Vocational Education and School-to-Work
The Emerging Synthesis

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Work-based education (WBE), including traditional vocational education and other career-focused programs, was an important curricular component in American schools for most of the 20th century. The 1990s was a period of substantial change for work-based education (WBE). Spurred on by a concern about the international competitiveness of the American economy, numerous reform efforts were launched during the decade, many with federal support. The federal initiatives included the Perkins Amendments of 1990, the Goals 2000: Educate America Act of 1994, the School-to-Work Opportunities Act of 1994, and the Perkins Amendments of 1998. In addition, many states and localities developed their own innovative WBE programs.

WBE is at a crucial moment in its long history. On the one hand, there is now a solid infrastructure of new research-based programming in schools as a result of the preceding reform efforts. On the other, this accomplishment is now challenged to adapt to new waves of educational change associated with the standards movement, school

choice, whole-school reform, and the 2001 No Child Left Behind Act (NCLB). There is a need to examine the legacy of the WBE reforms of the 1990s in an educational landscape now largely shaped by NCLB and other initiatives. Educators, parents, and policymakers remain concerned that students not only excel academically but also find satisfying pathways to productive adulthood. WBE has an important role to play in this new environment, and WBE researchers and practitioners must work together to define that role.

Within this context, a national invitational conference, "Vocational Education and School-to-Work: The Emerging Synthesis," was held in Philadelphia, PA, on February 10–11, 2003. Sponsored by the Laboratory for Student Success (LSS), the Mid-Atlantic Regional Educational Laboratory at Temple University, the conference focused on the relation between the school-to-work movement of the 1990s and current vocational education influenced by academic reforms. To frame discussion, the conference organizers commissioned papers from WBE researchers on a variety of topics

that are important for understanding current WBE policy and practice. Educators, researchers, policymakers, and parents were invited to discuss the implications of the papers and to discuss their experiences, concerns, and lessons learned.

The papers and general discussion centered on the role of WBE today, the legacy of the school-to-work movement, and critical issues in the field. Topics discussed included vocational-education reform, the relation of WBE to today's economy, participation in and results from school-to-work programs, the effectiveness of Tech Prep, and the development of WBE leaders. Participants also met in small work groups to explore issues raised in the general discussion and to generate next-step recommendations for linking WBE research to practice and for changing WBE programs so that they play a significant role in the changing educational climate. Groups were asked to make research, policy, and practitioner recommendations, to consider the most significant results of school-to-work programs, and to propose ways that WBE can support the goals of NCLB.

This issue of the *LSS Review* provides a synopsis of those recommendations and summaries of the commissioned papers. In doing so, the issue contributes to a goal that conference participants identified as crucial to improved WBE: dissemination of research and practical knowledge in an understandable form that can facilitate the policies and school-level efforts that lead to successful transitions from school to careers for America's young people.

Next-Step Recommendations

Although not all work-group participants agreed on all points, the conferees achieved considerable consensus on next-step recommendations. Grouped under five headings, the recommendations are as follows.

RESEARCH

Since some of the conference papers presented evidence that vocational education is beneficial and practicable, the conferees recommended further research to explore and better understand the actual and potential benefits of vocational education. For example, research on the variables that influence students' curricular placement decisions should be conducted to deepen understanding of the characteristics of students in WBE programs and to reform WBE so that it best serves all participating students. Moreover, researchers should focus on the relation of vocational education to K–16 education and beyond as a whole, not just on high-school programs. Especially important to study is the effectiveness of connections between secondary and postsecondary WBE in programs like Tech Prep. To identify best practices and models that work, researchers should investigate the impact at the state level of career and technical education (CTE), school-to-work (STW) programs, and youth programs under the Workforce Investment Act (WIA) on educational outcomes.

More assessment of the impact of programs at the student level should also be conducted.

Because vocational education is not currently an educational priority for governments, participants suggested that researchers should look for resources for their studies from private-sector sources, including foundations and corporations. To support the funding of vocational education itself, researchers should explore whether or not, where funding for programs like CTE is lost or reallocated, more children are left behind through increases in dropout and other negative academic effects. Moreover, to supplement their efforts, American researchers should examine research from other nations, which may provide successful models for reforming and sustaining WBE. Researchers should also not overlook the value of WBE practitioners in collecting data on program effectiveness and outcomes.

POLICY AND IMPLEMENTATION

Conferees agreed that research must be linked to vocational-education policy and implementation of programs. For instance, policymakers should use research to develop standards for the evaluation of vocational-education programs. This work would determine which CTE and STW activities should be institutionalized and linked with state standards. Research findings can help policymakers explain to school administrators how the chosen activities help students pass basic skills assessments. It is also important that policymakers work to ensure that vocational programs meet current labor-market demands. Programs preparing students for engineering technologies and other technical professions in which workers are in high demand should be fostered. Since business skills are also in demand, WBE policy should support training in entrepreneurship and financial skills. More WBE programs should be designed to

lead to credentials recognized in the labor market, either postsecondary degrees or certificates and licenses in occupational fields.

Policymakers and WBE educators must look beyond the programs themselves to provide students with connections to careers. To promote effective curricular and career choice, schools should implement K–12 career guidance systems for students and parents. Facilitated by career counselors and vocational teachers, these systems should give students access to career information, including data on relative wages and advice on developing a full set of skills for workplace success. Guidance systems should also promote the notion that all students need to be prepared for work. Furthermore, policymakers and school leaders should advocate increased numbers of internships and mentorships, which have proven particularly helpful for guiding students toward appropriate college and career choices.

Like researchers, vocational-education practitioners face diminished federal and state government interest in the current policy environment. Advocates of vocational-education programs should look for alternative sources of support. Since locally driven programs often work best, advocates should focus on getting local legislators and employers to support programs. Other sources of community support should be cultivated, including parents, who can be effective advocates in the private sector.

ALIGNMENT WITH NO CHILD LEFT BEHIND

Participants observed that educators today are predominantly concerned with reforming school curriculum and instruction to meet the accountability requirements of the No Child Left Behind Act (NCLB) of 2001. Since the act focuses on achievement in academic subjects, vocational education may itself be

left behind if its advocates do not attempt to align programs with NCLB efforts. To the extent that WBE increases school engagement, its demise may presage an increase in student dropouts. Participants proposed several recommendations toward that alignment.

Vocational educators should use their expertise to become active internal promoters of improvements in CTE and other programs linked to academic curriculum instead of merely reacting to the external pressure from NCLB. Schools should take advantage of the opportunity that NCLB provides for solving problems with some vocational programs, such as lack of academic challenge, low expectations, and tracking. School leaders should collaborate with policymakers and researchers in the development of strategies for merging improved CTE implementation with NCLB reforms. Common denominators like the emphasis on math skills in both CTE and NCLB should be found, and CTE courses should be made more rigorous where necessary to help schools and students meet NCLB standards and assessment goals. This work should involve greater integration of academic and vocational curricula.

To raise the academic quality of vocational education of all types and align programs with the goals of NCLB, resources and efforts that are now divided among programs like Tech Prep, STW, and WIA should be combined at the local and school levels. Moreover, to guide the integration of vocational education with NCLB reforms, researchers should provide educators with forecasts of the state of education (such as expected state assessment results) and the economy (such as wages and earnings) in the years during which NCLB is implemented.

DISSEMINATION

Conference participants emphasized that wide dissemination of findings from research and practice is essential to strengthening vocational-education efforts such as WBE that can affect national, regional, and local economies. To facilitate communication of findings, it was agreed that educators and disseminating agencies should work together to develop a comprehensive and consistent vocabulary for describing vocational-education activities and defining the roles of participants. Moreover, it is particularly important that research results showing advantages for students in WBE programs are disseminated to win support for WBE and to increase enrollments. Regional educational laboratories could take the lead in this effort. It is also important that dissemination of results from WBE research and practice includes private-sector leaders as sources and targets of information.

To promote the wider awareness of vocational education in the current policy environment, federal and business representatives should be included in important communications and conferences centered on vocational education. Including them may provide advocates with points of leverage needed to make vocational education a central education reform issue. To that end, one conference work group recommended the innovative idea of bringing together vocational-education stakeholders—education agencies, teacher associations, and business, industry, and labor groups—in one umbrella organization to represent vocational-education efforts nationwide. This organization would establish goals for vocational-education reform and develop a position paper carrying the charge that vocational education is for all students and leaves no child behind. This paper would be widely distributed to reform leaders, especially those in the Congress and the Department of Education.

PROFESSIONAL DEVELOPMENT

University education departments and school district professional development staff should devote more attention to establishing training for emerging leaders in vocational education. Initiatives for teacher and leader training in the private sector should be encouraged. Teacher training programs in universities should encourage new teachers to use career paths as a theme around which to structure academic curriculum. Policymakers and school leaders should actively recruit potential vocational leaders and teachers and support their ongoing training. Legislators in particular should provide fiscal supports for the professional development and certification of vocational leaders and teachers. Advocates of vocational education should work to make career-related teaching seem attractive to talented educators. In light of the need to integrate vocational and academic curricula, it is especially important to encourage teachers with high academic credentials to gain certification as vocational educators.

CONCLUSION

The conference papers, general discussion, and work groups all pointed to the conclusion that vocational education, especially when it is linked to academic standards such as those mandated in NCLB legislation, can benefit students' academic learning and help prepare them for lifelong success. Increasing knowledge among policymakers and educators about effective vocational-education practices is both achievable and necessary. Strengthening the links between evidence-based research and vocational-education programs can benefit both students and all those in the school and larger community who share the responsibility for helping them make the transition from school to work. ⌘

Overview of Work-Based Career and Technical Education in the American High School

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The terms work-based education (WBE) and career and technical education (CTE) both describe high-school coursework in which the performance goals include work-related skills as well as academics and the outcome goals include successful transition to work and higher education. This paper reviews the history and context of high-school WBE programs, describes the characteristics and extent of programs today, and examines WBE teachers and students.

History and Context

Work-based education has significant historical foundations. Before the 20th century, high school was not widely attended and featured only one academic curriculum for privileged children. However, increasing numbers of working-class children began to attend high school in the 20th century, presenting educators with a problem. These students were bound for work, not college; the academic curriculum was largely irrelevant to them. The solution was to divide the curriculum into academic and vocational programs. Some argued that it would be more democratic for all students to follow an academic program; others recommended integration of academic and vocational curricula. The debate over the value of this division continues.

Work-based education views students as individuals; thus one curriculum cannot appeal to all. The common academic curriculum, in contrast, focuses on what is best for all students. Work-based education exists in a complex context that includes problems such as poor academic skills and high dropout rates as well as reform strategies aimed at solving the problems. Most national and state reform efforts now focus only on academic skills and high-stakes examinations. Although WBE practitioners have argued that increased testing and coursework requirements decrease the time available for electives and thus reduce CTE enrollment, research suggests that instead, CTE students take more academic courses.

The emphasis on academics influences postsecondary plans. Most students plan to get a 4-year college degree and pursue a professional career. Of respondents to a 2001–2002 survey of 4-year college freshmen, only 4% of males and 1% of females indicated plans for a nonprofessional technical career. Despite their preference for post-secondary education, in reality a third of students go to work after graduation. Further, while college enrollment has risen, college success has not. The 6-year graduation rate at Division-One universities is about 50%. High-school dropout also remains a national concern. Between the 8th and 12th grades, one in every four students drops out. Among Hispanic American students, the dropout rate is estimated to be almost one in two. These students are least likely to be enrolled in CTE, which is associated with lower dropout.

The present workforce context suggests a need for technical training. Professionals with 4-year degrees are generally assumed to be the largest group needed in the high-skills/high-wage workforce. However, technicians are in equal and, in some fields, greater demand. While firms recruit professionals like engineers nationally or internationally, they look for technicians locally. Regions without a growing technically trained workforce will have difficulty supporting high-value businesses.

Learning theory indicates that technical training is essential. Most high-school instruction is based on the assumption that knowledge can be learned apart from practical context. Yet cognitive research finds that knowledge learned out of context remains unusable and is quickly forgotten. Classes taught in decontextualized modalities are effective only for a small number of students. For most students, skills and knowledge are best learned within realistic situations.

