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CHAPTER 6

Connecting the Dots: Creating a Postsecondary Education System for the 21st-Century Workforce

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For much of this century and, indeed, right up to the present, American enterprise has been organized on the principle that most of us do not need to know much to do the work that has to be done. This system may have worked brilliantly for us until recently, but it will do so no longer.

Ray Marshall and Mark Tucker. *Thinking for a Living* (1992:xii)

One clear measure of how much the economy has changed in the past two decades can be seen by reviewing the last LERA research volume that examines new developments in worker training (Ferman, Hoyman, Cutcher-Gershenfeld, and Savoi 1991). That volume contains few references to the nation's higher education system. Two decades later it is impossible to imagine a national system of workforce development without including colleges and universities. In 1976, Richard Freeman argued that an oversupply of college graduates, stemming from expanded access to higher education in the 1960s, had caused income returns from a college degree to decline so precipitously that additional social or private investments in colleges would yield only marginal benefit for the foreseeable future. Shortly thereafter, the economic returns to a bachelor's degree began a steady, uninterrupted rise that by 2006 yielded nearly a \$50,000 advantage in median annual income compared to a high school diploma alone (Haskins, Holzer, and Lerman 2009). This trend is not limited to bachelor's degree completion; recent research shows an

average income return of 4% to 6% for each 30 college credits (two semesters) earned, and a 29% earnings increase for those with associate's degrees compared to those with only a high school diploma (Furchgott-Roth, Jacobson, and Mokher 2009). Most experts predict that this trend is likely to continue. According to the Bureau of Labor Statistics, the U.S. economy will produce 15.6 million net new jobs between 2006 and 2015, nearly half of which will require some type of postsecondary education credential. A recent national poll by the Pew Economic Mobility Project indicates that the general public has taken these data to heart: 50% of respondents said that having a good education is very important to economic mobility, and 55% said that getting a college degree "almost perfectly describes their definition of the American Dream" (Haskins, Holzer, and Lerman 2009:4).

It is not surprising, then, that enrollment in U.S. colleges and universities has reached an all-time high, with over 65% of recent high school graduates and nearly 60% of the total birth cohort reporting some collegiate participation by their mid-twenties (Turner 2007). Unfortunately, neither colleges and universities themselves nor public higher education policies have yet adjusted to this enormous change in demand. After three decades of rising enrollments, the overall bachelor's degree completion rate for those who enter college is not only lower today than in the 1970s (Bound, Lovenheim, and Turner 2009; Haskins, Holzer, and Lerman 2009), but it also reveals a growing pattern of inequality. At the most selective public institutions (and most private institutions) completion rates have increased by 10% (Bound, Lovenheim, and Turner 2009). But at the nation's public two-year and less selective four-year colleges, where the largest increases in enrollment have occurred, completion rates have declined (Carey 2005; Bound, Lovenheim, and Turner 2009; Haskins, Holzer, and Lerman 2009).¹ Community colleges in particular, because of their greater elasticity in responding to increased demand, have received the largest share of increasing enrollments from the least prepared students; completion rates for this group—always low—declined further, from 5.6% to 5% (Bound, Lovenheim, and Turner 2009). During this same period, expenditures per student increased at private and selective public institutions but decreased at nonselective public four-year and two-year institutions, resulting in decreasing student-faculty ratios at private and selective public institutions and increasing ratios at less selective four-year and two-year institutions (Bound, Lovenheim, and Turner 2009). In their analysis of why college completion rates have declined, Bound, Lovenheim, and Turner (2009) found that declining student academic preparedness explains 88% of the decline in completion rates at community colleges, while

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increasing ratios of students to faculty account for 51% of the decline at less selective public four-year institutions.

The net effect of these changes is that, at the very moment a national consensus calls for a significant increase in college degree completion as a centerpiece of the nation's workforce development strategy, the trend at colleges and universities—with the exception of the nation's most selective and/or most expensive institutions—is in the opposite direction. Meanwhile, completion rates in other countries are increasing. While the United States still has the highest proportion of bachelor's degrees in the 55- to 64-year-old age group, it has fallen to 6th place in the 25- to 34-year-old group among the 30 richest countries (Organisation for Economic Co-operation and Development 2007). When associate's degrees are included, the United States has fallen to 12th place in degree completion among 25- to 34-year-olds (Organisation for Economic Co-operation and Development 2007).

In response, President Obama has proposed an ambitious agenda aimed at restoring U.S. leadership in postsecondary educational attainment. He has called for the United States to have the world's highest proportion of college graduates by 2020, to add 5 million people with community college credentials in the form of occupational credentials or associate's degrees, and to ensure that all adults have at least one year of postsecondary education.² This agenda poses a major question: How will the nation's postsecondary education system, already strained beyond capacity, meet this challenge?³

The purpose of this chapter is to describe a "pathway" by which the nation's existing postsecondary education and training system can be modified to help achieve these goals. In particular, our focus is on enabling the approximately 75 million incumbent workers who lack a recognized postsecondary education credential to resume their education (Soares and Mazzeo 2008). Soares (2009:13) terms these individuals "working learners . . . individuals between the ages of 18 and 64 who are already in the workforce and who currently lack a postsecondary credential." Working learners are of particular interest because data suggest that it will be impossible to meet the president's goals without helping them obtain a postsecondary credential. One recent study estimates that the United States will need to enroll as many as 10 million such working learners to retake the global lead in the proportion of adults with a postsecondary credential (Jones and Ewell 2009). Another study suggests that the focus for many of these prospective students should be at the two-year-college level (Holzer and Lerman 2007).

Despite wide variation on virtually all demographic characteristics, working learners share one important distinction: All are needed wage

earners for themselves or their families. To obtain a postsecondary credential, these individuals must be able to maintain their employment and family responsibilities while they are pursuing further education. Many of these working learners share another important attribute: They have some college credits but no credential. They are among the large number of high school graduates who entered college but left without completing a degree. A growing body of evidence indicates that to be successful, working learners require flexible education programs, courses of study that yield educational credentials that employers value, career guidance, and easy-to-use financial assistance (see, for example, Soares 2009 for review).

