

## Transforming via Technology

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Forty-eight students in a class. That may sound like a post-recessionary public school nightmare. But it is not. It is the design of a new public charter school that “blends” teachers and technology. Class sizes are large because students spend only part of their class time receiving instruction from the teacher. Broken into smaller groups, students rotate during class from the teacher to technology to other activities. The teacher is never trying to instruct forty-eight students directly; group sizes for instruction are small. In this blended model the teacher is both instructor of students and facilitator of students learning themselves.

For at least a generation—since the takeoff of the Internet, if not longer—educators have asked how technology will help students learn. Outside of school, the Internet and ever more accessible devices enable students, and adults, to access information, conduct research, and receive instruction about an infinite variety

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of topics with increasing ease. But schools struggle to incorporate online resources and computers into the education process. The tired observation that schools and classrooms look much the same today as fifty or a hundred years ago is nonetheless true. As obvious as it may be that the technologies that inform us outside of school should enhance learning inside school, this has simply not come to pass.

But finally it may be. The Alliance Tennenbaum Family Technology High School, with forty-eight students in a class, is just one example of models nationally that are rapidly providing students with substantial access to technology.<sup>1</sup> In the process, they are opening up new ways for students to learn. This is obviously important. American students need to acquire new skills to participate in the technologically sophisticated world in which they already live. They also need to master traditional knowledge and skills as successfully as students worldwide—something US students are not doing well at present.<sup>2</sup> The Alliance High School offers new opportunities to students who need them most. Located in East Los Angeles and serving predominately poor Latino students with a history of dropping out, the school is demonstrating that “blended learning” can actually change lives.

From schools like Alliance that mix technology and teachers in every classroom, to schools that allow students to choose to take courses either traditionally or online, to schools that serve students full-time online, technology is finally changing the ways that students receive instruction. To be sure, most US students are still taught the old-fashioned way. But the future is beginning rapidly to unfold. One need look no further than higher education to see the possibilities clearly. Students routinely learning online, universities scrambling and competing for a role in this dynamic new world, elite universities offering massive open online courses (MOOCs) for free—the media bring us daily developments. K–12 education moves more slowly, but just as the changes in higher education are today unmistakable, soon they will be obvious in America’s schools.

## The Driving Force

Schools are inherently conservative institutions. Responsible for the welfare of children, they appropriately approach experimentation and innovation with caution. All types of schools—private, public, public charter—show similar respect for the tried-and-true: students grouped in age-graded classrooms taught and supervised by a teacher. Traditional public schools are also slowed by the political process that governs them. Status quo interests, represented by teachers' unions and other well-heeled organizations, wield disproportionate influence in elections and the legislative process. They can often block or weaken reforms that threaten resources and roles in existing schools.<sup>3</sup> It has been thirty years since a landmark federal education report declared us *A Nation at Risk*. Every major school reform since—charter schools, higher academic standards, testing and accountability—has faced stiff resistance from the public school establishment and proceeded only after serious compromise.

It is easy to assume that much the same fate awaits today's technologies. Computers have actually been in schools since the time of *A Nation at Risk*. Every public school has been connected to the Internet for over a decade.<sup>4</sup> Schools have taken every other technological innovation in stride, beginning with television—predicted to be a game-changer in its day. Technology *is* a threat to jobs in the current system. If students can learn on their own over the Internet, they will require fewer teachers, at least of the familiar classroom variety. Teachers' unions have consequently fought state authorization of online charter schools, which take students and funding away from traditional schools much as brick-and-mortar charter schools have been doing since they were first authorized over twenty years ago. Technological innovation *has* been slow. Schools by and large teach much as they always have. Technology appears to be having about the same effect as every other serious school reform.

But technology is different. Technology is not an education reform, dependent on the education system for its development. Technological innovation—specifically the development of Internet-based electronic data, resources, computing, and communication—is a worldwide sector-spanning phenomenon. Fueled by industries and a society more open to innovation than education, and with more incentives to adopt and adapt, information technology is evolving rapidly and inexorably. Technology has fundamentally altered how every business does its work, generally enhancing productivity in the process. Companies like Google, Apple, and Amazon have transformed how we access information and media. Students and their parents—not to mention educators themselves—now learn regularly through online interactions, as accessible as a mobile application. Essential teaching and learning technologies emerge and evolve every day—industry needs them, society needs them—whether K–12 education participates or not. No law needs to be passed; no political opposition needs to be overcome.

