, offering a range of innovative programs, including an “electronically assisted student teaching” program that blended home-based computers with distance learning and satellite technology.

The first incarnation of what we think of as a K–12 virtual school appears to have been launched in the summer of 1995, with the CyberSchool Project in Eugene, Oregon. Started by nine district teachers, it offered supplemental online high-school courses. By 1996 the virtual fire was beginning to blaze: an experimental WebSchool in Orange County, Florida (a precursor to the Florida Online High School), offered online courses to local students; Federal Way School District in Washington State founded the Cyber-School Academy with nearly 50 students (both elementary and secondary); the Concord Virtual High School (later to be called Virtual High School) was awarded a $7.5 million federal Technology Innovation Challenge Grant; and the University of Nebraska–Lincoln was awarded a combination of grants to research and develop Internet-based high-school courses (later marketed by a for-profit enterprise called Class.com). The growth of large, multi-state programs such as Florida Virtual School and Virtual High School was especially important in putting K–12 virtual schools on the map.

Virtual schools are growing so quickly that a good count of them remains elusive. But the excitement is palpable, even if hyped. Mortimer Zuckerman, owner of U.S. News & World Report, has opined that, with distance learning and its accompanying “digital revolution … [w]e are on the threshold of the most radical change in American education in over a century…. Here with the Web is the way for America to use the marvels it created to end the regression in our competitive and academic performance.”

Mapping the Frontier
It is too early to know with much certainty how, or how well, the latest version of distance learning will serve the education needs of our children, but we can begin to map the territory in anticipation of studies to come. First, however, a note about terms. In Alaska and Pennsylvania, the programs are called “cyber” schools; in Minnesota and Colorado they are “online” schools; and Ohio prefers “e-schools.” They are essentially the same: education delivered primarily over the Internet.

Some people confuse virtual schools with home schooling, or with charter schools. The truth is that virtual schooling is more like a hybrid of public, charter, and home schooling, with ample dashes of tutoring and independent study thrown in, all turbocharged by Internet technology.

Most attempts to define virtual schools sort them into categories based on their operating entity. The problem, though, is that they mix critical distinctions and miss the full array of elements. We have identified six defining dimensions of “virtual” schooling: comprehensiveness (whether the activity is complete or supplemental), reach (whether spanning a district or the entire globe or something in between), type (whether public, private, charter, contract, magnet, or even home school), location (in school, at home, somewhere else, or a combination), delivery (synchronous or asynchronous), and control (run by
a school district, university, state, other provider, or combination. It is important for those who authorize and regulate these newfangled schools to fully understand the complexities in order to ask the right questions and review them against a set of rubrics that will ensure education quality while protecting the flexibility that is inherent in the virtual environment.

Perhaps the best way to think about a virtual school is to think of a regular school without the building. Students and teachers are at home—or anywhere there is an Internet connection, the equivalent of the cars and buses that take them to school. As with other schools, most virtual schools still have a central office, administrators, teachers, professional development, curriculum, daily attendance, grades, report cards, parent conferences, special-education and health services, field trips, rules, discipline infractions, state reporting, school board meetings, and even disgruntled parents. But they no longer have to be housed in big brick-and-mortar buildings.

Here is what several of the more-established virtual schools “look” like:

- The Florida Virtual School (FLVS) is a state-operated program founded in 1997 serving more than 33,000 students in grades 6–12. FLVS is a supplemental online program, with students averaging 1.7 courses, and it provides courses to public, private, and homeschooled students. Students receive some instructional materials, but not a computer or Internet access. Teachers and students interact through e-mail, telephone, and instant messaging (IM). Teachers are available from 8 a.m. to 8 p.m. weekdays. Students set their own schedule and can access all assignments, but must obtain teacher approval to access tests and quizzes. Students must submit a certain number of assignments each week as specified by the teacher, and each course includes a “pace chart” with traditional, extended, or accelerated options. FLVS also provides courses to schools in other states through contractual tuition agreements with school districts and states.