Serving these working learners requires a significant rethinking of the very idea of a "college education." The traditional view of college—four to six years of full-time study in the cloistered environment of a college campus before entering the "real world" of work—is simply not relevant to working learners. This traditional view needs to be replaced by a "lifelong learning" view (e.g., Fischer 2000; Field 2006; Smith 2010) in which education and training resources of different kinds are accessible to individuals throughout their lives, enabling them to build successful careers, update their competencies in response to economic shifts, and increase their understanding, as citizens in a democracy, of the complex issues affecting their lives.

We argue that the current structure of U.S. higher education lacks the flexibility to permit movement between work and learning on the scale required to meet the challenge. In contrast, job training programs provided by employers and unions or through the public workforce development program contain the needed flexibility but seldom yield recognized credentials. We outline here a conceptual framework for rethinking the role of postsecondary education in workforce development and give examples and policy recommendations to facilitate such a transformation.

Our framework is constructed around the fact that, in the knowledge economy, workers' knowledge no longer represents merely a set of competencies required to produce goods or services as was true in the mass-production economy. Rather, knowledge itself has become a commodity—"raw material that can be claimed through legal devices, owned and marketed as a product or service" (Slaughter and Rhoades 2004:17). The magnitude of this change has yet to be widely understood by policy makers at any level. It has triggered the most dramatic change in the nature of work and the competencies demanded by labor markets since the advent of mass production. To sustain a broad national prosperity, our workforce development system must adapt to the knowledge

economy. This calls for education to integrate with the labor market in an employer-based system.

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economy. This cannot be accomplished without transforming postsecondary education to integrate the rigor of our traditional higher education system with the labor market flexibility of our workforce development and employer-based job training systems (Soares 2009).

We refer to our framework as "connecting the dots" to underscore the fact that there is no need to reinvent the wheel. Most of the elements needed for the postsecondary education system we outline exist but operate on policies that are still aligned with the mass-production economy rather than the knowledge/information economy. This lack of alignment and connectivity causes Smith (2010:21) to argue that postsecondary education is "not a system at all . . . [but] actually resembles a large and diverse cottage industry"—a plethora of education providers including colleges and universities, community colleges, community-based organizations, employers, and labor unions, each of which implements and measures learning processes in unique ways and confers course credit and credentials based on different criteria. Connecting the dots refers to integrating this array of providers in three ways:

1. Reducing the sharp divide between the traditional liberal arts and vocational/professional curricula and integrating the competencies of both in new ways
2. Building new connections among various types of postsecondary education providers so that learners can progress smoothly from one to another
3. Enabling working learners to "earn while you learn" by making educational opportunities available in formats and with funding structures that permit people to continue working while acquiring new knowledge and skills

These three types of integration, we propose, will enhance economic competitiveness and improve individual opportunity, providing Americans with the ability to creatively apply knowledge to real-world situations and to bring knowledge gained in the real world to the classroom. Such integration also ensures that education is delivered in a way that meets working learners' need for flexible learning options that accrue credit and credentials across many providers. Facilitating these types of integration requires significant policy changes at institutional, state, and federal levels. The challenge is to adopt new policy levers that will encourage broader diffusion of innovations that increase access to postsecondary education for working learners while maintaining and increasing the breadth, rigor, and standards of excellence associated with college-level learning.

Workers' Knowledge Requirements in the Knowledge/Information Economy: A Framework

Human resource scholars identify four different types of knowledge that the workforce of any enterprise must possess: general, occupation-specific, firm-specific, and industry-specific (e.g., Lepak and Snell 2003). This focus on workforce knowledge has given rise to an "architectural view" (Lepak and Snell 2003; Morris, Snell, and Lepak, 2005) in which the knowledge-based firm is viewed as a "portfolio of human capital" that constitutes a significant source of sustained competitive advantage (Lepak and Snell 2003). Figure 1 depicts a typology of these different types of knowledge. "Knowledge" in this framework includes both *declarative* knowledge (e.g., facts, concepts, theories, events) and *procedural* knowledge (integrating physical and cognitive skills for action; Anderson 1976).

FIGURE 1
The "Architecture" of Knowledge in Organizations.

Industry/Sector
Knowledge

General
Knowledge

Firm/Agency-
Specific
Knowledge

Job/Occupational
Knowledge

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In the typology shown in Figure 1, each type of work-related knowledge is assumed to include both declarative and procedural knowledge that varies depending on the specific nature of the occupation or industry. Products or services and the structure of work in different industries and occupations generate different demands for knowledge in the workforce.

- *General knowledge*, acquired primarily through formal schooling, refers to such academic competencies as analytic skills, quantitative reasoning, written and oral communications, critical thinking, and problem-solving skills as well as mastery of specific subjects or disciplines.
- *Occupation-specific knowledge* pertains to specific jobs or occupations and may be acquired through formal education, training, on-the-job experience, or a combination of these, depending on the occupation.
- *Firm- or agency-specific knowledge* may result from some combination of formal schooling, training, and on-the-job experience and is, by definition, unique to the firm.
- *Industry-specific knowledge* can also be acquired through either experience or formal schooling, but in an increasing number of industries significant levels of both experience and education are required.

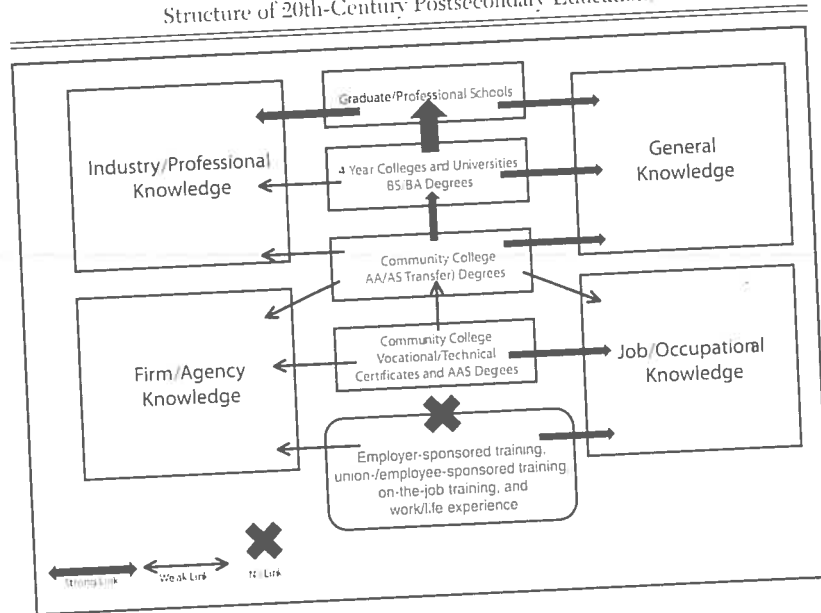
The mass-production paradigm of organization that dominated the American economy in the 20th century required a workforce knowledge profile very different from the profile required by the knowledge- and information-based organizations that form the primary engines of the 21st-century economy. Meanwhile, the existing postsecondary education system is still geared to the needs of the old economy.

