



---

### Highlights:

Education will be the critical determinant of success for our communities in the 21st century.

Student learning can be enhanced by insight from data that identifies at-risk students, skills gaps and recommended interventions.

Data and insights about operations can be used to manage critical resources within limited budgets.

---

# Smarter Education

*Building the foundations of economic success*

While considered a substantial expense to most governments, education is actually a critical investment. In fact, education is one of the most fundamental investments any city, province or nation can make for its future because it provides the human and intellectual capital that are essential to economic growth in our increasingly knowledge-based economies.

The returns from education accrue at both the individual and societal level. For example, highly educated citizens earn more money, contribute more to economic growth and will pay more taxes over their lifetime than those with a lower level of education. The Organization for Economic Cooperation and Development (OECD) found that across their member countries, a person with a tertiary level of education will generate, on average, an additional \$119,000 in income taxes and social contributions over a working life compared to one with an upper secondary level of education.<sup>1</sup> The OECD also found that education plays a major role in keeping a person in the labor force. This was demonstrated clearly with U.S. employment statistics for 2010, where 14.9 percent of those with less than a high school diploma were unemployed compared to only 1.9 percent of those with a doctoral degree<sup>2</sup> (see chart).

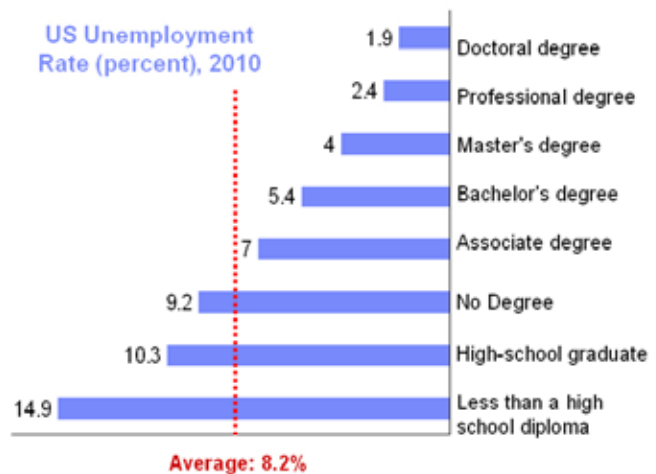


Figure 1: The level of an individual's education is directly related to their job prospects.



## Smarter Education

### Point of view

It's not surprising, then, there is concern by officials in many countries that they are not getting the results they need from their education investments. Some education leaders feel that completion rates at the secondary and tertiary education levels could be better, or that alignment between skills and workplace demand could improve. Across OECD countries, 20 percent of students do not attain an upper secondary degree, leaving them with a substantial employment disadvantage. And an example of the skills mismatch was provided in a recent report from McKinsey & Company, which indicated there were 3 million U.S. jobs unfilled due to the lack of qualified candidates, even with unemployment hovering around 8 percent.<sup>3</sup>

The global recession and the resulting pressure on government budgets has not improved matters. In fact, it has highlighted the costs of delivering education. Spending per student in the OECD countries increased by 43 percent between 1995 and 2007, which was a period of relatively low inflation.<sup>4</sup> According to the National Center for Public Policy and Higher Education, average college tuition and fees have risen by 440 percent over the past 25 years—more than four times the rate of inflation, and almost twice the rate of medical care.<sup>5</sup>

Clearly, these trends are not sustainable. Over the last 50 years, nearly every other sector in our society has had to become more productive to remain competitive in the face of global competition. And the time has come for a concerted effort to improve productivity and reduce the overall cost of education, as well. Education can do better.

### Meeting the needs of students and society

The role of schools and colleges is to provide students with skills and knowledge to prepare them to pursue advanced degrees and employment to be able to succeed in a globally competitive world. The world needs students who are engaged in their learning experiences and inspired to continually expand their skills throughout their academic and working careers along their own “education continuum.” This means educational institutions must tailor learning experiences to their students and focus on relevant skills within a more sustainable cost structure.

Through its work with major educational institutions around the world, IBM® has developed a roadmap that reflects the challenges confronting educators today and a vision of the opportunity for progress. The core elements of the roadmap are:

- Leverage data and analytics as a cornerstone of process transformation.
- Create a 21st-century digital curriculum and deploy digital instructional tools.
- Develop the skills needed for tomorrow's economy in alignment with regional and national economic development goals.
- Drive efficiencies in administration and operations to shift funds to learning activities.

### Leverage data and analytics

Academic and operational performance outcomes are a result of a complex interplay of many variables. Programs, staff, demographics, curriculum, testing style, funding, class size and school size are just some of the possible factors affecting student achievement. But when data is scattered across an organization, in paper files or spreadsheets, solving the puzzle of success and failure is next to impossible. That's why many school boards and districts are turning to analytics to correlate and analyze their own data.

