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Effectiveness of Previous Initiatives Similar to Programs of Study: Tech Prep, Career Pathways, and Youth Apprenticeships

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Abstract

The federal career and technical legislation reauthorized in 2006 required the recipients of its funding to offer at least one Program of Study (POS). All states have developed some components of POS through earlier initiatives, primarily Tech Prep, career pathways, and youth apprenticeship, that attempted to ease the transition of students from high school to careers. Evidence on the effectiveness of these initiatives implies that they had minimal impact upon postsecondary educational outcomes. The academic instruction provided by POS must be better than those in prior initiatives if POS are to produce meaningful impacts on the postsecondary outcomes of career and technical education students.

Introduction

The 2006 reauthorization of federal legislation for career and technical education (P.L. 109-270) is the fourth version carrying the name of Carl D. Perkins (Perkins IV). This legislation requires the eligible recipients of its funds, both secondary and postsecondary, to offer at least one Program of Study (POS), which must include coherent and rigorous content aligned with challenging academic standards and relevant career and technical content. This content must be delivered in a coordinated, nonduplicative progression of courses that aligns secondary education with postsecondary education and leads to an industry-recognized credential or certificate at the postsecondary level or an associate or baccalaureate degree. In addition, programs may include opportunities for secondary students to participate in dual or concurrent enrollment programs or other ways to acquire postsecondary education credits. (P.L. 109-270. Sec. 122[c][1]).

Prior to Perkins IV, all states had developed these components to some degree through earlier initiatives that attempted to ease the transition of students from high school to careers. There were many attempts in the last quarter of the 20th century to forge stronger links between secondary and postsecondary education and between education and work. Career education in the 1970s (Herr, 1976) and school-to-work in the 1990s (Hughes, Bailey, & Mechur, 2001) were two major federal initiatives. Both attempted to improve education by emphasizing the relevance and utility of the knowledge and skills studied in school to students' future careers. Neither had the impact on academic education that their proponents had hoped (Kazis & Pennington,

1999; Marland, 1971), but these initiatives helped to create the context from which three approaches eventually emerged: Tech Prep, career clusters/career pathways, and youth apprenticeships.

Two decades before federal law required POS Parnell (1985) proposed Tech Prep, articulated programs designed to teach technical skills through a combination of the final two years of high school with the first two years of postsecondary education. In the 1990s, career pathways emerged. These are templates for the integration of academic and technical content and the articulation of secondary and postsecondary instruction within specific career clusters. Youth apprenticeships, similar to Germany's dual system of combining employment and related academic instruction, also received considerable attention. This article examines the best available evidence on the effectiveness of these precursors of POS on improving academic performance and linking secondary and postsecondary instruction. This evidence provides a perspective from which to anticipate the effect POS are likely to have upon these outcomes.

Tech Prep

A Tech Prep program that satisfies the criteria set forth in federal legislation is a POS. The foundation of a Tech Prep program is an articulation agreement between one or more high schools with one or more postsecondary institutions. The agreement sets forth the instruction that will be delivered at the secondary and postsecondary levels and the criteria that students must satisfy to receive postsecondary credit for the skills and knowledge acquired in high school. This concept was endorsed in the 1990 reauthorization of federal vocational education legislation (Perkins II, P.L. 101-392), which authorized specific funds to support Tech Prep. This authorization was continued in Perkins III and IV, but under Perkins IV, states have the option of combining Tech Prep funds with their basic state grants. As with Tech Prep, Perkins IV gives states and local districts wide latitude on how they plan to implement POS. For Tech Prep, this flexibility has been both a strength and weakness. It allowed states and regional consortia to design programs judged to be responsive to particular circumstances, but the variability in the programs that emerged has made it difficult to isolate what is unique about Tech Prep much less the impact of participating in these programs.

Evidence on Effectiveness

Stone and Aliaga (2003) analyzed data from the National Longitudinal Survey of Youth 1997 to determine the effects of Tech Prep on the academic achievement of young people who were in grades 9 through 12 during the period from 1997 to 1999. These data are based on a nationally representative sample, but rely on students' self-reports of both the kinds of courses taken and grade point averages (GPAs).

Regression analyses found no significant relationship between Tech Prep participation and GPA; however, participation in career pathways had a slight but statistically significant net, independent effect. There was no attempt to examine why career pathways, but not Tech Prep, had an association with GPA.

Bragg et al. (2002) at the University of Illinois made a sustained effort to assess the effects of participating in Tech Prep. Their study was longitudinal and followed students in eight selected consortia from high school to college and into employment between January 1998 and December 2001. With the help of a national panel of experts, they initially identified six consortia in the country as "mature" implementers of Tech Prep. These consortia were located in urban, suburban, and rural areas and demonstrated a strong commitment to Tech Prep as a primary vehicle of educational change that, in the judgment of state personnel and panel members, reflected preferred policies and practices. Later, two more designated consortia were added to strengthen the design.