The Mass-Production Education and Training System

Figure 2 depicts the education and workforce development system that evolved to meet the needs of the mass-production economy. Three features are most relevant to the present discussion. First is the separation of "academic" from "vocational" knowledge; second is the specialization of education providers to serve these different education markets; third is the autonomy of the provider institutions, with poorly developed connectivity between and among them. These features stem in large measure from Fredrick Taylor's (1911) *Principles of Scientific Management*.

Taylor sought to improve the efficiency of production by finding the "one best way" to perform a task. His methods led to assigning the newly created industrial engineering department the task of decomposing workers' traditional occupational knowledge into discrete tasks, separating the conception of tasks (thinking) from their execution (doing), and giving management control over each step of the production process.

FIGURE 2
Structure of 20th-Century Postsecondary Education

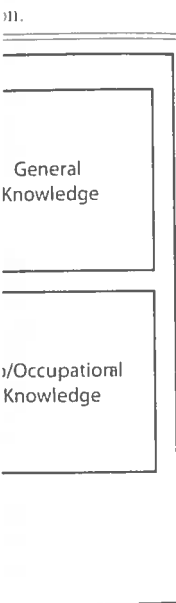


Taylor's methodology greatly facilitated the massive substitution of machines for human labor that made mass production possible and also enabled the mass employment of low-skilled workers to operate the machines. Front-line workers' jobs in Taylor's system are highly circumscribed, requiring little knowledge beyond the occupation level, where "occupation" often involved only one basic task that could be mastered with little training or experience. Higher-skilled workers, such as tool and die makers, electricians, and machine repairers, require more occupational and general knowledge and hence more training. Depending on the size of their firm, front-line workers may know a fair amount about the firm or even the industry, but this knowledge would not be integral to task performance.

Supervisors in the mass-production paradigm get promoted from the ranks of the front-line workforce, and their knowledge profile is very similar to those they supervise. They are required to have job/occupational knowledge and may also acquire additional knowledge about the firm, but, like front-line workers, they may know relatively little about their industry and do not require a high level of general knowledge.

As the mass-production economy evolved, higher-level managers were less likely to rise through the ranks and more likely to be professional

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managers trained at academic institutions. Executives were required to have higher levels of general knowledge as well as specialized firm and industry knowledge. At the same time, such managers often had less knowledge of the specific jobs at the front line of the firm. Perhaps most importantly, this system required increasing numbers of specialists—professional and technical workers like engineers and applied scientists with specialized technical and occupational knowledge acquired through formal schooling.

The principles of job design initially developed for manufacturing and food processing enterprises spread throughout the economy to other enterprises and industries, including, and most especially, the education sector (Tyack 1974; Marshall and Tucker 1992). Taylor's "principles" proved applicable to virtually any task—cognitive or physical—that can be decoded and described using "rules-based logic." Rules-based logic applies whenever it is possible to specify an action for every contingency: such "condition-action-outcome" (CAO) rules permit the specification of step-by-step procedures for workers to follow in executing tasks (Levy and Murnane 2004), thus achieving standardization—the foundation of mass production.

For nearly a century the mass-production workforce development system created broadly shared prosperity in the United States. However, as Marshall and Tucker (1992) point out, the system was a double-edged sword: It made front-line workers in the United States part of "the largest, richest middle class the world has ever seen" but at a very high long-term cost. Taylor's premise of separating "thinking" from "doing" ultimately yielded the world's highest and most expensive ratio of managers, support staff, and technical specialists to front-line workers. The result was a system "far more vulnerable than anyone imagined. There was one thread that ran through almost all its weaknesses—its elitist character. We had built a system of 'coolie labor' surrounded by a managerial, technical and support elite" (Marshall and Tucker 1992:10). Figure 2 sketches the structure of the postsecondary education and job training system that supported this system and emphasizes the key features that require alteration.

Separation of Academic and Vocational Knowledge. Paradoxically, the "elitist" character of the U.S. mass-production system spawned an "anti-elitist" education reform movement based on the notion that the traditional American intellectual ideal for schooling was aristocratic and had no place in a democracy. During the first half of the 20th century, the American secondary education system introduced increasing structural differentiation accompanied by increasing curricular differentiation between "academic" and "vocational" studies. According to Cremin

(1988:232; see also Tyack 1974), the progressive school-reform movement argued that the "attractiveness, or 'holding power,' of the schools would be increased only as studies were seen by pupils and their families as more useful[, i.e.,] . . . more vocational." The logic of this argument led to providing different curricula for different students depending on their occupational destinations. The result was a division of schooling into vocational—supplying large numbers of front-line workers who had "mastered the three R's, had some vocational skills and were well disciplined" (Marshall and Tucker 1992:20)—and academic, preparing students destined to be managers and specialists for advanced instruction at colleges and universities. Despite all claims to the contrary, this "tracking system survives to this day" (Marshall and Plotkin, Chapter 12, this volume).

Specialization of Education Providers. The separation of academic and vocational curricula initially developed in the K-12 system became the foundation of the nation's postsecondary education and training system as well. As Figure 2 shows, the mass-production education paradigm spawned a wide variety of education and/or training institutions specialized to serve either vocational or academic markets. In 2006, there were 4,829 two- and four-year colleges, of which about 35% are public, another 35% are private not-for-profit, and the remainder are private for-profit. Of the 14.9 million undergraduate students attending these institutions, 11.7 million attend public institutions, 2.4 million attend private not-for-profit institutions, and 0.8 million attend private for-profit institutions. Public two-year and four-year institutions are funded by, in addition to tuition and fees, state legislatures. Despite shrinking state appropriations and concomitant increases in tuition and fees, four-year public institutions continue to post tuition levels about 25% below the level charged by private institutions, and tuition at two-year public institutions remains a tenth of the private level.

