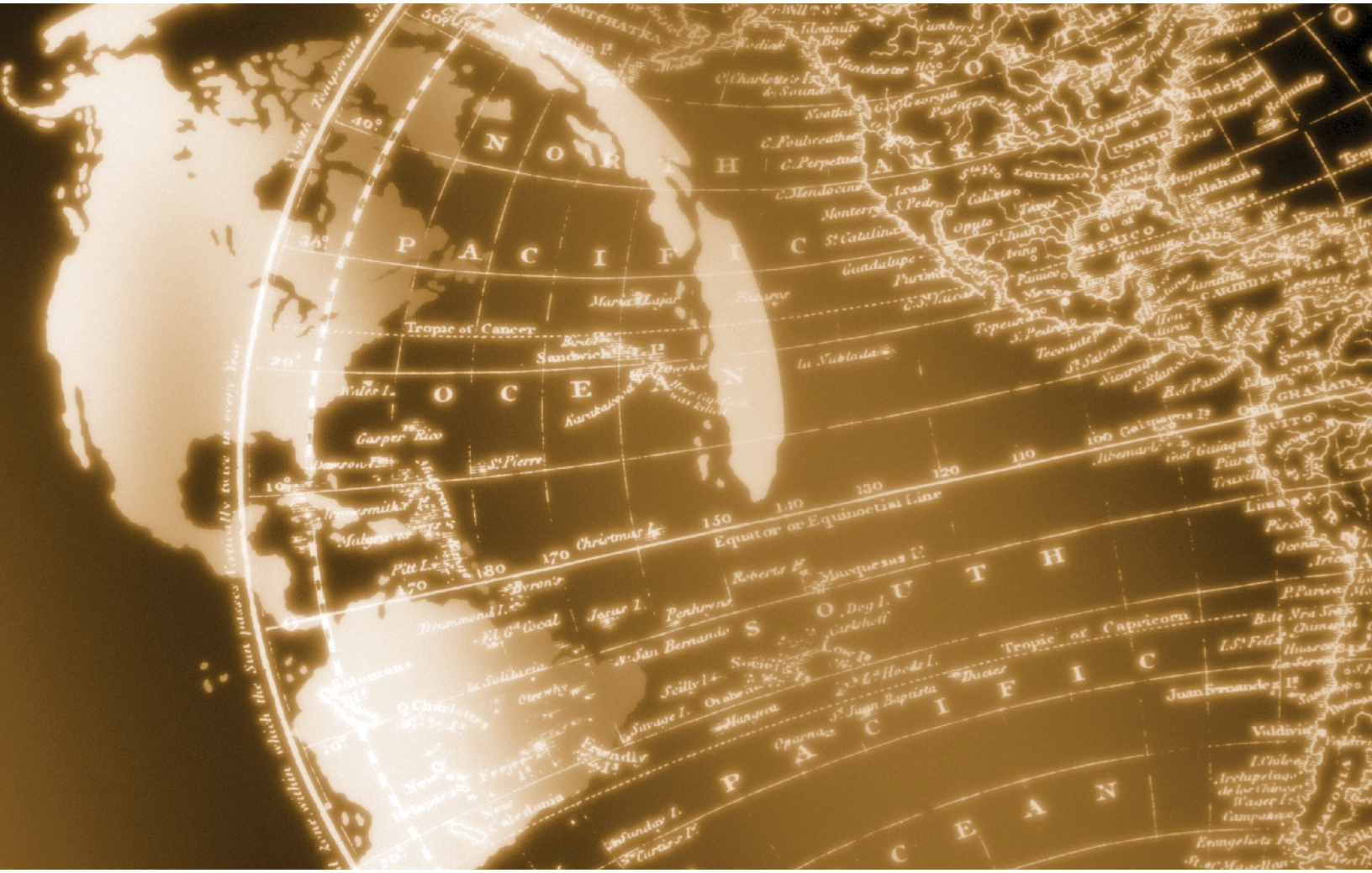
TurningPoint.edu:

The Next National Turning Point in Education



A Strategy Paper from the Center for Digital Education

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Executive Summary: It's Time

If America's K-20 education system cannot improve the proficiency of its students and increase the number of high school diplomas and college degrees in the workforce, the personal income of American families will decline over the next 15 years. Such are the stakes as education increasingly becomes the source for America's continued preeminence in the global economy in the years ahead. That said, income in many respects will be a symptom of larger systemic challenges, the long tail of which wraps around how, who and when we educate. As America's workforce ages, its best educated group (predominantly white Caucasians) will retire in large numbers in the next decade, while the racial and ethnic groups with the lowest educational attainment will see the greatest increase in its numbers, doubling as a proportion of the workforce.

Could we have seen it coming? Yes, and many did — some as long as a quarter-century ago. And we are feeling the effects today. As our society shifted from the Manufacturing Age to the Information and Conceptual ages, America's expectations of public education also radically changed. America's current economic competitiveness is now based on its ability to harness the intellectual capital of its workforce, not its ability to produce goods. Publication of *A Nation at Risk* in 1983 served as a rude wake-up call — much like the Soviet Union's launch of Sputnik — that the performance of America's educational system needed to improve to meet expanded expectations. How could the richest country on Earth have such poorly-educated students, as the report contended? Indeed, if Americans were moving from the making of things to manipulating knowledge to generate wealth, weren't we as a nation, then, at risk, much like the security risk posed by the surprising Soviet space program in the late 1950s?

This white paper explores the key issues in the American education turning point, the trends shaping the future of American education and a vision for that future.

Initial perceptions in the early 1980s were that the American public K-12 education system was in urgent need of reform, while the higher education system (particularly California's open enrollment three-tier system stressing access, equity, affordability and quality and those that followed a similar course) became a model to the rest of the world. While there is much even critics take pride in regarding America's colleges and universities, fast-paced global economic pressures affecting our workforce will revolutionize our expectations, requiring fundamental change even in higher education. These changing global economic competitive standards will make education the primary engine to ensure our continued national security, requiring both increased investment and improved system performance.

Nationally, it seems accountability, school facilities and teacher quality have emerged as key issues for American K-12 education. For their part, colleges and universities are confronting accountability, affordability and the viability of a lifelong learning system as the central issues in American higher education.

None of this happened in isolation. In fact, the issues in education reflect the confluence of numerous external factors:

1. Changes in technology and the ever-shrinking shelf life of technology are driving ongoing changes in learning and work, erasing prior boundaries and creating the urgent need for a viable lifelong learning system.
2. In many countries in the global economy, average real worker wages are stagnant or declining.
3. The American workforce is in the midst of a profound transformation.
4. Globalization will continue to integrate national economies, creating a globally-distributed labor pool while also increasing the need for a highly-skilled, literate workforce.
5. Fundamental change will continue in the relationship between people and information, as communication systems continually change the way people access information.

Social and learning environments are shifting on the fly. In this context, "old school" is not just a pop culture reference. As the "new school" model develops, it will carry forward everything of value from the "old school" disciplines to one-to-one customized learning,

where the student interacts with an artificially intelligent cyber-tutor specifically oriented to individual learning styles. Instructors, empowered by a network of tutors, could orchestrate learning as symphony conductors do: as the key player in the education environment interacting with the student-consumer. This is a vision where institutions and employers create rich, new, on-demand curricula available to the student and the worker.

To facilitate this "old school-new school" transition in the interim, governors and state legislatures can:

- Increase general fund appropriations to support state K-12 accountability programs and teacher pay.
- Support general fund bond issues targeted to 21st century school and college/university campus design incorporating digital classrooms and virtual learning management system (LMS) approaches.
- Establish a statewide public higher education digital course challenge grant fund to train faculty in the latest digital media technology.
- Significantly increase funding to the state's needs-based higher education grant program. The increase in funding will depend on the ability to demonstrate institutional collaboration with external organizations — particularly employers — on curricular design. Also, call upon state congressional delegates to significantly increase the Pell Grant program both at the aggregate federal appropriation and individual student grant award levels.
- Expand existing teacher education loan forgiveness programs for other jobs with public-service focus, such as nurses, social workers, firefighters and police officers.
- Set up and enhance tax incentives for external organizations — particularly employers — that provide funding for K-20 educational programs. Institute state tax deductions for up to $3,000 per year for in-state tuition for families earning less than $60,000 per year.