Work-Based Education Today

An important characteristic of WBE today is that it is elective. While most states have mandated graduation requirements, these typically do not include WBE courses. To follow a WBE curriculum, students must commit to more courses and effort. The teen in the academic middle may find it easy to decline WBE. A second important characteristic of WBE is that most of its funding is local. This money is difficult to raise; public pressure holds funding constant. Programs without sufficient enrollment are eliminated. Reformers must ask whether students will elect WBE programs, because if they do not, local school districts will not offer support. Reformers must focus on how programs can be improved while remaining interesting. Faced with current proposals for WBE as a modality to teach academics, not occupational skills, WBE professionals worry about students' reactions to these changes. The enrollment decline in technology education suggests that students do not enjoy applied math and science coursework that lacks vocational content. Practitioners feel that such unappealing curricula may destroy WBE.

High-school WBE is extensive. One fifth of credits earned are in WBE coursework. In 1998 the average number of CTE credits completed was 3.17. Students who elect CTE courses can be divided into two groups: those who take CTE courses as electives to gain skills, and those who take at least three related courses in a single labor-market area. These students, called "concentrators," make up one quarter of the U.S. high-school population. The number of CTE credits earned declined in the early 1990s, mostly because of economic trends leading to a consensus that academic coursework was required for college and economic security. Since the mid-1990s, however, CTE course taking has increased, particularly in trade/industrial and health occupations.

Teachers and Students in Work-Based Education

About 25% of secondary teachers are CTE teachers. Of these, 79% teach in comprehensive high schools, the rest in vocational high schools. In comparison to academic teachers, CTE teachers are older and more often male. Because in most states, certification in trade/industrial, law enforcement, and health fields requires work experience, not academic degrees, 16% of CTE teachers lack degrees. Generally, however, states have made certification requirements more rigorous. There is also a shortage of both academic and CTE teachers, but the stakes are higher for CTE, since inability to fill a vacancy can lead to program elimination. Meanwhile, university programs offering CTE certification have declined. Of the 432 institutions offering CTE programs in the 1980s, about two thirds remained by the 1990s, often in consolidated form. An important effect of this reduction is that certifying institutions can no longer offer a variety of discipline-specific programs.

In a 1998 study, 70% of high-school graduates completed an academic concentration, 20% a combined academic and CTE program, 4% a traditional CTE-only concentration, and 6% no concentration. Males were more likely to complete both a combined and a traditional program. African American students were significantly underrepresented in traditional programs. Hispanic American students were underrepresented in both academic and traditional concentrations. Similar percentages of academic and combined program students take a 3-year math and science sequence. Considering that combined-program students also take about 6.5 credits of CTE, this similarity is unexpected.

Curricula including CTE positively affect student performance and outcomes. In the 1998 study, traditional CTE students were the worst prepared for high school, while academic students were the best prepared. Significantly, while academic concentrators entered high school better prepared than combined concentrators, the achievement gap was small or insignificant by graduation. Traditional CTE students graduated with the lowest achievement. Moreover, employers are generally satisfied with the skill levels of CTE graduates. The probability of combined-program graduates going on to college is 60%. These students have a higher GPA and are more likely to persist in their freshman year than most high-school students. Students who complete a CTE concentration and pursue related employment earn higher wages and experience less unemployment. Further, taking CTE courses is related to persisting to graduation, with the relation maximal at a ratio of 3 CTE credits to 4 academic. Most important, this dropout-prevention effect was strongest for those students at greatest risk of dropping out at

entry to high school: those with test scores and GPA at entry one standard deviation or more below the mean. For most youth with special needs, who earned 43% of vocational credits in 1992, CTE is a beneficial curriculum.

Research suggests, then, that CTE teaches the academic skills valued in current education policy. Nevertheless, there is room for instructional improvement. In typical CTE classrooms, teachers miss opportunities to teach and reinforce communications, math, and science principles. Particularly when teachers lack advanced degrees, the academic skills they are asked to teach are those they have never formally studied. In one survey, 35% of CTE teachers indicated they needed math instruction. Half needed help teaching science concepts, integrating communications skills in their classes, and aligning skills with state standards. Fully 80% indicated not receiving staff development in these areas.

Conclusions

This overview indicates that WBE is a helpful alternative for some high-school students for whom an academic program is inconsistent with interests, aspirations, or learning style. Reformers must improve WBE so that it remains an attractive alternative for a critical mass of students. The stereotype of a CTE student as academically backward is generally not true. While CTE students enter high school less academically qualified than their peers, they show no achievement gap at graduation. Following a CTE curriculum reduces dropout risk, and two thirds of those CTE students who also take an academic concentration proceed to college. Policies to improve teacher training and local program support are needed to ensure that WBE can continue contributing to student success. ⌘

Developing the Next Generation of Leadership in Work-Based Education

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The greatest challenge facing work-based education (WBE) is the development of the next generation of leaders. The number of experienced WBE leaders is declining because of retirement of career-and-technical-education administrators, lack of coordinated policies for recruiting and developing leaders, and economic and social changes, like the increasing importance of information technology, that make the future role of WBE leaders uncertain. Meeting this challenge requires promoting the development of WBE leaders who can see the future, identify future workers' needs, and implement educational reform. Promoting WBE leadership also demands a learner-centered, interactive model of leadership development.

The development of WBE leaders is influenced by the Perkins Vocational and Technical Education Act Amendments of 1998 and the No Child Left Behind Act of 2001. The Perkins amendments require states to identify core indicators of student attainment of state-established vocational and technical skill proficiencies, attainment of related credentials, and placement in and completion of postsecondary education, advanced training, or employment. The No Child Left Behind legislation focuses on strengthening accountability for results, increasing flexibility and local control, expanding school-choice options for parents, and emphasizing proven teaching methods. Both these laws are intended to ensure equal educational access, promote educational excellence, and help close the academic and technical skills gap between disadvantaged minority students and the majority.

Effective WBE leadership plays an important role in achieving these intentions. To increase understanding of WBE leadership development in this context, this paper examines methods of delivering leadership development programs, suggests content for such programs, and describes an exemplary program. The paper concludes with recommendations for implementation and policy support of programs.

Methods of Delivering Leadership Programs

Several approaches to delivering leadership programs are currently available. The first is the widely used face-to-face approach, which includes regularly scheduled meetings through which potential leaders develop their leadership skills. Many postsecondary institutions offer face-to-face leadership programs for teachers and administrators. As of 2001, 25 states offered a statewide leadership academy, consortium, or institute. Twenty-two of the programs are for principals and superintendents; some of these are also open to teachers and staff members. Successful completers of statewide programs generally receive a certificate from the sponsoring agency. A more recent approach has been to deliver leadership-development programs online, either synchronously or asynchronously. Programs offered through this approach vary from short one-time sessions to integrated programs of several sessions with relevant learning activities. The increased availability of computer technology has made it possible to combine the face-to-face and online delivery methods.

Content of Leadership Programs

The content of programs to train WBE leaders is influenced by current issues in education, including decentralization, educational options, accountability, and reconfigurations in learning environments. Recommended content for training of WBE leaders has been identified. State leaders should learn to work collaboratively in a political environment, balance multiple priorities, manage resources effectively, advocate WBE, and promote accountability. College and school WBE leaders should learn to build coalitions, master technology, tolerate ambiguity productively, understand multiculturalism, and develop vision, confidence, courage, and judgment. The following program delivers such content for WBE leaders nationwide through a combined face-to-face and online approach.

National Leadership Institute

In 2001, the National Center for Career and Technical Education established the National Leadership Institute. The 2001–2002 program consisted of 33 scholars from 11 states, and the 2002–2003 program includes 25 scholars from 13 states. Each scholar in this nondegree program must develop an individual leadership plan for enhancing leadership capability and achieving career goals. The 12-month program includes face-to-face meetings, online meetings via distance technology, the leadership plan, mentorships, internships, and thought-provoking readings and discussion.

The institute helps current and future WBE leaders plan and implement effective programs, create conditions for high learner achievement and skill building, meet political and financial challenges, lead educational reform, use research and evaluation effectively, engage in continuous learning, and understand leadership. The program addresses five major themes. First, leaders develop leadership capability through training in leadership philosophy, style, and skills and in perpetual learning. Second, leaders learn to establish a

vision and mission for WBE through workforce development, academic achievement, and evaluation and accountability. Third, leaders address issues related to leading change, including change processes and education reform, establishing and monitoring partnerships, risk taking, conflict resolution, and new models of career and technical education. Fourth, leaders study aspects of policy development, including decision-making processes, legislative and budget processes, high-impact communication, networking, and influencing policy. Finally, leaders develop cultural understanding, learning about diversity and pluralism, ethics, civility, and globalization.

Recommendations for Implementing Leadership Programs

Candidates for WBE leadership programs should have a passion for excellence and a willingness to take risks. Candidates should be committed to high achievement, actively seeking new and creative ways of implementing WBE and solving problems. To encourage network development and mutual support, the number of participants in a leadership program should not exceed 35. Participants should collaborate in cohorts to develop group relationships, balance group and individual growth, provide a challenging learning environment, and effectively address tensions that arise.

Leadership programs should focus activities on a specific vision for WBE that acknowledges the importance of WBE in preparing students for the workforce. Programs should focus on key themes and emphasize action learning in which participants work together on real problems or case studies that address the challenges in WBE today. Programs should also include meetings with state and national leaders and discussion of strategic agendas for advancing WBE.

Individual leadership plans are crucial to program success. The plan should feature each participant's vision for WBE and an action plan that includes goals, areas of development, barriers and facilitators, resources, a realistic timeline, and opportunities for evaluation and reflection. Mentorships and internships should be key components of leadership plans and implementation. Formal mentorship agreements should define the goals, activities, resources, outcomes, and timeline for the mentorship. Internships should engage participants in experiences beyond their current leadership position in order to move them to a higher level. Those completing internships should prepare an evaluative report reflecting on their experience.

In general, leadership programs should provide challenging learning experiences, opportunities for written reflection on learning and clear feedback about performance. Programs should provide resources and rewards to facilitate achievement of goals. Finally, programs should evaluate their effectiveness through data from participants and program leaders.

Policy Recommendations for Leadership Programs

To develop a high-quality and economically competitive workforce, the United States must have effective WBE leadership programs. To that end, coordinated policy is needed from the national to the local level. At the national level, Congress should further amend the Perkins Act to provide awards for graduate education of WBE educators. Perkins should also provide awards for individuals selected to participate in national noncredit WBE-leadership programs and fund mentors and internship supervisors for such programs. The Office of Vocational and Adult Education should develop regulations to enhance training for WBE teachers and should sponsor conferences that address the concerns of WBE leaders. Moreover, national education associations like the Association for Career and Technical Education should support leadership programs through activities such as conferences and special studies. Associations should work with the private sector and with national governmental groups like the National Governors Association to promote legislation supportive of WBE.

In states, legislatures should fund postsecondary WBE leadership curricula and other innovative training programs. To increase the supply of WBE leaders, legislatures should provide education incentives such as scholarships. Furthermore, state education agencies should sponsor conferences on WBE leadership and activities that train WBE leaders in current topics such as career academies and integration of academic and technical skills. Agencies should also identify and nurture WBE teachers with potential to become effective leaders.

At the local level, diverse groups like community colleges and businesses should form partnerships to conduct WBE leadership development. Schools and districts should provide WBE teachers and administrators with time and financial assistance for participating in leadership development. University researchers should focus more attention on best practices in leadership programs and effective recruitment of leaders from diverse populations. Business and labor organizations should fund WBE leadership programs and provide educational opportunities such as internships. Business and labor leaders should serve as speakers in WBE leadership programs.