To study the effects of participating in these consortia, Bragg et al. (2002) selected a total of approximately 4,600 students for follow-up, with roughly equivalent numbers of Tech Prep and nonparticipants in each group. A systematic random sampling procedure was employed to ensure that the characteristics of the students in each group were similar. It should be noted that the random selection occurred among students who were identified as Tech Prep or not. The students were not randomly assigned to the two groups. Tech Prep participants did not differ substantially from the comparison group on GPA, but family income and parental education were somewhat lower among Tech Prep participants. Four of the consortia also had significantly more males than females enrolled in their Tech Prep programs. Tech Prep participants had many of the characteristics that placed them at higher risk of not completing college-level courses, including first-generation college enrollment and part-time enrollment combined with part-time or full-time work (Tinto, 1996).

In six of the eight consortia, 85% or more of the Tech Prep participants continued their education at two-year colleges. However, in only two, East Central Illinois and Miami Valley, were their rates significantly higher than those of nonparticipants. The difference between the groups in Miami Valley was a striking 45 percentage points and at East Central Illinois a more modest 11 percentage points.

While many students, both Tech Prep and nonparticipants, enrolled in college-level classes, few earned sufficient credits to obtain a certificate or degree. Most were required to take developmental, noncredit courses. Bragg et al. (2002) found across consortia that 40% to 80% of the Tech Prep participants took some college-level coursework, with a slightly wider range (nearly 30% to 76%) among nonparticipants. Transcript data were obtained from the lead two-year colleges of the eight consortia, the colleges that awarded credit for courses completed in high school. These data showed that the median percentage of students earning some degree (associate of arts, AA; associate of science, AS; or associate of applied science, AAS) or certificates within three to four years after high school graduation

was only 10.5%. The range of completers reported by the consortia was 8.5% to 19.0%. These results were consistent across sites for both study groups. Even in Miami Valley, where all but one of the Tech Prep participants had attended a two-year college, slightly less than one in five (19%) had obtained a certificate within three to four years after leaving high school.

A major congressionally mandated evaluation of Tech Prep (Hershey, Silverberg, Owens, & Hulsey, 1998) had a formative rather than summative focus and included case studies of the 10 consortia selected because of the reputed quality of their programs. These case studies included interviews with 486 former Tech Prep students conducted approximately 18 months after they should have graduated from high school. This follow-up, however, did not include similar non-Tech Prep participants against whom the outcomes of the participants could be compared. Enrollment in postsecondary education or other types of formal occupational preparation from these 10 consortia was 61%, but only 15% reported that their programs awarded credits for the articulated courses they had taken in high school. Over one-third (37%) of those attending community colleges had not started programs leading to degrees, but instead were taking developmental and general education courses.

In summary, the results reviewed indicated that participation in Tech Prep does not have a significant relationship with improved academic performance or less need for remediation at the postsecondary level. Bragg et al. (2002) and Hershey et al. (1998) studied consortia that were judged to be following all the practices recommended for good Tech Prep. If these consortia were among the best and the programs they offered were similar to the POS that will be offered under Perkins IV, how likely is it that high percentages of POS participants will obtain postsecondary degrees or industry-recognized certifications in the occupational areas they study in high school?

Career Pathways

At the same time Tech Prep consortia were being developed, other initiatives to align high school preparation more closely with the needs of the labor force were also being designed and implemented. One of these initiatives was career clusters/pathways. The link between Tech Prep and career pathways was highlighted by Dan Hull, the former chief executive officer of CORD[1] and one of the foremost advocates for Tech Prep. Under his leadership, CORD created the National Tech Prep Network to provide resources, professional development, and technical assistance to those establishing and leading consortia. In 2004, he responded to the

[1] Before it changed its name to its acronym, CORD was the Center for Occupational Research and Development. It was founded in 1979 to provide contractual services for educational improvement focused on careers.

growing interest in career pathways by publishing *Career Pathways: The Next Generation of Tech Prep.* In this publication, he challenged Tech Prep leaders "to become the change agents needed to convert traditional CTE programs to Career Pathways" (Hull, 2004, p. 3). The National Tech Prep Network accepted this challenge and in 2007 changed its name to the National Career Pathways Network.

The traditional organization of occupational instruction at the secondary level was created by federal legislation. In 1917, the Smith-Hughes Act limited the kinds of occupations eligible for federal funding to those in agriculture, trade and industry, and home economics, which evolved into family and consumer science. Later legislation expanded these categories to include distributive/marketing, health, and business occupations. For most of the 20th century, secondary vocational education was delivered within this structure and aimed primarily at teaching skills needed for entry into occupations. In the last two decades of the century, however, changes in the skills needed for success in the labor market caused increased emphasis on academics and preparing students to continue their occupational preparation at the postsecondary level. This emphasis led to efforts to more closely align academic and technical instruction and secondary and postsecondary education. Career clusters and career pathways emerged from these efforts. Career clusters organize related occupations by the types of products and services they provide, such as manufacturing, health services, and architecture and construction. Career pathways provide guidance as to the knowledge and skills, both academic and technical, that must be acquired to prepare for occupations at varying levels within these clusters.