It is only a matter of time until information technologies fully penetrate and then fundamentally change K–12 schools. Conservative and resistant though they may be, schools are ultimately accountable to a public that pays taxes or tuition and expects its young people to achieve. Public schools in the United States already spend as much per pupil as any nation in the world. Private schools charge tuitions that have risen more rapidly than inflation for two generations. Much as higher education has run into severe criticism for its high costs, K–12 education is finding it nigh impossible to ask parents or the public for more dollars. The recession of 2008 and its long aftermath only tightened public finances further. K–12 schools *need* technology to curtail expenses: with 60 percent of all expenditures in K–12 schools going to instructional salaries and 85 percent to personnel overall, schools cannot become materially more efficient without labor-saving technology. Today's innovations hold that promise, especially those that enable students to learn more independently.<sup>5</sup>

And, learning really is the key. Schools are already looking for efficiencies, to limit budget cuts in the public school sector and to retain tuition-strapped parents in the private. But technology would not be nearly as attractive if it merely helped schools accomplish the same for less. Technology is compelling because it has the potential to help more students learn more successfully. Technology can enhance the learning experience for students and increase the effectiveness and reach of teachers.

Students working online have the chance to move through lessons at their own pace, not at a classroom pace inevitably too slow for some and too fast for others. Students can be taught online through print, voice, video, animation, and simulation—multimedia not so easily available in a classroom. Students can work interactively online, responding to regular prompts and challenges built into the instructional software. Students can be assessed as often as necessary to ensure they are on track. They can be tutored, electronically or by a teacher online, with custom lessons matched to weaknesses exposed by ongoing assessments. They can conduct research and experiments and produce multimedia products and presentations. Students can collaborate through social media, much as they would be expected to collaborate some day at work. Indeed, it is hard to imagine students learning twenty-first century skills, which experts generally believe should supplement traditional academics, without new technology-infused approaches to learning.

Teachers can benefit from online instruction as well. If they are teaching online, they may find that they can provide more personalized instruction because electronic media are doing the heavy lifting of core instruction. If they are teaching in a mixed or blended classroom, they should find more opportunity to instruct higher-order skills and promote research and projects. The computer can present the basic knowledge and skills. The teacher can help students apply them. Classrooms can be “flipped,” students experiencing lectures at home online and interacting with teachers on assignments at school. Whether teaching online or in a blended

brick-and-mortar environment, teachers will find much better access to student performance data. Teachers will have comprehensive “grade books” that integrate data from multiple online and traditional assessments and programs, helping teachers stay on top of student progress. Teachers will be provided with differentiated assignments for students who need remediation or acceleration. And they will be offered online professional development to support any new instructional skills or content they may need.<sup>6</sup>

Technology offers all of these features today in some fashion. And technology is steadily improving as rising usage spurs investment in its development. Unlike our schools, which improve only slowly as they try to coax gains from an age-old model, technology should continue to improve substantially. It is a relatively new model of education—and one that is already working. A meta-analysis sponsored by the US Department of Education found that students working online achieve at least as much as students learning in traditional classrooms.<sup>7</sup> A recent large-scale randomized trial found that students in beginning statistics courses learned as much working fully online as students taking traditional classes—but at a fraction of the price.<sup>8</sup> Models blending online and classroom instruction are showing promising results, striving to get the best from both technology and teachers. Problems remain, to be sure. Student retention can be an issue if online instruction is not well-supported by teachers or if students are not ready for the independence.<sup>9</sup> But the evidence is growing that online education is helping more students succeed.

With its success, technology is being adopted. More than half of all school districts report using online instruction in some way.<sup>10</sup> Most of this usage, to be clear, is for coursework outside of the core academic program. Students are mostly working online when their schools cannot practically or economically offer courses in traditional classrooms. Advanced Placement classes with too little demand to fill a section, “credit recovery” classes for students who

failed a class the first time, or off-hour classes for students who have dropped out of high school—these are among the most common uses of online instruction. The district saves money moving students online and regular teaching positions are not threatened. School districts also make extensive use of remedial reading and math programs, to help elementary and middle school students catch up to their classmates. These uses are hardly the stuff of revolutionary change. But they are also just the beginning.

