



Training Tomorrow's Workforce

Community College and Apprenticeship as Collaborative
Routes to Rewarding Careers

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Center for American Progress



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Executive summary and recommendations

With nearly 15 million workers unemployed and another 9 million working part time involuntarily, the time is right to invest in upgrading the skills of many in the U.S workforce. Sound investments in skills today are likely to yield high returns in the form of added earnings and improved productivity tomorrow and well into the future. If directed at improving qualifications for middle-skill jobs, enhanced training can reduce inequality while promoting economic growth.

The president and the U.S. Congress are responding to the training agenda in a variety of ways, by increasing spending and promoting innovation in K-12 education and in post secondary college and job training programs. The Community College Initiative—part of the Student Aid and Fiscal Responsibility Act of 2009—would authorize \$730 million per year for several purposes. One is to fund innovative and effective programs that “... lead to the completion of a postsecondary degree, certificate, or industry-recognized credential leading to a skilled occupation in a high-demand industry...” Some of the dollars would go directly to states for reforms in community colleges.

In addition, President Barack Obama has proposed significant funding to help support construction projects to modernize facilities at community colleges. These proposed reforms reinforce recent legislation that expands college grants and loans and increases their accessibility to workers on unemployment insurance. At the same time, serious state fiscal woes have limited the budgets of community colleges and strained their capacity to serve the increasing numbers of students who wish to enroll.

Although a primary target of these interventions is to expand community colleges, the ultimate goal is to upgrade the skills of American workers and improve their prospects for rewarding careers. This paper considers a complementary approach to increasing valued and marketable skills: scaling up apprenticeship programs, especially in combination with community college and other postsecondary education programs. Apprenticeship programs train individuals to achieve the skills of a fully skilled worker through supervised, work-based learning and related academic instruction. Apprentices are employees at the firms and organizations where they combine productive work along with learning experiences that lead to demonstrated proficiency in a significant array of tasks.

Apprenticeship programs offer an array of advantages over pure postsecondary education programs. Since apprenticeship openings depend on employer demand, mismatches between skills taught and supplied and skills demanded in the work place are unusual. Apprenticeship provides workers with a full salary so that participants can earn while they acquire valued skills. Apprentices learn in the context of real work settings and attain not only occupational skills but other work-related skills, including communication, problem-solving, allocating resources, and dealing with supervisors and a diverse set of coworkers.

Apprenticeship is particularly appealing as a way of integrating minorities—especially minority young men—into rewarding careers. Having learning take place mostly on the job, making the tasks and classroom work highly relevant to their careers, and providing participants wages while they learn can give minorities increased confidence that their personal efforts and investment in skill development will pay. In addition, mastering a skill by completing an apprenticeship gives graduates a genuine sense of occupational identity and occupational pride. Apprenticeship offers a respected, portable certification. These advantages help explain why many countries have been working to expand their programs significantly.

There are currently about 470,000 apprentices in programs registered with the Department of Labor and perhaps another 500,000 or more in unregistered programs. About 56 percent of registered apprentices are in construction trades and about the same share are in joint union-management programs. However, most programs are undertaken by employers. Although research on apprenticeship programs is sparse, one careful study found that both the short-term and long-term earnings gains and overall social benefits from apprenticeship training are extremely high. The lifetime return to apprenticeship training is estimated at more than double the return to community college participation.

Can these benefits of apprenticeship training be incorporated into community college and other postsecondary settings? What is the rationale for apprenticeship-community college collaboration and the current state of collaboration? What steps should be taken to expand apprenticeship and collaborations between community colleges and apprenticeship programs?

This paper examines and provides some answers to these questions. Although the paper does not capture the full the complexity and diversity of community colleges and apprenticeships in the United States, it describes examples of cases in which the two systems do and do not interact.

Collaboration between community colleges and apprenticeship programs makes sense for several reasons. Worker success in occupations requires that they gain not only content knowledge about their field but also other skills—including problem solving—used in the context of the occupation as well as on other jobs. For many occupations, community colleges are well-positioned to provide the academic-based instruction

but cannot deliver the necessary nonacademic skills and occupational expertise. These require learning in the context of productive work and real operations, the type of learning that comes with apprenticeship training.

For community colleges, apprenticeships assure relevance for their students and allow students to document their abilities to perform in the workplace. In addition, they allow overcrowded, strained community colleges to offload some of their education and training to effective work-based learning under skilled supervisors. For apprenticeships, community colleges provide college credit and a college framework.

Notwithstanding the logic of collaboration, several barriers can limit the interactions between apprenticeship programs and community colleges. Sponsors of apprenticeship—usually employers but often union-employer programs—sometimes find that community colleges do not offer courses that are well-tailored to the apprentice’s needs. The content may not be sufficiently specific, the equipment at the college may be dated, the courses may not be offered or may meet at times that working people find hard to accommodate, and the starting dates of semesters may not meet employer needs. It may take too long for community colleges to develop new courses that are required as new programs or new technologies in existing programs arise.

Still, the paper finds many examples of collaboration. About one-third of all apprentices obtain their academic instruction from community or technical colleges. Some apprenticeship programs—for example, several sponsored by the Utility Workers of America—require apprentices to complete an associate’s degree along with their apprenticeship training. Some states—including Florida and Washington—provide tuition subsidies to community colleges for those in apprenticeship training. Community colleges often grant college credit for courses apprentices take as part of their related instruction. Many programs use community college instructors for courses held outside the school.

South Carolina, for example, offers a distinctive form of collaboration. Using a special grant from the legislature, the technical college system in South Carolina hosts the Apprenticeship Carolina initiative. Staff housed at the college system actively market apprenticeship and encourage employers to use community college and other resources for related courses. Other potential areas of collaboration are infrequent, including the granting of college credit for skills developed in apprenticeship programs and the use of community colleges as a base for recruiting potential apprenticeship sponsors.

Data on the views of employer sponsors comes from both a national sample of more than 900 apprenticeship sponsors as well as an in-depth set of interviews with a smaller number of sponsors. The interviews revealed some barriers to collaboration. One is the limited flexibility of community college courses—they are not offered enough on a regular basis and may be cancelled if the classes are too small. Other sponsors see the courses as not adequately matched to the requirements of the occupation. Although some sponsors

acknowledge that obtaining a joint associate's degree would add to the apprenticeship certification, others see little added value for their workers beyond the apprenticeship credential itself. In all likelihood, however, community college certifications would add significantly to the status, adaptability, and long-term earnings of apprenticeship completers.

Recommendations

The most important strategy for expanding apprenticeship-community college collaborations is to increase the employer demand for apprenticeships. More apprenticeships will lead to more collaboration as community colleges see opportunities for closer links with employers and jobs. Expanding apprenticeship training will diversify the nation's portfolio of training strategies and incorporate a wider variety of strategies that succeed in raising skills and earnings. Several actions taken today can increase opportunities for workers to gain occupational credentials valued in the labor market, but achieving a major expansion of apprenticeships will require a long-term effort. Although the community colleges and apprenticeship programs already cooperate in some ways, what policies might expand their collaborations? Here are 10 recommendations that can be implemented in the short run.

- Fund measures to scale apprenticeship programs by expanding the budget for marketing the programs and providing an incremental subsidy to employers expanding their programs. Marketing and technical assistance are necessary to show employers the advantages of apprenticeship training and to help them implement registered apprenticeships. Quality reviews should accompany the technical assistance to assure that the new apprenticeships yield the necessary skills for mastery of relevant occupational skills.
- Providing more resources for these purposes to the Office of Apprenticeship at the federal level and some state apprenticeship offices would generate large numbers of added slots which, in turn, would lead to social benefits—added earnings and tax revenue—that far outweigh the added costs. Tax credits can complement the marketing efforts and increase incentives for employers. One possibility is a tax credit of \$4,000- \$5,000 for each new apprenticeship position beyond 80 percent of last year's level. Given the job projections analyzed in this paper, increasing the penetration of apprenticeships in fields that already offer apprenticeships could generate a five-fold increase in some places.
- Encourage more states to subsidize portions of the tuition of apprentices taking community college courses. This step would encourage more employers to use community colleges for their related instruction and could ultimately lead more apprentices to obtain associate's degrees.
- Follow the earnings pathways of community college students and use the results as performance indicators. House bill H.R 3221 moves in this direction. Such a step could encourage community colleges to work closer with apprenticeship programs, since they

have an excellent track record of achieving earnings gains. At the same time, research with these data might provide evidence to apprentices about the long-term benefit of seeking an associate's degree alongside their apprenticeship certification.

- Draw on existing standards and develop new standards to award college credit for expertise gained and mastered on the job. The American Council on Education has produced a National Guide to College Credit for Workforce Training; it suggests credit levels for various components of several apprenticeship programs.¹ Some schools already offer such credits through this process or their own processes but the practices are spotty. Already, four-year colleges and universities offer credit to students for internships that involve far less documented expertise than apprenticeship. Doing so in the apprenticeship context would encourage more apprentices to complete degree programs.
- States should use their discretionary funds within the Workforce Investment Act to coordinate joint initiatives between apprenticeships and community college, potentially linked with WIA and even high school programs.
- States could provide incentives for contractors on state-funded programs to offer apprenticeship programs, including programs linked to community colleges. Some states—notably Washington—already use mandates and incentives for this purpose.
- Use funds available in the Community College Initiative to undertake innovations that foster apprenticeship-community college collaborations.
- Set aside funding from the reentry programs and other labor-related and justice-related programs to experiment with apprenticeship expansions for ex-offenders. The experiment could focus on two to three sectors, involve industry associations, local employers and close linkages between the criminal justice system, apprenticeship staff, and community colleges. The project would include a rigorous evaluation.
- Undertake a number of nonexperimental research projects to provide important policy-relevant information on apprenticeship and community colleges. For example, qualitative research on the use of apprenticeship and/or community colleges to train for a particular occupation could examine the curricula in each type of program, test graduates, and determine employer satisfaction and program costs. Another low-cost project could track earnings profiles of apprentices and conduct field interviews to determine whether apprenticeship completers subsequently take postsecondary courses and achieve postsecondary degrees.
- Experiment with training modalities—including apprenticeship and community college—to determine their net impacts on urban young people. It is possible to use experimental methods without rejecting applicants for the programs. Impact studies could test the effect of recruitment on participation into various programs as well as the separate

impacts of apprenticeship and community college on employment and earnings. These studies could provide persuasive evidence about the efficacy of recruitment into programs, the effects of training on earnings, and the employer's perceived estimates of productivity impacts. The study should also incorporate a study of employers participating in the apprenticeship program.