Modern analytic tools and the use of early warning systems for at-risk students can make a significant difference in the quality and results of education. Officials in the Hamilton County, Tennessee, Department of Education were very concerned about completion rates for upper secondary schools. By utilizing analytics and advanced modeling tools, the county's teachers, counselors and administrators have a better understanding of how adverse patterns develop and now can step in earlier to keep students on the right track. By engaging at-risk students in individualized education plans and making curriculum adjustments for broader-based problems, they succeeded in raising the graduation rate by 8 percent last year, to nearly 80 percent.

### Create a 21st-century digital curriculum

The worker of the future needs different skills to compete in an increasingly services-dominated job market. As demand for agricultural and industrial workers continues to decline, students need to acquire skills that prepare them for knowledge-based professions. But new skills require new methods of teaching. That's why teachers and faculty members are using tools for interactivity, personalization and collaboration to engage students in real-life situational experiences that convey concepts, promote learning and develop lifelong skills.

## Smarter Education

### Point of view

These new teaching methods are important in two ways: first, they deliver traditional courseware in a more interactive and effective digital mode in order to improve retention; and second, they develop lifelong, 21st-century skills that change the way a student learns and works. Employers increasingly hire workers who possess both job-related skills and foundational competencies that indicate an individual's potential to adapt to changing market and economic circumstances. These foundational competencies include problem solving, adaptability, global awareness and information technology proficiencies as top priorities for competitiveness.

An example of a modern digital curriculum can be found in IBM's collaboration with New York Hall of Science (NYSCI) and TeachEngineering.org, which created Teachers TryScience. It's a program that uses web-based technology and engaging, standards-aligned lesson plans to help teachers improve their instruction in project-based learning. The goal is to promote science, technology, engineering and math (STEM) skills, fields in which jobs are expected to grow much faster than average over the next decade.

### Develop the workers needed for tomorrow's economy

Government leaders and economists recognize that education is a key differentiator in economic prosperity in the 21st century. But in a rapidly shifting economic environment, governments must nimbly respond to opportunities for growth and sustainability.

For this reason, local and national leaders are calling for closer alignment between educational systems and regional economic development goals. In McKinsey's recent study, "An Economy That Works: Job Creation and America's Future," nearly two-thirds of business executives said they routinely have difficulty filling certain positions. The chief reason they cited was lack of specific qualifications or experience.<sup>6</sup>

Global markets are increasingly service-based economies, making services-related skills a high priority. The OECD studies indicate that the services sector accounts for more than 70 percent of the employment and the value created in member countries.<sup>7</sup> The majority of job growth will be services oriented. Even manufacturing firms are coupling

services with their product offerings, according to The Work Foundation of the UK's Lancaster University.<sup>8</sup> The growth of services economies requires a new approach in order for individuals, industries and countries to remain innovative and competitive.

To this end, IBM is collaborating with more than 250 universities around the world to offer degrees in Service Science, Management and Engineering (SSME). This new academic discipline, now offered at schools in 50 countries, combines business and technology skills and focuses on complex service systems in all industries. At the University of Ottawa's Telfer School of Management, business analytics is being taught as a highly valued skill that improves the students' job prospects in the services or manufacturing-oriented industries in which they will work.

In addition, because information technology has been a growth engine that also contributes to the competitiveness of the industries it supports, IBM is partnering with the New York City Department of Education and the City University of New York on a six-year information technology degree program that aligns the curriculum directly with workforce skills. The graduates of Pathways in Technology Early College High School, or "P-Tech," will be well positioned for employment in entry-level IT job openings.

### Drive efficiencies in administration and operations

In a time of increasing focus on student outcomes, educational institutions also must find ways to reduce the cost of providing an education and ensure its affordability over the long term. Leading innovators are helping transform their operational and financial environments by leveraging new methods, emerging technologies and performance management to improve operational outcomes in a meaningful, efficient and transparent way.

A smarter approach to administration integrates data and insights for use in operations, giving administrators and business officers more information about institutional performance, such as asset management, financial trends and risk exposures. The University of California developed an enterprise risk management system covering 10 campuses and five medical centers that aggregated information on claims and exposures to enable a focus on prevention and preparation. The centers have reduced injuries by 39 percent, and their cost for insurance has dropped \$167 million since the system's deployment in 2006.



Through cloud computing and virtualization, regions can deliver administrative services to multiple institutions more efficiently and effectively. These shared services environments can increase the reliability and quality of services while gaining economies of scale through collaboration with peers and partners. As an example, the education cloud managed by North Carolina State University is accessible to a quarter-million students across the state of North Carolina, supporting public school systems, colleges and universities while lowering their infrastructure costs.

