



GET HELP FINDING DATA

New occupational employment projections for Virginia will be available soon. In the meantime, to learn more about how occupations are changing nationwide, check out the [Career Cluster page](#) on the Trailblazers blog at <http://ctetrailblazers.blogspot.com>. Trailblazers can also provide more specific help using data for program and course planning, grant applications, and other purposes. Call us at **434-982-5582**.

TRAILBLAZERS BLOG

There is more to say about *Trailblazers'* topics than will fit in our newsletter, so we're writing a blog now. <http://ctetrailblazers.blogspot.com/>

COMPLETER FOLLOW-UP

Results for the CTE Completer Follow-Up Survey will be available soon. Keep an eye out for a notification email.

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Career Readiness — A Goal for All Students

Career and College Readiness continues to be a major topic for Career and Technical Education. In June I attended the [NASDCTEc annual conference](#) in Washington, DC where Career and College Readiness was one of the most important topics of discussion. Twenty-eight presentations addressed strategies for improving student readiness in areas from how to prepare middle schoolers for careers to how to reach urban learners. Such comprehensive coverage at the conference illustrates how thoroughly the CTE community has accepted that students should prepare simultaneously for college and careers while they are in high school.

As obvious as it seems to us, however, many outside of CTE still have doubts. For example, the Virginia General Assembly added the new requirement of an industry certification to the Standard Diploma but not to the Advanced Diploma ("[Beginning with students entering ninth grade for the first time in 2013-2014, a student must also earn a board-approved career and technical education credential to graduate with a Standard Diploma.](#)") Maybe this requirement was omitted from the Advanced Diploma out of concern for the problems and expense CTE will have in gearing up to meet this new requirement. But more likely was the presumption that students who graduate with a Standard Diploma are usually headed for work and need an industry qualification while those with an Advanced Diploma are heading for college and don't need to be prepared for work until after they graduate from college.

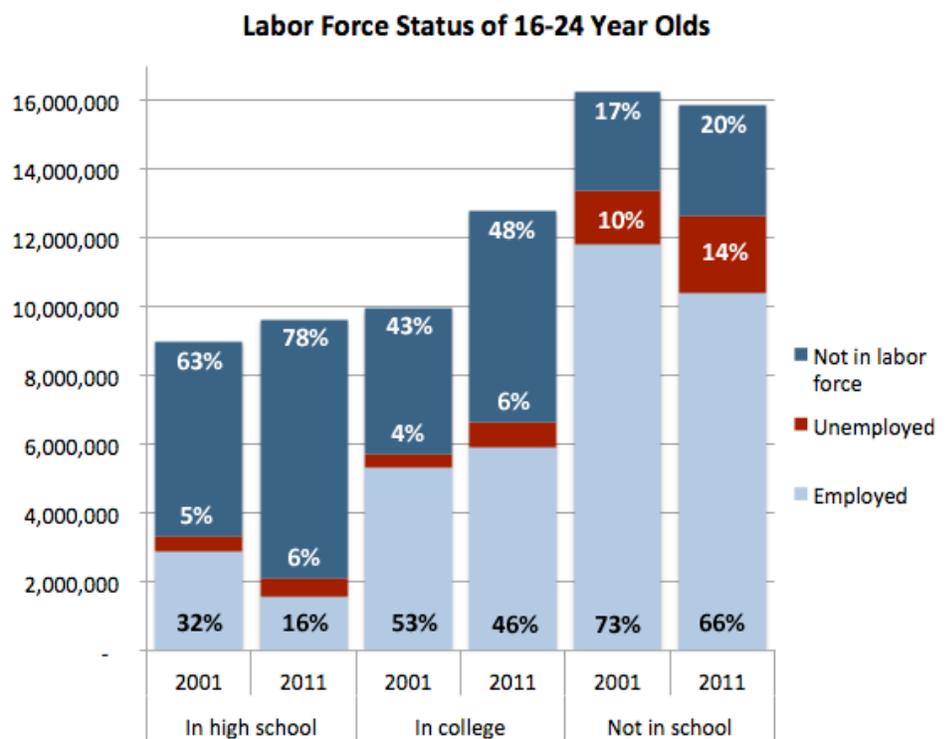
It would be great if this were true, but it's not, as anyone who has contemplated the cost of college can attest. According to the [College Board](#), four-year public colleges cost in-state students about \$17,000 per year including tuition, fees, and room and board. And according to the [Project on Student Debt](#), in 2010,

two-thirds of college seniors graduated with loans, carrying an average of \$25,250 in debt. Working while in college, then, is one of the best ways for students to help pay for college and reduce the debt they acquire through student loans.

But working during high school and college isn't just a way to pay the bills; it's a basic part of preparation for work after graduation. Employers look for workers with a proven record of accomplishment, and many are skeptical about the value of education without experience. Consequently, devoting high school time to career preparation is not only important for students who are going straight to work. Students who qualify for high quality part-time jobs can cut dollars off their student loan obligations and time off their post-graduation job search as well.