Context:
Education's Next Turning Point

America's expectations of public education have radically changed as technology has increasingly become an agent of change. People traveled by carriage for hundreds of years but the gas combustible engine changed travel in a matter of decades, permitting travel by car and plane. In our time, technology's shelf life is constantly shrinking as products are designed, delivered, and reborn faster than ever. The impact on education has been startling as technology has forever transformed learning, life and work.

Prior to the 1980s, education was seen as a pursuit unto itself. "Getting an education" meant an individual could attain personal growth, become a better citizen and increase social consciousness. Education was not necessarily linked to pursuit of a career, but was viewed more as a prerequisite to becoming an educated person and good citizen. As increasingly complex technology required increasingly higher levels of education, the role of education began to change. Education and its content became more career dependent as technology quickly changed processes and content in careers and work.

Because education content began to quickly evolve with new career developments and changing technology, education curriculum in turn needed to change. Technology became the conduit between education and jobs, creating a symbiotic relationship between the two, but also blurring the boundaries between them. A seemingly vocational thread arose in life, education and work not seen before. "How to do it" became a more important and more complex concept. One may know literature, but will be challenged to conduct research and write unless one knows how to use a laptop and search the Internet.

Furthermore, the increasingly universal social and commercial medium of the Internet in effect created "Web storefronts" for all organizations, whether they were for-profit or not, obscuring for the consumer any previous difference between a government agency and a private business. As a result, the new commercial competitive standards of maximum customization, quality, variety, speed to market and flexibility to changing marketplace needs have been increasingly applied by consumers to government services, changing and raising public expectations.

Historically, public sector government was seen as having different drivers than private companies, such as protecting the public interest. Corporations had to evolve in the Information Age to compete with new factors such as quality, speed to market, product customization, and price deflation as globalized markets commoditized products and services, creating a sea-change in company behaviors and expectations. Through the medium of the Internet, the factors consumers used to transform buying corporate goods and services began to change the competitive standards that the public used to evaluate what their government could and should do.

As FedEx used technology to become more efficient and expedient and created more value for consumer's money, citizen consumers began to question why the local post office could not achieve similar results. Consumers began to question why the U.S. Postal Service took four to six weeks to respond to a passport request when FedEx handled customer needs in real-time. They increasingly began to hold the post office accountable to the same standards as FedEx, a definite change in consumer expectations. In public education, "consumers" — students, parents and employers — significantly increased performance expectations of the education system because private sector markets were competitive on these standards. Commercial performance benchmarks were gradually applied to all organizations because the Internet blurred the longstanding difference between expectations of public trust versus private for-profit enterprise.

Against this backdrop of ever-increasing consumer expectations of all organizations, the publication of the federal government's report *A Nation at Risk* in 1983 sounded alarms across America. Parallels began to be drawn between the 1950s Sputnik call-to-arms and the perceived poor state of American education. How could the richest country on Earth have such poorly-educated students? If Americans were moving from making things to manipulating knowledge to generate wealth, weren't we as a nation, then, at risk?

Independent reports seemed to confirm the seminal observation. In 2003, U.S. performance in mathematics literacy among 15-year-old students was lower than the average performance for 20 of the other 28 Organization for Economic Cooperation and Development (OECD) countries in its annual study. In problem solving, U.S. performance was lower than 22 of the other 28 OECD countries, such as Poland and Korea. The U.S. average score in reading literacy was not measurably different from the OECD average, and the U.S. score in science literacy was below the OECD average.

To improve against these new competitive standards, the American education system will have to change. The public elementary and secondary education system is in the midst of that change following years of state standards reforms and the watershed federal No Child Left Behind Act (NCLB) of 2002, while online learning has changed delivery mechanisms for higher education.

But fundamental changes in global standards, similar to the performance and quality benchmarking that affected American industry and healthcare in the 1980s and 1990s respectively, are about to engulf 21st century education. As the world's labor supply is globalized and China and India invest heavily in developing a strong education system, America will have to increase proficiency and educational attainment or the United States will lose its economic edge to these countries producing better educated employees.

Change is difficult and the stakes are high, and so it is predictable that the debate will elicit disagreement. Despite differing opinions, economic realities that evolve over time influence public perception of any system's performance. The American healthcare system was the world leader in the 1970s, but spiraling costs, rapid caseload growth and technological change required the system to respond to public concerns about performance less than two decades later. As America enters the 21st century, education will become the chief means to protect our economy and national security, requiring different approaches to address costs, assure quality and create a networked, ubiquitous system of learning accessible throughout life and career.

To create the investment and performance necessary to deliver on these new and evolving expectations, some lessons learned in the NCLB legislative debate could help guide change for the higher education community. Taking the middle-ground in the NCLB debate — often extremely contentious — allowed for compromise despite long-held opposition to new accountability measures. Opposition to such measures receded in favor of increased funding and policy implementation flexibility. If concern over future economic competitiveness permits rethinking long-held approaches, then the vision of a truly strong American system of lifelong learning can emerge. The K-20 reform effort, if properly supported, will raise student critical thinking proficiency and increase the numbers of workers with diplomas, certificates and degrees, and thus play the pivotal role in raising American family incomes over the next two decades.

This white paper explores the key issues in the American education's next national turning point, the trends shaping the future of American education, and proposes a vision for that future.

From Good to Great, but Different:
Elementary and Secondary Education

Initial perceptions in the early 1980s were that the American public K-12 education system was in urgent need of reform, while the higher education system was the model to the rest of the world. The most significant recent federal effort to change public elementary and secondary education is the No Child Left Behind (NCLB) Act of 2002. This law attempts to address the market forces affecting corporations (quality, accountability, and the like) and adapt strategies for education to thrive in this new environment. NCLB establishes/provides:

- mechanisms tied to district and school funding to institute standardized student testing and benchmark achievement;
- accountability standards for improvement at both individual and system levels;
- teacher standards;
- state requirements for demonstrable adequate yearly progress (AYP) in student reading and math proficiency;
- notes strategies that are needed to narrow the achievement gap; and
- fiscal consequences for lack of progress on outcomes.

In return, this law increases federal funding (especially to K-3 reading and before/after-school programs) and permits states greater flexibility in use of these federal funds. Reviews of the program have been decidedly mixed. Proponents hail the legislation as a mechanism that is driving accountability into a system where results are hard to quantify. Critics complain the system encourages attention to numbers, supposedly benchmarking progress without real quality attainments. Many feel the mandate has come without sufficient funding.

Regardless of how the law evolves, many see NCLB as an event "crossing the Rubicon"[1] where there is no turning back. The fundamental performance metrics have changed and NCLB will continue to frame the future of educational policy in America for years to come.

As technology introduces the new market concepts of customer service, low cost and high product quality to manufacturing and healthcare, these standards are increasingly applied by the consumer student and their parents to education. Educators, faced with large, diverse enrollments and a teacher corps challenged by job burnout, are looking to technology to help meet these new and heightened expectations.

The system is undergoing transformational change in an effort to respond to public concerns and fast-moving global economic conditions. As this change proceeds, what are the major challenges facing the system that will affect its future condition? The key issues in today's K-12 system nationally are: accountability, school facilities, and teacher quality.

PUBLIC AND PRIVATE K-12 FAST FACTS

- In the fall of 2002, about 48.2 million students were enrolled in elementary and secondary schools nationally.
- About 3.5 million persons were employed as elementary and secondary school teachers.
- Enrollment in public elementary and secondary schools rose 22 percent between 1985 and 2004.
- The fastest public school growth occurred in the elementary grades (pre-K through grade 8), where enrollment rose 25 percent over this period, from 27 million to 33.7 million.
- In total, about $2 trillion was spent in 2002 on public elementary and secondary education from federal, state and local sources.
- Between the 1985-86 and 1990-91 school years, expenditures per student in fall enrollment grew 14 percent, after adjustment for inflation.
- From the 1990-91 to 1995-96 school years, expenditures per student increased by less than 1 percent. Between the 1995-96 and 2001-02 school years, expenditures per student in fall enrollment rose 18 percent to $7,727.

