

# **Hard Wiring: What the Next Decade in Education Policy Means for Educational Technology**

*By Andrew J. Rotherham\**

## **Introduction**

Speculation about the future of education, especially where technology is concerned, generally involves bold predictions about radical change. For instance, Thomas Edison saw motion pictures replacing teachers because they could deliver lessons with more consistency at a lower cost.<sup>1</sup> Even a casual observer of American education knows how widely that forecast missed the mark. More recently, laptop computers and the Internet are touted as technologies that will revolutionize schooling.

The merits of movies, computers, or the Internet notwithstanding, one reason education still awaits its promised technological revolution is that American public education is strongly averse to change culturally and institutionally. Historians David Tyack and Larry Cuban write of a deeply ingrained "grammar of schooling," observing that through the decades, "little has changed in the ways that schools divide time and space, classify students and allocate them to classrooms, splinter knowledge into 'subjects,' and award grades and credits as evidence of learning."<sup>2</sup> As a result, there is more than a little truth to the common quip that despite the radical changes in American society, a visitor from the 19th century would immediately identify with two institutions today—our churches and our schools. This is unsurprising. Our schools today are designed to be institutions of stability rather than nimble organizations that change rapidly.

Some critics contend that the promises made on behalf of new technology outweigh its likely benefits in the first place. Todd Oppenheimer writes that belief in a "technotopia" obscures understanding of the fundamental person-to-person nature of education.<sup>3</sup> Similarly, Cuban argues that technology in schools has been "oversold and underused," noting that the most prevalent applications are word processing and Internet searches rather than the fundamental redefinition of teaching and learning envisioned by many proponents of educational technology.<sup>4</sup>

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Regardless, whether it's because of deep-seated resistance to change in education, because technology has been oversold, or some combination of the two, thus far faith in the transforming power of educational technology outstrips the results. And, insofar as actual classroom teaching is involved, it seems unlikely that the two dominant themes in education policymaking—choice and accountability—will substantially change this pattern in the near future.

That choice and accountability are largely dominating the education policymaking agenda speaks to stability there as well. Like schools themselves, education policy changes slowly and for the most part also resists radical changes. In fact, the most significant change in American education policy in the past generation, the No Child Left Behind Act (NCLB), was actually more a punctuation to a decade-long effort to introduce more clearly defined standards and greater accountability into public education than it was a sudden change of direction.<sup>5</sup> And although NCLB's particulars will certainly change over time, the broad consensus about public accountability and various public school choice options embodied in the law very likely indicates that stability rather than radical changes will characterize the policymaking process for the immediate future. In addition, to the extent that choice and accountability continue to dominate the policymaking discussion, it leaves less space on national and state agendas for issues such as technology. This complicates the task of advocates and diminishes the attention span of policymakers.

Consequently, this paper makes the rather unexciting prediction that in a decade America's public schools will still look largely the same and generally function under the same governance and policy arrangements and modes of delivery as they do today. Nonetheless, the next decade will see some changes within this broad context. During the next 10 years, three powerful trends can be expected to begin to shape and inform policymaking and bear on education technology as both a management and a classroom issue.

These are:

- The explosion in both the *quantity and public availability of educational data*;
- An *increasingly "consumer" orientation in education* pitting educational consumers against educational producers; and

- *Emerging resource constraints* that put increased fiscal pressure on public schools.

As a management issue, the abundance of data and the ability to analyze it in increasingly sophisticated ways mean policymakers and educators will have greater analytic leverage over decision-making than ever before. Similarly, technology allows public packaging of this information and empowers parents to gain access to information about education and use it to make decisions. New data also empowers educators because it allows for a much more granular and specific understanding of student learning and progress.