Career clusters have evolved into the primary way of organizing secondary occupational instruction. Ruffing (2006) has summarized the somewhat difficult journey that led to their emergence as the accepted method of classification. This acceptance became official federal policy in 1999 when the Office of Vocational and Adult Education (OVAE), U.S. Department of Education adopted 16 clusters for use in funding and reporting CTE programs. The Web site of the States' Career Cluster Initiative (www.careerclusters.org/) provides information about the clusters and the pathways associated with each.

In the summer of 2007, the National Association of State Directors of Career Technical Education Consortium (NASDCTEc, 2007) surveyed its members on the implementation of career clusters and POS. Questionnaires were returned by 47 states, the District of Columbia, Puerto Rico, and Guam. Of these 50 respondents, 26 or more provided programs within 15 of the 16 career clusters adopted by the U.S. Department of Education, and 36 or more provided programs in the most popular 7 clusters. Many states reported working to ensure that the pathways being offered within these clusters satisfied the criteria for POS set forth in Perkins IV.

The College and Career Transitions Initiative (CCTI), a federally funded project administered by the League for Innovation in the Community College, works with community colleges to encourage career pathways within career clusters. The CCTI began in 2002 by inviting community colleges to submit proposals describing

how they would develop partnerships with high schools and employers to design and implement career pathways. The definition of career pathway adopted by CCTI was developed in cooperation with the National Clearinghouse for Career Pathways at CORD and other interested parties:

> A Career Pathway is a coherent, articulated sequence of rigorous academic and career courses, commencing in the ninth grade and leading to an associate's degree, an industry-recognized certificate or licensure, and/or a baccalaureate degree and beyond. A Career Pathway is developed, implemented, and maintained in partnership among secondary and postsecondary education, business, and employers. Career Pathways are available to all students, including adult learners, and are designed to lead to rewarding careers.[2]

From among the community colleges that responded to its request for proposals, CCTI initially selected 15 to receive funding to create pathways that would serve as models for other institutions. The initial experiences in developing partnerships and enrolling students in the 15 original colleges were sufficiently positive for CCTI to open its network to any community college in North America that wanted to adopt its goals and draw upon its resources. When the CCTI Web site was accessed on March 9, 2009, it listed 174 colleges in the United States and Canada as members.

At the 2008 meeting of colleges in the CCTI network, Warford, Beauman, and Kindell (2008)[3] presented data on the experiences of the original 15 community colleges. In 2004, the 40 high schools that had joined in partnerships with the 15 colleges enrolled 2,853 students in 15 different pathways based on 5 separate career clusters. By 2007, the number of high schools had doubled, the number of students had increased to 22,178, and they were following 176 pathways based on the 16 OVAE clusters. Each of these pathways had been jointly developed by the lead colleges and their cooperating high schools.

The original 15 CCTI colleges have provided yearly outcome data on 1,124 students who participated in pathways, graduated from high school in 2004 through 2007, and enrolled in the colleges cooperating with their high schools in the fall of their graduation years. These data do not include graduates who went on to other community or four-year colleges, or those who did not enroll in the fall following their graduation. Warford et al. (2008) reported the national average for enrollment in community colleges directly from high school at 14% compared to a CCTI average

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[2] The definition was retrieved on May 1, 2008 from http://www.league.org/league/ projects/ ccti /cp/characteristics.html. It is also published in Hull (2004, p. 6).

[3] The project director, Laurance Warford, kindly provided the 2008 CCTI Final Report (Warford, 2008) and a draft copy of the Year-4 quantitative report (Clery & Brooks, 2008). The outcomes summarized are based on these sources as well as the PowerPoint presentation

of 27%. This CCTI percentage, it should be noted, is based on graduates who enrolled in the same pathways they had studied in high school and in the community colleges that were the postsecondary partners in those pathways. The national figure cited by Warford et al. is for *any* community college enrollment and is derived from a longitudinal study that started in 1988. More recent data from the Educational Longitudinal Study of 2002 (Bozick & Lauff, 2007) indicated that the enrollment rate during the two-year period following high school is 27%. By limiting the data in the Bozick and Lauff report to public, two-year colleges, the enrollment rate estimated directly from high school is 23%. The national re-enrollment rate cited by Warford et al. is 54% and for CCTI participants 53%. Warford et al. reported remediation rates of 40% for mathematics and 27% for both English and reading for students following CCTI pathways into the original 15 community colleges. They also cited sources documenting that nationally about two-thirds of students entering community colleges require remediation in these subjects. These differences imply that the CCTI stress on rigorous academics and career courses, either through self-selection into the pathways or actual program effects, is associated with reduced need for remediation at the postsecondary level.

The Workforce Strategy Center (WSC) is another advocate of career pathways, but it defines them within a context of regional economic development. The WSC and CCTI definitions do not differ in goals, but do differ in emphases. The WSC definition stresses alignment of all systems and programs involved in workforce development within identifiable labor markets (Jenkins & Spence, 2006; Mazzeo, Roberts, Spence, & Strawn 2006). The CCTI definition focuses primarily on aligning academic and career courses and articulating secondary and postsecondary instruction (Hughes & Mechur Karp, 2006).