## **Competition and Choice**

School districts cannot be expected to engage in revolution. Left to their own devices, they would incorporate technology incrementally, slowly—safely. That is what online AP, credit recovery, and the like are all about. Technology has not left it at that. Over the last decade, the advance of technology, outside and inside of education, has inspired policymakers in a few places to push aside opposition and offer students new ways to access technology-based education. Most of the action has been at the state level, though some districts have had the will as well.

Legislation authorizes institutions other than traditional public schools to provide public education online. Legislation concomitantly provides students and their families the right to choose education online, with and without approval from traditional public schools. They can choose online education both full-time and part-time.<sup>11</sup>

Twenty years ago state legislators began to approve charter schools in order to give families public school options other than their district or neighborhood schools. Today, forty-one states and the District of Columbia permit charter schools. Nearly 6,000 charter schools enroll over two million students, approaching 4 percent of all public school students.<sup>12</sup> This is remarkable growth, and a generally positive influence on public education—for the students

choosing charter schools and the traditional schools spurred to compete with them.<sup>13</sup> The results have not been consistently good. But charter schools have won bipartisan support for being a largely positive force for change, especially for disadvantaged students who are most in need of better schools.<sup>14</sup>

Legislators have chosen similar measures to spur technological innovation.<sup>15</sup> States that permit brick-and-mortar charter schools are increasingly authorizing charter schools that serve full-time students completely or mostly online. These schools often serve entire states or at least multiple school districts. Students from rich and poor neighborhoods have access to the same online schools, an opportunity that brick-and-mortar charter schools cannot duplicate. Home-schooled students, who number 1.8 million nationally, have access to instruction otherwise unavailable to them. Legislators have also authorized state-operated virtual schools. These new entities offer students the opportunity to take individual courses online as well as, occasionally, to enroll full-time. For individual courses, legislation usually gives students the right to choose most any course, with limited guidance or veto power by their school of record.

A few states—Florida, Pennsylvania, and Utah being exemplars—are on their way to creating a dynamic of choice and competition in cyberspace. Students have more full-time and part-time options than choice in the brick-and-mortar world could ever create. As states become more accommodating, providers of online instruction have entrepreneurial outlets for their content; they need not depend on reluctant school districts as their only customers. Because the dynamic is at the course level as well as the school level, it has the potential to be far more disruptive to the status quo than traditional school choice. Whereas relatively few students may use school choice to improve their educational prospects, many if not most students may use course choice. The early numbers bear out expectations. Over two million students are already choosing online learning as a public education alternative.<sup>16</sup>



## Response and Counter-Response

The growth of online education, in all of its forms, has been driven by the inexorable development of information technology itself and by the competitive dynamic that state policymakers are beginning to create by extending choice to cyberspace. Online providers are responding to the new demand with a proliferation of offerings. Traditional public schools have countered with their own offerings. Competition has enriched the options for students and accelerated the use of information technology in schools of all kinds.

As of 2012, cyber-charter schools operated in thirty-one states, or three-fourths of the states that allow brick-and-mortar charter schools.<sup>17</sup> Where cyber-charters have not yet emerged, they are either proscribed by the charter school law or funded too poorly to be viable. These new online schools enroll about 275,000 students nationwide. In states with firmly established schools, the growth in enrollments has been strong: about 15 percent per year. State laws have a major influence on enrollments, and growth rates have varied accordingly by state. Five states—Arizona, Ohio, Pennsylvania, California, and Colorado—enroll about half of the nation's full-time online charter school students. If all states that authorize charter schools had laws similar to these five, enrollments overall would no doubt be much larger. Some charter laws limit enrollment geographically or numerically; other laws, like New York's and New Jersey's, prohibit cyber-charters. Demand for full-time online schools is likely well above the 275,000 students enrolled today.<sup>18</sup>

Still, most students interested in online education will not want to skip the traditional school experience altogether. They will want social learning experiences, proximity to friends, and the panoply of extracurricular activities available in many brick-and-mortar schools. While online schools find ways to assemble students for activities of various kinds—including an annual prom—online schools largely have students working at home,

supervised by a parent. This is not every parent's cup of tea either, especially working parents.