- The Arkansas Virtual School (ARVS), where one of us works, is a pilot program for students in grades K–8 that has been operated since 2003 by the Arkansas Department of Education in partnership with K12 Inc., an online curriculum company. It offers only a full-time program. Upon enrollment, each student receives a computer (on loan), Internet access, and an array of school materials including textbooks, science equipment, math manipulatives, art supplies, maps, videos, and more. Working from home, its 430 students spend less than 20 percent of their time online in the elementary grades and about 40 percent in the middle-school grades. Teachers monitor student progress and attendance from their home offices and interact with parents and students via phone, e-mail, instant messaging, web conferencing, and occasional in-person visits. Students attend school-sponsored field trips (for example, museums, libraries, zoos, and family picnic outings) and participate in all state testing programs.

In 1951, WFIL-TV in Philadelphia broadcast The University of the Air as one of the first educational television programs.
The Cyber Village Academy (CVA) in Minnesota was originally set up in 1998 to be the first online learning charter school to serve seriously ill children (often home- or hospital-bound) and home schoolers—now a total of 140 students in grades 4–8. The school’s founders devised a unique model to serve them: Most CVA students attend on-campus classes with licensed teachers two days a week and “attend” school from home three days a week, completing online learning activities via a Microsoft e-learning platform, a daily bulletin system, e-mail, and a synchronous classroom tool using an interactive whiteboard and an audio bridge. In other words, students at home actually “dial in” to the on-campus classroom and can hear the teachers (who use a wireless microphone) and see and interact with the lesson on their computer screen.

The Delta Cyber School is a fully accredited charter school in central Alaska serving about 425 students statewide in grades K–12 since its inception in 1997. The school offers a combination of packaged online programs and teacher-created lessons supplemented by commercial online programs, all flowing through a Blackboard Learning System. It offers two foreign languages and courses in fine arts, auroras, NASA, oceanography, zoology, and botany.

Students communicate via web conferencing and an internal messaging system and take self-grading quizzes online, conduct online research projects, and click through online reviews. About half the students access their classes from separate brick-and-mortar schools all over the state, while others log in from home, some from nearly a thousand miles away.

Old and New
Though virtual schools, like traditional schools, have a central office, administrators, teachers, curriculum, daily attendance, grades, report cards, professional development, parent conferences, special-education, health services, field trips—even school board meetings (though often conducted remotely)—there are important differences from their nonvirtual cousins: greater dependence on technology; more individualized, interactive, and self-paced instruction; complicated logistical issues due to the dispersion of students; different kinds of socialization (some face-to-face, some virtual); no snow days.

One of the key differences relates to time and learning. In a traditional classroom, time is fixed and learning is variable (that is, classes are held for a set period of time, and when the bell rings the amount of learning that has occurred varies, sometimes dramatically, by student). In a virtual classroom, learning is fixed and time is variable (that is, the lesson continues until each student achieves mastery). What does virtual schooling mean in practice for families, students, and teachers? Though the models vary, we can provide a basic snapshot. Families begin with the enrollment process—completing online forms and submitting the required residency documentation. Upon enrollment, students often receive a computer on loan from the school and reimbursement for Internet access—as well as the necessary books, supplies, and other instructional materials necessary for the program. (Some virtual schools are completely online while others rely heavily on physical materials.)
In a “typical” day (see sidebar), a student might take mostly core courses with some electives and log on to the computer for an hour or two, clicking through interactive lessons with text, audio or video clips, Flash animation, and links to related sites; completing an online math quiz; e-mailing the teacher; and “chatting” with classmates online. Students complete the majority of their work offline in many of these online schools, for example, reading assignments, drafting an essay, conducting an experiment with school-supplied materials, and studying for an exam. (Here we must pause to notice how much of what happens in virtual schools is so oddly “unvirtual.”) A parent or other responsible adult is asked to supervise—and sometimes to assist with instruction and motivation, all under the direction of a licensed teacher. (Some virtual schools don’t incorporate much parental involvement at all, but others, especially in the younger grades, rely on a close partnership among parents, teachers, and online lessons to facilitate student learning.) All students in public virtual schools take state tests. In addition, many students participate in extracurricular activities provided by their schools. Depending on the school, teachers work out of a school office building or from their homes (with school-supplied computers, Internet access, and training). Teachers may develop courses; assign lessons and homework; monitor student attendance and progress; provide feedback through phone conferences, e-mail, instant messaging, or web conferencing; grade assignments; collect student portfolios; attend field trips; proctor state exams; and more. Sometimes teachers meet face to face with students. Teachers often design individual learning plans for their students based on placement tests, standardized test results, parental input, and student interests.