Finally, this paper recommends the development of a long-term strategy to expand apprenticeship training, including college credit and other collaborations with community colleges. The goal should be to provide sufficient opportunities to cover at least 20 percent of the U.S. entry-level work force. To develop this strategy, foundations and governments should come together to sponsor a study group. The group would commission papers, learn lessons from the major apprenticeship expansions in the United Kingdom and Australia, hold a major conference and public meetings, and then propose a sequence of policies to bring the U.S. apprenticeship system to scale and to ensure close collaboration with colleges, especially community colleges.

Expanding and training the U.S. workforce

“Our community colleges can serve as 21st-century job training centers, working with local businesses to help workers learn the skills they need to fill the jobs of the future.” July 14, 2009

“And so tonight, I ask every American to commit to at least one year or more of higher education or career training. This can be community college or a four-year school, vocational training or an apprenticeship.” February 24, 2009

– President Barack Obama

“... I see the community college system in America as such a hopeful place, a place where people can gain the skills necessary to become employable; a place where people can gain the skills necessary to realize dreams.” “... we can use our community college system to help people who want to work gain the skills necessary to find jobs in what is a changing economy.”

The Bush administration revised regulations governing the nation’s Registered Apprenticeship programs for the first time since 1977 in order to advance Registered Apprenticeship’s strengths in developing a skilled, competitive workforce for the 21st century global economy.

– President George W. Bush

“I believe that the country we have to create in the 21st century has to work more like the community colleges. It has to be less political and more personal and more human. We have to be very flexible and willing to change and move with the markets, but also be committed to the development of every single individual. And that’s basically what the community colleges do.”

“So we have to establish a partnership between businesses and education and the Government for apprenticeship programs in every State in this country to give our people the skills they need.” 1993 State of the Union Message.

– President Bill Clinton

Preparing all workers effectively for rewarding careers is a traditional goal that remains elusive to policymakers, businesses, and the public. The need for improved career preparation is rooted in two major concerns: 1) that the United States maintains high and rising levels of productivity and 2) that all segments of the workforce share in the nation's economic growth. A plethora of commissions and studies over the last several decades document the weaknesses of high schools, job training programs, and colleges in generating a highly skill workforce.

These and other shortcomings in the skill preparation system are less clearly linked to slow economic growth than to rising inequality in earnings. The United States managed to generate robust economic growth between the early 1990s until the 2007-2009 recession. Real gross domestic product increased 45 percent between 1991 and 2006, more than double the 17 percent growth in Japan and 22 percent growth in Germany. In addition, the prerecession decade saw unemployment rates remain low, well below rates experienced in the 1970s and 1980s and in other countries. At the same time, however, less educated workers have seen their wages stagnate or decline, falling further behind college-educated workers.² The share of workers covered by pensions and health insurance has declined. Many see immigration and the intensification of global competition as threats to workers at all levels, especially as the expanding labor force in India, China, and other less developed countries becomes part of a world labor market.³

Of all the factors limiting wage growth, especially at the low and middle ends of the workforce, the skill shortfalls of many American workers are those most amenable to improvements in public policy. The primary emphasis of policymakers has been on expanding college enrollments and college graduation, a kind of college-for-all policy.⁴ This is partly because much of the academic literature on this subject has focused on the rising wage gap between college graduates—those with a bachelor's degree or higher—and high school graduates. The analytic basis for the college-for-all policy comes mainly from estimate of gains from years of school enrollment and in some cases to scores on academic tests. In addition, popular accounts of a coming bar-bell shaped economy, with mostly low-skill and high-skill jobs and few in the middle, have reinforced the CFA idea.

Some have called these conclusions overdrawn, in part because of the limited data on occupational skills and nonacademic skills highly relevant to good jobs. Moreover, researchers and policymakers have started to recognize the continuing high levels of vacancies in occupations that require some in-depth education and training but not a traditional B.A. degree.⁵ Nearly half of all workforce vacancies in the next decade are likely to demand serious occupational skills that are generally acquired with a combination of postsecondary courses and learning on the job. These careers range from health and information technology workers to electricians, and maintenance workers, and to mid-level office occupations, including supervisors and middle managers.

Many workers are currently unaware of these occupational opportunities and the related requirements. There is evidence of skill mismatches, with vacancies in good-paying jobs as welders, machinists, and health care professionals while workers either cannot find jobs or take positions well below their potential. The opaque nature of the middle segment of the market and the weak transitions between high schools and careers probably contribute to dropping out of high school by a significant share of the nation's young people.

With a growing number of jobs that require moderate academic skills, solid nonacademic skills, and occupational skills but not a bachelor's degree—hereafter called technical skill jobs—a number of vital questions to be asked include: what is the best approach to preparing workers for these productive and rewarding careers? How can the country improve the quality and accessibility of skill development? What is the “best approach” may differ from one worker to another and from the perspective of employers and other stakeholders. However, apprenticeship training offers an especially effective method for delivering on all three types of skills.⁶

Approaches to expanding skills and qualifications

Community colleges, for-profit career colleges, and apprenticeship programs are among the existing institutions already providing skills training for technical skill jobs. In addition, some workers learn the necessary skills through informal on-the-job training or through career and technical programs in high schools. The number enrolled in community colleges—over 6 million in the 2005-2006 school year—far exceeds participation in apprenticeship programs or for-profit career colleges.⁷

However, significant and rising shares of career and technical credentials are earned in for-profit career colleges and apprenticeships. The National Center for Education Statistics (NCES 2008) reports that in 2006, 3,833 colleges of less than four years awarded 981,000 career and technical credentials. For-profit schools accounted for at least 36 percent of these credentials in 2006—up from 30 percent in 1997—but the figure could be substantially higher because NCES tracks only certain types of career colleges.⁸

The size of the apprenticeship population is uncertain. While about 480,000 were in registered apprenticeship in 2008, as many as another 500,000 to 1 million are undergoing training in unregistered apprenticeships.⁹ Moreover, there may be some overlap among apprenticeships and community or for-profit colleges since many apprentices also take courses in community colleges and for-profit colleges.

All of these institutions and programs offer training and credentials that qualify students for a variety of occupations, from health to technical trades, from travel and hospitality to computers and business. Registered apprenticeship programs are concentrated in con-

struction and manufacturing occupations, but include a broad spectrum of fields, including health, security, and service occupations.

It is possible to earn certification through any of these routes in the case of many occupations. In this sense, the institutions are competing. But collaboration takes place as well. Apprentices often take classes at community colleges or for-profit colleges. Some community college students find out about an apprenticeship program through the college itself.

This paper investigates the current and potential future interactions between community colleges and apprenticeship programs. The underlying objective is not only to understand these relationships but also to determine how best to use the portfolio of training approaches to improve career preparation in the future. In the next section, we focus on the extent to which community colleges and apprenticeship programs collaborate and/or compete in skill development. We provide national data where feasible on actual collaboration and reports of barriers and of benefits to collaboration.

We then turn to a review of experiences in selected states and find wide degree of variation. After considering existing levels of collaboration, we analyze the possibility of enhanced collaboration in the future. We ask where linkages can and should be improved and where added linkages are less valuable. We examine the political feasibility of major changes and incremental steps that can be undertaken in the existing framework.

The diversity of community college and apprenticeship programs

Before examining the diversity of collaborations between apprenticeship and community college programs, it is important to recognize diversity within each type of program.

Diversity of community colleges

Community colleges are reasonably well-defined as publicly funded two-year programs of study that offer associate's degrees to students who successfully complete sufficient general and field specific academic credits. The colleges teach students academic and occupational courses that lead to 1) an occupational certification through an associate's degree in a specific field; 2) an academic certification, generally an associate of arts or associate of science degree, largely aimed at students will transfer to a four-year college; or 3) a certification based on a limited number of courses.

The vast bulk of community colleges students—probably 90 percent—are pursuing one of these objectives.¹⁰ In addition, community colleges provide continuing education courses to the general public but also to workers sent by their employers to learn specific skills. Employers often finance some of these courses.

Distinguishing the career component of community colleges from a general college education is not easy. One method is to examine the share of graduates by field. By far the three largest majors, based on categories listed by the National Center for Education Statistics, are liberal arts and sciences, general studies and humanities (250,000), health professions (145,000 including 67,000 in registered nursing), and business management and marketing (100,000). Placing health and business majors in the career clusters and categorizing the other majors, we find about half the degrees are in career-oriented areas.

Diversity of apprenticeship programs

Apprenticeships are programs under which individuals achieve the skills of a fully skilled worker in an occupation primarily through supervised, work-based learning along with related academic instruction. Employers, joint union-employer agreements, government agencies, and the military all sponsor apprenticeship programs. Apprentices are employees at the firms and organizations where they are training, and combine productive work along with learning experiences that lead to demonstrated proficiency in a significant array of tasks. The programs usually last three to four years and require students to complete course work that includes math, verbal, and occupation-specific content. The coursework is generally equivalent of at least one year of community college.

The U.S. apprenticeship system is highly decentralized, although many programs are governed by the “Registered Apprenticeship” system. Programs that are part of the registered apprenticeship system operate under the supervision of the U.S. Labor Department’s Office of Apprenticeship, or OA, and State Apprenticeship Agencies. The responsibilities of the OA include issuing certificates of completion to apprentices, protecting the safety and welfare of apprentices, providing guidance and technical assistance to program sponsors, monitoring program equal opportunity plans to prevent discrimination against women and minorities, and expanding the use of apprenticeship by employers.

There were about 27,000 registered apprenticeship sponsors training about 480,000 apprentices as of 2008, implying an average of about 18 apprentices per sponsor. The number of registered apprentices is comparable to the combined number of individuals receiving training through three federally sponsored Labor Department programs: the Workforce Investment Act’s Adult and Dislocated Worker programs, a formula-funded federal program that provides local workforce boards with funds for training and other services; the Job Corps, which is an intensive residential training program for the most at-risk youth; and the Trade Adjustment Act, which provides training dollars in addition to unemployment cash benefits to workers displaced because of trade.¹¹ The Department of Labor spent almost \$3.9 billion dollars on these programs in 2007, or more than 190 times more funds than were spent on the OA.