Source: *Projections of Education Statistics to 2014*, National Center for Education Statistics (NCES)

Accountability

The Education Commission of the States (ECS) defines accountability as "holding key individuals and groups responsible for student achievement through the systematic collection, analysis, use and reporting of valid and reliable information." This makes data collection, quality and integrity critical to the evaluation process of student, school and system. ECS points out that there is a long history of testing in American schools, but holding the vested parties accountable for performance grew out of the standards movement starting in the early 1990s. As states used standards to define expected student knowledge and then benchmark student proficiency against those standards, each state system evolved into a results-based approach to accountability. Instead of focus on "inputs" such as the number of library books in a school, states began assessing outcomes, such as graduation or dropout rates and student test scores measuring quality and performance.

The 2002 passage of NCLB was a radical change in education policy that occurred because of fundamental changes in social, economic and political approaches. These in turn changed federal, state and local roles in exchange for important compromises. "The original ESEA [federal Elementary and Secondary Education Act of 1965] was narrowly targeted (to disadvantaged students), focused on inputs (providing additional resources to schools), and contained few federal mandates."[2] Fundamental economic changes happening on global and national levels slowly transformed public concern regarding access to quality education. A dichotomy emerged: individual economic advancement was/is tied to educational attainment, but the education system was widely viewed as performing poorly. *A Nation at Risk* helped crystallize this growing public sentiment, and voter polling of public mood showing education as the nation's most important problem in the 2000 elections underscored this turning point in perception and expectation.[3]

Like most change, factions developed quickly. Democrats historically championed a redistributive role in education focused on a segment of students (the disadvantaged) to ensure equal treatment, rather than achievement of all students. They viewed inadequate federal funding as the primary problem facing schools and greatly increased funding as the primary solution to declining student achievement. As allies of Democrats, teachers unions and civil rights groups strongly opposed efforts to create national accountability standards, testing, merit pay and school choice. Republicans, however, historically favored states' rights over federal programs and championed limited or no federal role in education. Republican allies, including social and religious conservatives, wanted to cut federal education programs, spending and bureaucracy.

Because of a growing public realization that schools were performing poorly and this performance would ultimately have significant economic repercussions for America in the global marketplace, NCLB was a turning point built on compromise by nearly all parties involved. Democrats, despite strong opposition from teachers unions, accepted extensive federal mandates on teacher quality, testing and accountability in exchange for increased funding and flexibility for states in how funds can be spent. Republicans dropped school vouchers and agreed to a significant increase in federal education funding with a strong, determined federal voice on education policy, forcing all states to adopt standards and testing reform, requiring conformity to a federal timetable to achieve student proficiency, and implementing consequences for slow or no progress.

NCLB is important because it fundamentally changes the role of the federal government in education policy. The legislation is a watershed in another way in that it requires schools, principals, teachers, students and parents to focus on accountability. In so doing, it has changed behaviors and expectations in a basic way that is producing results, even if states petition for more time to accomplish progress toward those goals. In some ways, these events mirror the basic change that occurred in the 1980s to make American industry more globally competitive through adoption of total quality management and performance outcome evaluation. Events, conditions and needs larger than the education system have pulled society toward institutionalizing accountability. "Democrats and Republicans alike are now publicly committed to active federal leadership in school reform and to holding states accountable

ACCOUNTABILITY — NEW YORK'S DATA WAREHOUSE PROJECT: ACHIEVEMENT REPORTING AND INNOVATION SYSTEM (ARIS)

Objectives

Ensure access to the information and tools necessary to enable:

- longitudinal and detailed analysis and reporting of achievement and performance data;
- best-in-class assessment design and implementation processes to extract data from multiple sources, including designing own reports and the capability to slice and dice the data;
- tools to improve learning of students with a range of identified needs;
- sharing best practices and collaborating across schools to encourage cultures of continuous school improvement and professional learning.

Scope of the ARIS

- Provide principals, teachers and parents with online information on student achievement, including periodic assessments;
- Support development of longitudinal and detailed analysis;
- Develop an integrated portal, including a dashboard to analyze key environment factors and achievement metrics;
- Enable real-time prediction of school performance against year-end targets;
- Generate standard reports for specific end-users;
- Develop scorecards to enable drill-downs by student, assessment;
- Provide knowledge management tools that capture teaching and assessment content generated at school level with an ability to approve, publish and share with the networks or the broader district, as well as capturing new quality review data.

Source: New York City Department of Education, http://schools.nyc.gov/Offices/ChildrenFirst/Accountability/Support/DataManagementSys/default.htm

for improved academic performance."[4] Indeed, NCLB could provide insights into the social and economic forces now at work to apply accountability to higher education and, more broadly, the evolution of a viable lifelong learning system.

One key aspect of this accountability framework is education technology adoption at a district level. For instance, technology such as data warehousing permits data mining and ensures solid systems for data integrity and quality. This kind of reliable, stable data enables district leadership to review progress or lack thereof, and make the necessary changes. The National Governors Association has a Data Quality Campaign designed as a national collaborative effort to improve data collection, availability and modeling.

A practical example of the scope of this task is found in the school district of New York City. The district has more than 1.1 million students attending approximately 1,200 schools in its five boroughs with more than 90,000 employees. More than 40 percent of students in the city's public school system live in households where a language other than English is spoken and one-third of all New Yorkers were born in another country. To set up the data collection and analysis system necessary to operationalize accountability for New York, the Chancellor's Office created the Achievement Reporting and Innovation System (ARIS), which is currently in the design and implementation stage.[5] This ARIS system echoes the national data warehouse called for by the Commission on the Future of Higher Education and will provide numerous best practice lessons learned for other educational institutions. By way of example, the warehouse will show value in the area of accreditation. Historically, institutional accreditation has evaluated institutional quality through a review of inputs — such as number of library books and investment in new buildings — which may or may not have significant impact on factors affecting quality, such as college participation or completion. Existence of a data warehouse can evolve the accreditation approach through data mining of outputs previously not available. This will permit performance benchmarking on numerous factors such as any statistical connection between increased student persistence and access to online tutoring.

School Facilities

There are two major issues with respect to elementary and secondary school facilities. First, there is a pressing demand to build new facilities to address aging facilities, overcrowding and building disrepair; and secondly, the design of the traditional public school needs to be "revisioned" to accommodate significant changes in technology, teaching and learning.[6] More

than 48 million students are housed in 90,000 public elementary and secondary schools today in America, and according to a study by the American Society of Civil Engineers, 75 percent of those structures are inadequate and need repair due to aging, outdated facilities, severe overcrowding and newly-mandated class size reductions.[7] The situation is compounded by the fact that the federal Department of Education has not conducted a facility needs assessment nationally since 1999 when the last report of that kind was issued, entitled "Condition of America's Public School Facilities." Without a detailed and ongoing needs evaluation using uniform standards, it is very difficult to get an accurate reading on the size of the problem. The 1999 report set repair and replacement costs at more than $127 billion, but the now-outdated review makes that figure essentially meaningless.

What is clear is that technology is changing the physical layout of classrooms, libraries and entire schools. Outdated, dilapidated or inadequate school facilities have a negative impact on student learning and can undercut technology enhancements. "Today, there is clear and growing evidence of the need to fundamentally rethink the planning, design and use of school facilities in a way that reflects changing educational demands and needs; takes greater advantage of new technologies and new insights into the nature of teaching and learning; and, perhaps most important, forges stronger bonds between schools and the communities they serve."[8] Schools, communities and employers should explore new partnerships to realize potential shared facilities goals. "Schools in Washington, D.C. are already blending learning space with housing or commercial space, challenging quite literally the traditional separation between home, school and community."[9] Certainly, the quality and design of a school facility can have an even bigger impact on teacher retention than the seemingly more apparent issue of pay dissatisfaction, according to one study.[10]

If population growth is outpacing investment in school facility construction, declining allocations to building maintenance and repair can further exacerbate the problem. One study found that maintenance costs, on average, represented only 7.5 percent of school districts' overall budgets. Lack of sufficient repair funding can only increase longstanding new facility construction needs.[11]

The traditional approach to fund facility needs in public education is obtained via general obligation bonds, while ongoing maintenance and repair costs are typically funded from annual appropriations. If voters approve such bonds, their financing costs are paid through annual appropriations, sometimes with dedicated funding. California recently approved a $7.3 billion bond issue that will generate funding for nearly 1,000 school districts to use for modernization, new construction, charter school facilities, joint-use facilities, relief grants for overcrowded schools and career technical education facilities.[12] Yet even with such a significant infusion of funding, there will be many unmet facility needs across California. Thus, beyond the need for new approaches to facility design, use and repair, the education system will need to develop innovative funding approaches to new construction at the state and local level. One obvious approach is to involve corporate sponsors as the proficiency of student employees will determine the cost of doing business for employers unable to attract and retain skilled employees.