For Whom the Mouse Clicks
Virtual schools appeal to a wide array of students, attracting children from both ends of the achievement spectrum. Self-paced study allows struggling students to catch up without a classroom full of distractions and enables advanced students to accelerate their work according to their own abilities and without bogging them down in “busywork.” Families choose virtual schools for many reasons: curriculum quality or focus, individualized instruction, flexible scheduling, interest in technology, and more. Most students in virtual schools transfer into them from traditional public schools, but many home-school students transfer into them to connect with other learners and professional staff or to access the credibility of accredited programs. Students with intensive acting or athletics regimens and children of high-mobility military families are served well by the flexibility. Urban parents may want to address safety or overcrowding

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**Future Schooling Today:**
A “Day in the Life” of a 6th-Grade Virtual Student*

<table>
<thead>
<tr>
<th>Time</th>
<th>Activity</th>
</tr>
</thead>
<tbody>
<tr>
<td>7:00 a.m.</td>
<td>Wakes up, gets dressed, and eats breakfast</td>
</tr>
<tr>
<td>8:15</td>
<td>Logs on to his personalized school page and reviews his lessons scheduled for the day</td>
</tr>
<tr>
<td>8:40</td>
<td>American History: reviews notes on the French and Indian War; writes a diary entry in his history journal from the perspective of an officer in the Virginia militia serving with General Washington; reads chapter 3 on the role of the Iroquois Indians</td>
</tr>
<tr>
<td>10:00</td>
<td>Language Arts: reviews words for today’s spelling test; completes lesson on revising and proofreading an essay; completes grammar, usage, and mechanics lesson on the use of irregular verbs; completes vocabulary lesson on root words</td>
</tr>
<tr>
<td>11:45</td>
<td>Break/free time</td>
</tr>
<tr>
<td>12:00 p.m.</td>
<td>Lunch with mom and younger sister</td>
</tr>
<tr>
<td>12:30</td>
<td>Takes Spelling test</td>
</tr>
<tr>
<td>12:45</td>
<td>Reading time (continuation of literature lesson from yesterday): <em>A Wrinkle in Time</em>, by Madeline L’Engle</td>
</tr>
<tr>
<td>1:30</td>
<td>Pre-Algebra: reviews lesson on “Using Variables: Writing Inequalities”; completes practice problems in textbook; takes quiz on algebra lesson</td>
</tr>
<tr>
<td>2:30</td>
<td>Science: checks on science experiment and records changes in science journal</td>
</tr>
<tr>
<td>2:45</td>
<td>Break/free time</td>
</tr>
<tr>
<td>3:30</td>
<td>Soccer practice</td>
</tr>
<tr>
<td>5:00</td>
<td>Free time with friends</td>
</tr>
<tr>
<td>6:00</td>
<td>Dinner with family: discusses day’s lessons with parents</td>
</tr>
<tr>
<td>6:45</td>
<td>More free time</td>
</tr>
<tr>
<td>7:30</td>
<td>Logs on to personalized school page to review tomorrow’s lessons in Science, Language Arts, Pre-Algebra, and Art</td>
</tr>
<tr>
<td>7:45</td>
<td>Reading time: literature (continued)</td>
</tr>
<tr>
<td>9:00</td>
<td>Bedtime</td>
</tr>
</tbody>
</table>

*Based on real students’ schedules.
Evidence of Effectiveness

While there are hundreds of reports on distance education, the research on virtual schooling is newer and slimmer. There is a large base of research on postsecondary distance learning and a growing base of research on virtual high schools, but very little research on K–8 virtual schools.