Evidence on Effectiveness

Some outcome indicators are presented for CCTI, but there was difficulty finding additional evidence of the impact of career pathways, however defined and implemented, on achievement and transition. An ERIC search using the keywords "career pathways" for documents published in 1990 or later yielded 356 hits, but only a handful presented any evidence on the outcomes of career pathways.[4] Four that reported some data were conducted by the National Research Center for Career and Technical Education (NRCCTE). Each of these is discussed and then two others are summarized.

In the discussion of Tech Prep, it was noted that Stone and Aliaga (2003) analyzed data from students who had participated in different types of CTE programs. Regression analyses did not find Tech Prep participation to be related to high school GPA, but career pathways (also referred to as "career majors" in the

[4] The search was conducted on April 24, 2008 at http://www.eric.ed.gov/.

questionnaires) were. Students' reports of enrollment in career pathways/majors had a significant positive relationship with final, 12th-grade GPAs, and this relationship remained significant when measures of student characteristics, including their 8th-grade GPAs, were added to the equation. In the full equation, career pathways had a beta weight (the relationship with GPA holding other variables in the equation constant) of .079 compared to a beta of .401 for 8th-grade GPA. This equation explained 28 percent of the variability in final GPA, and the beta for pathways had approximately the same independent relationship with this outcome as gender, ethnicity, and household income.

Castellano et al. (2007) studied three selected high schools that were engaged in comprehensive school reform based on one of three models: career academies, High Schools That Work, or career pathways. All students at the third high school followed career pathways, and many whose pathways included CTE courses took these courses at a regional center that served several districts. The experiences of these students were compared to those of students in a similar comprehensive high school that had not adopted career pathways. Many students at the comparison school studying CTE courses took the courses at a different skill center than the pathway students. Comparisons of the students in the high schools implementing career-based reforms to their counterparts in similar high schools without such reforms did not control for unmeasured differences among the students. Such comparisons, however, did control for self-selection since all students in the intervention schools received the same treatment.

The career pathways model did not have higher graduation rates, but pathway graduates scored higher than their non-pathway counterparts on many measures of transition to postsecondary education. Logit regressions indicated that pathway students were about twice (1.85 times) as likely to have post-high school plans than non-pathway students, and equal numbers were accepted to four-year universities. Pathway graduates who attended the main community college serving their areas outperformed their comparison group counterparts. For each academic subject, fewer pathway students were required to take remedial courses; however, 65% still needed remediation in comparison to 85% of the non-pathway students. At the end of one year of college, pathway students had earned 28.2 credits and their counterparts 21.4, a difference significant at the .05 probability level.

A study by Lekes et al. (2007) reversed the sample selection from the secondary to the postsecondary level. This study chose one community college that had been identified by the National Dissemination Center for Career and Technical Education as having exemplary transitional programs, and a second community college that had received a *Star of Education* award from the NASDCTEc. At the first college, two health career pathways (Emergency Medical Technician and Patient Care Assistant) were examined, and at the second, the focus was on pathways for Information Technology/Computer Information Science (IT/CIS). For the secondary

component of the study, students following these pathways were matched with similar nonparticipants from their same schools. The high schools that were studied had been selected so that they varied in the degree to which they were engaged in career pathways. The postsecondary component relied primarily on analysis of transcript data from the second community college.

Like the Bragg et al. (2002) Tech Prep study, Lekes et al. (2007) studied transition initiatives that were recognized as among the best available. Their findings paralleled Bragg et al. in that few differences were found between students who had participated in pathways and those in comparison groups who had not. Pathway students were more likely than nonparticipants to have experienced the components recommended for pathways, such as contextualized learning, mentoring, and work-based learning. In most comparisons, however, these experiences were not associated with differences between pathway and non-pathway students in outcomes such as graduation, GPA, or postsecondary enrollment. Pathway students did have an advantage in postsecondary credits earned, in part, because of the dual credit courses they had taken in high school. This advantage appears to have increased their chances of earning a certificate or degree: 21.3% in the IT/CIS pathway earned a credential compared to 17.2% for the non-pathway students.

The third study conducted by the NRCCTE addressed career pathways that implemented the Workforce Strategy Center (WSC) model of attempting to coordinate all major components of workforce development. This model has been applied primarily with adult learners, and one of the three programs that were studied is described to show how the WSC emphasis differs from the traditional high school-postsecondary transition. Bragg et al. (2007) studied pathways at three sites that involved adult literacy, adult basic education (ABE), General Educational Development (GED), English language literacy (ELL), pre-collegiate developmental education, postsecondary career and technical education (CTE) certificate and associate degree programs, and potentially, baccalaureate degrees. As implied by this wide range of learning opportunities, these pathways were designed to serve low skilled adults.

Drawing on guidance from an advisory panel, a literature review, and telephone interviews with state and local educational administrators, the researchers, in collaboration with personnel from OVAE, selected the following three pathway programs for case studies: Carreras en Salud–Instituto del Progreso Latino (IPL), Chicago, Illinois; General Service Technician (GST)–Shoreline Community College, Shoreline, Washington; and Career Pathways Initiative (CPI)–Ouachita Technical College, Ouachita, Arkansas. Carreras en Salud–Instituto del Progreso Latino (English translation: Careers in Health–Institute for Latino Progress) is described to give a sense of the scope of these pathways.