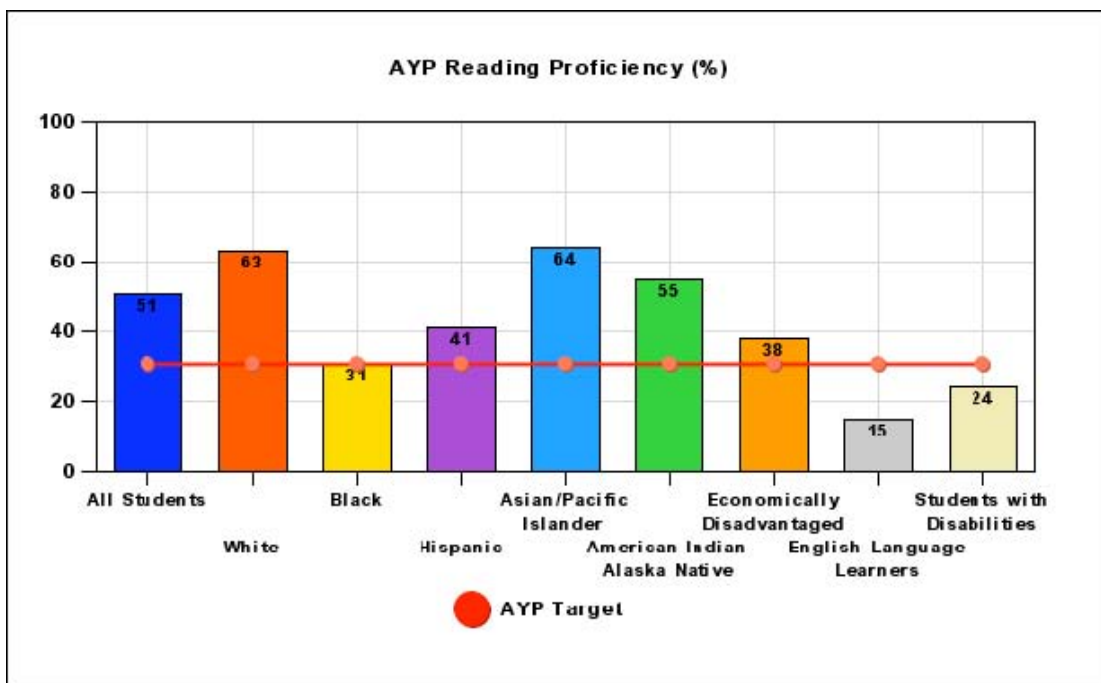
However, as an instructional issue, resource constraints are likely to hinder the ability of schools to use marginal dollars to make large investments in non-core and non-personnel areas such as educational technology. It's important to remember that, on average, salaries and benefits consume about 80 percent of school district budgets. These monies are difficult to redeploy, so marginal dollars are key to investments in new initiatives. Further, as public policy continues to devolve decision-making away from specific programmatic investments and requirements and instead toward broader funding streams, investments in educational technology will have to compete with other budget priorities and greater competition for scarce resources.

In addition, depending on parental taste for technology, the greater choices that are emerging in the public sector could lead to greater use of classroom technology—or less. Currently, though parents often express a desire for technology in the abstract, there is no reliable data or evidence on how this preference ranks against other educational tastes and desires.

### **The Data Explosion**

Most observers are stunned to learn how little data has, until recently, been available to answer basic educational questions. Perhaps the best example of this dearth of reliable data is the fundamental measure of how many students finish high school on time with a diploma. Until recently such completion data was self-reported by schools, school districts, and states and often was wildly inaccurate. For instance, while Texas claims a 95 percent graduation rate, research by Jay Greene using a more widely accepted methodology puts it at 68 percent.<sup>6</sup> Federal data was not much more reliable, similarly undercounting non-high-school completers.<sup>7</sup>

Likewise, not much data about student achievement was available, and most of what existed was aggregate data with little utility beyond broad-brush generalities. Lost in overall averages was crucial information about how subgroups of students—minorities, students with special needs, and English-language learners—fared. For instance, the chart below shows the percentage of students proficient in reading in Florida in 2003. Although 51 percent of students were proficient in reading overall, large gaps exist for minority students. The horizontal red line indicates the percentage of students who must pass the reading test for a school to make "adequate yearly progress," or AYP, under No Child Left Behind. In this case it's 31.<sup>8</sup>



Data about education finance was equally opaque and aggregate. While there was data about aggregate spending and revenue, it became less reliable at the school district level and often unavailable at the school level.<sup>9</sup> The result was a peculiar situation where finance debates generally turned on questions of spending rather than analysis of cost. In other words, policymakers were able to track how much was spent on various activities but had very little understanding about what these activities should in fact cost or the relative trade-offs among them outside of spending. In addition, there was little ability to track spending in relation to performance targets and organizational or policy goals or programs. Thus, strategies such as per-

formance-based budgeting or cost-benefit analysis were rarely employed in decision-making about educational expenditures.