Registered apprentices are highly concentrated in construction, energy, manufacturing, transportation and communication, and public administration occupations. However,

transportation and communication occupations jumped nearly fivefold between 2003 and 2007, the fastest growth in percentage terms of any occupation. Despite increases in recent years, apprentices still make up only about 0.3 percent of total work force and nearly 4 percent of a cohort's entrants to the work force.¹²

The decentralized U.S. apprenticeship system is quite diverse. Although registered programs have formal criteria for the hours of work-based and related course-based training apprentices take per year, employers and other institutions, mainly unions, offer programs of the scope and duration they prefer, so long as they cover accepted skill requirements for the occupation.¹³ The programs operate either under the governance of one of 26 State Apprenticeship Agencies or the national Office of Apprenticeship to register their program. Representatives of the national or state apprenticeship offices may advise companies and help them structure the sequence and content of their programs, but the content provisions are flexible and can be tailored to the individual employer. One result is that the Office of Apprenticeship recognizes more than 800 apprenticeable occupations. This decentralized approach to content standards offers considerable flexibility for employers starting programs but could result in a narrowing of the occupational competencies.

The value of apprenticeship

Apprenticeship in the United States has focused primarily on construction and manufacturing occupations, but it has many advantages as a skill development strategy for a range of other occupations, including many with programs in community colleges. Since apprenticeship is driven by employer demand, mismatches between skills taught and supplied and skills demanded in the work place are less likely to occur than when training is provided in school-based or community-based courses.

Apprenticeship provides workers with a full salary and wage progression so that participants can support their living standards without a government stipend. These features are especially important for low-income workers.

Apprenticeship generates high skills that can be well-documented through a process of learning in the context of actual work content. It offers a way for workers to master not only relevant content skills but also other work-related skills, including communication, problem solving, allocating resources, and dealing with supervisors and a diverse set of co-workers. Young people reap many developmental benefits from engaging in apprenticeships. They work with natural adult mentors who can guide them but allow them to make their own mistakes.¹⁴ Supervisors provide the close monitoring and frequent feedback that helps apprentices keep their focus on performing well at the work site and in the classroom.

For many young people, apprenticeship offers an attractive route to a valued credential and the added confidence in their learning capacity to pursue and complete a college

degree. Apprentices can take advantage of the tuition subsidies that most employers provide to incumbent workers for college courses.

Apprenticeship is particularly appealing as a way of integrating minorities—especially minority young men—into rewarding careers. Learning takes place mostly on the job, making the tasks and classroom work highly relevant to their careers, and providing participants wages while they learn can give minorities increased confidence that their personal efforts and investment in skill development will pay. In addition, mastering a skill by completing an apprenticeship gives graduates a genuine sense of occupational identity and pride.

Apprenticeship offers a respected, portable certification. The new regulations governing the U.S. registered apprenticeship program will result in making apprenticeship certifications well-recognized and sufficient to meet state licensing standards that are expanding across a variety of occupations.¹⁵ Employers' surveys indicate that sponsors of apprenticeship are highly satisfied with their programs. Nearly all would strongly recommend the program to other employers.¹⁶

Perhaps for these reasons, apprenticeship is a mainstream route to career success in Western Europe and in other advanced economies, providing training for 50 to 70 percent of young people in Switzerland, Austria, and Germany. It is expanding rapidly in other advanced economies, including Ireland, Australia, and the United Kingdom. Apprenticeships have been extended to many occupations, including nursing, information technology, finance, advanced manufacturing, and maritime occupations.

Perhaps the most persuasive argument for making apprenticeship more central to U.S. skill development is that the evidence that the rates of return to apprenticeships far exceed alternative training methods for middle skill jobs. Kevin Hollenbeck studied the earnings gains of individuals who exited various education and training programs, including community colleges, Workforce Investment Act, or WIA, training, and apprenticeship. Hollenbeck examined earnings gains relative to program costs to calculate social benefits using a matching strategy that allowed for comparisons of workers with similar characteristics.¹⁷ Looking at earnings impacts during the first 2.5 years after exiting the program, he estimated that the social benefits to apprenticeship were about \$50,000 per apprentice, far more than minimal gains accruing to community college students and WIA trainees. On a lifetime basis, Hollenbeck projects the present value of earnings gains less costs at \$269,000 per apprentice, compared to \$96,000-\$123,000 per community college attendee, and about \$40,000 per WIA trainee.

Makeup of registered and non-registered apprenticeship programs

Registered apprenticeship programs serve mostly middle-aged men, of whom about 30 percent are minorities. The age distribution is especially surprising. More than 75 percent

of apprentices are older than 24 years of age. Most apprentices have at least completed high school, but about 17 percent have not completed any diploma and 10 percent have only a GED as their highest qualification. More than half—about 56 percent of all apprentices (including the military)—are in joint union-management programs.

Making registered apprenticeship more accessible to women and minorities has long been an important goal.¹⁸ The OA requires all sponsors that train five or more apprentices to adopt written Affirmative Action Plan and Selection Procedures. OA routinely conducts performance reviews on Equal Employment Opportunity compliance.

The data suggest considerable progress in incorporating minority workers. In 1979, the minority share was only 13 percent. By 2008, minorities made up about 30 percent apprentices. The share of women apprentices remains low, at 5.4 percent, mostly because the industry composition of registered apprentices is so heavily weighted toward construction and other occupations with few women. Table 1 displays some characteristics of registered apprentices as of 2008, though the data exclude the nearly 50,000 in military apprenticeships and a few other programs.

An unknown number of programs providing apprenticeship training and their own certifications are not part of the registered apprenticeship program. Although many of these programs are in small companies, others include such large companies as BMW and Detroit Edison. According to tabulations from the 2005 National Household Education Survey, or NHES, 2.5 million individuals—or over 1 percent of adults responding to the survey—reported that during the last 12 months they were in a “formal apprenticeship program leading to journeyman status in a skilled trade or craft.”

If the figures are accurate, the scope of apprenticeship is about five times the amount of registered apprenticeship. The 89 individuals in the NHES reporting being in an apprenticeship constitute about 1 percent of the 8,904 individuals interviewed by the NHES, who are intended to represent about 212 million adults. It is unclear whether the NHES sample size is sufficient to yield an accurate estimate of total apprenticeships taking place in the United States.

While the focus of this analysis is on the collaboration between apprenticeship programs that are part of the registered apprenticeship system, we also provide some evidence involving collaboration between community colleges and apprenticeship programs that are not registered.

TABLE 1
Apprenticeship by the numbers

Demographic, education, and industry characteristics of apprentices, 2008

	Percent of apprentices
Age	
16-24	21.8
25-34	42.5
35+	28.5
Unknown	7.3
Sex	
Female	5.4
Male	90.0
Unknown	4.6
Race	
American Indian/Alaskan Native	6.3
Asian	1.4
Black	10.5
White	70.3
Ethnicity	
Hispanic	18.8
Non-Hispanic	76.4
Unknown	4.8
Education	
8th grade or less	1.3
9th to 12th grade	15.4
GED	10.5
High School graduate or more	72.8
Unknown	3.6
Industry	
Construction	56.4
Manufacturing	5.4
Public administration	5.4
Services	6.4
Transportation/communication	12.6
U.S. Military	10.9
Wholesale and retail trade	1.4

Source: Office of Apprenticeship, U.S. Department of Labor

Existing state of collaboration

Although community colleges loom much larger than apprenticeship in the U.S. skill development system, the two approaches can be complementary rather than mainly competitive. There are several natural reasons for collaboration between community colleges and apprenticeship programs. For workers to succeed in an occupation, they must gain not only sufficient content knowledge about their field, but also develop other skills—such as problem-solving, communication, and allocating resources—that are relevant to the occupation.

For many occupations, community colleges are well-positioned to provide the academic-based instruction but cannot deliver the necessary nonacademic skills and occupational expertise. These require learning in the context of productive work and real operations, the type of learning that comes with apprenticeship training. For community colleges, apprenticeships assure relevance for their students and allow students to document their abilities to perform in the workplace. For apprenticeships, community colleges provide college credit and a college framework.

Certification is a key issue for workers and firms. Workers try to earn a portable, recognized certification that they can use with various employers and in various geographic areas. Firms want certifications that document genuine skills and relevant qualifications so that they can assume that certified workers will perform well, with few errors and modest supervision. Both community colleges and apprenticeship programs offer forms of certification. The two forms of certification can complement each other or serve as substitutes; some apprenticeship officials see little added value in an associate's degree certification, while some community college officials have little appreciation for an apprenticeship certification. Almost certainly, having both A.A. and apprenticeship credentials offer the best of both worlds—a college degree for flexibility and documented expertise in a rewarding career field.

Notwithstanding the logic of collaboration, several barriers can limit the interactions between apprenticeship programs and community colleges. Sponsors of apprenticeship—usually employers but often union-employer programs—sometimes find that community colleges do not offer courses that are well-tailored to the needs of the apprentice. The class content may not be sufficiently specific, the equipment at the college may be dated, the courses may not be offered or may meet at times that working people find hard to accommodate, and the starting dates of semesters may not meet employer needs. It may take too long for community colleges to develop new courses that are required as new programs or new technologies in existing programs arise.

The prospects for expanded collaboration are still promising. Federal support for community colleges is increasing substantially. Competitive grant funding to community colleges is aimed at encouraging close relationships with employers and sectors so that students who complete their course work can find jobs in related occupations. Certainly, apprenticeships offer a straightforward vehicle for cooperation. In addition, the compelling evidence of extremely high rates of return to apprenticeship training and of employer satisfaction with apprenticeships is stimulating renewed interest among policymakers and practitioners to this skill development strategy.¹⁹

If apprenticeships do expand, community colleges would benefit from collaborating in two ways. First, providing the academic component of apprenticeship training will mean attracting students, most of whom will be highly motivated because success at their current job is directly tied to performing well in courses. Second, by interacting with employer—or union-employer—sponsors of apprenticeships, community colleges are able to establish closer ties with the employers for college programs not tied to apprenticeship.

Becoming a fully qualified skilled worker in an occupation for nearly all apprenticeable occupations in the United States and in other countries requires learning elements of theory and empirical evidence that can be effectively taught through classroom-based, academic approaches commonly used in school settings, such as a community college. A common approach to collaboration is for community colleges to provide the “related instruction” required under an apprenticeship program. In some cases, the courses required for an apprenticeship program become part of an overall major so that workers are able to combine apprenticeship with study leading to an associate’s degree.