Teacher Quality

Today, approximately 3.5 million U.S. elementary and secondary educators teaching more than 48 million students face unprecedented challenges. Aside from family and home life environments, the quality of this teacher corps will influence the potential academic success of millions of students, more so than any other factor in their education.[13]

Public education has many challenges with its teacher corps:

1) to prepare and mentor new teachers;
2) to recruit and retain new and existing teachers;
3) to develop new ways to recruit teachers to difficult-to-staff schools and subject areas;
4) to design and implement better ongoing and effective professional development; and
5) to certify teacher competency, conduct ongoing evaluations and hold teachers accountable.

These rising expectations play against a backdrop of significant new teacher burnout. According to the Education Commission of the States (ECS), one-third of new teachers leave the profession within five years, spurring chronic teacher shortages and staffing needs, and greatly damaging quality efforts.

Based on research conducted by the Carnegie Foundation for the Advancement of Teaching, connecting K-12 teachers with their postsecondary teacher education program and other resources through online interactions and interdisciplinary networks can address many ongoing quality issues.[14] The Carnegie Foundation created a Web site called *Inside Teaching*[15] that provides new teachers with an archive of best teaching practices, including:

- a compilation of key K-12 and teacher education Web sites;
- perspectives on the use of K-12 Web sites in teacher education;
- a reading room with related instruction articles, best practice guides and pedagogical Web sites; and
- a workshop designed to create a community using the archive of best practices, and to motivate others to add to it.

Teacher collaboration with the Carnegie Foundation's resources will produce structured, layered representations of classroom practices through video, teaching materials, student work and introspective reflection by both teachers and students. Teacher education faculty will in turn use these materials in their classrooms, helping teacher education students connect theory and practice by seeing how a teacher's work is shaped by its particular context, as well as its ongoing development. The Carnegie Foundation will also develop a parallel set of multimedia representations to record these teacher education program interactions. Finally, teacher education students, working as new professionals in their own classrooms, will be able to replicate, extend and transform the practices they have seen in the work of others. "Instead of the university-school teacher education 'partnership' being one way — the ideas of teacher education moving out into student teachers' field placements — this makes the 'wisdom of practice' a two-way street."[16]

By tying search, communication and community into one Web experience for teachers, virtual mentoring can become a reality.

Critics, however, believe teacher education programs are part of the quality problem. In a new report by the Education Schools Project, Arthur Levine — formerly president of the Teachers College of Columbia University — surveyed 1,800 K-12 school principals. His findings indicate that more than 90 percent of principals consider new teachers entering the profession from a teacher education program unprepared to teach.[17]

Overwhelmingly, these principals believe that teacher curriculum in education schools is outdated, with teaching material decades older than students. This creates a major gap between theory and practice. Recommendations to improve teacher quality from this report include:

- requiring four years of college education in a discipline, plus one year learning how to teach in that subject matter;
- setting student achievement outcomes as the primary measure of success of teacher education;
- assuring teacher education quality control by redesigning accreditation away from inputs toward outcome-based requirements for certification and licensure;
- closing failing programs to focus on successful ones; and
- transferring training for new teachers from master's degree-granting institutions to doctoral-granting research universities.

Other critics point to different factors affecting teacher quality than professional development and continued education. The National Education Association and the American Federation of Teachers have long advocated that teacher quality will improve when pay, work conditions and access to better facilities improve.

Whatever factors contribute most to improved teacher quality, there is widespread effort to raise performance to meet increasing expectations arising from employer concerns about average worker capacity to meet increasing marketplace performance expectations.

Higher Education

America's higher education system has long been the envy of other nations. Throughout this decade, changes are fast occurring that may challenge this view. In the Manufacturing Age, college was not necessary to obtain a well-paying job and support a middle-class lifestyle. As we transitioned into the Information Age and technology became embedded in every process, the nature of jobs changed. Suddenly, there were two concerns. First, for one to be successful, a college education became increasingly necessary. More jobs in the United States are high-skilled, have numerous technical and critical thinking prerequisites, and require a college degree instead of a high school diploma. Secondly, because technology churns quickly and changes the ways jobs are done, lifelong learning — the need to continually update and acquire new skills — became a concern and a necessity.

Against the changing landscape, what are the key issues for higher education today? Most sources identify accountability, affordability and the viability of a lifelong learning system as central issues in American higher education.

Accountability

As stated earlier, the American system of higher education, unlike its elementary and secondary education counterparts, has received acclaim for delivering well-educated students who quickly migrate to work. In the early 1980s, this perception was challenged as employer needs changed with a technology-driven workplace. Industry and the economy significantly restructured to meet increased global competition, and performance expectations began to bleed across both public and private organizations. Technology also revised employer needs to train and educate employees on technological advancements.

In the Manufacturing Age, a college education was not needed to achieve social mobility and economic security. Moreover, a college education was seen as a means of improving the individual, but not necessarily to assure employment. Indeed, there was a distance between business and higher education as the former pursued profits while the latter focused on individual enrichment, civic understanding and personal attainment.

FAST FACTS – PUBLIC AND PRIVATE HIGHER EDUCATION

- Enrollment in degree-granting institutions increased between 1994 and 2004 by 21 percent from 14.3 million to 17.3 million.
- In the 2003-04 school year, there were 4,236 degree-granting public and private higher education institutions nationally, including 2,530 four-year and 1,706 two-year institutions.
- Much of the growth between 1994 and 2004 was in female enrollment; the number of men enrolled increased 16 percent, while the number of women increased by 25 percent.
- During the same time period, part-time enrollment rose by 8 percent compared to an increase of 30 percent in full-time enrollment.
- The number of young students has been growing more rapidly than the number of older students, but this pattern is expected to shift. Between 1990 and 2004, the enrollment of students younger than 25 increased by 31 percent. Enrollment of persons 25 and older rose by 17 percent during the same period. From 2004 to 2014, there is an expected 11 percent increase in enrollments of persons younger than 25, and an increase of 15 percent in the number 25 and older, underscoring the demographic change of more students working part-time and taking longer to obtain a degree. This trend also reflects ever-growing lifelong learning pressures.
- For the 2004–05 academic year, annual prices for undergraduate tuition, room and board were estimated to be $9,877 at public colleges and $26,025 at private colleges. Between the 1994-95 and 2004-05 academic years, prices for undergraduate tuition, room and board at public colleges increased by 30 percent, and prices at private colleges increased by 26 percent, after adjustment for inflation.
- In fall 2003, there were 1.2 million faculty members in degree-granting institutions, including 600,000 full-time and 500,000 part-time faculty members.

Source: *National Center for Education Statistics (NCES)*

Because of this profit motive, many in both public and private higher education felt the separate pursuits were mutually exclusive. Some in academia saw business as greed-driven without concern for the common good, while some in business saw academia as increasingly marginalized in study of subjects not relevant to modern life, creating the impression of divided camps.

Technology and its ever-transforming nature, considered alongside new, competitive standards of a globalized economy, has forever changed the dynamic between education and business. Largely because of heightened technological requirements in job activities, a greater degree of critical thinking and problem-solving is required, changing societal expectations of workers and their level of education. Additionally, jobs that remained largely unchanged over decades in the Manufacturing Age can change in months in the Internet Age, potentially requiring frequent career — not just job — changes unheard of in the 1960s.

Over the last two decades, recipients of the educational delivery system have come to apply the new competitive standards of efficiency and productivity in industry and work to the education they received, starting with the K-12 system. As policymakers introduced outcome-based performance measures into elementary and secondary education (culminating in the NCLB Act), pressures mounted to apply such standards and outcomes to higher education, particularly as fast-paced economic changes have restructured the job market and greatly increased an individual worker's need for dynamic, ongoing and lifelong learning, training and re-education.