Substantial numbers of college students do work, keeping their debt down and their job prospects up. In October 2011, as the chart below shows, 46 percent of college students worked, and an additional six percent were unemployed and looking for work. Many high school students work too: 16 percent of high school students age 16 or over had jobs in October 2011, and six percent were looking for work. Better career preparation would be an asset for all of these students, and it would also be an asset for those students who are "not in the labor force" as such preparation will help them down the road when they begin to pursue their first jobs.

This chart also shows that many fewer high school and college students were working in 2011 than worked in 2001. The percentage of high school students with jobs fell by half, from 32 percent in 2001 to 16 percent in 2011. College students with jobs fell by about 10 percent. When jobs are hard to find and too few students are gaining work experience, then it's time for educators to step in and assist with this process. That is the mission of Career and Technical Education — a mission that serves the needs of both students who are college bound and those who are not.



Source: US Bureau of Labor Statistics, October Current Population Survey

Technology Changes Everything: Computers Really Are Taking Jobs

The last great recession began in December 2007 and officially ended in June 2009. But it doesn't feel like it's over. Even though productivity and in many cases corporate profits have rebounded, unemployment and underemployment remain high. We have seen this pattern after each recession since the 1990s and it has been dubbed "[jobless recovery](#)."

There are many arguments about why unemployment remains so stubbornly high. Some explain that because the economy is weak employers are afraid to grow and reluctant to hire. Others have argued that the economy is facing stagnation and a failure of innovation, especially relative to booming economies in Asia and India. For educators, the "skills gap" explanation has been the most pertinent. This posits that employers now require higher skill levels from their workers and education is not providing what is needed. Consequently too many people are simply unprepared for work in the 21st Century.

A [new book](#), *Race Against the Machine*, by MIT Sloan School of Business professors Erik Brynjolfsson and Andrew McAfee puts a fourth unsettling explanation in very clear and accessible terms. It's not simply that we're afraid to grow, or stagnating, or even unskilled. Instead, they argue, we're out of work because, as we have feared for some time, computers really are taking our jobs, and they're getting better at it every year. Computers are faster and cheaper than people at repetitive tasks, like filing documents and building things on an assembly line. And as they get more powerful, they can take on more sophisticated repetitive tasks like reading X-rays, analyzing legal documents, and [geocoding address data](#). And equally, if not more important, computerization allows for the reorganization of tasks in a way that eliminates the need for many jobs. Internet shoppers don't need store clerks; Google searchers don't need librarians; and Facebook friends don't need letter carriers.

This technological revolution is possibly more dramatic than the Industrial Revolution that transformed world economies and generated a period of mass dislocation and loss of work in the 18th and 19th centuries.

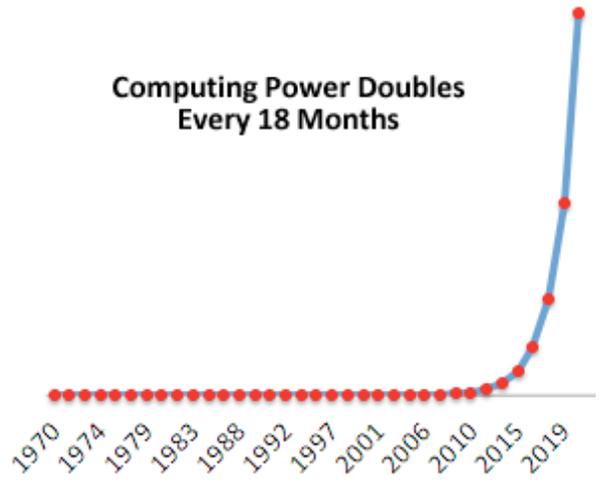
"Technological progress—in particular improvements in computer hardware, software, and networks—has been so rapid and so surprising that many present-day organizations, institutions, policies, and mindsets are not keeping up...Computers are now doing many things that used to be the domain of people only. The pace and scale of this encroachment into human skills is relatively recent and has profound economic implications. Perhaps the most important of these is that while digital progress grows the overall economic pie, it can do so while leaving some people, or even a lot of them, worse off." (8-9)