By far the fastest-growing segment of degree- or certificate-granting postsecondary education is the private for-profit institutions, which now enroll close to 10% of all college students. (For a theory and detailed analyses of penetration of market logic into higher education, see Slaughter and Leslie 1997 and Slaughter and Rhodes 2004). These institutions range from small, specialized, career-oriented institutions to large universities that confer credentials ranging from occupational certificates to doctoral degrees (e.g., DeVry and the University of Phoenix). Their rapid growth in the last decade can be attributed to the adoption of a new model that is specifically geared to working learners and consistent with many of the proposals that we outline below. The model is student-centric, linking course delivery and pedagogy specifically to the needs of students, and also labor market-centric, based on developing close ties

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with employers for the purposes of curriculum development and career placement. These institutions also tend to be early adopters of innovations, such as web-based instruction, as well as standardized curricula. However, the for-profit institutions have also generated growing criticism about program quality, enrollment practices, and financial models (Government Accountability Office 2009; Eisman 2010).

Consistent with the academic/vocational divide we have described, the public workforce development system is almost entirely separate from the formal higher education system and is geared to provide short-term training, mostly for hard-to-employ and dislocated workers to obtain jobs that require little skill. Its services, funded each year under the Workforce Investment Act (WIA) of 1998, are an amalgam of 16 different categories of programs housed in four different government agencies. These funds are managed at the state level by 650 local Workforce Investment Boards (WIBs) made up of business, labor, community, and education leaders. WIB staff contract for training services with a diverse set of certified education institutions, including community colleges (mostly noncredit programs), high school vocational centers, community-based organizations, and private training firms. At about \$4 billion a year, funding for these WIA training services is only about a third of that invested in college programs such as the Pell Grant and has decreased 40% since 1985. Of the total, only 40% is invested directly in training and serves about 416,000 individuals per year. Most importantly, with a few exceptions, WIA-sponsored training does not offer recognizable occupational credentials or academic credit that provides meaningful benchmarks of achievement with value in the job market or that links to a college-degree pathway. (For a more complete description and critique of the public workforce development system, see, e.g., Soares 2009 and Marshall and Plotkin, Chapter 12, this volume).

An Autonomous and Disconnected "System." The diverse group of colleges and universities in the postsecondary education system is regulated and governed in a highly decentralized fashion. Compared with many other nations, higher education policy and funding in the United States is concentrated in the states rather than in the federal government. Some scholars argue that the relatively limited federal role helps explain why other countries have surpassed the United States in college degree completion. Since the 1980s, virtually all developed and many developing nations have adopted policies redirecting public resources in efforts to more tightly link postsecondary education to economic competitiveness; most of the nations that have made rapid gains (e.g., Australia and the United Kingdom) have strong national education ministries (Slaughter and Leslie 1997; Slaughter and Rhoades 2004). In the United States each

individual state sets up its own public higher education system and provides regulation and oversight for the public, private nonprofit, and for-profit higher education sectors. States establish and implement rules governing the creation of private nonprofit and for-profit universities and specify the minimum requirements that all institutions operating in the state must meet in order to grant academic degrees. There is considerable variation in the specific details of state regulations, policies, and outcomes among the 50 states (see Jones and Ewell 2009 for an overview). Quality control of provider offerings is maintained largely through a voluntary accreditation system composed of privately run accrediting agencies that review the qualifications of member institutions. Though it is possible to forego accreditation, the Higher Education Act stipulates that an institution must be accredited by one of 61 nationally recognized accrediting agencies designated by the U.S. Department of Education to be eligible for Title IV federal financial aid programs. Within this framework of federal, state, and accrediting body requirements, education institutions have a high degree of local control over core policies such as admission standards, curricula, degree requirements, and the award of institutional financial aid.

Similarly, the workforce development system, as funded through WIA, is equally decentralized, with the 650 local workforce boards mentioned above certifying vendors in their service area and having limited communication with other boards. This service and governance model makes it exceedingly difficult to achieve the funding flexibility needed to serve increasing important regional labor markets (Marshall and Plotkin, Chapter 12, this volume).

As Figure 2 illustrates, within this vast network of educational providers, job or occupational knowledge for most "front-line" workers is primarily acquired through direct work experience supplemented by on-the-job training exclusively. At higher skill levels, training is provided through the private postsecondary education and training system or through vocational certificates and degrees at the public community colleges. As the figure also shows, there is little opportunity to translate this work-based training into a recognized and portable credential. Very little of the training provided by private education offers recognized certificates or credentials. Workers with only this type of knowledge are largely unable to apply their occupational knowledge to a pathway leading to formal credentials. A notable exception is the registered apprenticeship system, which provides an important model (see, e.g., Lerman 2007, 2009).

By the second half of the 20th century, the two-year community college system emerged to provide both general education and vocational

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training needs beyond high school but short of the baccalaureate degree. As can be seen in Figure 2, the community college is the linchpin in the nation's postsecondary system. It is the only institution whose mission is explicitly directed toward serving all four areas of work-based knowledge. Little wonder that many have argued that the community college mission is too broad, and as a result these institutions struggle to perform their many functions well (Pusser and Levin 2009) with a funding formula that in some states is less than elementary schools per full-time-equivalent student (e.g., Murphy 2004).

A particular tension exists between the community college's *transfer* role, offering lower-division liberal arts courses to students who will move on to four-year schools to complete bachelor's degrees, and its *vocational* function, where it offers a variety of occupational certificates as well as associate of applied science (AAS) degrees. AAS degree curricula contain a core of technical credits in an occupational specialty (e.g., heating and air conditioning technician, electrician) as well as a number of general education courses geared to the occupation (e.g., applied math, business English), and the degree is considered a terminal degree. In many (but not all) cases, general education courses are not considered equivalent to those offered in the AA/AS curricula, and hence fewer than half of the credits awarded on an AAS degree transcript are considered "transferable" to baccalaureate degree institutions. However, earning an AA or AS degree at a community college is also no guarantee that all degree credits will be accepted in transfer at four-year institutions. In the absence of statewide transfer policies or negotiated articulation agreements, each degree-granting institution decides what credits it will accept from other institutions (see, e.g., Jones and Ewell 2009), which can result in a significant loss of credits.