On Sept. 19, 2005, U.S. Secretary of Education Margaret Spellings formed a 19-member Commission on the Future of Higher Education, charging it to examine accessibility, affordability, accountability and quality. In its 2006 final report, the commission found the primary roadblock to a well-developed accountability system is the nation's lack of "clear, comprehensive and accessible information about the colleges and universities themselves, including comparative data about cost and performance." The commission, composed of many business executives long accustomed to providing their customers and investors with performance outcome data of their operations, sought to implement similar outputs to benchmark performance measures in higher education.[18] Key to this approach is the development of a national data warehouse to collect information on students attending colleges and universities to hold institutions and students accountable for performance. To accomplish this, the U.S. Department of Education would require higher education institutions to report individual student record data rather than the current approach of aggregated totals.

To meet the challenges of the 21st century, higher education must change from a system primarily based on reputation to one based on performance.

We urge the creation of a robust culture of accountability and transparency throughout higher education … We recommend the creation of a consumer-friendly information database on higher education with useful, reliable information on institutions, coupled with a search engine to enable students, parents, policymakers and others to weigh and rank comparative institutional performance.[19]

This approach, similar to approaches instituted in K-12 education as a result of NCLB, is a radical shift for higher education. Indeed, higher education advocacy groups have condemned the report and its accountability approach. The American Council of Higher Education (ACE) — representing approximately 1,800 accredited, degree-granting colleges and universities and higher education-related associations, including most private higher education institutions — contends that the report creates a "false sense of crisis." The American Association of University Professors condemns the report's assumptions as overly business-oriented, failing to take into account the rich diversity of higher education's component institutions (as opposed to treating it as a single, coherent system), its public trust and civic education purposes and its contribution to society's common good.

The primary complaint by ACE and the National Association of Independent Colleges and Universities regarding the proposed data warehouse is that it would violate student privacy rights. While these association advocates agree that greater operational transparency

is a fair goal, they are apprehensive of a larger, more intrusive federal government bureaucracy in the financial aid process.

The Commission on the Future of Higher Education's 2006 report attempts to address such privacy concerns.

The Commission supports the development of a privacy-protected higher education information system that collects, analyzes and uses student-level data as a tool for accountability, policy-making and consumer choice.

[The] privacy-protected … system would not include individually identifiable information such as student names or Social Security numbers at the federal level … It is essential for policymakers and consumers to have access to a comprehensive higher education information system in order to make informed choices about how well colleges and universities are serving their students, through accurate measures of individual institutions' retention and graduation rates, net tuition price for different categories of students and other important information.[20]

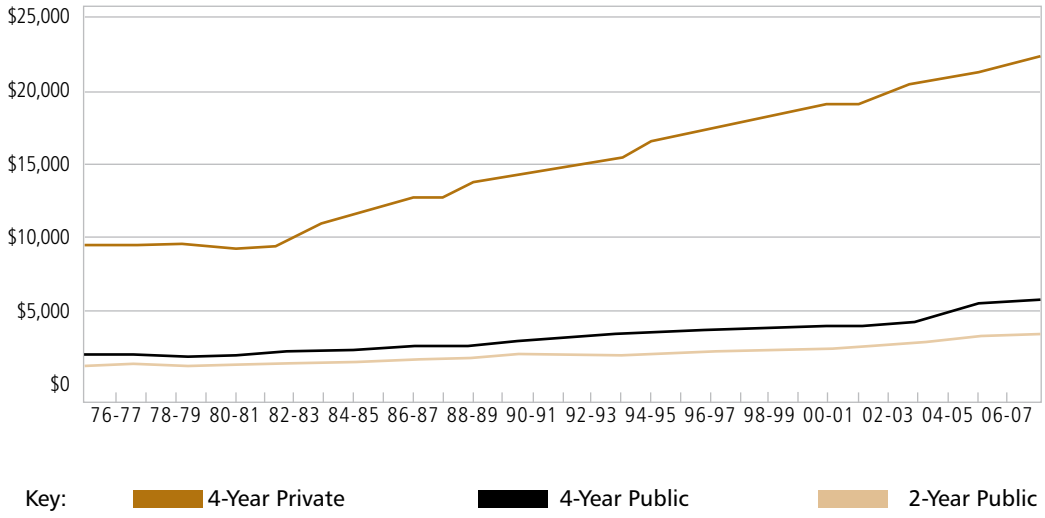
However, perhaps extreme rhetoric in early versions of the report has further polarized already-formulated and long-held positions. Some academics felt business representatives on the Commission were harshly and unfairly criticizing a system they were not party to, personalizing the report observations without weighing any potential validity by standing outside traditional perspective. Recognizing the larger forces at work, a middle ground environment is needed, where forward-thinking innovation can be found on the common ground of compromise.

Affordability

As states have sought revenue to pay for increased prison and healthcare costs, they have cut funding to public higher education, forcing students to shoulder the burden through higher tuition. In its policy brief *Trends in College Pricing 2006*, the College Board reports that average tuition at four-year public institutions is 35 percent more than in 2001 when inflation is taken into consideration. The overall per-student cost[21] at a typical public college is approximately $16,400 per year. At private colleges and universities, the average cost is more than $33,000 per year. While total

AVERAGE TUITION INCREASES (1976-2006)

Average Published Tuition and Fee Charges, in Constant (2006) Dollars, 1976-77 to 2006-07 (Enrollment-Weighted)



Source: The College Board

student aid (loans, grants and work study) did increase by 3.7 percent to $134.8 billion in the 2005-06 academic year, the increase came from loans rather than grant aid, as the average federal Pell Grant award decreased even without accounting for inflation.[22] Moreover, the loan money increase comes primarily from private lending,[23] which the federal government does not subsidize with lower interest rates, rather than from federal loans.[24]

Thus, students are faced with 1) increased tuition and fees beyond inflation; 2) less available overall grant aid; 3) less needs-based grant aid in particular; 4) more unsubsidized loan aid; and 5) more private lending with higher interest rates. Consequently, many students now have significant student loan debt, even before entering the permanent workforce. Many are taking jobs during college to hold down costs in a "pay-as-you-go" approach, but the unintended consequence is that students' graduation timelines are increased, driving up overall subsidy costs for state and federal government. In the mid-1970s, the total cost of a four-year public university degree was around $12,000. Today, even receiving aid, the same degree could cost $87,000, but now takes on average 6.2 years to complete, adding another two years of state funding. The additional time in school could increase taxpayer costs by approximately $25,000 per student. Those students not receiving aid could pay as much as $115,000 for their public higher education degree.[25]

In an issue brief on student work, the American Council of Higher Education (ACE) Center for Policy Analysis found that 78 percent of undergraduates in 2003-04 worked while they pursued their education.[26] On average, these students spent nearly 30 hours per week working and more than two-thirds cite tuition and other college costs as the reason for employment. Additionally, while research has shown that part-time employment (fewer than 15 hours per week in one's area of study or related academic interests) positively affects persistence and degree completion, most student employment is not in their area of study.

The social and economic impact of these events is profound, often meaning that low-income and middle-income families are unable to afford a college education for their children. According to the National Center for Public Policy and Higher Education, the proportion of family income required to pay college costs after accounting for grants and work study has grown since the early 1990s. In Ohio, for example, the 15-year growth in costs for a four-year public college or university education has increased the percentage of family income necessary to meet this obligation from 28 percent to 42 percent. In Iowa, percentages are up from 18 percent to 30 percent, which significantly impairs any student's ability to complete his or her degree. According to the report *Measuring Up 2006*, the United States is fifth among developed nations worldwide in college participation, but ranks 16th among 27 countries studied in the proportion of students who complete a college degree or certificate program.[27]

Thus, at a time when education is critical to employee and employer success in the marketplace, fewer students are able to afford the rising costs of higher education, adversely affecting college participation and persistence with what could prove to be a national threat to our continued economic preeminence in the global economy.