What we do know is that many comparative studies suggest that the distance-learning model can be as effective as the classroom model. A 2005 NCREL meta-analysis of 116 effect sizes from 14 web-delivered K–12 distance-education programs between 1999 and 2004 found “no significant difference in performance between students who participated in online programs and those who were taught in face-to-face classrooms … in almost every comparison, students in distance education programs performed as well as students in classroom-based programs.” A 2005 NCREL report draft (which we received special permission to cite for this article) finds “new evidence supporting the apparent effectiveness of online programs and schools and generally demonstrating the potential of online learning as a promising instructional intervention that can, when implemented judiciously, and with attention to ‘evidence-based’ practices, apparently improve student academic performance.” However, it is clear that we need more data points and more rigorous methodological approaches. According to the 2005 NCREL report draft, “Only a small percent [of the hundreds of studies addressing distance education] meet established standards as experimental or quasi-experimental research.”

What’s more, the question about the comparative effectiveness of virtual schooling may be too blunt. We should also ask which types of virtual schools work, under what conditions, with which students, with which teachers, and with what training. Note also that most virtual schools receive significantly less funding than conventional schools—often 20 to 30 percent less (though there are no systematic and reliable data on funding rates or comparisons nationally)—leading to interesting questions about equity, parity, and productivity.

Reactions to This New Model

Not surprisingly, the rapid growth of virtual schooling has generated mixed reactions. Some parents and schools, as we have seen, seem to have voted with their virtual feet. But within the policy community, there is no clear consensus on how to “do virtual schools.” In many cases, policies are being established after virtual schools are already up and running and by people without a good working understanding of how...
there is a seductive urge to regulate these schools using conventional bureaucratic protocols designed for physical schools. Not surprisingly, these approaches are outmoded in this new world and can end up hamstringing virtual schools by tying them to existing authorization regimes, salary schedules, certification requirements, textbook adoption processes, curriculum development processes, assessment procedures, and accreditation regimens.

Our own work with virtual schools has led us to a number of observations about their current practice that we believe can guide policymakers. First, the principles of quality education still hold. Just putting the word “virtual” in front of the word “school” doesn’t make it good, bad, or even innovative anymore. What matters is the school’s ability to educate children. The point of virtual learning is of course learning, not virtual technology. Without good curriculum, instruction, training, resources, support, and leadership, virtual schools will flounder. In good virtual schools, the technology is so powerful, well-designed, and intuitive that it becomes an afterthought.

Second, the politics of education also still hold. While virtual schools are not creatures of the Left or Right, they do run into the same roadblocks from special interest groups that other innovations encounter, usually centering on power and money. The roadblocks are especially severe when virtual schools also tie in with other controversial reforms, such as charter schools, contracting out to private management companies, and the interdistrict competition for students generated by open enrollment.

Third, we will always have a need for personal contact, and computers are no replacement for genuine human interaction—or for teachers and tutors. Though there are examples today of computer-based tutoring programs with artificial intelligence and offshore tutoring programs, these are not credible threats to the teaching profession. In the words of Katherine Endacott, CEO of Class.com, “This is another model. It won’t replace a classroom, and it won’t replace a teacher.”

Fourth, virtual schools are not for everybody (nor are they meant to be). According to Tom Scullen, superintendent in Appleton, Wisconsin (which has experimented with virtual schools), “This type of school is not for everyone, but for the kids who need it, this may be their best—or even only—opportunity to succeed.”

Finally, this is just the beginning. Over a century we have witnessed steady evolution of distance-learning approaches, structures, and technologies. We don’t know what’s next, but we can be confident that, as the technology continues its headlong leap to new frontiers and as we understand more about what works (and what doesn’t), the education benefits will surely increase with them. Clearly, the use of technology in education will continue to expand and evolve. As one high-school student aptly put it, “we have technology in our blood.”

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