At the higher end of the postsecondary system, the baccalaureate degree system is geared primarily to providing general knowledge. Although, as Figure 2 shows, it does have some links to firm or industry knowledge for some degree areas, these are relatively weak and provide little in the way of specific work-based knowledge except in those programs that combine internships or cooperative work experience with the curriculum. As Figure 2 also shows, by far the best-developed link in the system is between baccalaureate and graduate institutions where there are well-developed pathways to advance from bachelor's degree to graduate study. The link between graduate professional education and industry and firm knowledge is also quite robust, especially in some technical fields, such as pharmacy and engineering.

Overall, as Figure 2 shows, with the exception of bachelor's degree to graduate study, there are seldom well-developed pathways among these

different types of education institutions and providers. Until very recently, most employer-sponsored training programs—even those that offer recognized certificates or credentials such as registered apprenticeships—have not been considered part of the formal postsecondary education system. Despite the fact that there is a well-developed methodology for assessing the college-credit equivalence for life and work experience and job training ranging from military training to registered apprenticeships to employer-sponsored training, many academic institutions refuse to accept this form of learning as part of an official transcript. Exacerbating this lack of alignment, training funded through the workforce development system has yet to develop the consistent measures of quality and credentialing that would allow for integration with postsecondary educational programming (Soares 2009).

Even within the formal higher education system, transferring credentials from two-year to four-year schools or between four-year schools has been subject to institutional policies that cause transfer students to lose many credits earned at other schools. A 2005 study by the Government Accountability Office found that 60% of students—2.5 million a year—transfer at least once before completing an undergraduate degree. On average, transferring requires the student to attend at least one additional semester and can add an additional year or more of study. The total “transfer tax” paid for this lack of portability of credits has been estimated to include \$7 billion in additional costs to students for credits not applied to degree transcripts, \$14 billion in state subsidies for instruction delivered but not counted, \$5 billion in financial aid to cover credits taken and not counted, and \$6 billion in delayed or reduced tax revenues because students take longer to complete their degrees (Smith 2010). In total, the transfer tax adds more than \$30 billion in redundant costs to students, institutions, and governments for the 50% of students who actually complete degrees within eight years of starting. This figure does not include the costs associated with the 50% who do not finish. The Gates Foundation claims that fully half of all annual postsecondary education expenditures, including financial aid, go to people who never receive a certificate or a degree (Wallis 2008; also cited in Smith 2010).

Even if these calculations turn out to overestimate the cost, there is little doubt that modifying the postsecondary education and training system in ways that reduce the inefficiencies and inequities attached to transferring credits is crucial to making college possible for working learners. However, while improving the efficiency and effectiveness of the transfer system has the potential to dramatically improve working learners’ access to postsecondary education and improve completion rates at a much lower total societal cost per credit hour, it will not

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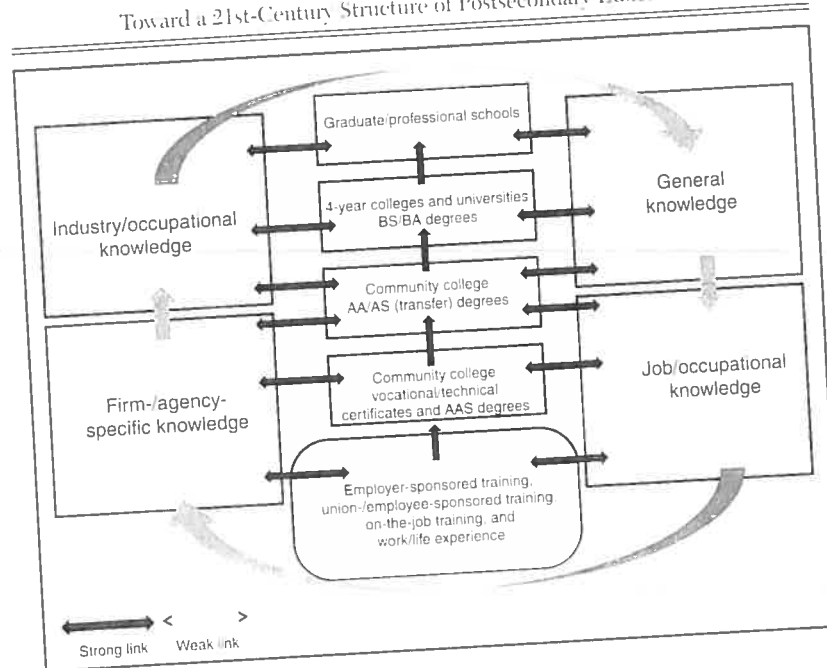
automatically lead to the kinds of knowledge these workers need to succeed in the knowledge/information economy. Increasing the number of people with *both* college-level credentials *and* long-term sustainable employment with middle-class incomes requires preparing them with the kinds of knowledge and competencies that the knowledge economy demands.

Creating a 21st-Century Postsecondary Education for Knowledge-Based Work

The emerging knowledge economy creates both a major challenge and opportunity for postsecondary education. Knowledge-based work reduces the disparity between some academic and vocational competencies but introduces new ones. For example, the analytic, critical thinking, and problem-solving skills traditionally attributed to a liberal arts education are important to knowledge-based firms along with other foundational skills of the academic curriculum, including quantitative reasoning, writing, information literacy, and demonstrated mastery of a major subject. However, knowledge work also places a high premium on collaboration and the ability to apply such skills when working in teams on real problems—skills not taught in many undergraduate liberal arts majors. Figure 3 depicts modifications that would “connect the dots” in order to alter the postsecondary education system in ways that meet the workforce knowledge requirements of a knowledge/information-based economy and the needs for working learners. The figure shows stronger integration both horizontally, between the various types of work-based knowledge, and vertically, between and among the education and training institutions. These changes reflect the significant difference between knowledge as a *means* to enable the mass production of goods and services and to produce highly specialized goods and services and knowledge as the *end* of the production process (Slaughter and Leslie 1997, Slaughter and Rhoades 2004). Knowledge work requires reversing Taylor’s principles. Instead of viewing workers’ knowledge and capacities for innovation and learning as an impediment to standardization, knowledge-based firms need to “harness” these capacities as the basis for competitive advantage (see, e.g., Jackson, Hitt, and DeNisi 2003; Smith 2010). The result is a very different workforce knowledge profile and a demand for increases in all four types of work-based knowledge among all types of employees.