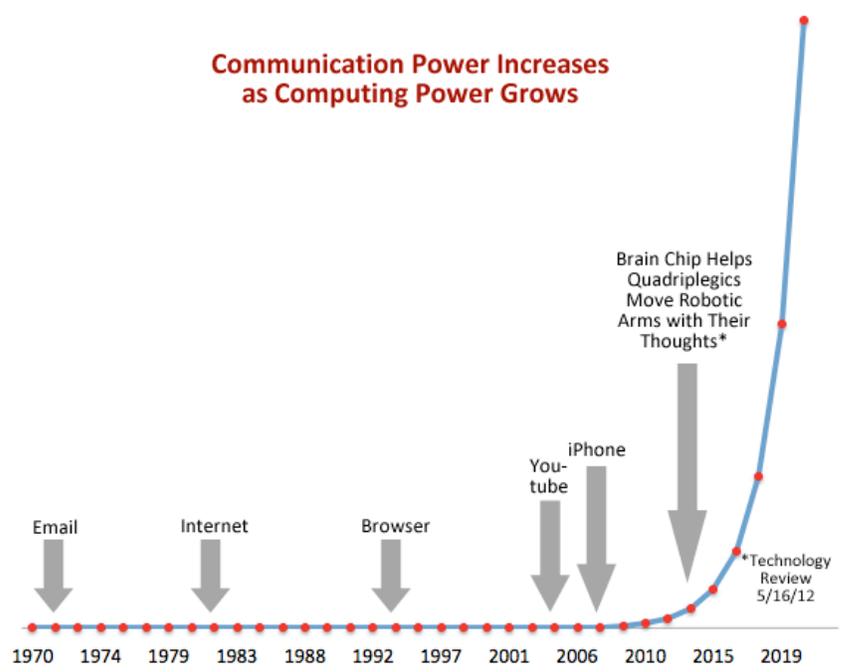
Brynjolfsson and McAfee speculate that we are now entering a time of rapid, even astounding, growth in computing power and the potential for new technology. The Google car that drives itself and the Watson Jeopardy-champion supercomputer, are just the edge of a wave of new technology emerging as the exponential growth of computing power takes off.

Two concepts, they argue, are key to understanding how computing power is beginning to explode. The first is Moore's Law, the codification of the observation, first noted by Gordon Moore of Intel, that computing power grows exponentially. It's generally accepted now that it's doubling every 18 months.

After recognizing that computing power grows in this way, the next step is to understand how dramatic this kind of growth ultimately becomes. In the first few iterations, this exponential growth appears comprehensible and manageable, as it does in the little green bar graph above, but continuing at this same pace, growth soon becomes incomprehensibly rapid. The graph on the right shows what computing power looks like when doubling every 18 months from 1970 to 2020. All of the growth in the first 30 years is so completely dwarfed by the rapidly escalating pace of growth from 2010 to 2020 that it is invisible.



It's difficult to understand what this kind of growth of capacity means without tying it to actual technological change. So, on graph below, I have labeled some key points in the recent history of communications. Email first began in the scientific and academic community in the early 1970s. The internet was born in the early 1980s and opened for commercial use within a decade. The first easy-to-use web browser, Mosaic, was introduced in 1993. Within 20 years, each of these technologies became ubiquitous. They have transformed the work of communication and led to complete reorganization and tremendous loss of jobs in fields like printing, publishing, telecommunications, and the U.S. Postal Service.



As computing technology continues to become ever more powerful we have seen innovations like YouTube, and streaming video generally, force the reinvention of broadcasting, and the iPhone, a full-powered computer in your pocket, begin to revolutionize more industries than I can list here. But the pace of growth doesn't stop. Last month MIT's *Technology Review* published an article titled "[Brain Chip Helps Quadriplegics Move Robotic Arms with Their Thoughts](#)" showing that implanted computer chips can now actually help people to perform complex real-world tasks. In other words, people can now communicate with computers by their thoughts alone. As far-fetched as this kind of communication seems to us today, it is no more preposterous than the first email or the first web page. These first iThought experiments have been done with quadriplegics eager for the freedoms this technology will bring. But over the next 20 years, as computing power continues to grow and costs to fall, this capacity might become available to anyone.

As well as becoming more powerful, computers are also becoming exponentially more energy efficient. According to a recent [Technology Review article](#),

"If a modern-day MacBook Air operated at the energy efficiency of computers from 1991, its fully charged battery would last all of 2.5 seconds. Similarly, the world's fastest supercomputer, Japan's 10.5-petaflop Fujitsu K, currently draws an impressive 12.7 megawatts. That is enough to power a middle-sized town. But in theory, a machine equaling the K's calculating prowess would, inside of two decades, consume only as much electricity as a toaster oven. Today's laptops, in turn, will be matched by devices drawing only infinitesimal power."

Technology Review, "The Computing Trend That Will Change Everything" 4/12/2012

Implanted computers powered by the energy of our own bodies are thus not inconceivable and if this revolutionary device is not created, others that we cannot currently imagine surely will be. Imaginable and as yet unimaginable creations like this will drive change in the world of work through 2020.

Later I will discuss Byrnjolfsson and McAfee's speculations about just how work will be changing over the next decade and how we can and should prepare. I will also discuss some of the implications of a showdown in the growth of computing power. Logic tells us that exponential growth cannot continue forever, and scientists foresee a clear endpoint to the growth of computing power using current technology. When this happens we will reach the end of this Industrial Revolution and perhaps have a breathing space before the onset of the next one.