Now, driven by No Child Left Behind and growing attention to educational management and leadership, states and the federal government are doing more to track such data. NCLB requires public dissemination of disaggregated achievement data. At the urging of the National Governors Association, most states are developing longitudinal data systems to track individual students as they progress through school. These efforts, however, are still in their infancy. A recent analysis by the National Center on Education Accountability identified 10 key elements of a longitudinal data tracking and analysis system and concluded that only six states had at least eight elements in place. No state had all 10.<sup>10</sup>

From the standpoint of educational technology, the impact of this new attention to data will be mostly a management and administrative issue. Increased data and analytic capacity means that educational managers and policymakers will be able to better understand performance patterns and the linkages (or lack thereof) between performance and resource allocation and make decisions accordingly. In addition, this data will improve the basic financial management of school districts by providing greater transparency. As Jon Fullerton notes, school boards, superintendents, and often school business managers themselves have instructional and educational experience but little financial management expertise.<sup>11</sup> In conjunction with poor data tracking and transparency, these problems conspire to result in a significant amount of financial slippage.

At a state level, longitudinal data tracking systems that allow states to track individual students from year to year will lead to more sophisticated inferences about various educational programs and strategies and, consequently, more informed decision-making. Likewise, school accountability schemes can become more sophisticated and textured. Right now, most states can hold schools accountable only for the "status" of students, meaning how a group of students performs on a state test at a particular point in time.<sup>12</sup> Such performance information is useful but sheds no light on the progress that a student has made while attending a particular school or the growth that a school has made overall.

However, in addition to more technical psychometric challenges for a state's assessment system, in order to reliably measure such growth or "value added" for individual students, states must be able to track individual students from year to year. This technological hurdle is one that relatively few states can surmount now, although an increasing number will be able to within a few years.

Of course, as a largely political enterprise, data alone does not drive decision-making in education. Instead, values, politics, and interest groups all play substantial roles as well. However, the abundance of new data is changing the public understanding of American education, as information about achievement disparities becomes more widely known and internalized. It's interesting that despite a multimillion-dollar campaign against the No Child Left Behind Act, multiple polls show that public opinion about the law has in fact changed very little and remains relatively favorable overall.

Within the classroom, although to a lesser extent, educational data will play greater a role as well. More and timelier data about student progress allows for more real-time customization of instructional programs, and over time it allows schools to identify strengths and weaknesses in their instructional programs. A growing cadre of consultants and experts specializes in such assessment and data analysis and works with teachers to use data to drive improvement. Such data-driven improvement is becoming increasingly common. "The culture of data is getting built into the conversation and will become more sophisticated, more reliable, and not as simple and discrete as it is now," says Paul Kimmelman, a former public school superintendent and author of *Implementing NCLB: Creating a Knowledge Framework to Support School Improvement*. "Educators are increasingly willing to look at their state assessments and see if their students are doing as well as they think they're doing."<sup>13</sup>

### **Consumers versus Producers**

While all this data has terrific potential as a tool for improvement, it will also destabilize political alignments in education. The availability of data is fostering a schism that—while new to education in its intensity and form—is an old story in many other industries: tensions between the producers of goods and the consumers of them. President Theodore Roosevelt is lionized for

his efforts to restrict trusts and "combinations." More recently, efforts to deregulate the telecommunications sector were intended to give consumers greater power vis-à-vis the producers of various goods by allowing more providers to enter the marketplace and allowing consumers to exercise more choice among them. As one of the last quasi-monopolies, education is now feeling similar pressure.