Carreras-IPL is a fairly new program, starting in April 2005, in response to the need for bilingual health care workers in the Chicago area. Almost all of its participants are low skilled women with limited English proficiency. The program is

administered by IPL, an established Community-Based Organization (CBO) that has served the Latino population since 1977. Among the partners that IPL has involved are employers, another CBO, community colleges, a vocational education center, industry associations, chambers of commerce, religious organizations, labor organizations, and the local Spanish-language media. Employers are represented by the Metropolitan Chicago Healthcare Council, which consists of over 300 hospital and nursing home members. Through this council, IPL obtains assistance in the development of curriculum, identification and recruitment of instructors, and sites for practicum and job placement.

The IPL recruits participants through public service announcements on Spanish-language television and radio stations, presentations in churches, and contact with entry-level workers already in health care who are blocked from advancement because of limited English and academic skills. The participants start their pathway at the point appropriate for their skills as measured by the Test of Adult Basic Education. Regardless of the level at which they start, all receive English language and academic skill instruction in a health context, provided by bilingual instructors. As they progress, participants take courses to prepare them for the examination required to become a Certified Nursing Assistant as well as for the GED and COMPASS, the placement test used by the Chicago community college system. Options are available for students who have difficulty passing the GED or COMPASS, including courses in phlebotomy and electrocardiogram that can lead to employment as a Patient Care Technician.

Students who obtain the GED and improve their English skills sufficiently to pass the COMPASS exam begin taking the courses necessary to enter the Licensed Practical Nurse (LPN) program at the community college. The college holds 20 slots in every entering class for Carreras-IPL participants, but at the time of the site visit, this number was insufficient. There were 50 participants who were qualified to enter the LPN program for which no openings were available. Those who complete the LPN training can transfer as second-year students into a two-year program that prepares them for certification as Registered Nurses.

The Carreras-IPL pathway was visited in August 2007, 28 months after it started. Due to the varying starting and ending (or pausing) points of students, it has proved difficult to produce unambiguous indicators of progress. Administrators reported that of the initial starting groups, over 70% had attained appropriate milestones, passed licensure exams at varying levels, and were employed. Retention of current students was reported at 94%. Program administrators recognized the need for more comprehensive outcome data and are seeking funding and expertise to conduct systematic follow-up protocols with former participants. The two other sites that were studied target different populations, but each attempts to provide learning opportunities that enable low skilled adults to enter and progress on pathways that lead to employment in jobs paying wages sufficient to sustain a family. Although the

WSC publications discuss how features of pathways could be implemented in elementary and secondary education, the approach has been applied primarily in adult training and retraining.

In the review, only two other published reports on career pathways were identified that included any information on outcomes. Rudy and Rudy (2001) compared the academic performance of students in Berrien County, Michigan prior to and after pathways in six broad career areas were implemented for all students. Over a five-year period, they found improvement on high school attendance rates, mean high school GPA, scores on statewide testing, enrollment in dual-credit courses, and the percentage of graduates enrolling in postsecondary education. These were all countywide indicators and no data were available from a comparison group for the same period.

The other report was from the Austin (Texas) Independent School District (Oswald, 2002), which offered 29 career pathways in 8 career clusters. This report classified students who took any CTE, about 60% of all high school students in the district, into three groups: *Elective*, those who took an incidental CTE course; *Coherent*, those who took a sequence of CTE courses focused on developing occupational skills and knowledge within a given career pathway; and *Tech Prep*, those who satisfied the coherent definition given above in pathways that include state-approved articulation agreement (college credit) courses.

Comparisons were made across these three groups and with high school students who took no CTE courses. The comparisons were less precise than desired because of difficulties in classifying CTE students. The plans and courses students take change as they progress through high school and it may not be possible to classify them until they have completed all their courses. The comparisons that were possible yielded a mixed pattern. With regard to attendance, non-CTE had a rate of 87%, virtually the same as the Electives. Those classified as Coherent had the lowest attendance rates (83%) while those classified as Tech Prep had the highest (89%). Students in all three CTE groups were more likely to pass statewide tests (Elective 74%, Coherent 76%, Tech Prep 87%) than those without any CTE courses (69%). Those in the Coherent group took the test an average of 1.59 times in order to pass all sections compared to an average of 1.35 times in the other groups. Students taking CTE courses were more likely than non-CTE students to earn adequate credits to progress to the next grade level. In the 9th grade, however, students classified as Coherent were the least likely of the four groups to earn enough credits to be promoted to the 10th grade. The fact that 9th grade students had earned enough CTE credits to be classified as Coherent implied that many were repeating that grade.

Obviously, all of these studies have many limitations. The collective results of the six studies, however, raise the same questions as the review of Tech Prep studies about the degree to which POS are likely to impact achievement and transition.

Youth Apprenticeships

In the 1990s youth apprenticeships emerged as a means of facilitating the transition between school and work. The German dual system of combining paid employment and academic studies linked to employment was perceived as a model with much potential for the United States. Youth apprenticeships have largely faded from the scene. Why did youth apprenticeships generate so much interest, and why did they fade so rapidly?