Policymakers have offered students a part-time option, most often provided by a state-sponsored virtual school.<sup>19</sup> In 2012, twenty-seven states had such schools with total enrollment of 619,847. The most recent annual growth rate was 16 percent. As with full-time cyber-charters, student participation varies widely across the nation as a result of state policies. One state, Florida, saw over 300,000 course enrollments, nearly half of the national total. The Florida Virtual School is one of the oldest state cyberschools. But its size is not a product of its age. Florida policymakers gave students the right to choose most any course in the state secondary school curriculum and receive school credit, without school permission—and used the student's pro-rated local per-pupil funding to pay the state. The program was thereby self-financing, and generously so. States with fewer enrollments may require a student's home school to give permission—which it may resist if that would jeopardize sufficient enrollment in core school offerings. Less successful states may fund their state virtual schools with extra appropriations, rather than regular public school aid, thereby limiting course offerings. Nevertheless, six states have state-sponsored virtual schools enrolling over 15,000 students per year. One of them, North Carolina, is approaching 100,000 course enrollments annually.

In all, state law enabled 900,000 students nationwide to participate in online education outside of their local school districts, full-time or part-time. That is less than 2 percent of all public school students. But a higher percentage of high school students participated. They constitute most of the course-takers and a large portion of the full-time students. Traditional public schools have taken notice and are fighting back.

In Pennsylvania, school districts have banded together to create their own full- and part-time online schools. Pennsylvania is one of the largest cyber-charter markets in the country, with over 32,000

full-time enrollments in 2012 and continued double-digit growth. Districts pay cyber-charters about \$9,000 per pupil. In recent years, Intermediate Education Units (IUs)—multi-district consortia that provide various services to member school districts—have created online schools. Individual school districts often lack the scale to open their own online schools, so their IUs have taken up the challenge.<sup>20</sup> Chester County, outside of Philadelphia, offered online education to students in thirty-eight school districts; Philadelphia recently became the thirty-ninth. Philadelphia currently pays to send 6,000 students to online charter schools each year. It hopes to shift 1,000 students to the Chester County–run school, saving \$4,000 per student. Similar IU-run schools surround Pittsburgh and Harrisburg, the latter enrolling 1,200 full-time students after just four years of operation. Exact counts of multi-district schools are not available for every state, but most states have IU’s—or districts big enough to create their own online schools. Cyber-charters and state virtual schools should expect continued competition from school districts.

The most exciting competition is from blended schools, like the Alliance High School with which we began. No one believes that the best education model for students is completely online, regardless of who the provider might be. Students can learn a great deal working online and interacting with electronic media. They also have much to learn from teachers, their peers, and face-to-face interaction. Students really need both forms of instruction. The challenge is finding the right mixes for different students and subjects. Schools are now experimenting, and at a quickening pace.

The most radical experiments are in charter schools, where rules governing class size, teacher assignments, and seat time (awarding credit for hours in class rather than mastery of subject matter) do not strictly apply.<sup>21</sup> Rocketship Education, based in San Jose, California, runs seven schools and is expanding to Milwaukee in 2013. It aims eventually to work in fifty cities and serve one million students. Carpe Diem began in Arizona and expanded in 2012

to Indiana. It too has ambitious growth objectives. Other emerging models include Nexus Academy, run by Connections, a division of Pearson Education and operator of numerous cyber-charters, and Touchstone Education, based in Newark, New Jersey. Like Alliance, these charter models radically change the school day to personalize education for every student, aiming to provide each the optimal combination of teacher-directed experiences and online education.