Viability of a Lifelong Learning System

A system of lifelong learning is the idea that an individual has access to affordable and quality learning from preschool into retirement. The concept arose out of a study by economist Anthony Carnevale in the early 1990s of the impact that rapid technological change will have upon the future of education and jobs. According to the federal Department of Labor, a worker in the Manufacturing Age might change jobs two or three times in a career of 40 years. Because of the much-faster pace of technological change in the Information and Conceptual ages, that same worker will change careers seven to eight times in the same work span with countless different jobs within each career. This development has led many to conclude that education will need to become more job-oriented and work will need to become more learning-oriented. Demands from work and family plus ongoing need to retrain and re-educate will create ever-increasing time compression for students and employees, leaving educators and employers with the challenge of developing new methods to deliver this learning.

To address this challenge, educators and employers will need to collaborate. Under the current approach, the "value" of a degree or certificate is based upon the academic reputation and resources of the issuing institution. Learning offered without input from educators will encounter accreditation issues. Curriculum designed without collaboration with employers will lack new content developed from fast-paced changes in work and the economy. To successfully meet demands the economy places on students and employees, educators and employers will need to pool resources and work together to develop a blended learning approach — a combination of traditional face-to-face and online delivery — to create a viable and truly lifelong system.

There are two primary cohorts in today's higher education system: the traditional 18- to 24-year-old college student,[28] and the worker seeking new or additional education and training for career advancement. There are more than 17 million students in the first cohort enrolled at more than 4,200 accredited, degree-granting public and private higher education institutions in America. These students are receiving the education and training they want and need in today's economy. It is the second cohort where the challenge lies; the challenge of a system not currently able or equipped to handle so many potentially new, ongoing students using traditional approaches and structures. The U.S. population consists of more than 300 million people, and our civilian workforce is comprised of more than 150 million workers — essentially half our total population.[29]

Technological advances and the attendant process changes (or, more properly, the introduction of new processes) change the jobs held by this workforce every three to five years, requiring potential career change and the necessary education and retraining to meet that change. According to the federal Department of Education, nearly two-thirds of all high-growth, high-wage jobs created in the next decade will require a college degree, but only one-third of the current workforce has one. The current higher education system is focused on the education of their enrolled students, but there are potentially 10 times the number of students in the workforce who require education and training services. Higher education must use technology to serve far greater enrollments than these institutions are capable of serving with their current approach and much greater collaboration by educators with employers to pool resources and create new approaches.

An example of the potential of this approach is the University of Phoenix. Founded 30 years ago, the university bases its delivery on online and blended (traditional classroom plus online) instruction targeted to working adult learners and convenient to their time-compressed lives. From this premise, Phoenix has grown to more than 300,000 students at more than 190 sites nationwide, making it the largest private university in the United States, rivaling the enrollments of the largest public universities, including the 23-campus California State University system and the 64-campus State University of New York system.

The best system currently serving the civilian workforce's need for ongoing education is the community college system with its open enrollment policies for adult learners. Community colleges are better equipped to handle this population, as this group has a large element of mid-skill workers seeking education and training at flexible intervals and low cost. As pointed out in the College Board's recent study on pricing,

LIMIT ONLINE CREDIT?

Colleges and universities are finding online classes can raise concerns as K-12 students use these courses to meet admission requirements. Last year, more than 600,000 K-12 students enrolled in online classes for credit, more than four times the number in 2003, according to a report by the University of California. Time compression is making online study increasingly popular and this occurrence will only grow; in fact, most significant enrollment growth in higher education over the next several years will come from online enrollments. Nationally, nearly half of the states run a statewide "virtual school" where K-12 students take online classes. In Michigan, educators will require students to take at least one class online by 2011.

The new delivery model for learning creates quality issues. Accepting online credit from another accredited college or university is less problematic than assessing the types of K-12 credit from commercial vendors for students seeking admission, especially in highly selective institutions. Currently, if a high school principal approves an online course for inclusion in a student's transcript toward postsecondary education, the University of California will accept it. However, multiple commercial vendors have created teaching quality issues. Without any accreditation process for Skillsoft's or Amazon.com's algebra course, how can the faculty at the University of California accept this type of credit as satisfying its preadmission prerequisites?

Faculty do not necessarily want to cap online courses but do want to set up a policy to protect admission quality. Evolution of admission issues and other quality concerns over digital courses underscore the importance of stronger affiliation, collaboration and communication between the K-12 and higher education systems, as well as with the growing commercial knowledge management vendor community and corporate universities.

SOURCE: *The State of Online Learning in California: A Look at Current K-12 Policies and Practices*, University of California College Prep Online

community colleges remain affordable to these workers: average annual tuition and fees cost approximately $2,300.[30] If a worker commutes and is able to complete an associate's degree on time, the cost would be about $8,000. But it is a financial challenge for community colleges to provide the kinds of infrastructure investments and technologies required to address significantly larger student populations, online or otherwise.

The rise of technology in instruction in the early 1990s promised to improve the quality of education, while also making it more convenient and customized to individual student needs. There is little doubt that higher education has embraced technology through blending classroom synchronous instruction with online or e-learning delivery. Despite early and perhaps ongoing faculty concerns to ensure instructional quality, about 62 percent of chief academic officers responding to a broad recent survey indicated their belief that students could learn as well or better online as in face-to-face synchronous instruction.[31]

Most accredited higher education institutions have adopted and customized or populated a commercial off-the-shelf (COTS) online learning management system (LMS), and many have learning content management systems (LCMS) with media, collaboration and synchronous tools. These LMS/LCMS systems can improve student assessment with what Gordon Freedman has dubbed "evidence-based education," mining deeply across these data warehouses of the enterprise systems to detect "what works."[32]

According to the Sloan Consortium, more than 3.2 million of the nation's nearly 19 million higher education students (one student in every six) took at least one online course in 2005, a near 40 percent increase in online enrollments from the previous year.[33] Additionally, a recent student survey found half of respondents preferred to receive some online instruction, and prospective students from age 25 to 55 preferred online classes due to convenience.[34]

There is a need to address workforce lifelong learning and technology. Inventive expansion of the LMS and LCMS platforms is beginning to be seen as the appropriate vehicle to address it. However, American higher education institutions are increasing enrollments at a moderate year-on-year rate of 3 to 5 percent, which is far less than what is required to serve more than 150 million workers. Corporations have, alternatively, begun to develop "corporate universities" using LMS platforms to meet the fast-paced needs of their workforce (this topic appears in more detail in the following section). In the process, corporations have suffered from lack of input in curricular design from traditional faculty, while institutions are challenged to make curricula more workplace relevant.

There is little doubt that the return on investment needed to create a viable system to address these worker learning needs is there. According to the College Board, college graduates in the 1970s earned from 19 to 35 percent more than high school graduates.[35] Today, male college graduates earn 63 percent more than their high school counterparts, and female graduates earn nearly 70 percent more. Beyond higher earnings, college graduates now have a lower average rate of unemployment and a broader range of job opportunities. For federal, state and local government, increased wages and lower unemployment mean higher tax revenue with less interruption. Therefore, the civic, social and economic incentives to develop a better-defined system of lifelong learning are significant for all parties — worker, institution, employer and government.

Trends Shaping the Future

Against the backdrop of the education crises, numerous social and economic trends are determining the shape and substance of the future. The third part of this paper will examine these trends and their potential impact on the future of education in America.

1. Technology is Driving Changes in Education

Changes in technology and the ever-shrinking shelf-life of technology are driving ongoing changes in learning and work, erasing prior boundaries. New technology is continually replacing older technology, creating needs for new learning and affecting change in the way work is done. Information overload is present at every turn, and time compression is affecting nearly every aspect of life. Ultimately, as employers are squeezed to have better educated workers and employees are unable to find workable solutions in the current higher education and adult learning systems, corporations such as Best Buy, FedEx, Home Depot and Wal-Mart are going to develop their own accredited degree programs, according to Michael Allen, author of *Guide to E-Learning* and developer of Macromedia.[36]

CHIP BREAKTHROUGH MEANS LOWER COST, HIGHER SPEEDS

A silicon-based computer chip breakthrough that uses laser light rather than wires to send data will allow chip-to-chip data transfer at speeds hundreds and possibly thousands of times faster than current technology. The new chip design comes from the University of California at Santa Barbara and Intel, the world's largest manufacturer of computer chips.