Additional forms of collaboration can involve: 1) joint development of curriculum and occupational profiles for new and updated occupations; 2) the use of community colleges as suppliers of qualified applicants for apprenticeship programs; 3) the granting of college credit for “related instruction” in apprenticeship programs that is not part of a standard academic course; and 4) the use of community colleges as a base for recruiting potential apprenticeship sponsors. Often, by supplying courses for an employer’s apprenticeship program, the community college can establish linkages with employers to connect students to a range of jobs, including many that do not involve apprenticeship.

Evidence of collaboration based on national data sets

The scope of this project was not sufficient to allow for a nationally representative sample of colleges and apprenticeship programs to track all of these elements of collaboration. However, we can draw on data from selected surveys to answer questions about collaboration. These include the Survey of Sponsors of Registered Apprenticeship,²⁰ and the Adult Education Supplement to the 2005 National Household Education Surveys.

The SSRA provides nationally representative data on the characteristics and attitudes of registered apprenticeship sponsors. The survey was administered in March and April of 2007 via phone, fax, and Internet. A total of 947 sponsors completed the survey instrument, which asked about the sponsor's program characteristics, benefits, and drawbacks of registered apprenticeship, perspectives of the current apprenticeship and workforce investment systems, and related instruction and standards.²¹

Interviews with the 2005 NHES Adult Education Supplement were conducted with a nationally representative sample of the civilian, noninstitutionalized population age 16 or older who were not enrolled in school in grades 12 or below. The 8,904 NHES telephone interviews represent a weighted total of 211.6 million adults in the United States.

Additional information on collaboration comes from selected telephone interviews conducted for this project. We contacted more than 20 officials at community colleges, state offices, and apprenticeship programs to illustrate examples of collaboration, no collaboration, and the reasons for each strategy.

We begin by examining the SSRA data for existing collaboration between community colleges and sponsors of registered apprenticeship programs.²² The first calculations (in Table 1) show that just over half the sponsors report using a community college or a public technical college for the related instruction. Since programs differ significantly in terms of the number of apprentices, most apprentices still might not use community colleges. As Table 2 reveals, only about one-third of all apprentices obtain their academic instruction from community or technical colleges.

Whether or not apprentices obtain academic instruction from a community or technical college differs a great deal by industry. For example, only 24 percent of apprentices in construction obtain their instruction through community or technical colleges, while 42 percent of apprentices outside construction do so. Nearly all the sponsors of automotive manufacturing and hospitality apprenticeships report using community or technical colleges, as do 61 percent of apprenticeships in the health care area. Joint union-management apprenticeship programs in the construction industry are less likely than the average program to use community-technical colleges, but outside construction, joint programs are equally likely to assign their apprentices to community-technical colleges. Whether or not construction programs use community colleges for related instruction, the number of individuals completing an associate's degree in construction is small, less than 4,000.

Apprenticeship sponsors may be especially invested in community/technical programs if they pay directly for the courses. In fact, over 70 percent of sponsors pay for the related instruction portion of apprenticeships at community-technical colleges. This figure is similar to the share of sponsors supporting the instruction provided by other organizations such as public technical colleges and proprietary trade schools.

TABLE 2
Apprentices in the classroom

Sources of related instruction and sponsor satisfaction

Source of related instruction	Percent of apprentices	Percent of programs
Community/technical colleges	32.2	52.6
Distance learning	2.4	5.8
High school	3.8	10.6
Proprietary career school	9.5	16.7
Own facility	52.5	23.4
Construction industry		
Community/technical colleges	24.7	41.2
Proprietary career school	7.2	19.9
Own facility	56.7	30.7
Industry—not construction		
Community/technical colleges	42.2	58.8
Proprietary career school	12.5	15.2
Own facility	48.3	19.4
Union-linked program		
Community/technical colleges	28.0	45.4
Proprietary career school	7.5	12.6
Own facility	57.7	35.7
Employer satisfaction with related instruction¹	Weighted by apprentices	Weighted by program
Community/technical colleges	4.56	4.09
Distance learning	4.22	4.10
High school	4.53	4.06
Proprietary career school	4.57	3.95
Own facility	4.69	4.37

¹ The rankings go from 1 to 5, with 5 the highest and 1 the lowest level of satisfaction.
Source: Tabulations by author from Survey of Sponsors of Apprenticeship Programs

When asked about the quality of related instruction, sponsors of registered programs generally give high marks to all the related instruction providers, including community and technical colleges. On a scale of 1 (lowest quality) to 5 (highest), community-technical colleges earned a 5 from about 37 percent of sponsors and a 4 from 43 percent. These grades are slightly below the average for other providers, but the gap is quite small.

Although not many apprenticeship sponsors report the costs of related instruction as a serious problem, about one-third view costs as a minor problem. In this regard, community and technical colleges have some advantages. Of sponsors using these institutions,

34 percent report costs as a minor or serious problem, as compared to 39 percent of sponsors not using community or technical colleges.

A final indicator is the sponsor's overall satisfaction, measured as how strongly the sponsor would recommend apprenticeship to other employers. On this score, there is little difference across employers based on their use of community or technical colleges.

The NHES data provides information drawn from surveys of individuals reporting participating in apprenticeship, defined broadly and including programs not registered with the Labor Department. Although the weighted number in apprentices is about 2.5 million, this figure is only an approximation since only 89 out of over 9,000 people surveyed reporting being in an apprenticeship training program.

The NHES data yields estimates of apprentices pursuing an associate's degree or a vocational certification. Only about 10 percent of apprentices were in a community college or similar program according to the NHES. However, about 16 percent of apprentices reported participating in a vocational-technical diploma program after high school. Together, about one-quarter of apprentices said they participated in a community college or vocational program over the last 12 months. An additional 30 percent reported taking some nondegree course, but most of these were provided through the employer.

The NHES data show over one-fourth of workers in an apprenticeship within the last 12 months already report attaining an associate's or higher degree. About 10 percent report having an A.A. degree and another 15 percent report at least a B.A. However, given the small sample of apprentices and the lack of detail on the type of program reported as an apprenticeship, we should approach these figures with caution.

The national data reveal considerable collaboration with respect to the role of community colleges supplying academic instruction for apprenticeship programs. For occupations other than construction, about 42 percent of registered apprenticeship sponsors use community colleges for related instruction. Sponsors are satisfied with community college instruction, but no more than their satisfaction with other sources of related instruction. At the same time, the limited information we have suggests only a small share of apprentices are pursuing A.A. or A.S. degrees or even having their workplace learning and academic courses counted toward a degree.

Evidence of collaboration from informal surveys

To learn more about community college-apprenticeship collaborations, we conducted informal surveys with a number of community colleges, state officials, and apprenticeship sponsors. Although the information obtained in this way is not necessarily nationally representative, it does offer portray a range of program experience taking place in various states

and among various apprenticeship programs. The states of primary focus were Florida, Maryland, Virginia, Washington, and Wisconsin. In addition, we drew on information from South Carolina as well and obtained information from sponsors of registered apprenticeship programs in Arizona, Arkansas, Florida, Illinois, Iowa, Michigan, and Wisconsin.

Perspectives of selected colleges

In all five of the states contacted, most community colleges have linkages to at least one apprenticeship program. Moreover, some states provide tuition waivers or subsidies for sponsors to use community colleges. In Washington, which has an extensive and mature apprenticeship system, the majority of sponsors use 20 of the state's 36 community colleges for related instruction. One possible reason for the extensive use of community colleges is Washington's incentive to sponsors that discounts tuition costs to apprentices by 50 percent. Most of the courses in Washington community colleges are in the construction trades, but others include subjects for child care and education, firefighting, utility, and even optician occupations.

In Florida, 14 of the state's 28 community colleges provide related instruction for apprenticeship programs. Florida exempts apprentices from schools' fees, thus incurring an extra cost of about \$600 per year and reducing student or employer costs by the same amount. However, as David Islitzer of the Florida Division of Career and Adult Education reports, only about 20 percent of apprenticeship-related instruction takes place through community colleges. Forty percent of the instruction is taught through the program sponsor—employer or a joint union-employer group—and another 40 percent is taught at vocational centers operating in each school district. Some of the Florida colleges count the related instruction in some programs as credits toward an associate's degree. For example, in a recently started program at Seminole College, apprentices can count up to 12 hours of related instruction as college credit toward an associate's degree in construction management.

St. John's River Community College, which provides courses to apprentices in several construction trades, offers those who complete three to four years of instruction in an apprenticeship up to 18 to 24 credits toward an associate's degree in industrial management. On the other hand, Gold Coast Community College provides related instruction to about 70 to 80 electrical workers per year, but does not yet offer credit toward an associate's degree.

In Virginia, 12 of the 23 community colleges offer related instruction to apprentices. The occupations covered include several construction trades, as well as computer technology, welding, and machinist, and heating, ventilation, and air conditioning of HVAC trades. In most of the programs, the courses do count toward an associate's degree or certificate. The tuition for apprentices is the standard rate for all students; it is often paid by the employer.

As with Virginia schools, related instruction for apprenticeships takes place in about half

the Maryland community colleges. Again, construction occupations are common points of contact, as are home inspectors, maintenance, welding, installation technicians, and construction management. Policies on earning credit for the related instruction courses or for participating in an apprenticeship vary.

Associated and Building Contractors, a major association of nonunionized construction companies, sponsor a large number of apprenticeships that use Maryland community colleges. Some union-linked programs, including some associated with the International Brotherhood of Electrical Workers, rely on community colleges, but other joint union-employer programs have their own in-house training facilities and receive no government subsidy.

In Wisconsin, 16 technical colleges offer related courses as part of apprenticeships and in order to earn credits toward an associate's degree in applied science or A.A.S. The coverage is extensive in the sense of training many apprentices, but the concentration is on the construction trade occupations. The Wisconsin Technical College System considers apprenticeship-related instruction as approved academic programs with full program status. The standard fees apply—though like in other states—tuition makes up only a modest share of the actual costs of instruction. Those apprentices that complete their related instruction in one of the 16 technical colleges earn 39 credits toward a 60-credit Journeyworker A.A.S. degree.

Wisconsin is distinctive in offering a youth apprenticeship program that begins while students are in high school. The work-based learning is part-time under youth apprenticeship, unlike standard apprenticeships where workers are full-time employees. Some community colleges collaborate with high schools and employers for the related instruction on youth apprenticeships as well. At Waukesha Technical College, for example, courses are available to youth apprentices in automotive tech, architectural drafting, mechanical design drafting, banking/finance, health services, machining, printing, and welding.