These schools are working with students in different physical spaces, not traditional classrooms. Teachers are playing a range of roles with their students, not leading whole group instruction. School financial arrangements are also different, with fewer teachers and more technology than traditional schools. The hope is that net savings can be used to raise the compensation of individual teachers. Blended schools could potentially attract and retain top talent by paying teachers more for serving more students—in “high tech, high touch” fashion.<sup>22</sup>

Traditional public schools do not have the flexibility to be as inventive with their blends. But creative models are emerging. Nashville, Tennessee, and Charlotte-Mecklenberg, North Carolina, school districts are using blended models to extend the reach of their most successful teachers.<sup>23</sup> The Chicago public schools operate several different blended models, including VOISE (Virtual Opportunities Inside a School Environment) Academy, part of the district’s ambitious Renaissance 2010 new schools program. Firm counts of blended public schools—traditional or charter—do not exist. The Innosight Institute, which tracks and supports blended learning, has identified scores of organizations and companies that work with schools to implement blended models.<sup>24</sup>

## **Research Could Help Make the Difference**

Online learning is already being used in the majority of the nation’s school districts. Outside of the districts, in cyber-charter schools,

blended charter schools, state virtual schools, and multi-district online schools, public education is offering students something quite different. Well over two million public school students now participate annually in online learning in traditional and non-traditional venues. That's more than double the figure just five years ago. Students and families—and a new generation of teachers raised in the digital world themselves—will demand better use of information technology in public education. Yes, there is resistance. But policymakers have provided just enough choice for families and openings for competitors to serve the rising demand. The great breakthrough in recent years is the development of educational models that aim to bring students the best of what both teachers and technology have to offer. Schools really are becoming different this time.

In the grand scheme of things the precise direction and pace of these changes will be determined more by the forces of politics, the economy, and technology itself. But, public policy will also play an important role, and that work could and should be shaped by research. What is not known about education and technology is vast. Advocates and opponents fuel the debate with self-serving “analysis.” Now is the time for serious research to provide policymakers with more factual guidance. Several issues are ripe for analysis.

For all of the encouraging evidence of student progress online, we have little systematic evidence of what instructional models work best. Data on student achievement, demographics, and school attributes are strong for full-time online schools. They are public schools, after all, and must comply with testing and reporting requirements like brick-and-mortar schools. Research could already begin to clarify success factors for cyber-charters and other full-time online schools. But even with decent data, that task is not straightforward. Students who select full-time online learning may differ from traditional students in unmeasured ways, confounding comparison between innovation and the status quo. Many full-time

online students enroll for only a year or two—intentionally—and then return to regular schools, making common statistics like graduation rates or one-time high school assessments imperfect measures of performance. These technical issues can certainly be addressed, but currently we have no strong studies of full-time online schooling.

Part-time online instruction has been studied even less—and here is where most future enrollments will surely lie. States generally do not keep track of individual student course-taking, even if the courses are taken at state-run schools. Districts do not keep systematic track either. We have no common assessments of student success at the course level. Estimates of the volume of course-taking nationally, cited above, are based on spottily reported data and guesstimates in other places with known course-taking activity. As a result of the data gaps, we do not know how much course-taking is by advanced students, remedial students, or regular students. This question is important, because it is the regular students whose participation indicates a real opening up of the traditional system. A national study just documenting course-taking would be a huge contribution to the state of knowledge.

Blended-learning models are another gaping hole. Anecdotes abound highlighting new learning spaces and new roles for teachers and technology, as already described. But we know little systematically about the varying attributes of models, their incidence, or their effects on learning. We also know nothing of the business models that might make blended-learning schools more efficient. Descriptive studies of significant samples of schools would be very useful, before sophisticated analyses are even contemplated. And on the point of business models, uncertainties extend well beyond blended models: the economics of online instruction, including MOOCs, have not been worked out in higher education, not to mention K–12. We have as much to learn about the business of online learning as we do about the educational proposition.

Finally, there is the matter of public policy. It is clear already that technology adoption varies by state. Terry Moe and I first reported on the variations in *Liberating Learning* in 2009: the stronger the organized opposition to technology, the more limited the adoptions. In ensuing years, many states have moved to adopt more open-access measures and online learning activity has increased, predictably unevenly, across the nation. But policymakers really do not know what laws are the most important levers of change. If research could document the use of online learning full- and part-time more accurately and completely, it could then help policymakers understand how to promote online learning most effectively.