Managing knowledge work for competitive advantage also requires major change in organizational structures and processes to enable workers to contribute their specialized knowledge and capacity for creating and innovating. This leads to a major reduction in the number of layers of managerial employees, “flattening” the organization hierarchically or shifting

FIGURE 3
Toward a 21st-Century Structure of Postsecondary Education.



from a hierarchical structure to a more lateral or horizontal structure (for more in-depth discussions of these changes, see Piore and Sable 1984; Marshall and Tucker 1992; and Benson and Lawler, Chapter 4, this volume). Not all types of knowledge will be rewarded, however.

One feature of the mass-production paradigm persists and has become more prevalent in the knowledge economy: the substitution of machines or less-skilled (hence lower-paid) workers for higher-skilled labor. Levy and Murnane (2004) describe the effect of computers on "routine" (i.e., rule-based) tasks: "Computers excel at the rapid application of rules. A task that can be fully described by rules is a strong candidate for computer substitution" (p. 30). Rule-based tasks are not confined to the "low-skilled" end of the labor market. In fact, many so-called low-skilled occupations are among the least amenable to computer substitution. For example, Gatta, Bonshey, and Appelbaum (2009) describe the complex face-to-face skills of interactive service occupations typically termed low-skilled that make them less susceptible to computerization or offshoring. On the other hand, at the higher end of the labor market, Levy and Murnane (2004) describe how computers eliminated the jobs of

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"open-pit" bond traders and significantly reduced the salaries of their replacements, who now conduct their business from their offices. These authors argue that the knowledge economy will increasingly relegate routine (rule-based) tasks, at both the high and low ends of the labor market, to computers while investing in people to perform tasks that require "expert thinking" and "complex communication."

Expert thinking involves pattern recognition (often called intuition), which Levy and Murnane (2004) describe as information processing based on nonroutine CAO rules that are too complex to specify. A better definition might be this: inductive information processing based on CAO rules that must be inferred using complex perceptual processes in complex, cluttered information contexts (see Holland, Holyoak, Nisbett, and Thagard 1986). Expert thinking requires mastery of both declarative and procedural knowledge in a specialized area. Computers, thus far, lack the capabilities for such advanced inferential thinking and for physical tasks like changing bandages on nursing home patients, serving dinner at fine dining establishments, and performing heart transplants. Humans, on the other hand, have highly evolved inferential and physical capabilities that can be enhanced with education and experience and augmented by computers' capacity to perform routine tasks.

Complex communication refers to the ability to engage in expert thinking in the variety of new contexts contained in the knowledge-based workplace, such as multidisciplinary teams (both face-to-face and virtual), new forms of social media (like Facebook), and telecommuting. For example, Gittell (2009) describes the enhanced quality and efficiency outcomes obtained in health care organizations where patient care is organized to emphasize "relational coordination" so that the various specialized occupations work in teams to contribute their expertise. Gittell's research also highlights the fact that current educational programs in the various professional specialties—especially medicine—do not prepare practitioners to engage in such collaborative processes.

In summary, the emergence of the 21st-century knowledge and service economy has both elevated the education level needed for economic competitiveness to a postsecondary level and changed the mix of skills needed by workers to add value in the workplace.

"Connecting the dots" requires changes in postsecondary policy and practice at the federal, state, and institutional levels. Using several examples, we will highlight the policy issues and propose solutions. Our focus is primarily state and institutional levels, since many of the challenges outlined earlier are governed by these policies (Jones and Ewell 2009). Marshall and Plotkin (Chapter 12, this volume) propose federal policy changes that support those we present below.

Integrate Liberal Arts and Vocational/Professional Curricula

A growing number of colleges and universities now provide work-based learning opportunities, such as service learning, internships, and research and teaching assistantships, all of which add valuable applied experience to liberal arts curricula. For the most part, however, such experiences do not reflect broader integration of occupational/professional knowledge with traditional liberal education or vice versa. Here we want to highlight some new initiatives that seek to achieve a higher level of integration between the knowledge demands of work and the academic curriculum. We begin at the bottom of Figure 3 with the concept of linking work-based training to a college-degree pathway.

Connect Workforce Development and Job Training Programs to Degree Paths. As we have described, workforce development programs at their best deliver outcomes-based training, build partnerships, and provide support to help working learners navigate changes in the labor market. There is a well-established methodology for assessing the credit course equivalent of noncredit courses and experiential learning. The process can lead to the inclusion of more general learning outcomes in job training and work-based learning outcomes in college programs (see, e.g., Jones and Ewell 2009). Two examples illustrate the potential impact of expanding this process. The Washington State Community and Technical Colleges "Integrated Basic Education and Skills Training" (IBEST) program seeks to move low-income, nonnative English speakers quickly through a combination of English as a Second Language, intensive adult basic education, and skills training linked to occupation credentials (Washington State Board for Community and Technical Colleges 2005). Innovative models such as IBEST are an essential first step, helping working learners obtain a recognized credential. The next step is to connect such credentials to degree pathways. The New Jersey Pathways Leading Apprentices to a College Education program (NJ PLACE; <http://www.njplace.com>) is the result of a statewide collaboration among all the major stakeholders to workforce development: New Jersey's 19 community colleges, employer associations, organized labor, the State Employment and Training Commission, and a number of registered apprenticeship programs. The goal of the program is to integrate apprenticeship courses offered by noncollegiate providers with general education offered by the community colleges to yield an AAS degree in technical studies that will be transferable to baccalaureate institutions. The experience of NJ PLACE reveals one of the major obstacles to creating a degree pathway for noncredit job training: the most widely accepted source of assessing the credit equivalence of noncredit courses—The American

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Council on Education's College Credit Recommendation Service—is cost prohibitive for many providers. In New Jersey discussions are under way about the need to establish a state-based assessment service.