In the case of education, as people—especially parents—get a more complete picture of the educational landscape and more detailed information about schools serving their own students, some are understandably concerned about vast disparities in performance, in particular those disparities that systematically impact low-income and minority youngsters. On average, minority students trail white students by four grade levels in achievement by the time they finish high school, and the on-time high school graduation rate for minority students hovers near 50 percent while overall on-time graduation rates are around 72 percent.<sup>14</sup> Socioeconomic disparities are also stunning. While 60 percent of affluent students achieve a bachelor's degree by age 26, only 7 percent of low-income students do.<sup>15</sup>

Until recently these issues did not receive a great deal of public attention. While there was a general awareness of disparities between rich and poor school districts, and popular authors, for instance Jonathan Kozol, called attention to inequalities in schooling, these issues were rarely quantified and systematically analyzed. Now, parents are finding out that achievement gaps between racial groups exist in all kinds of communities—even America's most affluent—and that there are a not insignificant number of high-poverty schools that substantially outperform the averages.

In fact, entire Web sites now exist to provide parents with detailed state, local, and school-level data about performance, finance, school environment, and other issues. The two most prominent sites are [www.greatschools.net](http://www.greatschools.net) and [www.schoolmatters.org](http://www.schoolmatters.org). The not-for-profit *Greatschools.net* offers performance information and parental feedback about particular schools.

*Schoolmatters.org*, a division of Standard and Poor's, provides performance, demographic, and financial data and allows parents to make various comparisons among schools within particular communities or states. Both sites are heavily trafficked; *Greatschools.net* receives more than 2 million unique visitors each month.<sup>16</sup> Meanwhile, the S&P Web site is increasingly popular with

policymakers and journalists. These sites illustrate technology's promise as a tool for information management and dissemination.

Rhetorically, educational producers (for instance, teachers, school districts, state education officials) claim that their interests are aligned with the interests of educational consumers (parents and children). At a superficial level this is basically true; most people in education are sincerely motivated by a desire to do what they see as in the best interest of children. However, at a more specific level it quickly becomes clear that there is a often a serious misalignment between what is in the interests of teachers, principals, school administrators, and state policymakers and what is in the best interest of students.

There are obvious examples of this tension—provisions in teacher collective bargaining agreements that prevent school districts from offering extra compensation to teachers working in the most challenging schools—and subtle ones, such as state laws and regulations regarding the preparation and licensure of teachers and principals, which often protect established franchises for training teachers and principals but exclude other talented individuals and restrict hiring flexibility within the profession.<sup>17</sup>

Now, just as in other industries, consumers are realizing that their interests are not always foremost in the minds of the producers. But this change is not happening in a vacuum. Historically, unsatisfied educational consumers could leave the system. For instance, dissatisfaction among 19th-century Catholics led to the establishment of parochial schools, which are a fixture of the education landscape today. However, for many parents, an ability to leave in theory did not translate into an ability to actually do so in practice. Today, however, not only do parents have the right to exercise choice as well as to exit but they also possess a more affirmative ability to do so.

For starters, more parents can choose where they live, and the quality of local public schools is often a key factor in their decisions. Moreover, choices are increasingly decoupled from residency. Forty states and the District of Columbia now have laws allowing public charter schools, and there are more than 3,400 charter schools around the country.<sup>18</sup> In addition, Florida, Ohio, Milwaukee, Washington, D.C., and Utah now have some sort of publicly funded private



school choice programs.<sup>19</sup> Thus, just as parents are becoming more empowered with information and attentive to educational performance, there are increasingly active and organized interests working to satisfy their growing demands for alternatives.

The growth in demand for gourmet coffee offers an instructive parallel for the trend in education. Essentially, 20 years ago consumers accepted the mass market coffee brands, sold largely already ground in cans, as satisfactory—in no small part because few were aware of or sought other alternatives. However, providers of new coffee options aggressively sought to educate consumers, change their tastes, and encourage consumption of gourmet alternatives. Not surprisingly, consumption of gourmet and specialty coffee increased rapidly. From 1999 through 2005 consumption of gourmet coffee among *all* Americans increased from .22 to .36 cups a day while consumption of regular coffee dropped from 1.48 to 1.26 cups per person per day.<sup>20</sup> Policy actors advocating greater choice, and new providers of education services including nonprofit and for-profit networks of schools and community groups, are seeking to stimulate similar changes in taste and demand.

In politics, publics waiting to be mobilized are what political scientists would characterize as "inattentive publics," or in other words, citizens with potential preferences, interests, and tastes that they are not articulating until given a reason or opportunity to do so because of a threat to their interests.<sup>21</sup> Today, various political actors are seeking to galvanize the attention of parents and mobilize them to demand greater choice in education. Polls show relatively strong support in the minority community and mixed support overall.