South Carolina locates their major apprenticeship initiative, Apprenticeship Carolina™, at its technical college system.²³ Stimulated by studies and public affairs efforts of South Carolina Chamber of Commerce, the state government funded a \$1 million a year initiative that now employs a small staff to attract employers to registered apprenticeship. The South Carolina government funded annual employer tax credits of \$1,000 per apprentice per year beginning in 2007. Since that time, the Apprenticeship Carolina™ Division of the South Carolina Technical College System has stimulated the registration of an average one new employer-sponsored apprenticeship program per week and more than doubled the number of apprentices in the state.

This expansion has created opportunities across broad industry sectors including advanced manufacturing, health care, and information technology. Moreover, the effort is adding to the linkages between the technical colleges and the business community. Although the

technical college system's career programs generally have business groups that offer advice on curriculum and program development, the direct linkage between the technical college and the apprenticeship system raises collaboration to an unusually high level.

Although Apprenticeship Carolina™ is based in the technical college system, the outreach to employers is in place for businesses to establish registered apprenticeship programs, whether or not they wish to use the technical college for their job-related education. Of the new programs established under the initiative, 55 percent use the technical college for at least some portion of their training, 60 percent of which are in credit-bearing courses and some through the continuing education branches of the colleges. About 15 percent of the programs incorporate an associate's degree into their apprenticeship requirements.

Some other states provide tax credits for apprenticeship. Connecticut offers employers 50 percent of the wages of apprentices up to \$4,800, but only for apprentices in the manufacturing, construction, or plastics-related trades. In Michigan and Arkansas, tax credits of up to \$2,000 are offered for apprentices who are in school and between the ages of 16 and 20. Michigan's credits are restricted to apprentices in high school or a GED program. Rhode Island offers an incremental credit or up to \$4,800 for each apprentice hired that exceeds the average number hired for the prior five years, but only for apprentices in the machine tool, metal trade, and plastics fields.

Perspective of individual apprenticeship sponsors

Individual apprenticeship programs are in the tens of thousands, encompassing a large number of employers. In the registered apprenticeship system alone, there are more than 24,000 individual programs. As noted, an unknown number of other apprenticeship programs are not registered, though they involve all or most components required for registered apprenticeships.

To gain insights on how selected apprenticeships view collaborations with community colleges, we called representatives of several programs, used limited site visit data, and examined program information from other sources, including Jeffrey Cantor's 1993 book on apprenticeship-community college collaboration.²⁴

The programs contacted included apprenticeships in the construction, utility, HVAC, and personal service occupations. The patterns reflect the mix observed in the national data. Some apprenticeship programs have little to do with community colleges; others use community colleges for related instruction but the coursework does not count toward an associate's degree; and in other cases, community college instruction counts toward graduation only for those completing the apprenticeship while others provide credits as apprentices completed individual courses. Consider the following examples of registered programs.

- Trish Davis, project manager of an Arkansas apprenticeship sponsor in electrician and plumbing trades, reports that apprentices take their related instruction at community colleges all over the state. But, in many cases, the program only rents classrooms. The program often does not use community college instructors because state law requires instructors to have different qualification—as master practitioners—than most professors have. The classes do not qualify for college credit but completing the four-year program can yield some transferable credits. The sponsor reports that few apprentices are interested in pursuing an associate’s degree because the apprenticeship certification is what they need to work in the field and even to start their own business.
- Gerald Barky, a sponsor of an electrician apprenticeship program in Arizona, offers a similar story but with some variations. Although few apprentices—fewer than 10 percent—seek an associate’s degree because of its limited added value beyond apprenticeship certification, the sponsor reports enhanced collaboration would benefit the program by attracting better quality applicants to the program and insuring uniformity in at least basic math and reading skills. Still, the outlook is uncertain because the financial problems of community colleges make it difficult to accommodate new courses.
- Al Herdon, apprenticeship representative for a Florida sponsor of a three-year masonry program, reports the use the community colleges for several courses, with state financing for tuition. The apprentices are eligible for 24 credit hours toward a construction management associate’s degree after completing the three-year program. Although very few—about 5 percent—pursue the A.A. degree, the sponsor found value in the community college linkage since it added credibility to the program.
- Mike Grimslid, a business manager for an Ironworkers local union in Wisconsin, reports extensive use of technical colleges for welding, safety rigging, and other industry-related classes. A key reason for using community colleges is low costs, given that the joint union-employer program lacks its own training center. Although some credits are available toward an associate’s degree, very few pursue the degree since most will be career ironworkers.
- Ken Brown, director of workforce development at Tri-City Mechanical in Arizona, sees the collaboration with community colleges as more extensive in the context of their apprenticeship programs in plumbing and pipefitting. Within their program, apprentices take 7 to 15 classes per year at community colleges, earning college credits. About 20 percent take up an associate’s degree. Brown sees the associate’s degree as adding significantly to the apprenticeship, especially for the long term and possible promotions to management. Getting curriculum accredited by the community college is sometimes a serious barrier.
- Gena Fonts, of Central Illinois Light Company, describes their three-year gas and line-man apprenticeship programs. For this program, apprentices take classes at a center for

gas and electrical training that is part of and paid for by the utility company. However, Illinois Central College still grants college credits for this training. Still, she believes that the community colleges are not interested in expanding collaborations with their program because they face so many other demands.

- Allen B. Clinedinst, III reports on Baltimore's Plumbers and Steamfitters Union five-year apprenticeship programs for certification as a plumber, pipefitter, or HVAC specialist. The joint union-employer program funds and operates a center where instructors teach courses in math, science, computer-aided-design and safety procedures as well as trade-specific courses. Teachers include former journeymen and community college instructors.

The program is highly selective, sometimes choosing only about 10 to 15 percent of applicants. While the program does not lead to an associate's degree, graduation nearly always comes with a variety of external certifications established by third parties, including state licensing examinations for work in high end pipe-oriented construction jobs. Although the courses look at least as demanding as community college courses, they do not typically count for credit toward a degree, presumably because existing certifications have much more value in the job market for these workers. It is worth noting that 15 percent of entrants already have an associate's or bachelor's degree.

One local union apprenticeship program shows that efforts to develop close collaborations with community colleges can work. As Rich Mata of local 223 in Dearborn, Michigan, of the Utility Workers of America explains, the union decided to work with electrical utility employers and some Michigan community colleges to develop a set of curricula in several trades. Among them are high voltage transmission, substation operation and maintenance, relay-system equipment, and underground line splicer and cable technician. In addition, participating companies helped develop a financial technician program that could lead to an associate's and bachelor's degree in business. Not only are the programs designed in a way that strongly encourages apprentices to complete an associate's degree, but also the joint program's trust will pay for course work up through the bachelor's or even master's degree. Courses that yield 48 hours toward the A.A. are built into the apprenticeship program. Nearly everyone—95 percent—who complete the apprenticeship continue for the remaining 12 hours to earn their associate's degree.

As in other apprenticeship programs, employers keep close track of the apprentice's progress in mastering tasks at the workplace. There are oral exams every three months of the first year and subsequently every six months. For coursework, students pay the tuition and fees initially but are reimbursed in full if they pass the course with a C or better. The program draws on retired skilled workers to serve as mentors. In addition, there is a long two-semester probationary period for remaining in the program.

The program started in 2003 in selected counties in Michigan and has extended statewide and to Iowa, Illinois, and New Jersey. There is now an effort to move the system nation-

wide. The programs have never been registered through the U.S. Department of Labor, despite the union co-sponsorship of the traditional and current apprenticeship programs. Initially, the electrical utility operators saw no need for registration because their programs geared their training to their specific needs, because they provided long-term jobs, because their training programs had an excellent reputation, and because they saw registration as onerous.

However, as jobs with a single firm have become less secure, the importance of having a portable occupational certification has increased. While the registered apprenticeship system offers a well-recognized and portable credential, the firms providing the jobs and apprenticeships choose not to register their program. As a result, the utility workers have turned to the associate's degree program as an alternative approach to achieving portability. In this case, the certifications from each type of program are competitive. At the same time, the education and training components of the apprenticeship and of the community college are complementary.

Some well-established apprenticeships offer their own academic programs. One example is the George W. Gould School in Burlington, Massachusetts. The Gould school provides a demanding set of courses for apprentices in a variety of construction and maintenance fields, sponsored by the Associated and Building Contractors, or ABC, and linked closely with their apprenticeship programs. The school has eight branches and is in some ways run like a community college. But, nearly all students are apprentices working full-time in relevant jobs, and tuition is paid by their employers. The school makes use of a national curriculum developed by the National Center for Construction Education and Research. Again, neither ABC nor the school appears to push for articulation of courses with community colleges. The licensing and certification that takes place in the trades have more currency in the job market.

Still another distinctive, perhaps unique example involving a well-established academic program with apprenticeship is the Apprenticeship School of Shipbuilding, run by Northrop-Grumman and in continuous operation since 1919. At one level, it is a type of college with a faculty and staff of 80 delivering 75 courses in 17 programs, complete with men's and women's sports teams that compete with Division 3 colleges. At another level, it is an apprenticeship program with 800 apprentices engaged in work-based learning and taking courses in math, science, composition, computing, engineering, shipbuilding, management, and other subjects. Although students study rigorous courses and participate as apprentices for four to five years, only some, such as those who pursue the advanced options in such fields as advanced shipyard operations and machine design, complete their studies with an associate's degree. Most of the graduates are expected to work for and become leaders at Northrop-Grumman.

Based on the small sample of officials affiliated with apprenticeship programs, this paper draws several conclusions. First, registered apprenticeships provide a form of certification

that is sufficiently respected in the labor market as to moderate the interest of apprentices in remaining in school long enough to complete an associate's degree. In general, apprenticeships embody at least three to four years of in-depth training and skill development, with a great deal of mastery learned at workplaces. Perhaps for this reason, apprentices achieving journeyman status feel they have attained what they require for their career. Whether they would be significantly better off completing an associate's degree is unclear.

Second, a great deal of classroom-based instruction takes place at community colleges, some in for-credit programs, some in continuing education programs, and some at the physical location of the college. Third, there is a considerable variation across states in the treatment of tuition and in the involvement of community colleges. Fourth, unionized programs are no more or less likely to involve articulation with community college programs, once we control for industry status. Apprenticeship programs in construction—whether union or nonunion—rarely lead to an associate's degree. Fifth, it is feasible to build programs that incorporate associate's degrees. A great deal of learning, especially classroom-based learning, should in principle qualify for credit. There is considerable scope for potential credits linked to the skills mastered through the work-based learning of apprenticeships.