In computer chips, data moves at great speeds over the wires inside the chip, but slows dramatically when transferring data chip-to-chip inside a computer. This innovation, achieved by bonding a layer of light-emitting indium phosphide onto the surface of a standard silicon chip with etched pathways as light-wave guides, creates, in essence, optical communications, allowing the chip-to-chip barrier to be removed.

The commercial applications of this development have the potential to drastically alter high-speed data communications. Most cities and urban areas use slower wire-based communications gear, but then jump to fiber optic networks when the data is parsed to individual homes. This technology will allow far more data to travel over both systems at far less cost, creating new applications in entertainment, education and gaming. Learning applications, in particular, could permit much richer media content and community.

Source: Markoff, John. "A Chip That Can Move Data at the Speed of Laser Light," *New York Times*, Sept. 18, 2006

2. Increased Worker Education Needed for Global Competitiveness

In many countries in the global economy, average real worker wages are stagnant or declining. Numerous social commentators have complained about outsourcing, one effect of the globalization of the workforce, saying that American jobs are disappearing to workers overseas. For instance, Microsoft can pay a software developer in Bangalore $2,000 per month instead of paying a software developer $8,000 in the United States.

The real threat, however, is not shipping jobs overseas, but that wages abroad are being held down because employers have options.

Over long periods of time, real wages tend to track to average productivity growth. But so far this decade, workers' real pay in many developed countries has increased more slowly than labour productivity. The real weekly wage of a typical American worker in the middle of the income distribution has fallen by 4% since the start of the recovery in 2001. Over the same period, labour productivity has risen by 15%.[37]

Many American workers have not felt the full impact of this occurrence because of the double-digit yearly increases in home values, shifting focus from declining or stagnant wages to escalating and significant equity gains in home ownership. In other words, the growth in U.S. wages has gone to corporate profits and top income earners rather than an increase in workforce pay, creating growing income inequality across the economy. "America's top 1 percent of earners now receive 16 percent of all income, up from 8 percent in 1980."[38] Only raising average worker education and training will redress this occurrence.

3. The Changing Face of the American Workforce

The American workforce is in the midst of a profound transformation. Two significant demographic changes are at work: 1) ethnic minorities now constitute larger percentages of younger workers, and 2) increasing numbers of white workers are retiring. From 1980 to 2020, the percentage of minorities in the workforce is expected to double from 18 percent to 37 percent. Concurrently, the number of whites in all age groups younger than 45 will decline.[39]

This occurrence will greatly exacerbate the public's focus on education because the greatest projected increase in the workforce will occur in the racial and ethnic groups with the least educational attainment. Indeed, the educational gap between these two demographic groups has expanded over time, rather than contracted. "If current population trends continue and states do not improve the education of all racial and ethnic groups, the skills of the [American] workforce and the incomes of U.S. residents are projected to decline over the next two decades."[40] In contrast, personal per capita income grew nationally on average of 41 percent from 1980 to 1990, and from 1990 to 2000.

4. Investment in Education is Necessary

Globalization will continue to integrate national economies, creating a globally-distributed labor pool while also increasing the need for a highly skilled, literate workforce. In emerging countries, globalization has brought significant investment in their systems of education, permitting economies once dominated by low-skill workers to develop an advanced technology industry and services because of access to a well-educated workforce. Furthermore, these newly-educated, highly-skilled workers are also available for remote employment by American corporations, further undercutting American worker ability to negotiate higher wages.

"It used to be thought that only rich countries had educated workforces able to produce skill-intensive goods, but poor countries have invested heavily in education in recent years, allowing them to start competing in more sophisticated markets."[41] To redress this happening, America must increase its investment from both public funds and private sources in its system of education as it attempts to improve its performance. As the American workforce is increasingly dominated by population segments with the least educational attainment, this need for investment becomes a priority to preserve America's global economic leadership.

OPEN SOURCE SAVINGS

With a $2.5 million grant from the Andrew W. Mellon Foundation, a consortium of colleges and universities (University of Arizona, University of California, Cornell University, University of Hawaii, Indiana University, Michigan State University, San Joaquin Delta Community College, National Association of College and University Business Officers (NACUBO) and the rSmart Group) has undertaken the development of a comprehensive open source financial services suite for higher education institutions. Phase I of this software package, called the Kuali Financial System (KFS) 1.0, was released on Oct. 13, 2006, and is available without license fee to anyone to use, modify and redistribute.

Designed by higher education, it fully meets all standards of both the Governmental Accounting Standards Board (GASB) and the Financial Accounting Standards Board (FASB). The system is based upon a robust chart of accounts supporting financial management and reporting for fund accounting, functional activities and programs.

According to Lee Belarmino, Associate Vice President of Technology at San Joaquin Delta College, the rewards for higher education in this approach will reverberate in the classroom, which is the most important mission of the institution. "This application allows us to use state-of-the-art financial software without crushing licensing fees, and permits the college to invest the money saved back into the instructional program," said Belarmino.

The prototype of the system was developed at Indiana University, where it has been in operation for a decade. The Kuali Foundation is a nonprofit organization supporting open, modular and distributed system development with the goal to bring proven functionality of legacy applications to online services.

SOURCE: Kuali Foundation, http://kuali.org/communities/kfs

5. New Access, New Information

Fundamental changes will continue in the relationship between people and information, as communication systems continually change the way people access information. There are now more than 100 million Web sites with domain names and content, according to the Internet tracking firm Netcraft, as opposed to 18,000 when the firm began its survey in August 1995. Information is exploding and people are desperate to improve their ability to make sense of it. This phenomenon is driving the dramatic improvement in Web search and the very nature of the Internet.

Many technologists now refer to Web 2.0 and 3.0. Web 2.0 is the goal of seamlessly connecting applications to services over the Internet. "The classic example of the Web 2.0 era is the 'mash-up' — for example, connecting a rental-housing Web site with Google Maps to create a new, more useful service that automatically shows the location of each rental listing."[42] Web 3.0 is the application of some layer of artificial intelligence on top of the Web to create actual targeted answers instead of text-search response lists, making a guide as opposed to a catalog or list. Obviously, change in the structure and practical uses of the Internet will have profound consequences for the economy and for learning.

Vision of the Future

With today's issues and the trends affecting the future, what vision of tomorrow's American public educational system can we offer? This paper explores five areas where enormous change can and should occur.

1. What will the learning experience be like in 2015?
Each student will have a computer transmuted into an ultra-mobile wireless nomadic device permitting multi-sensory visual and auditory interaction. This device, dubbed "Muse," will have artificial intelligence, operate on highly sophisticated voice recognition software, be heavily networked, and interact with its student charge, much like another human being. Each Muse will follow its student charge from pre-school through college and into the workforce, becoming a lifelong learning tutor and knowledge management agent. It will need to be a virtual concept capable of being ported to new platforms and co-existing between client and server.

The Muse will help guide a student through lessons within parameters established by the instructor, who will continue to play the lead and key role in the education experience. This sensory interaction will involve all media but will be additive to, not in lieu of, classroom instruction (remote or onsite). The Muse will interact with an Internet that also has a layer of artificial intelligence and the ability to respond to questions with meaningful answers — what many are now calling Web 3.0 or the "semantic Web." Lastly, the Muse would give authorized adult guides, such as parents and other instructors, the ability to consult the Muse on changes to the student's learning plan.