For instance, in Los Angeles, veteran Democratic activist and founder of Green Dot Public Schools Steve Barr, has organized parents there to demand changes to Jefferson High School, a demonstrably failing local high school. The parents want the 4,000-plus-student school broken into smaller schools with choices for students and parents. Green Dot, a non-profit network of public charter schools has established successful small schools in underserved areas of Los Angeles and consequently has "proof points" that parents can see. In other words, better coffee is not an abstract concept; parents there can see it and taste it. Barr gathered signatures from 10,000 local parents on a petition and organized a march of hundreds of parents to deliver it to the school district headquarters.<sup>22</sup> Activists like Barr are the Starbucks to the school district Followers,

and thus far the districts are not yet responding sufficiently to the demand.<sup>23</sup>

Increasing parental demand for better options threatens to realign the coalitions that have traditionally supported public schools and more funding for them. In particular, minority parents are threatening to bolt the public education coalition as urban schools continue to chronically underperform. Rather than a wholesale political realignment around education, it seems more likely that No Child Left Behind and increasing attention to educational inequities are ushering in a period of coalitional instability which, while not creating dominant new power bases and alignments, may substantially weaken existing ones.

This raises three issues for advocates of greater technology in schools. First, to the extent that this instability weakens the coalition that has traditionally supported more funding for public schools, it creates even greater challenges for new investments. Second, to the extent that choice dominates the policymaking agenda, it leaves less space for other issues such as technology. Third, it's entirely unknown how preferences for technology factor into parents' decision-making about choosing schools and relative trade-offs.

There is, however, a potential upside for technology as well. The challenge facing educators and policymakers is to provide greater mass customization in public schooling and thereby meet growing and changing consumer demand. Technology plays a key role here, as it increases the ways curriculum can be delivered and, even in extreme cases—for example, virtual schools—change "schooling." More commonly, state and local policymakers are turning to online classes and virtual schools—based in traditional public schools but offering additional courses online—as a way to provide more options using technology.

Finally, in the longer term, to the extent technology can help with data management and analysis and improve school performance, it will also address some of the demand for more options than now exist.

### **Resource Constraints**

The explosion of data and increasing consumer-producer tensions will play out against a backdrop of increasing resource constraints for public-sector activities such as education. Several

demographic trends and political decisions mean that the next decade will see the beginning of a period of more intense competition for public resources.

Since 1970, per-pupil spending in the United States has more than doubled, from \$3,500 to more than \$8,000, and total spending on elementary and secondary schools now stands at approximately \$440 billion annually.<sup>24</sup> Put another way, America now spends more on its public schools than the entire gross domestic product of all but 26 nations worldwide.<sup>25</sup> Among other things, these increases led to better education for disabled students, higher teacher salaries, and new technologies in classrooms. Unfortunately, this influx of resources also fed a belief among many educators that the public well is bottomless when it comes to education spending and the nation can spend its way out of whatever educational needs it has.

This upward trajectory, however, is unlikely to continue. For starters, the population is aging. According to the Census Bureau, in 1995 only about 13 percent of the population was over 65; in 2030, 20 percent will be. At a national level this aging trend will create fiscal pressures because of health-care costs and entitlement obligations—particularly Medicaid and Medicare. But a shifting demographic burden carries particular problems for education. For instance, most jurisdictions give property tax abatements to older citizens and the impact of these abatements will grow as the population ages. Property taxes are a primary source of local education revenue. In 2002, local funding constituted, on average, 43 percent of education funding.<sup>26</sup> In addition, older citizens historically are less likely to consume goods and services, a trend that will impact state sales taxes.<sup>27</sup>

Meanwhile, tax cuts are popular and state tax policies are out of date. The nonpartisan Center on Budget and Policy Priorities estimates that most states face structural budget deficits because of these aging trends coupled with insufficient revenues due to tax cuts and outdated tax structures that, for instance, focus on work instead of investment income or that under tax in a service-oriented economy.<sup>28</sup> The center notes that the tax policies of most states do not reflect the shift to a service-based economy, the increasing ability of corporations to do business from anywhere in the country or the world, or greater interstate and online sales.<sup>29</sup>