Define and Assess Learning Outcomes at Community Colleges. As noted earlier, community colleges are the key institutions for serving working learners. Through their vocational and technical programs, community colleges have always had close partnerships with employers in their service areas and have the capacity to adapt quickly to changes in the local labor market. Many community colleges have already created articulation agreements to award credits for employer or joint union–employer training programs as part of an AAS degree. The challenge for community colleges is to better integrate their general education (transfer) and technical missions. The following example illustrates both the possibilities and the challenges inherent in achieving such integration.

The Learning College project, initiated by the League for Innovation in the Community College in 2000 with 12 “vanguard” institutions, now involves a group of 72 institutions around the country committed to creating innovative instructional forms focused on learning outcomes and interdisciplinary learning. In particular, these colleges have created faculty, staff, and student communities aimed at transforming both general and occupational education by transforming instruction from “learner-centered”—which most community colleges have always been—to “learning-centered,” with a focus on the *outcomes* of the educational process. The most significant of the many challenges that these colleges faced is also the most essential for “connecting the dots”: defining, assessing, and documenting student outcomes. Evaluating the Learning College project, McClenney (2002, emphasis added) observes that, despite considerable experience with outcomes-based learning, most colleges had difficulty applying the process to all college courses, programs, and degrees—in particular, “*general education courses and critical across-the-curriculum skills (e.g., writing, critical thinking, problem-solving, and the like) remain a considerable challenge.*” McClenney found that few of the colleges were satisfied with their methods for assessing the acquisition of skills and knowledge identified in the outcomes statements, and none had created satisfactory models to document and transcript the learning outcomes. Developing a common approach to the definition, delivery, and assessment of required learning outcomes at the course, program, and degree levels is essential both for integrating occupational and general education and for reducing the inefficiencies and inequities in the transfer of credits discussed earlier.

Create a “Practical Liberal Education” at Baccalaureate Institutions. One promising example of integration at bachelor’s-degree-granting

institutions is the Liberal Education and America's Promise initiative (LEAP), where over 150 members of the Association of American Colleges and Universities are striving to integrate the elements of a liberal education across all collegiate disciplines, including career and professional disciplines (Association of American Colleges and Universities 2007). As one of its primary goals, LEAP seeks to "challenge the widespread belief that students must choose either a practical or a liberal education by building widespread support for educational changes that already are producing a new synthesis of practical and liberal education" (from the LEAP website). LEAP member colleges identify essential learning outcomes in four categories: knowledge of human cultures and the physical and natural world; intellectual and practical skills; personal and social responsibility; and integrative learning. LEAP colleges work with both employers and public schools to help college and college-bound students "understand, prepare for and achieve a challenging, public-spirited and practical liberal education" (Association of American Colleges and Universities 2007; from the LEAP website).

As is clear from the examples described, experimentation with integrating liberal and occupational/professional education is occurring along the continuum of postsecondary education providers. State and federal policy initiatives could increase both the pace and scale of these changes by grants supporting the following types of initiatives:

1. Support for faculty and staff to develop a common approach to the definition, delivery, and assessment of required learning outcomes at the course, program, and degree levels as well as to develop commonly accepted measures of the college equivalency of work-based learning.
2. Grants to create partnerships that align integrated curricula across postsecondary education providers. Colleges, universities, training providers, employers, and unions must be able to articulate areas of knowledge, skills, and attitudes that are being developed across their programs so that students and instructors can define an educational pathway. The federal Departments of Education and Labor could invest in these types of partnerships through regional skills initiatives that encourage standards and curriculum development in high-demand occupations.

Build New Connections Between Various Types of Postsecondary Education Providers

As noted through this chapter, working learners are mobile learners. For these learners, connecting the dots means facilitating the ability to

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earn college degrees by transferring credits among education providers. As outlined in the previous section, this cannot be accomplished on any large scale without a better alignment of standards among institutions. Since the majority of transfers occur within states, we concur with Jones and Ewell (2009) that the most effective policy interventions would encourage states to target their policy and resource leverage toward helping working learners obtain recognized and portable postsecondary credentials. Space limitations prohibit a comprehensive discussion, but the following recommendations are illustrative (for more detailed recommendations, see Jones and Ewell 2009 and Soares 2009).

Align Transfer Policies for Lower-Division General Education Courses Among All Colleges and Universities Receiving State Operating or Capital Assistance. Some states already have such policies in place while others, such as California, do not (Jones and Ewell 2009). New Jersey's statewide transfer policy applies to AA/AS degrees, but the legislation does not cover students who complete the general education credits equivalent to the AA degree at four-year schools that do not offer the associate's degree. After aligning outcomes and standards for lower-division courses, the two- and four-year schools will also need to align assessment mechanisms so that transfer students will be prepared to perform as well as students who enter four-year institutions directly. Properly implemented, such policies should lead to improved completion rates with fewer lost credits without negatively affecting four-year schools' ability to control the content and standards of their major baccalaureate programs of study.

Create a State-Based "Assessment Center." To capture the credits and/or learning that would help working learners earn formal credentials, there must be a system that coordinates the assessment of credits and provides information and guidance to all students and potential students, regardless of their current status. The optimal location of such a center would be statewide. Specific functions of such an assessment center might include these:

1. Assessing individuals' prior learning (PLA). Research indicates that students who can apply PLA credit in the most flexible way possible—for general education credits, major requirements, waiving course prerequisites, and obtaining advanced standing—have much higher graduation rates than students who lack this flexibility (Klein-Collins 2010). PLAs should be treated as transfer credits rather than as "recommendations," for which many colleges require students to pay tuition in order to receive the credit. To encourage institutions to offer more PLA credit and to expand the ways that such credits can be applied, states will need to establish a coordinated effort to ensure that common standards apply.