Management of educational buildings and campuses, focusing particularly on energy efficiency, is another area with major cost savings potential. Tulane University is using sensor technology and advanced analytics to transform its most historic campus building into a model of sustainability and energy efficiency for the whole university and community. Syracuse University has focused on the power consumption required for its evolving IT needs and implemented a green data center approach to save energy and reduce costs.

## Partnering for change

IBM is committed to working with educational institutions to help transform the education experience into one of smarter education environments that focus on positive outcomes and success for every student. IBM helps institutions shift resources from traditional expenditures in proprietary learning materials, personal computers and software to a new model that can deliver integrated, analytics-informed learning content from multiple providers to the student, family or teacher via cloud-based services.

Looking to the future, IBM is collaborating with the American Council on Education (ACE) and its institutional leaders to encourage the development of new ideas for the advancement of education. Through the ACE Fellows Program, IBM works with the next generation of higher education leadership to create a dialog on new management approaches and methods.

Education provides the foundation for a strong and vital society. It develops the human capital to fuel business and the public sector and to generate new ideas and innovation. In the aftermath of the global financial crisis, the need for economic growth is clear, and the skills to support that growth have never been more critical. At the same time, the limits of government budgets are now evident. It is essential that we work together to find a path that improves learning outcomes in an operating structure that is financially sustainable. Student success is everybody's business: schools, colleges, universities, government and industry, and we must all contribute to smarter education in order to build a smarter planet.

## For more information

For more information on education on a smarter planet, please visit <http://www-935.ibm.com/services/us/gbs/bus/html/education-for-a-smarter-planet.html>.

© Copyright IBM Corporation 2012

IBM Corporation  
Route 100  
Somers, NY 10589 U.S.A.

Produced in the United States of America  
January 2012

IBM, the IBM logo and [ibm.com](http://ibm.com) are trademarks of International Business Machines Corp., registered in many jurisdictions worldwide. Other product and service names might be trademarks of IBM or other companies. A current list of IBM trademarks is available on the Web at "Copyright and trademark information" at: [ibm.com/legal/copytrade.shtml](http://ibm.com/legal/copytrade.shtml)

The content in this document is current as of the initial date of publication and may be changed by IBM at any time. Not all offerings are available in every country in which IBM operates.

The performance data and client examples cited are presented for illustrative purposes only. Actual performance results may vary depending on specific configurations and operating conditions.

THE INFORMATION IN THIS DOCUMENT IS PROVIDED "AS IS" WITHOUT ANY WARRANTY, EXPRESS OR IMPLIED, INCLUDING WITHOUT ANY WARRANTIES OF MERCHANTABILITY, FITNESS FOR A PARTICULAR PURPOSE AND ANY WARRANTY OR CONDITION OF NON-INFRINGEMENT. IBM products are warranted according to the terms and conditions of the agreements under which they are provided.

- 1 Organization for Economic Cooperation and Development. 2010. *Education at a Glance, 2010, OECD Indicators*. Paris, Fr.: OECD Publications.
- 2 U.S. Bureau of Labor Statistics. May 2011. Education pays in higher earnings and lower unemployment rates, [http://www.bls.gov/emp/ep\\_chart\\_001.htm](http://www.bls.gov/emp/ep_chart_001.htm), May 2011
- 3 James Manyika and others. 2011. *An Economy That Works: Job Creation and America's Future.*, McKinsey Global Institute, June 2011, [http://www.mckinsey.com/Insights/MGI/Research/Labor\\_Markets/An\\_economy\\_that\\_works\\_for\\_US\\_job\\_creation](http://www.mckinsey.com/Insights/MGI/Research/Labor_Markets/An_economy_that_works_for_US_job_creation)
- 4 Organization for Economic Cooperation and Development. 2010. *Education at a Glance, 2010, OECD Indicators*. Paris, Fr.: OECD Publications.
- 5 National Center for Public Policy and Higher Education. 2008. *Measuring Up 2008: The National Report Card on Higher Education*, <http://measuringup2008.highereducation.org/>
- 6 James Manyika and others. 2011. *An Economy That Works: Job Creation and America's Future*, McKinsey Global Institute, June 2011, [http://www.mckinsey.com/Insights/MGI/Research/Labor\\_Markets/An\\_economy\\_that\\_works\\_for\\_US\\_job\\_creation](http://www.mckinsey.com/Insights/MGI/Research/Labor_Markets/An_economy_that_works_for_US_job_creation)
- 7 Organization for Economic Cooperation and Development. 2005. *Growth in Services: Fostering Employment, Productivity and Innovation*. Meeting of the OECD Council at Ministerial Level, 2005., Paris, Fr.: OECD Publications.
- 8 Andrew Sissions. 2011. *More Than Making Things, A New Future for Manufacturing in a Service Economy*. London, UK: The Work Foundation, Lancaster University.



Please Recycle