Collaboration through awarding college credit for apprenticeship courses and training

Colleges have granted course credit for workforce learning for decades.²⁵ The American Council of Education, or ACE, assessed and certifies training programs to determine their suitability for college credit. Currently, ACE posts recommended credits for learning in a number of apprenticeship programs.²⁶ Individual colleges decide whether to accept or reject ACE's recommendation. Glover cites a number of cases of colleges that offer credit, including in the electrical, construction management, sheet metal, carpentry, and pipe trade occupations.

For example, Pellissippi State Technical Community College in Knoxville, Tennessee, offers an online associate's degree in general technology with an emphasis in electrical construction. It awards 30 of 36 elective credits with proof of completion of apprenticeship as ACE credits—that is, credits certified by ACE. Another Pellissippi associate's degree is offered in construction management technology, and this program allows for a seamless transition with credits to a bachelor's degree program at Middle Tennessee State University.

Thus, vehicles already exist for the granting of college credit for apprenticeship training. However, the use by community of the ACE system is spotty, as is the actual granting of college credit. Although estimating the proportion of colleges granting these types of credits goes beyond the scope of this study, evidence garnered from apprenticeship programs indicate at best only a modest share of colleges are actually granting credits and encouraging associate's degree completion.

Industry-based efforts for collaboration

Although many apprenticeships are tailored to individual employers, some industries have developed curriculum and other standards relevant to employer apprenticeship programs and community colleges. Cantor describes industry-based initiatives linked with community colleges in the auto repair, maritime, and fire-fighting fields.²⁷

Auto manufacturers—including GM, Ford, and Toyota—have worked with community colleges in developing courses for auto repair technicians to work at their dealers. Many of the dealers combine the coursework with registered apprenticeship programs or with informal apprenticeships. The National Automotive Technology Education Foundation acts as an external organization to certify the skills of workers in eight areas developed by the National Institute for Automotive Service Excellence. Dealers seek workers that will develop their skills sufficiently to pass ASE examinations in several or all areas; the eight are engine repair, automatic transmission and transaxle, manual drive train and axles, suspension and steering, brakes, electrical and electronic systems, heating and air conditioning, and engine performance.

Dealers often use community college automotive programs as partners in developing skills and as sources of recruitment. Other dealers attract workers who are in high school and combine work-based learning with courses on automotive subjects; some hire students who recently graduated from high school. In all of the programs, trainees begin with less demanding tasks and then move to more complex tasks, usually under the supervision of an experienced, skilled worker. In addition, all programs require trainees to learn from coursework, often in classrooms but increasingly through distance learning. Dealers still use a variety of mechanisms for training, including informal work-based programs that require some technical courses.

Data from the Survey of Sponsors of Registered Apprenticeship indicates that fewer than 500 registered apprentices were in the automotive repair field and about 3,000 in automotive manufacturing at the time of the survey. Community colleges graduate a total of about 15,000 mechanics of all types, many of which are in fields other than auto repair. One reason informal training mechanisms can work effectively to document skills is that external ASE certifications are available and do not depend on community colleges or apprenticeship programs. As long as the technician gains his or her ASE certification and his or her work is sufficiently high in quality and timeliness to satisfy the service manager, dealers will find the skill development process meets their needs.

In the maritime field, apprenticeships operate in Navy shipyards not only at the apprenticeship school in Newport News—as noted above—but also in other areas such as Norfolk, Virginia Navy Shipyard and the Bath Iron Works in Maine. The Norfolk shipyard offers apprenticeships in a range of trades such as welder, pipefitter, and electrician. All

apprentices take academic courses at a community college, although only some have the option of continuing through to an associate's degree. At Bath Iron Works, all the apprentices enroll in an associate's degree program at Maine Maritime Academy.

Firefighting training often takes place in about 150 apprenticeship training programs throughout the country. The California Fire Fighter Joint Apprenticeship Committee is a large program with extensive connections with a number of community colleges. More than 90 percent of California firefighters are in departments with apprenticeship programs. Several of the community college programs offer both certificate and associate's degree programs. In other parts of the country, community colleges may provide related instruction in apprenticeship programs but departments do not require or finance associate's programs.

Scaling up apprenticeships for future job openings

Given the evidence that apprenticeships yield very high returns for workers at very low cost to the government, one might ask whether they can be expanded, with or without the collaboration of community colleges and perhaps four-year colleges. Although a full analysis of the scale issue is beyond the scope of this paper, we can bring to bear data that yield a very approximate estimate of the potential for expanding apprenticeships. The main idea is to examine how many job openings per year are expected in occupations already using apprenticeship training through registered apprenticeship. Put another way, if apprenticeship training became the main way of developing skills to fill occupational vacancies, how many apprenticeships would be created?

The analysis uses occupational projections produced by the Bureau of Labor Statistics along with a list of apprenticeable occupations with current programs. In one sense, this approach understates apprenticeship possibilities because it ignores occupations that rely on apprentices that are not registered with the Department of Labor and other occupations that could be apprenticeable and sometimes are apprenticeable in other countries.

The estimates focus on job openings over the 2006-2016 period and not total employment. Job openings offer a better indication of training needs than does employment change. The retirement of qualified workers in an occupation create openings as much as an increase in jobs in the occupation. Filling each type of opening generates a demand for training, such as apprenticeship training.

According to the results highlighted in Table 3, currently apprenticeable occupations are expected to generate nearly 8 million job openings over the decade 2006-2016. Of course, the recession has brought job losses to some of these fields, but with the economic recovery, openings in these occupations are projected to reach about 780,000 per year. This figure is greater than the approximately 725,000 students completing associate's degrees in the 2006-2007 year.²⁸ If the country used apprenticeship to produce about 780,000 fully skilled workers in these occupations per year and assuming an apprenticeship program runs for an average of 3.5 years, the stock of apprentices would reach about 2.7 million or 5.7 times the current level of registered apprenticeships. Even if we take account of the likelihood of another 0.5-1 million apprentices not in registered programs and exclude registered nurses, the scale of apprenticeships—within existing occupational profiles—could be more than doubled to about 2.3 million.

Because apprenticeships are unlikely to penetrate fully all the apprenticeable occupations, these figures overstate apprenticeship’s expansion potential. On the other hand, many new occupations could incorporate apprenticeship training and certification as the primary skill development tool. The increased interest in “green jobs” offer some examples, such as energy auditors and installers of energy lighting systems. Other fields include mid-level managers, real estate agents, claims adjusters, network administrators, travel agents, and shipping agents. It is feasible and probably quite desirable to widen the occupational scope of apprenticeship to include more careers that require in-depth skills but not a B.A.

TABLE 3
Employing apprentices

Projected job openings in apprenticeable occupations

Occupational category	Actual 2006 employment	Projected 2016 employment	Job openings
	(in thousands of jobs)		
Auto, bus, and truck mechanics, body repairers	1,231	1,393	420
Construction jobs (including electricians)	4,281	4,702	1,248
Cabinetmakers and bench carpenters	149	153	48
Welders, cutters, solderers, and brazers	409	430	107
Register, licensed practical, and licensed vocational nurses	3,254	3,946	1,310
Other health professions	3,461	4,431	1,400
Child care workers	1,388	1,636	646
Fire fighters	293	328	142
Heating, air conditioning, refrigeration mechanics, installers	292	317	77
Computer operators and programmers	565	515	112
Correctional officers and jailers	442	516	175
Drafters	253	268	88
Machinists	394	384	61
Maintenance and repair workers, general	1,391	1,531	174
Hairdressers, hairstylists, and cosmetologists	617	694	151
Chefs and head cooks	115	124	23
Electrical power-line installers and repairers	112	120	43
Telecommunications equipment installers and repairers,	198	203	54
Butchers and meat cutters	131	134	44
Truck drivers	2,911	3,193	798
Others	2,434	2,548	658
Total	24,321	27,566	7,779
Total without Registered Nurses	21,816	24,474	6,778

Source: Tabulations by author based on Arlene Dohm and Lynn Shnipper. “Occupational Employment Projections to 2016” *Monthly Labor Review*, November 2007 and other Bureau of Labor Statistics projections.

Policies for the future

High returns to apprenticeship training and to community college education are attracting renewed interest as sound investments in the nation's supply of human capital. While estimates show apprenticeship training yields much higher returns than community college education (Hollenbeck 2008), both approaches develop skills that qualify workers for a range of occupations that do not require a bachelor's degree. The Obama administration has proposed large expansions in federal funding for community colleges to increase graduate rates, to develop innovative programs, to modernize community college facilities, and to increase grant and loan funding to college students, including those attending community colleges.

Although by comparison federal support for apprenticeship training is meager, the Obama administration recently awarded grants of \$6.5 million to assist national industry and employer associations and labor-management organizations in advancing Registered Apprenticeship. Community college and apprenticeship programs are both cited by President Obama as ways in which Americans can achieve "... at least one year or more of higher education or career training."

Policymakers generally view the two approaches as distinct and substitutes for one another, but they complement each other in many ways. Community colleges frequently provide apprenticeship programs with the academic instruction required for apprenticeable occupations. In a small number of cases, the apprenticeship builds in sufficient courses for the apprentice to earn an associate's degree. The interaction with businesses providing apprenticeships can open doors to community colleges for the business community.

Collaboration between schools and apprenticeship programs still takes place only in the minority of cases, despite its promises. One reason is the relative scale of the two interventions. More than 6 million students attend community colleges but less than 500,000 participate in registered apprenticeships and perhaps 1 million to 1.5 million in any type of apprenticeship program. A second reason is the large share of construction jobs in apprenticeship programs that provide their own academic instruction.

Given the current mixed relationship between community colleges and apprenticeship, does additional collaboration make sense? What benefits might accrue to community colleges, workers, and employers? What are the barriers to added collaboration? What forms

of apprenticeship- community college collaboration would work best? What mechanisms are available to promote added collaboration?

From the perspective of apprenticeship sponsors, community colleges are effective providers of the “related instruction” components required in an apprenticeship. But, so are other providers. Still, several benefits accrue to apprenticeship programs from working with a community college. Apprenticeship sponsors may save on instructional costs since state and local governments generally subsidize community college instruction; the tuition charged to students is sometimes far less than the full instructional costs. In addition, some states offer tuition subsidies, lowering the costs further.