All stakeholders should collaborate to promote WBE leadership. If education for the workplace is to keep pace with rapid economic and social changes, it needs strong leaders. With effective training programs, WBE leaders can acquire the skills that will in turn raise the skills of the American workforce. ⌘

Work-Based Education and Reform

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The vocational-education (VE) community responded reactively to the 1983 report, *A Nation at Risk* (NAR), and to the academic reforms it engendered. The community pursued a separatist approach to reform. In doing so, it committed a strategic error. By laying particular claim to students it deemed non-college-bound, the community validated the traditional view of VE as exclusively for children at the socioeconomic margins. VE reform rejected academic literacy in favor of workplace literacy in which affective skills such as teamwork are valued and academics are limited to basic skills. Thus VE remains at the curricular margins in schools, while calls within the field for integrating academic and vocational knowledge go unheeded. This paper considers the context of VE reform and discusses the reaction of the VE community to two waves of reform following NAR. It explores the implications of curricular tracking and proposes reform that offers vocational literacy to all students.

Reform Context

For most of the 20th century, VE was an alternative to the dominant academic curriculum. The curricular paths were separated after the debate on VE between John Dewey and David Snedden. Dewey argued that VE should lead to critical citizenship and that curriculum should focus on general vocational knowledge for all. Snedden argued that VE should lead to jobs, that curriculum should focus on job-specific knowledge, and that students' occupational potential should determine their curricular path. Job-specific VE has persisted, although the conditions justifying it have disappeared. The industrial economy supporting VE has metamorphosed into today's information economy requiring knowledge-based work and workplace dispositions such as cooperativeness and adaptability.

In this context, does the vocational track still provide adequate workplace preparation? Those technical skills that are still important can and sometimes must be gained through college programs and industry apprenticeships. High-school VE on the old job-specific model seems insufficient and unnecessary today. Meanwhile in Europe, a reform movement toward a "new vocationalism" has developed, featuring emphasis on combining academic and technical curricula. The new vocationalism is not part of mainstream reform in America. However, the 1998 Perkins Act Amendments did stipulate that vocational programs improve both the academic and technical skills of participants. The new-vocational emphasis on curricular integration was thus established legislatively, moving VE away from Snedden's view. Yet Dewey's conception is far from being achieved.

First-Wave Reform

NAR argued that global economic competitiveness demanded greater academic rigor for all students. Connections between academics and the economy characterized the first wave of reform following NAR. Schools strove to bolster academics, and enrollment in VE consequently declined. Vocationalists reacted by arguing that VE complemented academics. The 1980s saw a sharp change in VE, with education for jobs being supplanted by education for broader ends. A national commission made the case for continued public-school VE by arguing that an academic focus harmed students not bound for college. The commission suggested that VE address nonacademic goals such as personal attitudes, communication skills, employability skills, and career planning. It is difficult to distinguish aspects of first-wave vocational advocacy driven by genuine reassessment of the nature of VE from those that were defensive and self-serving. One must question whether reform advocacy offered students unique skills compensating for the opportunity costs of foregone academics. It is unclear whether the goal of providing students with general skills instead of job skills was beneficial. Far from beneficial was the avoidance of issues of curricular segregation. In this period, VE increasingly became a curriculum for the socioeconomically marginalized. VE researchers and educators generally remained silent on this score.

Second-Wave Reform

By the 1990s, arguments against academically focused reform of VE gained momentum. In a second wave of reform, consensus emerged that global competitiveness could be increased by improving not academic literacy but workplace literacy. Focusing on workplace literacy and building on the idea that schools should support the non-college-bound, VE developed its nonacademic version of reform distinct from mainstream reform. This wave derived legitimacy from commissions that recommended workforce skills and from Tech-Prep initiatives geared to workforce training. Reformers did address academic-achievement issues by advocating applied academics and curricular integration, but they failed to address vocational tracking of the marginalized. While this separatist reform wave was premised on the idea that most students were non-college-bound and thus needed work skills, it claimed academic respectability through curricular integration. Meanwhile, the academic standards for vocational students remained low.

Curricular integration was a fundamental element of vocational legislation in this period. Analysts praised the goal of integrating academics and VE but questioned whether it could be achieved through legislation alone. Comprehensive, effective curricular integration would require systemic restructuring through whole-school reform. Despite its rhetoric, second-wave reform left VE a vehicle for segregation, not integration.

Tracking

Admittedly, the decades of reform since NAR have been a period of creativity in VE. New forms of schooling such as career academies were developed, new articulations of secondary and postsecondary education suggested alternative pathways for the underprivileged, and new theories such as critical pedagogy were explored. Yet despite these efforts to bridge the academic–vocational divide, schools continue to structure curriculum in inequitable ways. If academic and vocational teachers planned curriculum jointly, students could see correspondences between subjects, and effective integration with academic and vocational knowledge would be possible. But existing curricular integration largely involves applying academic knowledge in vocational courses, burdening vocational teachers without raising the low status of their courses.

To provide an effectively integrated curriculum, schools would also have to abandon segregative tracking practices. Separatist reform ensured the survival of VE but also reinforced the separation of students into different curricula and career paths. Emphasis on workplace literacy allowed employers' needs to dictate what students learn. Though employers claimed to need highly skilled workers, they disregarded highly academic skills like foreign-language mastery. Instead they encouraged modest academic accomplishments and strong social skills. Abandoning tracking would mean revising this relation between schooling and employer needs.

Although vocational researchers ignored tracking, social scientists analyzed it extensively. Many identified VE as the primary instrument of continuing segregation in schools. The negative consequences of tracking minorities were well documented. African Americans typically receive socially undesirable curricula—general or vocational tracks leading to menial social positions. Minority students are often placed in low-status courses despite superior test scores or grades. Students placed in low-ability curricula tend to remain there in subsequent years. This problem seems impervious to reform. A study of tracking in high schools with different levels of African American enrollment found that established school procedures existed for using achievement scores and teacher recommendations to make tracking decisions. A belief prevailed that students' educational prospects cannot improve after they begin high school. Thus tracking was viewed as merely accommodating the student characteristics.

In schools that have attempted to de-track, parental resistance associated with privilege has arisen. One study concluded that some parents resisted de-tracked classes for fear that racial mixing would result, reducing the power differential they wished to maintain between their children and minorities. Parents sustained leverage over curriculum by the threat of flight. These findings support the argument of education critics that schools assign superior status to the knowledge of the socially privileged. Some critics propose solving this inequity by encouraging working-class parents to find ways to gain power. Others contend that legal action against tracking is appropriate, because in tracked curricula, educational opportunities are not equal to the extent required by law.

Vocational Literacy

Although Dewey's ideas are often cited as the theoretical basis for current vocational reform, its separatist practices oppose his vision of comprehensive VE for all. Reform has approached Dewey by recommending connections with academic subjects, but its tracking practices are precisely what made Snedden's view of VE revolting to Dewey. The VE community is wrong to resist broad academic reform. When schools are pressured to improve the academic performance of all students, those children traditionally left behind in VE classes benefit. Large numbers of students in nonacademic tracks are capable of improving their performance if given better opportunities to learn. Further, by holding all students to high achievement standards, academic reform can encourage schools to abandon tracking. Academic standards motivate schools to find alternative strategies that help all students excel.

In a de-tracked curriculum, VE would function chiefly as education about work. Offered to all students, it would feature reformulated curriculum based on what students need to know and experience about work to prepare them for responsible and critical citizenship. This curriculum would inculcate *vocational literacy* synthesizing knowledges, experiences, and dispositions learned through activities pertaining to work. The curriculum would highlight collaborations across disciplines and combine academic and vocational knowledge through contextualized learning. Activities could include modules on pertinent topics such as "Inside the Computer," structured work-related projects, and actual work experiences. Efforts to increase vocational literacy would be neutral to race, socioeconomic status, and probable student destinations. If VE is to survive amid persistent calls for increased academic rigor, it must pose intellectual and creative challenges for children across the spectrum of abilities and interests. ⌘

Curriculum and Learning in Work-Based Education
Implications for Education in the New Economy

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In recent decades, the most popular work-based education (WBE) programs in Canada have been co-operative education (co-op). These programs consist of credit courses for 11th- and 12th-grade students, with in-school and (typically unpaid) workplace components. This paper examines recent developments in WBE in Canada. The paper analyzes the academic/vocational dualism in secondary education as a threat to WBE, explores education reform related to WBE, and considers the knowledge economy into which graduates move. The article also shows the insufficiency of a skills emphasis in preparing students for that economy and offers knowledge-economy thinking and entrepreneurship education as alternatives. Curricular and research recommendations are also offered.

The Basic Dualism

By offering a route different from that leading to postsecondary education, WBE has reinforced a longstanding dualism in education between academic and vocational curriculum. The dualism is unbalanced, mirroring the higher social status given to theoretical knowledge than to technical knowledge and vocational practice. So pervasive is this privileging that assessments of WBE are frequently based on academic indicators, reinforcing the dualism. Thus programs are viewed as valuable when they help students maintain good grades and take difficult courses. The privileging extends to Canadian universities, which often do not accept high-school co-op credits. The emphasis on the academic pole of the dualism overlooks the point that education must ultimately prepare all students for the world of work.

Reform Efforts

Two Canadian provinces have initiated curriculum reforms to improve the school-to-work transition, but research suggests that these reforms have met with little success. British Columbia implemented an applied academics curriculum to integrate academic and occupational education. However, the content was less rigorous than that in the competing academic courses, and enrollment declines have rendered the reforms nonviable. Ontario also introduced reforms, including a more demanding 4-year curriculum (replacing the province's 5-year curriculum), a required career studies course, and a teacher advisor program (TAP) including career planning. Co-op was recommended for all students.

Studies of the Ontario reforms have reported distressing results. The more challenging 4-year curriculum resulted in fewer credits being awarded, especially in mathematics. New WBE courses were hampered by small enrollments and lack of facilities. Moreover, the 4-year program decreased opportunities for students to participate in co-op, although a chief aim of the reform was to enhance such programs. In one study, only 15.2% of students indicated they were taking or intending to take co-op. Of those not taking the program, 33.6% cited inability to schedule it, and 8.1% cited fear that co-op would prevent their graduating in 4 years. Additionally, the TAP program appears ineffective, with students rating TAP as less important than parents and friends in influencing career plans.

Standardized testing with published results has been implemented in Ontario at the same time as WBE-related reform, making classroom teachers reluctant to grant to career education time otherwise available for academic work. Researchers have argued that these practices decrease the likelihood of implementing reform elements designed to meet nonacademic expectations. The province has not prepared teachers to understand how career-preparation experiences differ from traditional academics. Because teachers know academic subjects best, they understandably stay with what is most familiar under the uncertainties of reform. To change this trend, teachers need to be given increased exposure to workplaces other than their own. Curricular change seeking to redress the academic/vocational dualism will flounder unless teacher education programs help teachers understand the need to abandon the dualism. Further, curriculum integrating WBE and academics requires assessment measures that honor the changed nature of learning and that help students meet the challenges of the knowledge economy.

The Knowledge Economy

The term "new economy" or "knowledge economy" encompasses economic activities that rely on information and communication technologies and related innovations in production, finance, and work. The imperatives of the new economy and WBE reform are related. Research shows that the educational bar is higher for job seekers in this new, knowledge-based economy; high-quality education preparing students for rapidly changing workplaces must be provided for all. Schools must foster innovative knowledge in the workplace. This demands both ending the academic/vocational dualism and embracing WBE for all students. Education must move beyond old-economy thinking that assumes that formal knowledge can be readily transferred to workplaces. This rationalist view must give way to recognition that the new economy demands experiential knowledge.

The Skills Response

The shift to the knowledge economy has increased demand for highly

skilled workers. Employers' declarations that many entering the workforce lack necessary skills have prompted responses to address the skills gap. One such response has been the development of essential skill profiles to increase employee productivity and skill portability. A second response has been development of skills sets related to employability. In 1991, the Secretary's Commission for Achievement of Necessary Skills (SCANS) identified fundamental skills and workplace competencies needed by American workers. In Canada, the Employability Skills Forum produced tools for enhancing employability in three skill categories: fundamental, personal management, and teamwork.