An ERIC search using the keywords "Youth Apprenticeships" yielded 372 documents.[5] The search identified any document with both "youth" and "apprenticeship" somewhere in the title, descriptors, or abstract. When these documents were reviewed by decade, 46 were found from 1979 or earlier, 59 from the 1980s, 215 from the 1990s, and 52 from 2000 to the present. Few of the earliest or most recent documents had the two words together. In the 1980s, the term "youth apprenticeships" appeared more frequently, and in the 1990s, the majority of documents concerned programs that were similar to the youth apprenticeships model that had been proposed by Hamilton (1990).

Stephen and Mary Agnes Hamilton were key players in generating the interest shown in youth apprenticeships during the 1990s. Stephen Hamilton became a college professor after having taught in a vocational high school. To overcome transition problems experienced by students who did not continue their education after high school and the inherent limitations of school-based occupational training, Hamilton (1990) proposed that elements of the German dual system be adopted. He not only proposed a model, he and his wife tested it in Broome County, New York (Hamilton & Hamilton, 1993). The model had all the components of POS. It articulated the last two years of high school with two years of postsecondary education. It had rigorous academic and technical standards and integrated academic and technical content. The goals of the Hamiltons' youth apprenticeships were for students to earn associate degrees and nationally recognized skill certificates once the program became registered with the New York State Department of Labor. The Hamilton model differed from POS; however, in that it placed the responsibility for skill training on employers.

The Hamilton model aligned well with the political climate of the 1990s. In the year before his election to the presidency, Bill Clinton (1991) wrote an article for the *Vocational Education Journal*, the primary publication of the American Vocational Association (now the Association for Career and Technical Education), in which he described the advantages of apprenticeship and endorsed their expansion. In his initial State of the Union address, Clinton proposed a federal initiative to encourage youth apprenticeships.

[5] The search was conducted on July 9, 2008 at http://www.eric.ed.gov/.

As interest in youth apprenticeships grew, the W. T. Grant Foundation asked six leading scholars, including the Hamiltons, to prepare papers that could serve as a conceptual foundation to guide future efforts (Rosenbaum et al., 1992). Earlier, this foundation had convened the Commission on Work, Family, and Citizenship to examine the declining employment opportunities being experienced by young people who did not continue their education beyond high school. The 1988 report of this commission, *The Forgotten Half*, recommended an expansion of apprenticeships and did much to create the climate that was so receptive to youth apprenticeships.

Rosenbaum et al. (1992) acknowledged the potential of youth apprenticeships to address many of the problems related to the transition from education to employment, but they also recognized the difficulties of large-scale adoption. The potential lies in demonstrating to young people the relevance of what they study in school, thereby, increasing motivation and the learning of both academic and technical skills. Apprenticeships can also socialize young people to the realities of the workplace by requiring the performance of tasks that have economic consequences. For these benefits to accrue, however, the authors discussed the many challenges that must be met if schools and employers are to work together. The most significant of these is encouraging employers to assume a greatly expanded role in training young people. When such employers are identified, students must be recruited and matched with employers. Teachers and workplace mentors must be trained and given time to work together to create and modify curriculum for both for the classroom and the workplace, and school and work schedules must be adjusted.

In 1994, the School-to-Work Opportunities Act was passed to bring about systemic changes in the preparation that young people receive to facilitate their transition from education to careers. Its primary strategy was to encourage the involvement of employers in the planning and delivery of instruction. The Act called for school-based learning, work-based learning, and connecting activities. Youth apprenticeships were a perfect fit with this legislation, and the Act provided funding for many state and local efforts to establish programs.

Youth apprenticeships even reached the level of serious scholarly discussion in *Educational Researcher*, the flagship publication of the American Educational Research Association, and a journal that rarely concerns itself with the role of education in preparing young people for careers. In 1993, however, it devoted most of one issue to an article by Bailey (1993a), Director of the Institute on Education and the Economy, Columbia University, a rejoinder from Hamilton (1993), and a response to Hamilton by Bailey (1993b). Bailey doubted if youth apprenticeships would ever enroll a significant number of young people. He cited the high job mobility of young people, as one of the major reasons for his pessimism. This mobility makes employers reluctant to offer serious training to those in their late adolescence and early twenties. Bailey also questioned the pedagogy of work-based learning. Such learning is often job- and even employer-specific and does not teach skills applicable in a range of settings. His third major concern was the likely

inequities in the availability of apprenticeships. There are inequities in the educational opportunities available to minorities and the poor, but these are less severe than the inequities in employment opportunities.

In his rejoinder, Hamilton (1993) argued that while young people in the United States have high rates of job mobility, this is not true of their counterparts in countries that have extensive apprenticeship systems. In Hamilton's view, the labor market floundering experienced by young people who do not continue their education after high school is the result of a disconnect between education and employment. Frequent job changes are due to the lack of true career opportunities, not the inability of young people to make career commitments. Hamilton acknowledged that employers train only to the degree that it is in their own self-interest. The changes that are occurring in the nature of the work, Hamilton contended, will redefine self-interest. The need for highly skilled, flexible workers will make employers willing to offer apprenticeships.