Learning itself will undoubtedly involve next generation techniques associated with simulations and gaming to ensure the student is active in the experience. Clark Aldrich, author of *Learning by Doing: A Comprehensive Guide to Simulation, Computer Games, and Pedagogy in e-Learning and Other Educational Experiences*, has outlined four techniques — branching story, interactive spreadsheet, virtual lab and role-playing — that will evolve to allow the instructor and Muse ample opportunity to interact with the student.[43]

The virtual world application "Second Life," with more than 1.3 million worldwide users, already allows sophisticated role-playing that growing numbers of educators use to enhance online learning through real-time interactions. "Second Life allows users to animate a computer-generated representation of themselves — or someone they might like to be — and move, talk, walk, and 'teleport' from place to place in a computer-generated world all while interacting with people who might be, in physical fact, thousands of miles away."[44] So a person who wants to understand how real estate is sold in the marketplace could "role-play" that experience to learn that skill. This application creates new approaches to allow a player (called "avatars") to learn through doing, creating a rich virtual world where students can design fashion lines or participate in a corporate merger. For example, the news organization Reuters has a correspondent based in the cyber world and General Motors is spending thousands of dollars to create a virtual car dealership selling virtual cars at several real dollars per car.[45]

2. What role will teachers and faculty play?
Instructors will continue to be the primary education professional in the learning experience. They will plan lessons for established classroom interaction, but the instructor will evolve into a manager of many different modalities of learning and social interaction for the student, similar to a symphony conductor. The instructor, through their lead Muse, will interact with all other student Muses on student progress using a "smart" online learning management system (LMS). The lead Muse will act as an agent for the instructor and the class (students and their Muses), searching the semantic Web for new content and digital material to either address the class need or individual needs as reported by student Muses, including career and technology developments. Together, the instructor and lead Muse will decide how to translate this new information into useful knowledge that can be inserted into instruction, discussion groups, individual advising and so on.

The instructor will become a sought-after knowledge management professional and will no longer be

wedded to the education system. Rather, instructors will move back and forth between education and outside organizations such as corporations, government agencies and nonprofits, carrying their knowledge management techniques and curriculum design innovations across organizational boundaries.

3. How will educational institutions operate?

Institutions, particularly higher education, will need to ally much more closely with business and employers as technology increasingly makes instruction more vocational (knowing, for example, how to construct a spreadsheet in addition to how to interpret its data). Individual institutions will affiliate with corporate universities in a mutually beneficial alliance, with employers imparting information from simple updates to skill demands in the marketplace, and institutional faculty can contribute to training and instruction developed by the corporate universities.

Currently, largely because of the correspondence schools' controversy of decades before online instruction via the Web, institutions and instructors tend to look at any learning occurring off-campus (for instance, distance learning) as less academically rigorous than seat time. As mediated instruction and its various modalities becomes as good as or better than synchronous learning, institutions need to become more entrepreneurial about allying with news organizations and commercial digital content providers. Globalization will increase the value of localized knowledge and personal contact, creating further affiliation opportunities for education institutions, allowing an American university theater arts program to affiliate, for example, with the Paris Opera to offer specialized content, virtual study and interaction with company principals via Web casts. Original thought, content and research now present an opportunity for education's role to evolve. Finally, increased use of collaborative research in the commercial sector will create new and varied opportunities, properly harnessed, to fund the research mission of doctoral-granting institutions.

4. How will educational systems evolve and interrelate?

Rising public sector costs require rethinking how public education is structured. The K-12 system would make better fiscal sense as K-10, as in Europe, focusing entirely on reading, computation and writing skills. Such reorganization would allow for smaller grouping (K-3 in elementary schools, grades four through seven in middle schools, and eight through 10 in high schools) of grades and, thus, smaller class sizes. Schools could still operate on the same physical campus, such as the Oxford/Cambridge model, but remain discrete schools. Taxpayer savings over two years of school subsidy could be reinvested for facility and electronic campus/network infrastructure improvements.

After the high school graduation exam (given in grade 10), students could select either the vocational/technical or general education (for graduation or transfer) pathway in community college. Currently at state colleges and universities, more than one-half of entering freshmen require remedial education. These remedial programs need to be eliminated and any remediation handled at the community college levels. Fiscal incentives need to be instituted for state colleges and universities to accept a community college transfer student over other applicants. State colleges and universities need to develop a lifelong learning master plan incorporating local corporate universities and moving to a model without enrollment caps.

5. What role will employers play in education?

Employers need to develop a lifelong learning benefit for each full-time employee. One model would be annual benefits with roll-over capability, where an employee would contribute 4 percent of their salary, matched by an employer. If employees could not find their needed learning within the corporate university environment, they would be free to use this benefit at either a state or private accredited college or university. Employers would receive tax benefits in exchange for their outlay while employee contributions would come from pre-tax income. Learning maintenance organizations could help direct employees to academic or vocational programs that best fit their needs.

Conclusion

As America's system of K-20 education adapts itself to raise student proficiency and increase the number of workers with high school diplomas and college degrees, American family incomes — after years of flat or no growth in real wages — will increase, and America's place in the global economy will be assured.

That process begins with educational institutions learning to do what their students do. The habits and learning styles of students have proven to be incredibly malleable, adaptable and more than a little unpredictable. They not only adapt, but create environments that reflect their values and preferences. Perhaps the greatest challenge and opportunity is that students, including learners of all ages in all life stages, internalize new technological and social norms much more nimbly than can the educational institutions where they are enrolled. Casting aside past distrust of private sector profit motive, educators must reach out to employers to partner on the development of a robust, ubiquitous system of lifelong learning that takes a student from preschool through their work life, and into retirement.

That process ends when government, educators and employers realize that they are in a global struggle to redesign learning to maintain America's premier status as the leading economic power. They must recognize the opportunity and spring to action to harness their incredible innovative talents. Forming a social contract to assure the future, these parties must look beyond long-held approaches and develop out-of-the-box solutions designed to meet mounting educational needs. Government and employers must significantly increase investment in learning as China and India are investing in their systems. Educators in turn must commit themselves to embrace technology and change to create the wondrous and endless opportunities presented by a networked universal system of learning for the 21st century. In this way, learning can be transformed to become the engine to raise American family incomes and maintain its place in our society as the primary vehicle for social mobility and economic security.

Endnotes

[1] "Crossing the Rubicon" is a figure of speech that means "to go past a point of no return." The idiom comes from the idea that the Rubicon River was an ancient boundary between Gaul and Italy. Source: Wikipedia.

[2] Patrick McGuinn; *No Child Left Behind and the Transformation of Federal Education Policy (1965-2005)*; (University Press of Kansas, 2006), p. 1.

[3] McGuinn, p. 149. Source data comes from surveys conducted by the Roper Center for Public Opinion. In the 1960 presidential elections, education ranked 14th among the 20 most important issues for the nation and ranked last (or not even listed) among all issues in every presidential election until 1980. Since that election year, education is consistently associated by voters with jobs and identified as a top issue to the nation.

[4] McGuinn, p. 193.

[5] New York Department of Education Web site http://schools.nyc.gov/Offices/ChildrenFirst/Accountability/Support/DataManagementSys/default.htm "Starting in September 2007, the Achievement Reporting and Innovation System (ARIS), an advanced data management system, will provide principals, teachers, and parents with online information and reporting regarding student achievement that will follow a student wherever he or she attends school in the City. ARIS will include not only the accountability-focused reporting and analysis of summative and comparative data about DOE schools, but also data from periodic assessments provided to and/or created by all DOE schools through a flexible menu of options, at all grade levels. These periodic assessments will provide key data points to enable teachers, principals, students, and parents to chart student progress throughout the school year and adjust intervention and instruction when supports are not succeeding. ARIS will assist educators in conducting longitudinal and more detailed analysis, provide an integrated view of relevant environmental factors (e.g., attendance and safety), as well as the ability to highlight key achievement metrics and demographic data for relevant stakeholders including principals, teachers, and, over time, parents."

[6] *Digital Designs*; (Center for Digital Education, 2006.)

[7] "Report Card for America's Infrastructure: 2003 Progress Report," (Washington, D.C.: American Society of Civil Engineers; 2003), p. 3.

[8] "The Progress of Education Reform 2006 — School Facilities," (Denver: Education Commission of the States; April 2006.)

[9] "The Future of School Facilities — Getting Ahead of the Curve," (Seattle: University of Washington Center for Reinventing Public Education; May 2002), p. 25.

[10] "The Effects of School Facility Quality on Teacher Retention in Urban School Districts," (Boston: Boston College; February 2004), p. 7.

[11] "Challenging Times," (Overland Park, Kan.: *American School and University*; April 2005.)

[12] "Analysis of Proposition 1D — Kindergarten-University Public Education Facilities Bond Act of 2006," (Sacramento: Legislative Analyst's Office, 2006), p. 4-5. Through the School Facility Program, school districts apply to buy land, build new construction and modernize existing structures. School districts must match anywhere from 40 to 60 percent of the project cost from local funds. Proposition 1D also contains $3.1 billion for public higher education facility needs in California.

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