Unfortunately, there is little evidence that these responses have succeeded. Employers require highly context-dependent skills. A skills-list approach to developing curriculum overlooks the importance of context in today's economy. Workers must adapt to new circumstances and acquire new skills throughout life. Further, workers must do more than perform rote skills; they must participate in team projects and take responsibility for end products. This work requires not a greater number of occupation-specific skills but a greater ability to function in work systems that demand varied skills and autonomy. Today's workplace features a less hierarchical management structure with more decisions made by workers, yet the educational system preparing them for work remains hierarchical, unable to train workers to anticipate and respond to rapid change. A skills focus, then, has little point in school-to-work curriculum. We need a curriculum that helps students learn in the workplace how to use and adapt skills in response to change.

Knowledge-Economy Thinking

Curriculum thinking must match knowledge-economy thinking.
Predictability, an idea basic to curriculum planning, must be questioned. Given unpredictability in the new economy, curriculum thinking should stress change and uncertainty. Yet certainty can be found at a different level. An analysis of work demonstrates the prominence of routines. We can improve workplace preparation by introducing WBE students to ideas about routines, the ways they differ in context, and the questions learners can ask about them. The concept of routines can be taught, and being metacognitive about routines gives structure to workplace learning. When we teach students to identify generalizable functions of routines, we engage in metacognitive instruction that invites them to analyze their own work routines, enhancing their learning at work. Further, analysis of the meaning of changes in routines situates unpredictability in the curriculum, preparing students for the nonroutine demands of the new economy. Transferability is not at the level of routines themselves but of recognizing when the nonroutine must be anticipated. This nondualistic view of education acknowledges that all learning is aimed at *doing* that is intimately related to understanding. High-school education should thus be considered prevocational: helping students develop an active, anticipatory stance toward work.

Entrepreneurship Education

High-school WBE should consider the importance of small and medium enterprises (SMEs). As of 2000, 43% of Canadian private-sector GDP was attributable to SMEs. In the last decade, self-employment accounted for 80% of job creation in Canada, and research shows a positive correlation between business start-ups and economic growth. Schools should provide experiences that develop the sense of entrepreneurship crucial to the success of SMEs. Being entrepreneurial means knowing how to learn, adapt, and innovate in the knowledge
economy. Entrepreneurship education teaches students about starting and running businesses and about entrepreneurial skills such as creativity, adaptability, and risk management. Entrepreneurship education reflects the ideals of a new vocationalism for all students, and it should be an essential component of WBE.

Recommendations

The dualism in secondary curriculum should be rejected. Much of life after schooling is vocational, so secondary curriculum should be prevocational, emphasizing career education and entrepreneurship education. Moreover, high-school curriculum should be reformed to balance authenticity and academic intensity. Authentic, experiential course content prepares students for flexible, innovative thinking in the knowledge economy. For successful reform, WBE courses must be accepted as appropriate preparation for university entrance. Parents must be persuaded of the academic intensity available in WBE, and teachers must gain experience in the world of work beyond school walls. Finally, workplaces must offer appropriate scaffolding so that high-school students can maximize the value of their WBE placements.

These curricular reforms require systematic investigation. Further research on instructional relationships in workplaces should help determine how WBE provides students with transferable knowledge. Research should also consider the literature on adult workplace learning, which focuses on issues relevant to WBE such as mentorships. Further, the lessons learned from recent school-to-work reform efforts in Canada suggest that more research should investigate how to make implementation effective. Researchers, parents, teachers, and employers must collaborate to make high schools more anticipatory of the demands of the new economy facing high-school graduates. ⌘

Assessing the Premise and the Promise of School-to-Work

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The 1994 School-to-Work Opportunities Act (STWOA), motivated by the early labor-market instability experienced by some youth, aimed to provide a more effective transition from school to stable employment. Researchers claimed that early instability is costly and supported STWOA to impose more order on transitions to careers. Now that STWOA funding has ended and states are deciding whether to continue support of existing programs, it is appropriate to assess available evidence on the effectiveness of school-to-work (STW) programs. Two central questions arise in this assessment. One concerns the *premise* of STW—whether unstable early labor-market experiences hinder long-term economic success. The other concerns the *promise* of STW—whether programs are effective. The paper discusses the premise and promise, examining the effects of early labor-market stability on adult outcomes and the effectiveness of STW programs, and offers conclusions and directions for future research.

The Premise

Contradicting the premise of STW, labor-economic data offer compelling evidence that workers receive advantages from transitions through a variety of jobs. A study using data from 1957 to 1972 showed that one third of wage growth for males during the first 10 years in the labor market was attributable to job changing, as workers learned about aptitudes and interests by trying different jobs. The returns to this "job shopping" suggest that funneling workers quickly into long-term jobs could prove counterproductive for those who may otherwise have found better job matches. The STW premise would be strengthened by statistical evidence that youth with early unstable employment suffer long-term consequences. One important difficulty is that research on this question must grapple with the possibility that early job stability and adult wages are determined by common factors unobserved by researchers, confounding estimation of any causal relations between them.

The Promise

Numerous obstacles have hindered determination of the effectiveness of STW programs in improving adult labor-market outcomes. Large, representative data sets on STW programs have been unavailable. Establishing causal relations between programs and outcomes is difficult because individuals typically choose to participate, making the cause of the outcome—program or individual characteristics—hard to determine (a statistical problem called "endogenous selection"). The goals of STW are difficult to quantify. Researchers can finally address some of these obstacles, because the 1997 National Longitudinal Survey of Youth (NLSY97) makes it possible to study the impact of STW programs on early transitions from school while at least partially accounting for selection.

Examining the Premise

Two earlier studies have linked early labor-market experiences to later outcomes. One found that early mobility (during the first 2 years in the job market) is associated with higher wage growth. The other found considerable early mobility from low-wage jobs to high-wage jobs, with little mobility in the other direction. Both sets of results suggest that early job-market stability is not necessarily advantageous. The analysis of the premise of STW reported on here differed from those studies in making long-term connections between early and adult labor-market experiences and in accounting for the influence of unobserved worker characteristics and of endogenous determination of the relation of early stability to later success.

The data set for the analysis was NLSY97 for 1979–1992. In the 5 years (in windows from 1979–1983 to 1983–1986) following labor-market entry, transitions from entry to steadier employment were observed. Entry was regarded as the first year in which individuals no longer reported schooling (other than at 2-year colleges, where many obtain training during early employment). The analysis focused on two characteristics measuring stability, longest job tenure and number of employers during the 5-year window. To study adult outcomes, data for one of the years from the 1990–1992 period were used.

Examination of outcomes centered on adult wages. The only indication of a positive effect of early stability on adult wages was for the number of employers. Longest job tenure was negatively related to wages. A potential source of bias in the analysis was unobserved, ability-related worker characteristics that could influence wages. If high-ability individuals had stronger returns to job shopping, then they might change jobs more frequently, biasing the results negatively. Thus ability indicators—test results and parent education—were used to control this bias, but they had no appreciable impact on the findings. Further, when possible bias resulting from good early job matches linked with higher wages was accounted for, the relation between number of employers and adult wages became insignificant.

The analysis also considered effects of early stability on the employee benefits most strongly

associated with good jobs—health insurance and pensions—and on the probability of holding a full-time job. For men, longest job tenure was positively related to receiving health benefits; for women, tenure was positively related to both benefit types. For both genders, there was no significant relationship of benefits to number of employers or of full-time employment probability to either stability characteristic. There was thus no strong association between early stability and good adult jobs.

A potential source of negative correlation between stability and adult wages was unobserved heterogeneity in the returns to search, such that those with higher returns would both exhibit less early stability and search more successfully, generating the negative correlation. This factor was as problematic as overstated positive correlations due to good early job matches. To control for these factors, youth labor-market conditions—unemployment rates from the entry years—were used as instrumental variables (IVs) for early stability. Where the IV estimation was informative, results indicated strongly that both characteristics of early stability improve adult wages. While evidence of gains from early stability fortifies the premise of STW, it does not address their effectiveness, which must be assessed directly.

Examining the Promise

Evidence that STW programs improve labor-market outcomes is weak. Many studies do not construct reasonable comparison groups or consider selection bias. Even studies with good comparison groups find only limited short-term labor-market benefits. Benefits of some programs dissipate over a few years, as comparison-group members find good jobs. A recent report on STWOA does not even attempt program evaluation, arguing that STW implementation has been too broad to distinguish between participants and comparison groups. One exception to this dearth of rigorous evidence is the recent Manpower evaluation of career academies. It showed no impact of academies on high-school graduation, postsecondary education, or early employment.

Educators and administrators may have the most current evidence of STW effects. To assess STW effectiveness at this level, a case study was undertaken in Michigan. The current incarnation of STW in Michigan is the Career Preparation System (CPS), with goals parallel to those of STWOA. Elements of CPS that developed from STWOA are career pathways and education development plans for secondary students. The case-study strategy was to interview state and local STW educators and administrators regarding STW in Michigan and find evidence on the effects of STW on youth education, employment, and career decisions. Interviews revealed that the state and localities have gathered little useful information for assessing STW. The state does collect data on vocational-education graduates to determine links between their education and current job or schooling. However, the surveys provide no comparison groups or selection controls. Similar problems arise in local efforts. Little convincing evidence of the effectiveness of STW in Michigan could be found. Such evidence may exist for other states, and effectiveness studies there should be supported.

Without random-assignment experiments, difficult to implement for STW initiatives, longitudinal data are likely to be central in assessing STW effectiveness. The present analysis used NLSY97 data to that end. NLSY97 provides survey data on high-school participants in a range of STW programs. Outcome data are limited to effects of STW programs on students' subjective assessments of future schooling and work. Participants could not be studied as if they were randomly assigned to programs, so selection bias was controlled for. Results did not show that STW participation affected likely college attendance. There was slight evidence that participation influenced intentions of getting a high-school diploma, expected work at age 30, and intended degree of labor-market involvement the year following high school. Research is now under way to assess how well these subjective expectations accord with behaviors observed in later NLSY97 surveys.

Conclusions

Some support exists for the premise and promise of STW. Some adult labor-market gains result from early job-market stability. Insofar as STW can increase that stability, it may improve adult outcomes, but STW assessment has proven difficult. Perhaps the strongest evidence is the association of STW participation with greater expected labor-force commitment. More reliable evaluations of STW programs are needed. Given the nature of STW, no longitudinal data can provide meaningful observations on outcomes of interest prior to program participation, which would help evaluate actual program effects. The most convincing evidence must come from well-designed evaluations of existing or new STW programs. Educators must dedicate resources, assign potential participants to treatment and control groups, and face the possibility that programs are ineffective. Researchers must accommodate practitioners' concerns. It will be critical to work on two fronts, with researchers engaged in statistical, nonexperimental studies and researchers and educators cooperating on experimental studies. These efforts can help to identify which STW programs (if any) make the transition from school to work more successful for students. ⌘

Career and Technical Education, Career Pathways, and Work-Based Learning
Changes in Participation 1997–1999

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In the last decade of the 20th century, federal legislation to improve workforce-development opportunities for high-school students focused on improving both academic and technical competencies. Despite the legislation, the proportion of high-school students concentrating in career and technical education (CTE) declined during the period, while a new dual curricular concentration, in which students take both a strong academic and a CTE program, developed from reform efforts. This paper reports on a study investigating patterns in CTE participation and other student characteristics in the late 1990s. The paper reviews reform efforts and study data and methods; then it examines findings on curricular concentrations, on CTE-related activities, and on student outcomes.

Reform in the 1990s

Three legislative efforts related to workforce preparation affected high-school students graduating in the late 1990s. The 1990 Perkins Act Amendments attempted to upgrade CTE and develop all students' academic and occupational skills. The amendments created the Tech Prep (TP) program. The amendments also called for curricular integration to help more CTE students acquire transferable academic skills and for state-level accountability in CTE programs. Passed in 1994, the School-to-Work Opportunities Act (STWOA) encouraged states to bridge the gap between education and work for all students. STWOA established a national framework of coalitions among education stakeholders. The act funded school–employer partnerships to promote work-based learning (WBL) and called for high educational and occupational standards. The 1998 Perkins Act Amendments placed CTE in a broader reform

context. The amendments further integrated academics with CTE and provided strong secondary–postsecondary connections. The legislation's most important aspect was further emphasis on accountability. New core indicators for CTE-program performance were established, and annual performance evaluations were mandated.