Along with these structural factors, will an aging population be less likely to support public

schools? It is too soon to tell, and the evidence as to whether a "gray peril" exists for schools is mixed and depends in part on how aggregated the considered data are. James Poterba found that a greater proportion of people over 65 resulted in less spending on schools, all else being equal. However, Helen F. Ladd and Sheila E. Murray found that the geographic distribution of seniors *within* a state had greater impact on school spending.<sup>30</sup> A study of *preferences* (as opposed to actual voting) found that while seniors are heterogeneous in their governmental preferences, they were unlikely to vote in block against school funding as a value issue (meaning because they - didn't benefit from the service). Yet there is a risk that personal economic circumstances could fuel anti-tax and public services sentiment.<sup>31</sup> Only actual voting patterns over time will answer this question definitively.

While there are organized efforts to increase funding for public education, they all face challenges. Politically, the coalition supporting greater education spending is threatened by the same demographic challenges that are pressuring public finance. Fewer adults have children in school, weakening the direct connection to the public schools. In addition, as discussed above, the producer-consumer tension in education threatens to weaken the traditional coalition supporting school funding.

Advocates are also attempting to use the courts to generate more funding through lawsuits—arguing that state spending on public schools is inadequate to meet the states' obligations to provide public education. However, though the current record is mixed, the politics of these suits will become more complicated as resources become more constrained. To the extent that large judicially ordered increases in education spending threaten other social-service programs, it will strain the coalitions that traditionally support this litigation. Similarly, if the courts begin to order remedies in addition to more spending as part of the settlement of this litigation, some likely actions—specifically greater school choice or more serious consequences for underperforming schools—threaten to shatter the coalition supporting the suits in the first place.

The implications of these issues on educational technology are obvious. While the shifting demographic burden will not hit with the sudden force of a tsunami, the pressures it is creating will begin to swirl around schools during the coming decade. Competition for public resources will become more intense, and as spending constraints increase, less money will be available for non-core activities such as expanding access to educational technology or developing or improving

state data systems. The labor-intensive nature of education only complicates this challenge. With four dollars in five, on average, tied up in labor costs, uncommitted or marginal dollars are scarce, and redeploying existing resources is difficult. In addition, when new dollars are available the most popular place to put them, from a political standpoint, is into salary increases. Regardless of the merits of such increases, they put additional pressure on scarce marginal dollars. Conversely, of course, to the extent that technology allows educators and policymakers to better use existing resources and increase productivity, it will to some extent offset but certainly not fully address these emerging resource constraints.

## **Conclusion**

Three broad trends will define education policymaking over the next decade. These are the increasing abundance of education data and the ability of policymakers and educators to use it in more sophisticated ways; a growing tension between consumer and producer interests in education; and emerging resource constraints. Collectively these trends offer both promise and pitfalls for advocates of greater technology in schools. It seems likely, however, that because of these trends, the impact of technology will be felt more strongly in out-of-classroom activities than directly as an instructional matter.

Though this assertion runs counter to the enthusiastic claims and hopes of some boosters of educational technology, schools are resistant to change, resources are becoming constrained, and the current attention in the policymaking community is more toward technology as a management and accountability strategy than as an instructional one. These trends very likely indicate that for the near future, the greatest promise of technology to change public education is around activities that support teaching and learning but in fact occur, for the most part, outside the classroom.

## Endnotes

<sup>1</sup> Oppenheimer, Todd, *The Flickering Mind*, (New York, N.Y.: Random House, 2003).

<sup>2</sup> Tyack, David, and Larry Cuban, *Tinkering Toward Utopia*, (Cambridge, Mass.: Harvard University Press, 1995).

<sup>3</sup> Oppenheimer, op. cit.

<sup>4</sup> Cuban, Larry, *Oversold and Underused*, (Cambridge, Mass.: Harvard University Press, 2001).

<sup>5</sup> For more on how policy agendas change see: Baumgartner, Frank R., and Bryan D. Jones., *Agendas and Instability In American Politics*, (Chicago, Ill.: University of Chicago Press, 1993).

<sup>6</sup> Greene, Jay P., and Marcus A. Winters, *Public High School Graduation and College-Readiness Rates: 1991–2002*, (Manhattan Institute, 2005).