Another benefit is that community college classes count toward an associate’s degree or certification and thus provide apprentices with opportunities to earn an additional portable certification and ultimately to transfer credits to a four-year college. Having apprentices attend community colleges provides a signal that higher education and continuous learning are useful for the employer and the apprentice. In some communities, community and technical colleges help promote apprenticeship, which can upgrade the reputation of apprenticeship programs both in the eyes of prospective employers and prospective apprentices.

Another rationale for apprenticeship programs to expand their use of community colleges is to increase the understanding of apprentices about the organizational and business contexts of the occupational field. Understanding the operational constraints and goals of manufacturing firms, building contractors, hospitals, day care centers, or nursing homes can help apprentices do their job more effectively and widen their perspective about future jobs.

In some cases, apprenticeship sponsors see little reason for collaboration and even barriers to collaboration. They see little value for the apprentice or employer in adding college credits or even an associate’s degree to the certification already provided by completing a registered apprenticeship. In addition, community college classes may be offered at inconvenient or infrequent times and may not provide the specific curriculum that employers want. New classes may take long to organize. Further, if too few apprentices and other students are available to fill a class, the college may either cancel the class or require the employer to pay far more than the standard tuition.

From the perspective of community colleges, joint efforts with apprenticeship programs bring several benefits. Community college instruction provides the assurance that students have jobs linked to their education and training, thereby lessening the concern of a mismatch between skills taught and skills demanded. Unlike many community college students who work part-time in jobs unrelated to their degrees, apprentices will see a close connection between their course work and their careers.

Another way the apprenticeship connection can improve student performance in the classroom and increase program completion is that employer—or union-employer—sponsors will mentor and monitor the apprentice-student on a frequent, at least monthly basis. Currently, community colleges lack the resources for effective counseling of students on an individual basis.²⁹ Apprentices will be motivated to do well in order to keep their jobs and move up in the organization sponsoring them. The added motivation and improved performance of apprentice students will raise retention and completion rates at community colleges and possibly positively enhance the learning atmosphere in classrooms.

Building closer connections with employers is another benefit for community colleges. Evidence from sectoral programs documents the value of close industry-training collaborations. Sectoral programs attempt to identify job ladders and training requirements that are already built into the apprenticeship model. Alliances between community colleges and apprentice programs thus can bring the benefits of sectoral initiatives without the high levels of overhead associated with organizing sector strategies.

On the downside, some community colleges may lack sufficient apprenticeship sponsors with which to collaborate. Others may find the occupational-specific focus too narrow for the courses that should be offered at the community college level. Another quandary is how to find the resources for the added students and for the improved employer-school collaborations. In addition, many if not most community colleges are currently operating well above capacity and thus might see little gain in trying to attract additional students. On the other hand, encouraging some of the skill development to take place off-site and at real work sites might allow colleges to maintain overall enrollments with fewer faculty members per student.

Methods for increasing collaboration

What, then, are the mechanisms by which to encourage added collaborations? The most important step would be to expand the scale of apprenticeship training so that apprenticeships become common at community colleges. The South Carolina approach cited above offers an interesting model. Basing the effort to expand apprenticeships at the community-technical college system can raise the status of apprenticeship in the eyes of prospective employers. It also allows for a more seamless integration of courses and the occupational profiles for each apprenticeship program. In addition, recruiting an effective staff is easier when the jobs for people marketing apprenticeship are based at a technical college. In the case of Apprenticeship Carolina, the staff employed by the technical college system—not any one college—work closely with a representative from the Office of Apprenticeship at the U.S. Department of Labor.

Such a collaborative arrangement might not work everywhere, but it has clear advantages. The technical college location allows for neutrality with regard to unionization and thus

makes apprenticeship accessible and attractive to nonunion as well as union firms. In addition, while the apprenticeship staff does not insist on having the apprenticeship programs use technical colleges, apprenticeship sponsors are much more likely to do so when staff can help make the appropriate connections with participating colleges.

Federal subsidies to employers adopting or expanding apprenticeship are likely to help but effective marketing of the apprenticeship concept will remain a critical ingredient. According to staff in South Carolina, the availability of the modest \$1,000 per-year tax credit for each apprentice for each year opens the door to conversations about establishing an apprenticeship program. One way to target such subsidies in ways that do not pay for all the existing apprenticeships is to use a marginal credit, whereby employers would receive tax credits of perhaps \$4,000 for each new apprenticeship position beyond 80 percent of last year's level.³⁰

A federal subsidy for expanding apprenticeship makes sense on several grounds. First, while apprenticeships significantly increase human capital at least as much as community colleges, they receive no governmental support, except for some indirect subsidies based on low community college tuition. Subsidies to the general educational component of apprenticeships are as justified as subsidies to college and university education. Second, the expected benefits from subsidies to stimulate added apprenticeships are likely to far exceed the costs.

In South Carolina, an investment of about \$2 million for two years of operational activity as well as an additional \$1,000 per year per apprentice has resulted in an increase of 860 apprenticeships. Assuming apprenticeships last 3.5 years, the total costs per apprentice are about \$5,800—or well below the public costs of a two-year community college program. Using Hollenbeck's estimates,³¹ the present value of earnings gains of apprentices are more than \$270,000 on a lifetime basis, with a gain for the public sector of about \$47,000. The public recoups in the form of higher taxes almost double its \$2,700 investment in the first two and a half years after the apprentices exit from the program. These gains far exceed the net benefits to investing in community college enrollments.

A variety of other methods could promote collaboration between apprenticeship and community colleges. One would be to extend to apprentices the student aid programs currently available to college students. In Florida and some other states, the state government provides apprentices with tuition assistance for community-technical college courses. A second would be to help community colleges follow student earnings outcomes and ultimately to consider earnings gains as indicators of community college performance.

Judged from this light, many community colleges might be eager to work with employers who are already providing a progressive wage scale and a job to current students and prospective graduates. To encourage apprenticeship programs to use community colleges, including accredited programs that offer portability, the subsidy level for expanding

apprenticeships could be set at a higher level for employers whose programs lead to a certificate awarded by the community college or an associate's degree.

Another potentially fruitful approach is to develop standards to award college credit for expertise gained and mastered on the job. Some schools already offer such credits but the practice is spotty. The knowledge and capabilities apprentices attain are often of a highly advanced character and certainly deserving of college credit. Four-year colleges and universities already offer credit to students for internships that involve far less documented expertise than apprenticeship. Were the practice of awarding systematized and widely practiced, more apprentices would be encouraged to complete degree programs, at least at the Associate's level.

Apprenticeship can and sometimes does serve as a foundation for completing further education. The completion of an apprenticeship involves great dedication, attention to detail, near-perfect attendance, an ability to listen and learn from peers and more knowledgeable colleagues, and demonstrating a mastery of complex material. By the time apprentices graduate and become certified, their confidence in their ability to learn and their awareness of what learning requires has increased substantially. At some later point, many will attend courses that update their skills. If entering and completing college degrees became more of a seamless process, the number of apprentices with college degrees would probably increase significantly. At the same time, the high return to apprenticeship training is likely to cause many skilled workers to become satisfied with their existing careers.

The role of states

States play a central role in the skill development process, providing about \$60 billion to fund higher education and serving as the largest funder of community colleges. In addition, governors often lead job service and training programs sponsored by the Workforce Investment Act, or WIA. About half of all state governments operate State Apprenticeship Agencies that approve programs as registered in the federal system.³² Other states can promote apprenticeship by sponsoring staff in government or in other organizations to work closely with federal apprenticeship representatives in the area.

States can in principle coordinate joint initiatives involving not only community colleges and apprenticeships, but also WIA and high school programs given their deep involvement in this mix of education and training for careers. States also can use their funding of construction projects and other activities to promote apprenticeship or other types of career-based training. Under WIA, governors have discretionary funding that could be used to stimulate apprenticeship and improve linkages with community colleges.

Another potential source of funding is the competitive grants under the Community College Challenge Fund proposed by the Obama administration. One goal of the grants

is to “...create career pathways where workers can earn new credentials and promotions step-by-step...” and “...curriculum coordinated with internships and job placements...” Other goals are to stimulate projects that make career pathways more transparent and to link adult education with occupational training. All of these objectives can be met through apprenticeship-community college initiatives.

Certainly, transparent career pathways are among the hallmarks of apprenticeship. Apprentices see a progression of skills, wages, and credentials in an occupation that offers a rewarding career. Job placements and work-based learning—as with internships—and coordination with curriculum are central to apprenticeship. Thus, although the announcement of the Challenge Fund criteria does not mention apprenticeship explicitly, the ideas promoted for community college innovation are well within the existing structure of apprenticeship programs.

Other approaches to expand apprenticeship programs at the state level might involve focusing on target groups, such as ex-offenders and dislocated workers. Many groups place a high premium on earning money while undergoing training. Funds designated for these groups could be used to develop new apprenticeships and link individuals to existing apprenticeships.

States that take the initiative to expand apprenticeship and offer links to community and technical colleges are likely to find a receptive audience politically. The public realizes the importance of ensuring that training programs are well-matched to the job market and to actual careers for graduates. Also, most people recognize that college should not be the only pathway to a rewarding career. Businesses and other employers continue to emphasize the importance of skills that can be best learned at the workplace. Current sponsors of apprenticeship programs highly recommend the strategy to other employers and certainly would support the initiative. These are among the reasons that apprenticeship has long attracted bipartisan support.

Research and demonstrations

While the body of research on community colleges is extensive, there are few studies of apprenticeship programs in the United States.³³ Despite the enormous difference in available research, the two systems are similar in that neither has been subjected to an experimental evaluation using random assignment. Some studies have matched individuals who enter alternative training schemes based on their observed characteristics and examine their earnings profiles over time to determine program impacts.³⁴

A number of research projects could provide important policy-relevant information on apprenticeship and community colleges. One set of studies could involve qualitative research on people using apprenticeship and/or community colleges to train for a

particular occupation and on employers hiring from community colleges or providing their own training. The project could examine the curricula in each type of program and test completers and graduates. It could also determine employer satisfaction and program costs. Such an effort would undoubtedly yield insights into the strengths and weaknesses of the two modes as distinct and as collaborative approaches to training.