Data and Methods

This study used data from the National Longitudinal Survey of Youth 1997 (NLSY97), a nationally representative sample designed to document the transition from school to work. Data from 1999 surveys were the focus of the study. The NLSY97 surveys, administered through personal interviews, gathered information on students' education, including curricular concentration and participation in WBL activities. The sample members' schooling was influenced by STWOA and the later Perkins legislation. Thus NLSY97 may indicate effects of those reforms.

Most analyses in the study used a subgroup with respondents in 9th through 12th grade during the 1999 surveys. Key variables were CTE-related activities outlined in STWOA: career pathways (CP) or career majors, TP, and six WBL activities. These were cooperative education, job shadowing, workplace mentoring, school-based enterprises, internships, and apprenticeships. Responses to survey questions about participation in curricular concentrations (academic, general, CTE, or dual) and in the CTE-related activities yielded the key findings. Use of existing survey data posed some limitations. For instance, NLSY97 included only a limited list of CTE courses. Also, data were based on possibly inaccurate student self-reports, and differences in curricular-concentration

data between NLSY97 and separate transcript-based studies were found.

Findings

CURRICULAR CONCENTRATIONS

Data on concentrations showed that about 5% of youth identified themselves as CTE concentrators, less than a 1992 estimate of 18%. Other studies corroborate this decline during the 1990s. There were significant differences among students in the four concentrations. Females were underrepresented in CTE and dual concentrations, Blacks were overrepresented in CTE, and Whites and Hispanics were underrepresented in CTE and dual. Urban youth were disproportionately enrolled in CTE and dual concentrations. Moreover, CTE concentrators were predominantly from lower income families. Middle-income youth were distributed more uniformly, while nearly 60% of higher income youth were general or academic concentrators.

Significantly, there were differences among concentrations in course taking. Such course-taking patterns are noteworthy because they predict baccalaureate completion—and possibly career success—better than GPA or college-entrance test scores. CTE concentrators took more math than general concentrators. Fewer academic than dual concentrators reported taking two to five math courses. Although dual concentrators took more math than did academic concentrators, the latter took a greater number of advanced math courses. Additionally, more CTE concentrators took harder math courses (starting with geometry) than general concentrators.

Differences in science course taking were similar. Fewer CTE than general concentrators reported taking only one science course; more reported taking between two and four. More dual concentrators

took two to four science courses than did other concentrators. More CTE than general concentrators took biology, chemistry, and physics. More dual than academic concentrators took biology and physics.

Dual concentrators took more CTE courses than did CTE concentrators. More CTE than general concentrators took all categories of CTE courses but one. More dual than academic concentrators took all categories. Surprisingly, more than 25% of both CTE and dual concentrators reported taking no CTE courses, perhaps because of limited course types in survey questions. These findings suggest that 1990s reforms encouraging more academics for CTE students may have had an impact.

CTE-RELATED ACTIVITIES

Patterns of correlation among participants in CTE-related activities were also analyzed. Participation in these activities slightly but consistently fell over the three rounds of interviews. Youth engaged in CTE-related activities took more math, science, and CTE courses than the student population generally. Analyses indicated that curricular choice and participation in CTE-related activities were a function of student characteristics. The analyses showed that CTE concentrators were more likely to be Black than White and to come from less affluent households. They were likely to report lower eighth-grade GPA. General concentrators were similar in GPA and income but more likely to be White. Dual concentrators were likely to be male and Black. They did not differ in eighth-grade GPA but took more CTE courses than others. Academic concentrators came from higher income households, and their eighth-grade GPA was higher than others'.

Participants in CP were likelier to be Black and to be CTE or dual concentrators. CP participants took more science and CTE coursework than others. TP participants were likelier

to be Black. They were more likely to be CTE or dual concentrators, and they took more CTE courses than academic concentrators. WBL participants were more likely female, Black, and in CTE or dual concentrations. They took more math and CTE than the student population.

Analysis of specific WBL activities found correlations between participation and student characteristics. Cooperative-education participants were likely to be CTE or dual concentrators. They took more math and CTE than the student population, although cooperative education leaves less time for coursework. This finding may indicate the impact of 1990s legislation on CTE program rigor. Job-shadowing participants took more CTE courses but did not identify as CTE concentrators. Mentoring participants were likelier to be Black or Hispanic and take more CTE courses. Youth in school-based enterprises took more CTE courses and were likelier to be male and CTE or dual concentrators. Internship or apprenticeship participants were likelier to be CTE concentrators. Youth from poorer households were not more likely to participate in WBL activities, nor did academic ability predict participation.

OUTCOMES

The study examined relationships of student characteristics, curricular concentration, and CTE participation to two student outcomes: cumulative high-school GPA and engaging in risky behavior. In a limited analysis, all concentrations and activities except TP correlated with GPA. In a full analysis including student characteristics, concentration remained a significant, if less important, GPA predictor. General concentrators showed a greater difference in GPA from academic concentrators than did CTE concentrators. This finding may result from the greater number of math and science courses CTE concentrators take. CP participants reported higher GPAs than others. Males,

Blacks, and Hispanics showed lower GPAs than females or Whites.

Other analyses related concentrations and CTE participation to student reports of risky behaviors—sex, smoking, drinking, and marijuana use—associated with low GPA. Academic and CTE concentrators did not differ. Dual concentrators were likelier to smoke and use marijuana than academic concentrators. General concentrators were likelier to engage in sex, smoking, and marijuana use. TP participants were no more likely to report risky behaviors than the student population. CP participants were likelier to use marijuana. WBL participants were likelier to smoke and drink.

Conclusions

This study showed that the proportion of CTE concentrators remained about the same throughout the 1990s, while the proportion of dual concentrators rose. Participation in CTE-related activities steadily declined from 1997 to 1999. CTE and dual concentrators were more likely to be Black. CTE concentrators also came from poorer households and had lower eighth-grade GPA. These findings suggest racial and class distinctions may exist in high-school counseling regarding curricular choice. Moreover, the emphasis on academics in Perkins legislation may be affecting course-taking patterns among CTE and dual concentrators. In the 1999 NLSY97 survey, CTE concentrators took more and harder math and science. Being a CTE or dual concentrator predicted participation in CTE-related activities. Course-taking patterns correlated with participation in these activities, with some participants taking more math and science than others. Finally, participation in CP had a significant impact on high-school achievement, science and CTE course taking, and avoidance of some risky behaviors. Encouraging CP—and CTE generally—may increase students' likelihood of success. ⌘

The Continuing Contribution of Work-Based Learning

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Work-based learning (WBL) encompasses activities from brief work-site visits to intensive apprenticeships. The goal of WBL is to enhance traditional schooling objectives—teaching academic skills, preparing students for citizenship and work, and helping them develop into mature and responsible adults. The 1994 School-to-Work Opportunities Act (STWOA) gave WBL a boost in high schools, making it central to national education reform and leading to significant growth in some WBL activities. Since STWOA funding expired in 2001, federal reform policy has increasingly focused on more stringent standards, testing, and accountability, while support for WBL as a national initiative has faded. While WBL remains valuable in strengthening the education and development of many students, given its costs in staff resources and student time, it is important to understand its benefits.

Reported here are results from an inquiry into one form of WBL, internships. The inquiry involved 25 students observed at internship sites and schools. Internships lasted from a few weeks to several months and included unpaid and paid placements. Students, work supervisors, and instructors were interviewed and documents related to the internships were examined. The inquiry explored whether WBL could benefit all students, not just those bound for work after high school. It also attempted to identify the mechanisms of WBL effects. This paper examines the veracity of three main claims made by its advocates: that WBL reinforces academic learning, that it enhances work-related skills and career understanding, and that it advances students' social and emotional development. The research findings also suggest that WBL engages youth in modes of thought seldom fostered in schools, and that the curious relationship between school and work creates a dialectic that contributes to students' learning.

Academic Skills

Cognitive theorists suggest that people use skills differently in classrooms and on the job, and that learners do not easily transfer knowledge gained at one site to the other. It follows that youth should have learning experiences both in and out of school, but it does not directly follow that out-of-school learning will improve in-school learning. Advocates of WBL assume that workplace experience reinforces academic learning in three ways. First, school-based knowledge may be applied at work and thus solidified. Second, the utility of academic knowledge may be tested at work more elaborately and profoundly. Third, WBL may motivate academic learning, when students recognize that scholarship is relevant to attractive careers. To test the claim that WBL benefits academic learning, this inquiry posited that the benefits must be detectable in details of students' workplace experiences. For evidence of engagement in school-like knowledge at worksites, internship data were examined for content knowledge, use of academic skills, and motivation toward schoolwork.

It was difficult to identify workplace knowledge corresponding with classroom knowledge. Workplace learning usually deepened not academic knowledge but knowledge about the working world. Surprisingly, learning related to school skills was hard to find. Students rarely used skills that drew obviously on school knowledge. Reading, for instance, was highly episodic, and its function was usually to gain specific work-task information. Only a few students engaged in substantial mathematics requiring complex operations. Reinforcement of science concepts did occasionally happen, especially in hospital internships. For 9 of 25 students investigated, no evidence of academic learning was found. Twelve experienced some simple application of school-based knowledge, while only three tested and explored that knowledge. As for effects on motivation, some students claimed that scholastic improvement was due to increased interest in topics or fields related to internships.

Work Skills and Careers

A commonsensical argument for WBL is that students acquire practical skills and learn about careers. Many have proposed lists of workplace skills that schools should teach, such as that of the Secretary's Commission on Achieving Necessary Skills (SCANS), which itemizes *fundamental skills* and *workplace competencies*, including basic skills like reading, thinking skills, and personal qualities, as well as interpersonal, resource-related, informational, and technological work competencies. The internship study examined what site-specific skills and competencies interns displayed, including SCANS items, and whether they participated in communities of skilled practitioners. The results were encouraging. Many students performed simple or elaborate context-specific skills. Some might be useful in other workplaces. Salient, SCANS-related skills acquired included mastering work procedures and improving personal and social skills. Many students had opportunities to follow through on tasks and maintain control in difficult circumstances. This demand for responsible behavior was among the strongest elements of skills learning. As for SCANS competencies, while some students were able to practice them, because the students were low in

status, few used them extensively. Interns participated in work communities to a limited extent. They had marginal roles and performed prescribed tasks, but they did form good working relationships. Most observed and interacted with practitioners in ways not available in schools, while building rudimentary skills.

Many assert that internships foster career exploration and planning. Some interns did get a strong feel for career tasks, from the routine to the technical. Most witnessed much ordinary occupational life, an advantage in making career decisions. However, interns rarely exceeded the daily-life perspective on careers. Some conversed with co-workers about educational preparation and career paths. But students rarely engaged knowledge about longitudinal aspects of occupations or thought systematically about career trajectories.

Youth Development

The internship study demonstrated that WBL can contribute to youths' social and emotional development. Work-based learning gives youth extended interactions with supportive adults and offers legitimate roles in professional workplaces. Interns explored adult roles and responsibilities, promoting their development. As students learned new roles and tasks, adults provided scaffolding that led eventually to autonomous work. Interns showed significant development of self-confidence. Taking on challenging work in adult contexts, they felt proud that adults relied on them to complete it. Moreover, by allowing youth to engage in adult roles, WBL participation broadens the range of professional and productive selves youth can imagine. If the increased maturity and motivation generated by WBL transfers to the classroom, workplace experiences may influence academic achievement. The potential relationship between WBL, personal development, and academics merits further research.

New Modes of Thought

Students in WBL learn new thought processes not available in school that add value to WBL experiences. Differences between school and work generate thought and contribute to student learning. Workplace and classroom thinking differ, for example, in the way that problems are formed. In school, students follow standard, teacher-supplied procedures to solve ready-made problems, while in workplaces, ambiguous and shifting problems require solutions that make sense of complex issues. In the internship study, students learned to define problems in ways unlikely to arise in classrooms. Interns developed a repertoire of solution skills and learned to recognize subtle contextual differences. Workplace and classroom thinking also differ in using the workplace itself for cognitive functions, rewarding minimum time and effort taken on tasks, and emphasizing cognitive teamwork.