The good news, however, should not be lost amid all of this uncertainty. Online and blended learning are increasing rapidly. Technology is pushing its way into education as policymakers provide just enough openings and technology itself proves its worth. This time *will* be different. But differences could come sooner, and with greater benefit for students, if research were a better guide.

## Notes

1. The school is examined in Susan Headden, “The Right Mix: How One Los Angeles School is Blending a Curriculum for Personalized Learning,” *Education Sector*, February 6, 2013.
2. For a recent analysis, see Eric A. Hanushek, Ludger Woessmann, and Paul E. Peterson, “Is the US Catching Up? International and State Trends in Student Achievement,” *Education Next* 12, no. 4 (Fall 2012).
3. The resistance to education technology and its eventual breakdown are analyzed in Terry M. Moe and John E. Chubb, *Liberating Learning: Technology, Politics, and the Future of American Education* (San Francisco: Jossey-Bass, 2009).
4. For statistics over time on technology in schools, see “Technology Counts,” *Education Week*, March 15, 2012, and earlier annual reports.

5. On education spending domestically and internationally, and its implications for teacher quality, see John E. Chubb, *The Best Teachers in the World: Why We Don't Have Them and How We Could* (Stanford, CA: Hoover Institution Press, 2012), chap. 2.
6. For a description of blended models, see Peter W. Cookson, "Blended Learning: Creating the Classroom of Tomorrow Today" (Alexandria, VA: ASCD, 2013).
7. Barbara Means, Yukie Toyama, Robert Murphy, Marianna Bakia, and Karla Jones, "Evaluation of Evidence-Based Practices in Online Learning: A Meta-Analysis and Review of Online Learning Studies" (Washington, DC: US Department of Education, 2010).
8. See Steve Kolowich, "Score One for the Robo-Tutors," *Inside Higher Ed*, May 22, 2012.
9. On the persistence problem and potential remedies, see Mandy Zatynski, "Calling for Success: Online Retention Rates Get Boost from Personal Outreach," *Education Sector*, January 16, 2013.
10. John Watson, Amy Murin, Lauren Vashaw, Butch Gemin, and Chris Rapp, *Keeping Pace with K-12 Online and Blended Learning: An Annual Review of Policy and Practice* (Durango, CO: Evergreen Education Group, 2012), 20-21.
11. The status of legislation authorizing, funding, and regulating online learning at the state level is detailed in "2012 Digital Learning Report Card," Digital Learning Now! an Initiative of the Foundation for Excellence in Education.
12. For current statistics, see Center for Education Reform, "National Charter School and Enrollment Statistics 2011-2012."
13. For a rigorous study of charter school performance, see Caroline M. Hoxby, Sonali Murarka, and Jenny Kang, "How New York City's Charter Schools Affect Student Achievement: August 2009 Report" (Cambridge, MA: New York City Charter Schools Evaluation Project, September 2009).



14. For the mixed results, see Center for Research on Education Outcomes, “Charter School Growth and Replication,” Stanford University, January 2013.
15. On the challenges and opportunities for state online policy, see John E. Chubb, “Overcoming the Governance Challenge in K–12 Online Learning,” in *Creating Sound Policy for Digital Learning* (Washington, DC: Thomas B. Fordham Institute, February 16, 2012).
16. Based on estimates of the gamut of student uses in Watson et al., *Keeping Pace*, 20–33.
17. Statistics in this section are from *ibid.*, 24–27.
18. For more on the effects of state laws, see Chubb, “Overcoming the Governance Challenge.”
19. See Watson, *Keeping Pace*, 29–32.
20. See Benjamin Herold, “Philadelphia to Launch Online School,” NBC 10 Philadelphia, April 20, 2013.
21. On blended charter models see Chubb, *The Best Teachers in the World*, chap. 2; and Watson, *Keeping Pace*, 23–24.
22. For a national model of savings from technology and increased compensation for teachers, see Chubb, *The Best Teachers in the World*, chap. 2.
23. For models extending the reach of top teachers, see Public Impact, “Extending the Reach of Excellent Teachers,” February 2013.
24. Heather Staker, “The Rise of K–12 Blended Learning: Profiles of Emerging Models” (Mountain View, CA: Innosight Institute, 2011).