Another potentially useful, but descriptive project could track educational and earnings outcomes of past registered apprentices. Using the list of apprentices drawn from the Office of Apprenticeship, researchers could track earnings profiles over time and could conduct field interviews to examine the extent to which apprenticeship completers subsequently continued to take postsecondary courses or to achieve a postsecondary degree.

A set of impact studies, using experimental methods, might focus on how well various modes of training perform in working with low- and lower-middle income young people, say ages 16 to 26. One plausible model is a “randomized encouragement” approach, which randomly assigns potential applicants to a treatment group from which the program recruits intensively and a control group not subject to any recruitment. As an example, suppose we obtain a sample of individuals whose year of graduation from urban high schools was two or three years ago. After conducting a screening interview to check contact information and to exclude those attending four year colleges or in jail or prison, the program could randomly assign individuals into program and control group status. Those in the program group would be heavily recruited into a generic work skills program, followed by access to an apprenticeship. The control group would not be contacted, except for follow up interviews and/or matching earnings records. An impact analysis of the demonstration would provide rigorous estimates of the impact of recruiting on participation as well as the impact of participation on earnings. An accompanying implementation study would examine the way the program operates and analyze the reaction of employers participating in the apprenticeship program.

Other experimental and quasi-experimental research should be expanded in these fields and help fill important gaps, especially in our state of knowledge about the operations and impacts of apprenticeship training.

Conclusion

Sound strategies to educate and train individuals for rewarding careers are critical for achieving high productivity but also for raising the earnings of workers at the middle and lower middle of the educational distribution. Today, the country offers several strategies that often operate independently of each other, including formal apprenticeships, community colleges, for-profit career colleges, and purely employer-sponsored training. Unfortunately, the systems are often opaque and hard to navigate for individuals. Firms can often locate local training providers to satisfy their demand for skilled workers, but sometimes find the system quite difficult to penetrate. Gaps between skills learned and skills needed are common, whether they involve machinists in Texas or long-term care workers in the western parts of the country.

The Federal initiative to direct billions of dollars toward community colleges to improve career outcomes is significant. Under the scheme, the federal government would provide a substantial amount of funding for community colleges to innovate especially in providing occupational training. Apprenticeship programs have drawn far fewer dollars, despite their high economic returns relative to community college training and despite President Obama's inclusion of apprenticeship as one way Americans can achieve postsecondary credentials.

One way to attract more interest in apprenticeship is to broaden the program's collaboration with community colleges. Currently, large numbers of community colleges provide some training for apprentices. But, only modest numbers of apprentices currently pursue an associate's or bachelor's degree. With appropriate encouragement, collaboration would expand degree-seeking students and course taking. In principle, the two approaches *could and should* complement each other.

Community colleges are well-equipped—though currently operating under a strain—to provide relevant formal courses and to grant educational credentials. They reach millions of students, most who are interested in preparing for careers. By doing more to link their programs with apprenticeship training, community colleges could off load some of their training burdens to apprenticeship programs that have a strong record of teaching and documenting skills.

Students who are part of apprenticeship programs are likely to do better in school because of the close mentoring and counseling at their work sites and because of the increased

motivation when they can see the relevance of course work to their careers. In the long term, expanding the apprenticeship component of programs for community college systems could allow existing government dollars to serve more students effectively—since more of the training would be paid for by employers.

Over the coming decades, jobs will be emerging in fields amenable to collaborative apprenticeship-community college training. It is time for political leaders, policymakers and the public to recognize the potential of apprenticeship in helping to fill these jobs. Apprenticeship-community college collaboration can effectively deliver training, enhance productivity, and integrate the many workers who prefer the learning-by-doing and the earning-when-learning aspects of apprenticeship training.

Endnotes

- 1 See <http://www.acenet.edu/nationalguide> for details.
- 2 Claudia Goldin and Lawrence Katz, "Long-Run Changes in the Wage Structure: Narrowing, Widening, Polarizing." *Brookings Papers on Economic Activity*, (2) (2007): 135-165.
- 3 Richard Freeman, "Is a Great Labor Shortage Coming: Replacement Demand in the Global Economy." In *Reshaping the American Workforce in a Changing Economy*, edited by Harry Holzer and Demetra Nightingale (Washington: Urban Institute Press, 2007).
- 4 James Rosenbaum, *Beyond College for All: Career Paths for the Forgotten Half* (New York: Russell Sage Foundation, 2001).
- 5 See Harry Holzer and Robert Lerman, *The Future of Middle Skill Jobs*, Center on Children and Families, CCF Brief 41 (Washington, DC: Brookings Institution, 2009).
- 6 Robert Lerman, "Are Skills the Problem? Reforming the Education and Training System in the United States," *A Future of Good Jobs?* (Kalamazoo, Michigan: W.E. Upjohn Institute for Employment Research, 2008) 17-80.
- 7 See National Center for Education Statistics, Special Analysis 2008, available at http://nces.ed.gov/programs/coe/2008/analysis/sa_table.asp?tableID=1055.
- 8 While the NCES reports about 2,100 for-profit career schools offering programs of 2 years or less, Cellini (2005) finds about 3,800 in California alone.
- 9 Tabulations based on weighted data from the 2005 National Household Education Survey (NHES) show about 1.5 million individuals reporting participation in an apprenticeship program in the prior year. However, the sample size for NHES may be too small to provide a precise estimate.
- 10 Gary Hoachlander, Anna Sikora, and Laura Horn, *Community College Students: Goals, Academic Preparation, and Outcomes* (NCES 2003-164). (Washington: U.S. Department of Education, National Center for Education Statistics, 2003), available at <http://nces.ed.gov/pubs2003/2003164.pdf>.
- 11 Kelly Mikelson and Demetra Nightingale, "Estimating Public and Private Expenditures on Occupational Training in the United States," Report to the US Department of Labor, Employment and Training Administration, 2004, available at <http://www.urban.org>.
- 12 According to the website of the U.S. Bureau of Labor Statistics, the U.S. labor force stood at 153.6 million at the end of 2007. Dividing the 468,000 apprentices by the 153.6 million in the labor force equals 0.3 percent. A cohort of 22-year-olds entering the labor force is about 3.4 million. Since apprenticeships usually last about 3.5 years, the number of apprentices per single year of age is 134,000. Dividing 134,000 by 3.4 million equals 3.9 percent.
- 13 According to the 2008 regulations issued by the Office of Apprenticeship, programs may base their standards on the content of skills learned by apprentices and not follow the time-based criteria. Few programs actually have so far moved away from the hours-based elements of their programs.
- 14 As Robert Halpern points out, youth see themselves judged by the established standards of a discipline, including deadlines and the genuine constraints and unexpected difficulties that arise in the profession. To quote Halpern, "Young people learn through observation, imitation, trial and error, and reiteration; in other words through force of experience. Though professionalism and care are expected, perfection is not. Adult mentors hold the discipline for the apprentice, sequencing and controlling task demands to keep them on the constructive side of difficulty. They direct apprentices' attention, demonstrate and sometimes collaborate." See Robert Halpern, *The Means to Grow Up. Reinventing Apprenticeship as a Developmental Support in Adolescence* (New York: Routledge, 2009).
- 15 Morris Kleiner and Alan Krueger, "Analyzing the Extent and Influence of Occupational Licensing on the Labor Market," Working Paper No. 14979 (NBER Cambridge, Massachusetts, 2009).
- 16 Robert Lerman, Lauren Eyster, and Kate Chambers, "The Benefits and Challenges of Registered Apprenticeship: The Sponsor's Perspective," U.S. Department of Labor, Employment and Training Administration, 2009, available at http://wdr.doleta.gov/research/keyword.cfm?fuseaction=dsp_resultDetails&pub_id=2421&mp=y.
- 17 Kevin Hollenbeck, "State Use of Workforce System Net Impact Estimates and Rates of Return," presented at the Association for Public Policy and Management Meetings. Los Angeles, California, November 2008.
- 18 F. Ray Marshall and Vernon Briggs Jr., *The Negro and Apprenticeship* (Baltimore, MD: The John Hopkins Press, 1967).
- 19 Hollenbeck, "State Use of Workforce System Net Impact Estimates and Rates of Return."
- 20 Lerman, Eyster, and Chambers, "The Benefits and Challenges of Registered Apprenticeship: The Sponsor's Perspective."
- 21 The sampling frame for the survey was comprised of 90 percent of the estimated universe of private sector sponsors (about 21,324 running 24,700 apprenticeship programs), based on the 2006 data from the 32 states that fully participated in the Registered Apprenticeship Information System database and six additional states. Sponsors of registered programs in the military and in prisons were excluded.
- 22 All of the results reported below come from tabulations by the author from the two data sets.
- 23 The author thanks Ann Marie Stieritz, Director of Apprenticeship Carolina, and her staff for providing information and insights about the South Carolina program.
- 24 Jeffrey Cantor, *Apprenticeship and Community Colleges: Promoting Collaboration with Business, Labor and the Community for Workforce Training* (Latham, Maryland: University Press of America, 1993).
- 25 Robert Glover, "Developing a Joint System of Training and Apprenticeship in American Transit: Lessons from the Experience in Other Industries," unpublished paper prepared for the Transportation Learning Center, Silver Spring, Maryland.
- 26 See <http://www.acenet.edu/nationalguide> for more details.
- 27 Cantor, *Apprenticeship and Community Colleges: Promoting Collaboration with Business, Labor and the Community for Workforce Training*.
- 28 The figure for graduates comes from National Center for Educational Statistics (2009), Table 269.
- 29 James Rosenbaum, Regina Deil-Amen, and Ann Person, *After Admission: From College Access to College Success* (New York, NY: Russell Sage Foundation, 2006).
- 30 The marginal nature of the subsidy was less important in South Carolina because of the very small number of apprenticeships at the base period.
- 31 Hollenbeck, "State Use of Workforce System Net Impact Estimates and Rates of Return."
- 32 Under regulations issued in 2008, the SAAs, which are state government entities, have the registration responsibility. Previously, State Apprenticeship Councils, which included labor and business members, carried out the registrations.
- 33 Various university-based research centers are devoted to the study of community colleges, but none to apprenticeship. Columbia University's Community College Research Center has conducted scores of studies with grants from foundations and governments. A Proquest search found 2,258 scholarly published articles dealing with community colleges, but only 35 with apprenticeship programs, including many unrelated to apprenticeship programs of the type discussed in this article.
- 34 Hollenbeck, "State Use of Workforce System Net Impact Estimates and Rates of Return."

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