Moreover, as workers, interns must work competently in productive activities, while as students, they are by definition incompetent, needing to learn. If exploited by effective pedagogy, this tension between roles can be enlightening. While interns work, they can ask questions, make mistakes, and explore the work. They can ask not just about work procedures but about their rationale. The role contradiction can produce a learning dialectic: a compelling impulse to make sense of the work and build competence. While engaging in the rich cognitive activity of this dialectic could develop higher order cognitive processes needed in advanced academic work, the dialectic may fail to develop. Students may view the work experience only from the worker's perspective, supervisors may remain focused on interns' productive role, and school-based educators may not know how to exploit the dialectic in classrooms. Some interns explored the dialectic by asking

co-workers questions about institutions and careers, while others gave little sign of perceiving the bigger picture.

Conclusions

Educators should do more to facilitate WBL in schools, particularly setting student goals for WBL and tailoring pedagogical practices accordingly. Given the effort required from educators, employers, and students to implement effective WBL and declining enthusiasm at the national level for the practice, some might wonder whether it is worth pursuing. However, WBL was a significant educational practice before STWOA, engaging hundreds of thousands of students in apprenticeships and internships. Some WBL programs, including career academies, continue to grow despite the end of STWOA funding. Work-based learning gives many students substantial academic, career, and personal advantages.

What next steps should WBL policy take? National education policy appears directed toward local decision making and accountability; WBL is compatible with this direction. Many state and local initiatives have been effective and should be sustained, and certainly we would not recommend that WBL replace a significant amount of classroom learning or that it substitute for classroom preparation for tests. Further, the federal government can promote local research on WBL initiatives and disseminate the results. Research should include refined inquiry into promotion of adolescents' cognitive and psychological development through WBL. Research should explore the spectrum of adolescents' nonacademic activities, including internships, service learning, and extracurricular activities. In sum, WBL brings more adults into students' lives, while it facilitates the use of the world outside schools as a learning environment. These are good reasons for furthering this practice. ⌘

Preparing for Productive Careers
Students' Participation in and Use of Career-Focused Learning Activities

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Policymakers have a longstanding interest in helping students prepare for successful careers. The federal government has supported vocational and other career-focused programs in high schools for nearly a century. Even after the reductions recently proposed by the Bush administration, these funds will still represent one of the largest federal commitments at the secondary level.

The goals and form of high-school career-focused activities have evolved considerably since their inception. As a growing number of students plan to attend college, some policymakers have questioned the value of traditional vocational programs, particularly those that focus on narrow occupational skills and prepare students for jobs that do not require a college degree. This has led some schools to develop career-focused activities designed to complement, or even reinforce, the academic curriculum and to prepare students for at least 2-year college programs.

This paper draws on recent surveys of three cohorts of students in eight states to examine both the extent of student participation in specific career-focused educational activities and the potential value of those activities. The surveys include a 12th-grade baseline survey of the classes of 1996, 1998, and 2000, as well as a follow-up for the classes of 1996 and 1998 that was conducted 18 months after the students graduated. Surveyed students were randomly selected from the 12th-grade classes in 69 high schools covered by the school-to-work initiatives of the eight states. The rest of the paper outlines findings related to (a) the challenges that students face as they seek to achieve their education and career goals, (b) the extent and recent growth of high-school activities designed to help students achieve their goals, and (c) the ways that students value these activities and appear to make use of them.

Career-Related Challenges for Young Adults

The paths young adults take as they leave high school reflect some of the challenges they face in defining and pursuing career goals. While some people figure out their goals early in life, most change their goals as they accumulate work experience. As young adults formulate and refine their goals, they often need to change their educational plans accordingly. Conversely, those discovering that they do not have enough resources or preparation for postsecondary-education programs may need to revise their career goals. The ways in which young adults' postsecondary paths conform to, or deviate from, their expressed goals point to challenges they face and needs that educators may be able to address.

Most of the students surveyed 18 months after high-school graduation had ambitious educational goals, but, for economic reasons, many dropped out or did not enroll in postsecondary programs. Despite a nearly universal intention to obtain a college degree, 305 of the respondents were not enrolled in and had not completed any postsecondary program. About 14% of those who had enrolled in college dropped out. Half of those dropping out or never enrolling cited an inability to pay tuition or a need to work as the reason.

Most of the high-school graduates obtained low-paying jobs unrelated to their career goals. About 71% of young adults who were employed 18 months after high school reported that their job was in a different field than their career goal. The pay and benefits of most students' jobs was usually modest, with the average student earning $7.76 per hour. With these earnings, it is understandable that many young adults report difficulty financing postsecondary education.

In designing career-focused high-school activities, educators must confront the instability of young adults' career and education goals, the economic difficulties they face in securing a postsecondary education, and the low average quality of their jobs. Educators should try to identify which high-school activities help students clarify their goals. The economic factors that prevent many students from completing postsecondary programs point to the potential value of both financial-aid policies and efforts to help students secure good jobs that can pay for their education.

Participation in Career-Focused Activities

We analyzed the extent and growth of student participation in three types of activities: (a) career-development activities designed to expose students to alternative careers or help students develop educational plans; (b) vocational and academic classes or assignments that students perceive to be related to their career interests; and (c) work experiences developed by schools for students, including paid and unpaid workplace positions and school-based enterprises.

Brief career-development activities engage the largest number of students, and some of these activities

expanded during the late 1990s. Nearly all (99%) of the members of the class of 2000 in the study schools participated in at least one of six career-development activities (namely, job shadowing, group worksite tours, employer presentations, career counseling, career-interest inventories, or the selection of a career area to plan for). The activities involving the largest percentage of students were career counseling (84%) employer presentations (82%), and career-interest inventories (76%). During the late 1990s, there was growth in the percentage of high-school students who reported attending employer classroom presentations (from 78% of the class of 1996, to 82% in the class of 2000) and in the percentage who had at least one job-shadowing experience (from 25% to 43%). By contrast, the more intensive career-focused activities—including vocational and academic classes focused on careers and extended internships—attracted somewhat smaller fractions of students and did not grow appreciably.

The growing popularity of career-exposure activities probably is due partly to the feasibility of implementing these activities without disrupting the academic schedule or imposing a large burden on school staff members. In addition, these activities often are perceived as being relevant to all students, since they are designed to help students select high-school classes and develop postsecondary plans. However, as schools increasingly focus on academic achievement, it is uncertain whether these activities will continue to grow.

Assessment and Use of Career-Focused Activities

After high-school students graduate, the way they perceive and make use of specific high-school experiences can point to both the value and the limitations of these experiences. The student follow-up survey, conducted 18 months after graduation, included questions on the extent to which students (a) perceived that specific high-school activities were useful in clarifying their career goals, (b) made use of postsecondary credits earned during high school, and (c) found postsecondary jobs with help from high-school staff.

Students responding to the 18-month follow-up survey reported that their high-school workplace activities and career-focused classes were particularly effective in helping them clarify their goals. Specifically, more than 60% of those participating in job-shadowing experiences, paid jobs and internships found through school, and career-focused academic classes reported that these activities were "very helpful" in clarifying their career goals. In contrast, students gave much lower ratings to various other career-focused activities—such as group worksite tours, employer presentations, and school-based enterprises. Both career-focused classes and paid internships may allow students to glean whether they would enjoy specific careers. In addition, students may perceive that internships and job-shadowing experiences were more helpful in clarifying their goals than were worksite tours and employer presentations, because the former tend to provide more opportunities for one-on-one discussions with employer staff.

To help students prepare for a postsecondary education, some high schools have expanded opportunities to earn postsecondary credits during high school. About 5% of those enrolling in postsecondary education said they had earned and made use of college credits from high-school vocational courses. But many students did not make use of college credits earned in high school. Among students enrolled in college who reported taking a class offering postsecondary credit in high school, only 43% said that those credits had been recorded on their college transcripts. Some states are trying to increase the use of these credits by encouraging all state 2-year colleges to accept credits for specific classes.

Although only a fraction of those leaving high school (about 5%) found jobs with help from school staff, these positions appear to have significant, qualitative advantages over the positions students found in other ways. These positions did not pay higher wages, but instead were more likely to relate to students' goals, provide training, and offer tuition reimbursement. Moreover, these apparent advantages persist even after one controls for a limited set of student characteristics.

While these findings suggest that some students may benefit from career-related activities in high school, many uncertainties remain. We still do not know which career-focused activities, if any, really help students choose better postsecondary education and jobs. Researchers need to determine the impacts of career-focused activities on students' ability to enter and succeed in a chosen career, taking into account all preexisting differences between those who participate in these activities and those who do not. Clearly, high schools have a variety of competing priorities and demands on their resources. Assuming that some career-focused activities can improve students' long-term outcomes, educators nevertheless will need to make sure that these activities do not interfere with academic or other activities that are determined to have a greater impact on students' outcomes. Addressing these questions and issues could help more students prepare for productive careers. ⌘

Selected Measures of Student Progress in Schools With CTE-Centered Whole-School Reform

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This paper focuses on selected student outcomes from the first two years of a 5-year longitudinal study investigating promising secondary programs that integrate career and technical education (CTE) with whole-school reform to improve the academic outcomes of at-risk students. The schools examined serve high percentages of economically or socially disadvantaged students who are at risk of not completing high school. After describing the study and the sample, the paper presents results from analyses of math achievement and graduation progress.

Research Base

Research on education for at-risk youth reveals that providing students with opportunities to learn more math at younger ages can improve achievement, and that tracking has strong effects on differential student outcomes in math. At-risk students who attend schools offering insufficient opportunities to take algebra are hard-pressed to achieve in math to the extent that government policies demand. Research on CTE shows that students participating in CTE activities are more likely to take advanced courses in math and science. CTE can motivate students to stay in school and take more advanced coursework. Students attending high schools that combine reforms with CTE may thus have better math outcomes and school-completion rates than do students attending schools that do not integrate reform efforts.

Study Sites

The three study schools are involved in different whole-school reform designs and CTE reform efforts, and they serve a range of at-risk populations. The first study school, called Academy High School (AHS), is located in a large city. AHS uses the Urban Learning Centers reform design, which includes high academic standards, stakeholder governance, and onsite learning supports. All centers are K–12 schools housed as one integrated facility. AHS curriculum is structured around career academies with a strong college-preparatory focus.

The second study school, called Vocational High School (VHS), is located in a medium-sized city. Before reform, VHS was in danger of losing accreditation. Adult authority had broken down, with educators afraid of gang violence. After new leadership succeeded in making the school safe again, VHS joined the High Schools That Work network, which advocates rigorous academics and an integrated curriculum for CTE students. Helping entering students get to grade level in math and English is a major focus at VHS. The school has also implemented a college-preparatory curriculum designed to help students meet state-mandated academic standards.

The third study school, called Comprehensive High School (CHS), is located in a small city. The school has reformed its curriculum around career pathways, which replace traditional tracks. Students choose one of five pathways at the end of their freshman year. Electives are aligned with pathways, and academic teachers attempt to incorporate pathways.

Study schools were matched with control schools. For each study school, its control school is either in the same community and district or in another community in the state with similar demographics.

However, none of the control schools is involved in a schoolwide reform effort.

Participants and Measures

Participants were students in the study and control schools who were in the 9th or 11th grade during the 2000–2001 school year and not participating in special education. Participants were preponderantly minority and economically disadvantaged students. Although not all students made yearly progress to graduation, these cohorts are called the class of 2004 and the class of 2002, respectively. In the 2001–2002 school year, data were collected again for students from these cohorts, whether or not they had advanced a grade.

Data were collected on math course-taking patterns and on progress to graduation. Math courses were grouped into three levels of difficulty: low (courses less difficult than Algebra 1); medium (higher courses less difficult than trigonometry); and high (trigonometry and higher courses). Math progression was evaluated by comparing students' math courses during each year with the school's math sequence. After taking math the first year, a student might advance to a higher course, repeat the previous course, or take no math course. Graduation progress was measured in terms of three possible outcomes: repeating a grade, advancing a grade, or leaving the school.