Bailey (1993b) concluded the exchange by recommending that work-based learning be incorporated into the broad educational reforms that were started by *A Nation at Risk* (National Commission on Excellence in Education, 1983). This would require greater employer involvement in education, but still keep the primary responsibility with schools. This approach became federal law with the passage of the School-to-Work Opportunities Act of 1994.

Even with broad political support and start-up funding from the School-to-Work Opportunities Act, however, Bailey's doubts about the widespread adoption of youth apprenticeships proved prescient. Some of the programs begun during the 1990s, including the one started by the Hamiltons, continue, but they enroll few students. During the four years that the Hamiltons directed the program, it enrolled a total of 100 students (Hamilton & Hamilton, 1999). That program continues now as one of the options offered by the Broome-Tioga Counties Bureau of Cooperative Educational Services (BOCES), a career center that provides skill training programs for 15 school districts. Enrollment in the youth apprenticeships offered by this center for the 2008-2009 school year was 32 (S. Watkins, personal communication, dated March 10, 2009).

Evidence on Effectiveness

What is striking about the literature on youth apprenticeships is the absence of any studies that compare the achievement and postsecondary experiences of students who participated in apprenticeships to those who did not. After all the interest and investment following their emergence in the 1990s, youth apprenticeships just seemed to fade away. The closest approximation found to an outcome evaluation was a study by Schug and Western (1999) in Wisconsin. The results of this study are of special interest because Wisconsin was a national leader in the implementation of

youth apprenticeships. Schug and Western found that between 1992 and the 1996-1997 school year, only 1,150 students had participated in apprenticeships and only 347 had completed them. These 347 completers represented about one-tenth of 1% of the number of students in Wisconsin high schools during the 1994-1995 school year.

While no outcome evaluations of youth apprenticeships were found, an extended formative evaluation that identified the main problems involved in establishing such programs was found (Silverberg, Bergeron, Haimson, & Nagatashi, 1996). In 1990, as the interest in youth apprenticeships began to build, the U.S. Department of Labor funded six demonstration projects. In 1992, it extended grants for five of these six and issued 10 more. Data on the implementation of these 15 programs were collected for more than four years. These data showed that the amount of work-based leaning varied widely across the 15 sites. Some provided only job shadowing while others provided two full days per week at work sites. Only three came near the goal of evenly dividing the time spent in school-based and work-based learning.

Despite the variability in work site exposure, most students who participated in youth apprenticeships were positive about their experiences. From interviews and focus groups, the evaluators identified three categories of favorable comments made by participants: project-based learning, program requirements, and premium workplace experience. Under project-based learning were comments about learning in the context of job requirements, the direct relevance of mathematics, working in groups, and problem solving. All of these were much preferred to the traditional academic classroom. Students viewed the requirements for entering and staying in an apprenticeship, keeping a specified minimum GPA, and maintaining high rates of attendance as causing them to work harder in school. The comments classified as premium workplace experiences included the skills students reported learning, which they perceived as giving them an advantage in the labor market. Those who worked for well known companies thought this would add value to their resumes. A study regarding the attitudes of youth apprentices in Wisconsin yielded very similar findings (Scribner & Wakelyn, 1998).

Athough students who participated in the apprenticeships studied by Silverberg et al. (1996) perceived them favorably, the programs had difficulty recruiting both students and employers, changing how students learn at school, ensuring students learn on the job, and reducing costs. Most programs were unable to meet these challenges to the degree that youth apprenticeships became available for large numbers of students. For all but a few, youth apprenticeship is an initiative whose time came and went. It required too much change both by schools and by employers. It was difficult to recruit students and even more difficult to recruit employers who were willing to go beyond minimal types of work-based learning such as site tours and job shadowing.

Conclusions and Discussion

The evidence reviewed in this article cautions that POS are unlikely to produce marked improvements in achievement and transition to postsecondary education. Good Tech Prep programs and career pathways have the components required for POS: rigorous academic and technical content and alignment of secondary and postsecondary instruction with the goal of preparing students to earn postsecondary degrees or industry-recognized certifications. Some of the programs studied, especially by Bragg et al. (2002) and Lekes et al. (2007), were selected because they were judged as among the best that could be found. When comparisons were made between the outcomes of participants and similar nonparticipants of these programs, however, few statistically significant differences emerged, and those that did were usually only a few percentage points. While no rigorous studies of the effects of youth apprenticeships could be identified, the unwillingness of significant numbers of employers to provide skill training makes the issue largely moot. An inference that can be drawn from the short history of youth apprenticeships is that initiatives that require major change in traditional practices have limited chance for wide-scale adoption. Programs of study represent incremental changes that build upon existing structures and offerings, which increases their potential for implementation

If POS are to produce higher achievement and postsecondary completion than their precursors, the academic components of secondary POS must be strengthened. Doing so will realize the hopes for CTE that were expressed in the 1914 *Report* from the Commission on National Aid to Vocational Education and repeated in the 1984 report, *The Unfinished Agenda* (National Commission on Secondary Vocational Education, 1984). Both of these reports carried the message that CTE is pedagogy as much as content. Career and Technical Education is inherently contextualized and can reach many students for whom the abstract nature of the typical academic classroom can be simultaneously intimidating and boring.