<sup>7</sup> *ibid.*

<sup>8</sup> Even with this low passing bar of 31 percent most Florida schools failed to make AYP. However, without disaggregated information about student performance it is difficult to understand why, because the overall pass rate is 51 percent.

<sup>9</sup> Today even Standard and Poor's *Schoolmatters.com*, which is the industry standard, can provide only finance data to the school district level.

<sup>10</sup> *2005 Survey of State Data Collection Issues Related to Longitudinal Analysis* (National Center for Education Accountability, 2005). [http://www.dataqualitycampaign.org/activities/about\\_survey\\_2005.cfm](http://www.dataqualitycampaign.org/activities/about_survey_2005.cfm) Retrieved Dec. 14, 2005.

<sup>11</sup> Fullerton, Jon, *Mounting Debt*, (Education Next, Winter 2004).

<sup>12</sup> To help mitigate this, No Child Left Behind allows states to average test scores for up to three years.

<sup>13</sup> Interview with Paul Kimmelman, senior adviser to the CEO, Learning Point Associates, Dec. 15, 2005.

<sup>14</sup> Sources: Greene, op. cit. National Assessment of Educational Progress: <http://nationsreportcard.gov>.

<sup>15</sup> Carey, Kevin, *Declining By Degrees*, (The Education Trust, 2004).

<sup>16</sup> Correspondence with Bill Jackson, founder, president, and chief executive officer, *Greatschools.net*, Dec. 13, 2005.

<sup>17</sup> For a fuller discussion of these issues see: Hannaway, Jane, and Andrew J. Rotherham, *Collective Bargaining In Education: Negotiating Change In Today's Schools*, (Cambridge, Mass.: Harvard Education Press, forthcoming); Hess, Frederick M., *A License to Lead? A New Leadership Agenda for America's Schools*, (Progressive Policy Institute, 2003).

<sup>18</sup> Vanourek, Gregg., *The State of the Charter Movement 2005: Trends, Issues, and Indicators*, (National Alliance for Public Charter Schools, 2005).

<sup>19</sup> Florida has multiple programs. Colorado passed a private school choice program, but it was subsequently declared unconstitutional by the state's Supreme Court.

<sup>20</sup> *National Coffee Drinking Trends 2005*, (National Coffee Association of USA, 2005).

<sup>21</sup> Arnold, R. Douglas, *The Logic Of Congressional Action*, (New Haven, Conn.: Yale University Press, 1990).

<sup>22</sup> Merl, Jean, and Joel Rubin, *Marchers Urge Remaking L.A. Campus Into Charters*, (*Los Angeles Times*, Nov. 16, 2005).

<sup>23</sup> The evidence to date suggests that districts are more likely to respond politically to the threat of losing parents than to make substantive changes. See: Hess, Frederick M., *Revolution at the Margins*, (Washington, D.C.: Brookings Institution Press, 2002).

<sup>24</sup> *Digest of Education Statistics*, (U.S. Department of Education, 2004).

<sup>25</sup> Based on 2004 GDP estimate from *CIA World Factbook*.

<http://www.cia.gov/cia/publications/factbook/rankorder/2001rank.html>.

<sup>26</sup> *Digest of Education Statistics*, op. cit.

<sup>27</sup> It's unclear, however, what effect the higher standard of living that the next generation of retirees is expected to have will have on this.

<sup>28</sup> Lay, Iris J., Elizabeth McNichol, and Robert Zahradnik, *Faulty Foundations: State Structural Budget Problems and How to Fix Them*, (Center on Budget and Policy Priorities, 2005).

<sup>29</sup> *ibid.*

<sup>30</sup> Ladd Helen F., and Sheila E. Murray, *Intergenerational Conflict Reconsidered: County Demographic Structure and the Demand for Public Education*, (Economics of Education Review, 2001).

<sup>31</sup> Duncombe, William, Mark Robbins, and Jeffrey Stonecash, *Measuring Citizen Preferences for Public Services Using Surveys: Does a "Gray Peril" Threaten Funding for Public Education?* (Public Budgeting and Finance, Spring 2003).

## **Hard Wiring**

Education Sector co-director Andrew J. Rotherham looks ahead to the next 10 years in educational technology-related public policy.