Results

Results for each school are reported separately. As for level of math difficulty, AHS students generally took higher level math courses than Control-A students. AHS students also opted out of the

math sequence less often than did Control-A students. Students from Control-B were more advanced in math level than VHS students. Students at CHS generally took math at higher levels than did students at Control-C. For the class of 2004, differences were largest in the medium level of math courses for 2000–2001; this difference led to a significant difference in high-level course taking during the sophomore year for the majority of these students.

As for math progression, advancement for the class of 2004 was almost identical at AHS and Control-A. No AHS students repeated a math class the following year. The class of 2004 at VHS appeared slightly more successful in math progression than their Control-B peers, with more students advancing to a higher course and fewer repeating a course. Results were reversed for the class of 2002, with more of them repeating a course and fewer advancing at VHS. Math progression for the class of 2004 at both CHS and Control-C was similar. A similar percentage of the class of 2002 advanced at each school, but fewer of them repeated a course at CHS, and fewer took no math course at CHS.

As for graduation progress, the class of 2004 from AHS and Control-A advanced at similar rates, but students in the class of 2002 at AHS were more likely to advance. Students at Control-A were more likely to leave school than AHS students. VHS and Control-B students were similar in promotion and school leaving. Control-C had more students from the class of 2004 on track to graduate than did CHS. At both schools, the class of 2002 had similar rates of progress toward graduation. Although more CHS students were a year behind in graduation progress, fewer CHS students had left school.

Discussion

ACADEMY HIGH SCHOOL

While the class of 2004 at AHS and Control-A progressed equally, the class of 2002 at AHS outpaced Control-A. The academic and personal supports that are part of the Urban Learning Centers design may have helped students succeed in math. Moreover, at AHS, students in the class of 2004 who were not on target to graduate were much more likely to be in school a year later. At Control-A, one quarter of the class of 2002 was not attending school a year later. The career themes at AHS may provide some students a reason to continue through the challenges of an academically rigorous curriculum.

VOCATIONAL HIGH SCHOOL

Of the VHS class of 2002, almost one quarter took trigonometry or higher in 2001–2002, whereas before the reforms were implemented, few students took higher math at VHS. Although students in the class of 2002 at Control-B did take significantly more high-level math courses, two thirds of the VHS class of 2002 who moved out of medium-level math went on to high-level math, while only one third opted out of math. Conversely, at Control-B, only half of the class of 2002 moving out of the medium level went on to high-level math; almost half opted out of math. That VHS has kept pace with another high school in the district is a positive finding, and is especially encouraging given its high numbers of initially low-achieving freshmen.

COMPREHENSIVE HIGH SCHOOL

Both classes at CHS and Control-C were similar in math progression. However, the higher numbers of ninth graders who took medium-level math in 2000–2001 at CHS led to a significantly higher

number of 10th graders taking high-level math in 2001–2002. More students passed math at CHS in 2000–2001; but by 2001–2002, Control-C students had caught up. CHS students took higher level math courses and progressed through the math sequence faster than did their Control-C counterparts. The greater achievement at CHS may be due to career pathways, which encourage students to plan their futures. Students may have realized the career significance of taking math classes throughout high school; fewer CHS students in the class of 2002 opted out of math. Fewer students from the class of 2004 at CHS were on track to graduate, but of students not on track, more persisted at CHS.

Conclusions

The results show that those schools that have infused career themes into their schoolwide reforms are either achieving parity or showing a clear advantage over control schools. At AHS and CHS, strong retention is noteworthy. Overall, the results suggest that at-risk students can experience improved math achievement and graduation progress when CTE and whole-school reforms are blended. Schools attempting to implement such comprehensive reforms need support from districts and local employers, because integrating career themes or programs into a curriculum with higher academic expectations requires extensive external support. Success for at-risk students at the schools examined here was related both to increased emphasis on academics and to community support helping students relate schooling to career goals. The comprehensive, well-supported reforms seen at these schools could be usefully implemented elsewhere to help at-risk students achieve. ⌘

Effective Dissemination Strategies for Work-Based Education
Increasing the Connection Between Research and Practice

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Research indicates that the role of dissemination in vocational-education reform is weak. The influential Educational Resources Information Centers (ERIC) database contains few documents on vocational education. This article critically examines the problems involved in getting knowledge on a major type of vocational education, work-based education (WBE), into policy and practice. The article defines dissemination; surveys federal efforts addressing dissemination; examines the roles of disseminators and users; explores relations among research, policy, and practice; and discusses implications for WBE dissemination.

Dissemination Defined

Viewed most broadly, both dissemination and diffusion can be construed as socially shared cognition through which individuals interact and relate new ideas to shared knowledge and culture. Dissemination may be distinguished from its more informal partner, diffusion, by its emphasis on purposive and goal-oriented communication of information that is specific and useable. The intent of dissemination in education is to improve educational organizations and practice.

Major Federal Programs

Regular communication channels are a feature of effective dissemination systems, and in the 1970s, the United States experimented with efforts to establish state and national networks that could fulfill this function. These projects, which were based on the 19th century model of the agricultural extension system, have been maintained but not expanded. As in the extension system, designated agents answer individuals' questions by consulting research and researchers. In turn, researchers use extension agents to communicate new findings rapidly to the field. While the extension model has been effective, it limits dissemination and knowledge use to serving individuals' needs. The problems of education, however, are associated with schools as organizations.

The federal government initiated the ERIC dissemination project in the belief that inaccessibility of research contributed to low levels of innovation in education during the 1960s. The ERIC system evolved with little attention given to how educators would use the system; it has not been practitioner-friendly, although federal efforts to launch more active dissemination strategies in the 1970s did try to show ERIC's usefulness for teachers and administrators. The need to justify ERIC still drives dissemination policy, focusing it on the knowledge base, not on solving users' problems.

The regional educational laboratories (RELs) initiated in the 1960s were another major effort to improve education through research and development. The RELs became the backbone of the government's general-purpose dissemination system serving the broad needs of schools. Despite their central position, the RELs have been bypassed in critical knowledge-use and school-improvement projects, including those targeted at vocational education. For example, many federal programs, such as Title I, designate special-purpose assistance centers to provide information and technical help to program recipients. A major feature of special-purpose centers has been isolation from broader strands of school reform and from each other. The isolation of general-purpose dissemination efforts, such as ERIC and the RELs, from other special-focus projects is typical of the tendency of federal policies to promote competition rather than integration.

The Roles of Disseminators and Users

Disseminators are individuals or groups that link weakly connected social systems. These linking agents are positioned to move research knowledge into practice. Much attention has been paid to ways for disseminators to make information more useable, particularly scholarly reports and large computerized databases like ERIC. However, most efforts to move beyond research reports to alternative modes of presenting research have addressed only the spread of information, not its use. Dissemination should go beyond merely spreading information by addressing incentives for individual change, targeting useable knowledge to practitioners, creating shared understandings of how knowledge can improve local practice, stimulating increased diffusion of new knowledge within and between educational agencies, and emphasizing social processing involving interpersonal contact.

Knowledge use occurs when a decision maker uses disseminated research findings for problem solving and decision making relevant to improving an education system such as WBE. From the user's perspective, relevance is key; practitioners should see a match between their perceived needs and the information provided. Since research began to focus on knowledge use, conflicting views on how knowledge affects practice have arisen. While the relevance of constructivist perspectives to educational practice is debated, several of its tenets correspond with important concerns for disseminators. For example, constructivists suggest that "all knowledge is local." While dissemination is based on the presumption that practitioners have much to gain from ideas that are not local, information generated elsewhere must be compatible

with existing beliefs and have local utility. Constructivists also see knowledge as contested, an idea supported by cognitive research that views contesting knowledge and measuring its validity as central to learning. The truth and utility of research will not automatically strike practitioners and policymakers. To transfer knowledge, disseminators must understand the needs of the users who interpret it.

Research, Policy, and Practice

Many WBE scholars lament that their research is not incorporated in policy. Findings show that despite the close relationship between WBE and economically significant employment policies, policymakers are not turning to WBE research for guidance. However, researchers have overlooked the relationship between policymakers' existing knowledge and new research, which is most applicable when it is compatible with existing beliefs, diffuses rapidly, has obvious local utility, and is discussed in ways that accommodate it to local preferences. Linking agents (and researchers) must recognize that their work must fit policymakers' needs, and they must draw clear connections when immediate utility is not obvious. They must also recognize that "mainstream knowledge," whether research-based or not, tends to crowd out divergent voices, no matter how well established in research. Knowledge becomes a political instrument subject to critical validation.

At the federal and state levels, the interactions between researchers and those who commission research are crucial. Governments typically sponsor research by noted scholars but rarely use it fully without considerable interaction between the scholars and policymakers. This political reality is particularly relevant to WBE, where funding is largely limited to federal agencies with mature policy agendas. At the local level, organizational problems arise that need quick solutions. Local decision makers do not have the time or the resources to consider knowledge systematically. Most instances of research use at the school level involve small-step decisions made with limited deliberation and based on earlier decisions.

Characteristics of schools and districts, such as their socioeconomic composition, also affect knowledge use and reform. More disadvantaged schools often have weaker connections to sources of knowledge and technical assistance, and are thus lower in internal capacity to use knowledge to solve problems. The WBE community should not ignore the consequences. Most students who could benefit from WBE research are located in disadvantaged communities unable to implement research-based innovation.

The larger policy setting is also important for WBE, because schools have pressing incentives to meet state performance standards. Comprehensive high schools with weak student test results have de-emphasized WBE by requiring students to take more remedial courses as a quick fix. This strategy ignores the long-term solution, advocated by WBE scholars, of integrating academic and vocational subjects; here the research–practice gap is wide.

Other features of school organization influence teachers' ability to use WBE knowledge. Shared memories of previous school learning situations can create openness to future learning. In WBE, however, shared memories can be a constraint, if teachers remember a "golden age" when WBE was central and thus resist change. Further, communication links within schools are often attenuated. Teachers possess knowledge about their own discipline, but they lack the skills to discuss practice across programs, an important step in creating cooperation between academic and vocational programs. Because WBE teachers are often isolated in comprehensive high schools, their expertise also remains on the margins. Since teachers must interpret and distribute innovative ideas before they can be put into practice, the development of internal communication networks can provide a foundation for school change.

Implications

This article suggests implications for dissemination practice. Research generated in universities is only one source of knowledge, and its use must be negotiated through a process involving teachers and school leaders. Where barriers to change exist in school organization, redesigning the school should be part of sustained efforts to improve knowledge use. Utilization and impact can only be assessed over the long term, when knowledge-use efforts have improved organization and practice so that practitioners perceive benefits. Given the latent demand for research information among practitioners, dissemination can be consistent with both a bottom-up approach to school reform and with government mandates.

The article also suggests implications for dissemination policy. Coordination between knowledge producers and potential users needs continued policy attention. If schools are directly involved in university research, the chances of utilization and the probabilities of future collaboration increase. The WBE and federal education dissemination systems must include practitioners as partners more intensively. These complex systems must become more coordinated, user-friendly, and reciprocal. Dissemination systems should provide incentives for practitioner knowledge use that can be stimulated by policy. Dissemination cannot be micromanaged at the policy level. Its success—and that of students who benefit from research knowledge—depends on creating environments for competent communication and use at the school level. ⌘

Understanding Tech Prep as Reform
Major Results and Policy Implications of the "Community College and Beyond" Longitudinal Study

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Tech Prep (TP) emerged from the Tech Prep Education Act of the 1990 Perkins Act Amendments. TP was promoted to meet the needs of disengaged students, who often graduate without competencies needed for work success, by integrating rigorous academics with vocational education and formally linking secondary and postsecondary curricula. Federal law mandated that federal TP funds be administered through local consortia of secondary and postsecondary institutions. TP initiatives must include articulation agreements formalizing partnerships and core curriculum with progressively rigorous, sequential academic and career-and-technical-education (CTE) coursework. This work must lead to a 2-year certificate, associate's degree, or formal apprenticeship.