For most students, secondary occupational preparation will not provide sufficient skills to enable them to compete for the more rewarding jobs in the labor market. Many CTE high school graduates will need additional preparation that will be acquired at the postsecondary level. Deficiencies in academic skills, however, prevent many of these students from completing postsecondary training (Bailey, Jeong & Cho, 2008). Bragg et al. (2002) and Castellano et al. (2007) documented the high rates of enrollment by CTE graduates in postsecondary developmental courses. Students must complete these courses before studying the occupational skills needed to compete for jobs that offer stable employment and higher earnings.

Enhancing the academic content of CTE courses will require major change in the field; however, the hardest part has already been accomplished. Virtually all CTE leaders have accepted that their programs must reinforce academic skills. The best evidence to support this statement is ACTE's 2006 position paper, *Reinventing the American High School for the 21st Century*. The question is no longer whether

academics should be reinforced but how can academics be reinforced. The way not to do it is to try to resurrect career education or school-to-work. Both of these initiatives primarily impacted CTE and were peripheral to most of secondary education. The review of the short history of youth apprenticeships implies that efforts that require major change in the basic institutions of society have little chance for widespread adoption.

Programs of study are unlikely to have any significant impact upon academic education, but that is not to say that POS cannot enhance academic instruction in CTE. Career and Technical Education instructors can identify the academic concepts that are embedded in their curricula and develop lessons to explicitly teach these concepts. They can, and should, work with their academic colleagues to ensure that they understand the concepts and the best ways to teach them. But they should not attempt to become academic teachers. If they try to do so, they will devalue the technical component of their courses and, in all likelihood, lose their students' interest and engagement.

If what has been described sounds unrealistic, it is not. The NRCCTE conducted an experimental study that did just what has been described to enhance the teaching of mathematics (Stone, Alfeld, Pearson, Lewis, & Jensen, 2006). This study found that teaching enhanced mathematics in five separate occupational contexts yielded differences in academic performance between the experimental and control groups on two standardized tests of 8% and 9%, respectively. These improvements were achieved by spending an average of just 11% of the instructional time in a one-hour, year-long class. And the time spent on these lessons was not all allocated to mathematics; occupational content was also taught. The occupational content was essential to demonstrate the relevance of mathematics.

Such curriculum integration requires a major investment of teacher time. Teachers cannot be given a set of mathematics-enhanced lessons and told to teach them. A follow-up survey of the teachers who participated in the Stone et al. (2006) study in the school year following the experiment was conducted (Lewis & Pearson, 2007). After the experiment ended, the control group teachers were sent the lessons that had been developed for the experiment and some had attempted to teach them. When the control teachers were interviewed about their experiences, they reported considerable difficulty understanding, much less teaching, the lessons. They had not participated in the workshops that identified the mathematics in their curricula or collaborated with mathematics teachers to develop the lessons. These experiences were crucial to an understanding of the mathematics and the pedagogic model upon which the lessons were based.

Extrapolating from the experience in the Stone et al. (2006) study, it is *not* recommended that POS aligned with challenging academics standards be developed and distributed to teachers to implement. It is recommended that CTE teachers be given opportunities to work with their academic colleagues, examine CTE curricula to identify embedded academic content, and develop their own POS. Providing such

opportunities encourages the emergence of communities of practice (Wenger, 1998) among teachers. These communities, in turn, develop a sense of ownership in the POS and a commitment to their implementation. Obviously, these communities will need criteria, templates, professional development, and technical assistance. The review of the state plans (*State Plans for Implementing Programs of Study*, in this issue) indicates that virtually all states will be providing these kinds of support. The critical component is to involve the teachers who will have the final responsibility for delivering the POS in their development.

Evidence has accumulated that one of the essential components of educational improvement is professional development that promotes a sense of community among teachers (Hord, 2004; Leithwood, Louis, Anderson, & Wahlstrom, 2004; Louis, Kruse, & Marks, 1996; Newmann and Associates, 1996; Wei, Darling-Hammond, Andree, Richardson, & Orphanos, 2009). Such communities incorporate what is probably the most enduring finding from decades of small group and organizational research: Individuals are more likely to accept change if they are involved in deciding what that change will be and how it will be implemented (Berelson & Steiner, 1964). In the years since this conclusion was published, several continuous improvement models, including Total Quality Management (Deming, 1986) and Six Sigma (Pande, Neuman, & Cavanagh, 2000), emerged in manufacturing and spread to all types of organizations. The Baldrige National Quality Program (2008) is the most visible example of applications of such improvement models within education. All of these models incorporate methods to involve those who will be affected by decisions in the making of those decisions. The degree to which POS aligned with challenging academic standards will be accepted and implemented by CTE teachers will be determined by the degree to which the teachers are involved in the development of the POS. Maximum involvement will yield maximum implementation, and minimum involvement will yield minimum implementation.

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