2. Assessing credit equivalence of noncredit courses. Assessing noncredit courses for credit equivalence is far more strategic and cost-effective than assessing individuals' prior learning. States should follow Ohio's lead (Jones and Ewell 2009) and establish clear guidelines for converting noncredit learning to credit that counts toward associate's or bachelor's degrees. State-based entities like the National Program on Noncollegiate Sponsored Instruction, based at the State University of New York, have the ability to assess training programs offered by noncollegiate postsecondary providers. States should also work together to ensure that these credits can be portable across state lines.
3. Providing guidance to students. Working learners need guidance as to the pathways they may have toward a credential or a degree. Currently such guidance is primarily available from advisors at the college or university where students are enrolled or where they are considering enrolling. These advisors may not have complete information or may be focused on competitive recruitment and therefore not be willing to provide full information. A state-based center can inform students about articulation agreements that easily enable students to transfer one set of college credits to another institution, and this center should also provide guidance on other options such as degree-completion institutions, competency-based institutions, and credit transfer services (see Soares 2010).
4. Expanding articulation agreements. To better serve student needs while ensuring institutional diversity, the United States needs a much more universal system of articulation agreements. Currently, the existence of articulation between institutions depends on the individual college or university, occasionally facilitated by a systemwide agreement. A more universal articulation system that is intentional rather than haphazard is essential to improving degree-completion rates among working learners. States should encourage the development of agreements systemwide between noncollegiate providers and two- and four-year public institutions as well as between four-year public institutions; these agreements should also extend, wherever possible, to private institutions.

Earn While You Learn

As we stated at the outset of this chapter, a very large group of U.S. workers needs—and wants—to combine work, family responsibilities, and lifelong learning. This poses a challenge to the design of the postsecondary education system at all levels. Those who do not start college

right after high school, but rather begin their education after a period of time spent in the workforce, may find it difficult to enter college programs to prepare for a career. This requires a program that can be completed while working.

Community colleges have a long history of providing a "learn while you work" system. This system allows students to begin their education while they are still in the workforce (Horn 2003). This system is primarily designed to provide a pathway to the middle class, but it also provides a pathway to the workforce. This system is designed to be flexible and to allow students to enter the workforce at any time.

Research has shown that students who enter the workforce after high school are more likely to complete a degree or certificate than those who enter the workforce after high school. This is because students who enter the workforce after high school are more likely to have a clear career goal and to be motivated to complete their education. This is also because students who enter the workforce after high school are more likely to have a support system in place to help them through their education.

Federal programs such as the Pell Grant and the Federal Work-Study program have helped to support students who are working while they are in college. These programs have helped to make college more affordable for students who are working. This has helped to increase the number of students who are able to complete a degree or certificate while they are still in the workforce. This has helped to create a pathway to the middle class for students who are working.

right after high school and attend full-time while depending on their parents for income and support are considered "nontraditional" students by colleges and universities and do not fit into the traditional structure of college learning. Workers who have lost their jobs are considered "dislocated workers" in need of quick intervention by workforce training programs to get them new jobs. In combination, these two groups comprise around half of all college students. Serving these working learners requires a postsecondary education system that allows them to earn a living while continuing their education.

Community colleges are the ideal place to foster an "earn while you learn" system because data show that many working learners will either begin their journey in community college, gain a postsecondary credential there, or pass through on their way to more education (Berker and Horn 2003). For the most part, community colleges are still designed primarily to serve the needs of traditional students. In addition to many of the changes already discussed, earning while learning can be facilitated by such innovative practices as tightly defined course sequences, compressed class formats, consistent class schedules, competency-based educational advancement, coordinated support services between classes and work, and whole program registration (with students registering once rather than every semester).

Research indicates that these innovations at the institutional level make it more likely that a working learner will be successful at getting a degree or credential (Bosworth 2007). They modify community college practices in ways that support the learning style and work and life responsibilities of people who are needed wage earners in their families. Ivy Tech Community College of Indiana is pioneering these earn-while-you-learn innovations through its College for Working Adults (CWA), which enables working learners to obtain an associate's degree in under 24 months while working full-time (Ivy Tech Community College 2010).

Federal policy makers can support these types of innovations with targeted investments through competitive grant processes. For example, President Obama's 2011 budget includes a \$321 million Workforce Innovation Fund that redirects current budget dollars from the Departments of Education and Labor into a co-managed, competitive grant program to support and test new ways to deliver workforce training programs that yield postsecondary credentials through earn-while-you-learn models. The Center for American Progress (Soares 2010) recommends that 50% of this fund be directed toward community college partnerships with business, unions, and nonprofit organizations that use apprenticeship and career pathways programs linked to regional economic growth initiatives to help working learners complete associate degrees. Such an

investment could be significantly expanded by adding lifelong learning accounts to Section 529 of the Internal Revenue Code and allowing contributions from individuals, employers, and the state. In addition, federal financial aid policies are currently geared to completing the bachelor's degree in four years, which pushes working learners toward full-time study and consequent failure because they do not have sufficient time to complete the coursework. Fewer and fewer students—even among the traditional age group—complete in four years, and the standard for completion by which institutions and individuals are measured should be increased from six to eight years.

Conclusion

President Obama has proposed an ambitious agenda aimed at restoring U.S. leadership in postsecondary educational attainment. This will require changes to postsecondary education practice and policies that will make it possible for working learners to persist and succeed in postsecondary education. The great strength of higher education in the United States is that individuals and families view it as an investment. Unlike many countries in the world, it is "normal" for Americans to go back to school multiple times to retrain or pursue additional credentials. Connecting the dots between academic and occupational curricula within postsecondary institutions and making better connections among the various institutions will make it possible for many more people to do so. Making these changes is essential to a national workforce development strategy that will ensure that the knowledge economy not only produces the kind of broadly shared prosperity as the mass-production economy but also restores to American workers the opportunity to develop their capacity for learning, creativity, and innovation.

Endnotes

¹ Bound, Loxenheim, and Turner (2009) define completion rates as the proportion of students who attend college within two years of high school graduation and obtain a BA within eight years of high school graduation. Student ability is measured by senior-year scores on the National Assessment of Educational Progress.

² Remarks by the president on the American Graduation Initiative at Macomb Community College, July 14, 2009 (http://www.whitehouse.gov/the_press_office/Remarks-by-the-President-on-the-American-Graduation-Initiative-in-Warren-MI) [March 15, 2010].

³ Not everyone agrees that the focus on increasing credentials is the right policy (e.g., Mishel and Rothstein 2007). These critics argue that there are more skilled workers than demand for their skills and that the solution lies in labor policy, not education policy. However, employment data from February 2010 (Bureau of Labor Statistics 2010) showed that despite the overall loss of seven million jobs, there was strong job growth in three sectors: educational services, health care, and social

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assistance. All but one of the growing occupations had average incomes above the national average (\$42,270), and most of the higher-income jobs required at least some college. These data suggest that adjusting to the knowledge/information economy will require changes in both labor and education policy.

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