After several years of assessment, a national evaluation of TP sponsored by the Office of Vocational and Adult Education (OVAE) praised consortia for strengthening stakeholder collaboration and career guidance, emphasizing applied instruction, and linking employers with students. However, evaluators criticized TP programs for lacking consistency and for failing to create seamless curricular pathways. The evaluators suggested that programs with whole-school reform goals were too unfocused and underfunded.

At about the time of the national evaluation, new Perkins legislation authorized TP funding beyond 1998 and encouraged alternative instructional strategies for learners not well served by current curriculum. Contextual learning and work-based learning (WBL) received greater attention. The legislation also supported 2+2 TP programs articulated with baccalaureate programs in 2+2+2 options; accountability was emphasized. This article analyzes TP as a reform strategy. It summarizes the current reform context, examines a longitudinal study of TP programs, and considers implications of the study.

Reform Context

TP emerged on the cusp of a new vocationalism focusing on both rigorous workplace requirements and high academic standards. This new vocationalism also emphasizes progression from entry-level to professional preparation, the changing nature of education and work, curricular integration, learner-centered instruction, assessing outcomes accountably, faculty collaboration on reform, and the prominence of WBL in school reform.

American educational reform has evolved in three waves since the 1983 *A Nation at Risk* report. First-wave reforms aimed at increasing academic requirements and standards from the top down. Second-wave reforms aimed at deepening the relationship between schools, families, and communities. The current reform wave aims at whole-school reform. The 2001 federal No Child Left Behind (NCLB) legislation is consistent with the current wave's emphasis on holding schools accountable for student achievement. NCLB also gives state and local officials the flexibility to find solutions to local problems without undue bureaucratic interference. In the complex context of the new vocationalism and NCLB, making TP an effective reform strategy is both challenging and worthwhile.

Longitudinal Study

Student experience in TP was central in a 4-year longitudinal study, funded by OVAE and beginning in 1998, called "Community College and Beyond" (CC&B). The study used a longitudinal design that followed students from high school to community college and into employment, combining qualitative cross-case analysis with quantitative assessment of student outcomes. Study sites were representative and longstanding consortia showing strong commitment to TP and implementing programs effectively. Multiple interviews were conducted with high-school and community-college administrators, teachers, students, and other stakeholders. At each site, comparative assessment of student outcomes was conducted, drawing heavily on analysis of student records and follow-up surveys. A sample of TP participants (locally defined) and nonparticipants was selected systematically within each consortium. The sampling technique allowed generalization of results to all schools within the consortia. The study assessed transition to postsecondary education and employment, controlling for individual differences associated with academic ability.

Implementation Results

In study consortia, TP focused mostly on secondary curriculum reform during initial implementation. A college TP model emerged in some consortia. This model emphasized the coursework required for admission to 4-year colleges, except that TP participants took CTE courses rather than a foreign language. Participants engaging in college-prep courses in the initial high-school years progressed to advanced academics more readily than those taking basic courses. This pattern was most evident in states with rigorous graduation requirements. New articulation agreements allowing concurrent enrollment and dual credit increased college-credit opportunities. All consortia established some 2+2+2 agreements and enhanced pathways to 4-year degrees. Changes in secondary CTE curriculum appeared in all consortia. New CTE programs were integrated with TP because of required postsecondary components and local labor-market needs. Career clusters (groupings of related careers) and career pathways (secondary–postsecondary

career preparation) were emphasized. They were helpful in building sequential core curricula leading to multiple exit points and credentials, including new occupational certifications.

Community colleges also added CTE programs, although these were not usually associated with TP. In some cases, curricula integrating clusters (e.g., allied health professions) with related academic studies (e.g., biological sciences) were already long in place. A few community-college learning communities sequenced curricula with secondary curricula. The design of TP curricula leading to multiple credentialing points helped link secondary and postsecondary levels. Increasingly, TP programs awarded college credit for high-school coursework by utilizing certifications as benchmarks of college-level skill acquisition.

Attribution of participation and outcomes to particular student groups was hampered by differences in key definitions. Because the stigma of tracking associated with vocational education kept some students away from TP, leaders advocated involvement of all students, exacerbating confusion about program purpose. Practical issues regarding articulation agreements and alternative curriculum characterized implementation. Some consortia aligned TP curriculum effectively with state standards. Substantial effort was made to replace standard academic pedagogy with contextual teaching and applied academics. All consortia implemented workshops for teachers on this pedagogy. Several sponsored teacher worksite visits.

Extensive professional development of administrators was beneficial. In communities where TP was perceived as opposed to academic reform, it helped to have former academic teachers lead consortium activities. Communication between constituent institutions was crucial to successful implementation. Better articulation agreements resulted from commitments to ongoing communication between key secondary and postsecondary personnel. Local leadership turnover complicated and slowed implementation, and funding was often too limited for effective implementation. Some consortia found state support useful, while others complained about lack of state guidance or protested against excessive state interference. Business support of TP was strong.

Student Outcomes

Students in TP did not differ substantially in race and socioeconomic status from comparison-group students, suggesting that racial and economic tracking was not occurring for these groups. However, TP had more male participants in four consortia, probably as a result of male-oriented CTE specializations. Course requirements within consortia influenced academic and CTE course taking. Consortia that programmed TP with academic subjects such as math and science had students who took more intensive math and science. Math course taking was slightly greater for TP participants in four consortia. TP participants at one site started significantly below their counterparts in math level but ended significantly higher. In five consortia, nonparticipants exceeded participants in total semesters of science taken. At two sites, dual TP/college-prep enrollment was comparable to or greater than general-population enrollment in college prep. Course enrollment in CTE was enhanced by TP programming. WBL activities such as co-op were prominent among TP participants. Articulated course taking was substantial for TP participants at five sites

The percentage of students attending 2-year colleges was high. TP participants slightly exceeded nonparticipants in 2-year college enrollment. Attendance at 4-year colleges was particularly evident where higher education options were plentiful. College enrollment among TP participants involved substantial continuation of CTE in related postsecondary fields. However, most TP participants need remedial courses in college. Completion of 2-year college degrees or certificates was not common among study participants, with only about 10% earning a credential 3 or 4 years after graduation. Some TP participants advanced beyond low-wage jobs after high school, indicating potential labor-market advantages for TP training, which seems relevant to semiskilled or technical employment.

Implications

Analysis of CC&B suggests implications for policy and practice. Consortia are supporting NCLB by aligning TP with other state and local efforts to enhance student achievement and developing rigorous secondary–postsecondary curricula. Full-scale reform focused on core academic curriculum and CTE enhances learning best. Consortia progressing most with TP implementation distinguish between TP and secondary CTE programs geared to immediate post-high-school employment. Because TP, like CTE, continues to be viewed as tracking, consortia should encourage rigorous academics and recruit students of all abilities and traits. Overcoming gender inequities is important. Effective assessment of TP impact requires clear definitions of programs and participation that enable innovation and consistency. Assessment must provide detailed information showing how reform benefits students over time.

Consortia have accomplished considerable change despite limited funding. If TP is to function as whole-school reform, additional funding at all levels is needed. Also essential are dual-credit programs for advanced CTE and academic courses. Community colleges must play a key role in administration, articulation, curriculum, school–businesses links, and evaluation. To strengthen their role, it will be important to learn from consortia where the colleges are active. By collaborating effectively in TP implementation, secondary and postsecondary institutions can increase all students' chances of success. ⌘

Policy Perspectives for Work-Based Education in U.S. High Schools

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Effective education practices are linked to effective policies. In work-based education (WBE), today's policies are made and implemented in a complex reform environment. This paper examines WBE from the perspectives of policymaking. It defines WBE, relates WBE to standards-based reform, outlines a new approach to high school incorporating WBE, discusses benefits of WBE, presents typical programs and schools, and offers policymaking implications.

Defining Work-Based Education

Ranging from career fairs to intensive apprenticeships, WBE is not clearly defined in policy or practice. One definition might include only learning that occurs at a worksite, while another might include what is often called career and technical education (CTE), which encompasses career-related coursework in school buildings. The concept of WBE could also embrace related activities such as community service and alternative education programs using work to motivate students. Also difficult to define is the link between WBE and academic standards, a link that most policymakers would question. Meaningful, comprehensive, and rigorous WBE is rare in high schools. Policymakers still define WBE in terms of vocational shop programs, and unfortunately, many high schools still only offer outmoded programs that reinforce this view.

Federal education policy does not focus on WBE, and few members of Congress are familiar with WBE programs. The upcoming reauthorization of the Perkins Vocational and Technical Education Act will raise questions about the role and value of WBE. Moreover, states do not focus on WBE because they are engaged in addressing the academic progress requirements of the No Child Left Behind Act (NCLB). States are also facing budget deficits that could result in fewer dollars for WBE. Because local programs vary widely, WBE remains unequally supported and inconsistently defined.

Work-Based Education and Standards-Based Reform

Given the education policy landscape focused on NCLB, WBE advocates must consider ways to link WBE with improving academic performance. Standards-based reform is focused on relating curriculum and instruction to improved performance. The impact of standards-based reform on WBE is still unclear. Some fear that career and technical courses will be crowded out of secondary curriculum. All high-school students will have to participate in a rigorous course of study. If WBE programs are weak academically, they will be eliminated. Reformers interested in WBE must address the question, "What should WBE look like to help students meet standards?" New models for high schools that help all students succeed will be important; such models can include WBE.

A New Approach to High School

The American Youth Policy Forum (AYPF) has conceived a theoretical high-school model, High Schools of the Millennium, that offers rigorous, motivating curriculum and college and career preparation that meets adolescents' developmental needs. Major elements of this model are high standards and expectations, provisions for civic involvement, use of community resources for learning, personalized learning communities, instruction based on interactions with adults and development of real-world competencies and career goals, ongoing assessment, and accountability to the community and to NCLB mandates.

This model emphasizes that high schools must focus on rigorous academic curriculum and high achievement. Although no evidence indicates that WBE participation improves high-school students' test scores, research does show that participation can increase attendance, grades, graduation rates, and postsecondary entry. This evidence can show policymakers that WBE leads to successful academic outcomes. The many benefits of WBE merit examination.

Benefits

By providing interesting content related to future activities, WBE engages students in education. Careers provide the context for academic material, teaching students not just academic skills but the relevance of schooling to career goals. Career learning helps teens see how studies lead to success in both careers and college, providing a double incentive to work hard. Learning in the context of meaningful, real-world problems often excites students discouraged by an abstract teaching approach. Furthermore, WBE students can benefit from working with professionals. Such connections with caring adults are a key factor in adolescents' success. Workplace mentors can have valuable influence on youth who lack other adult support. Industry-relevant WBE also provides students with occupational skills that enable them to support themselves after high school. Employability skills not usually learned in high schools, such as reliability and effective professional communication, are also gained through WBE.

In sum, WBE is a beneficial context for learning, provided it is not linked with watered-down curriculum. Rigorous academic coursework is required to ensure that all students meet standards. Many students need extra academic support in the early

high-school years, and WBE activities should not interfere with that support. If policymakers replace low-expectation vocational education with new, academically challenging programs, WBE can help students reach both standards and career goals. A number of innovative programs and schools can serve as models for policy.

Leading Programs and Schools

A well-known program that has helped modernize vocational education is *Tech Prep*. Federally funded, Tech Prep links secondary and postsecondary technical studies in a sequenced program using applied career learning and leading to a 2-year postsecondary degree. *Dual enrollment programs* are similar, featuring opportunities to take community-college occupational courses during high school and progress toward a college degree. *Career academies* have garnered interest because they are often structured as small schools, which bring many benefits. Academies have strong business partners who provide student internships, a strong incentive for participation. Classes are set in career contexts. Similar programs use *career clusters*, small learning communities focused on career-related, college-preparatory coursework. *High Schools That Work* (HSTW), a widespread program, features rigorous classes with high credit requirements in English, math, and science. Academics are integrated with career-oriented occupational learning. HSTW schools have shown performance gains on national standardized tests.

Many schools use the leading programs to provide rigorous academic curriculum integrated with WBE opportunities. The following exemplary schools provide rigorous academics for all students; comprehensive curriculum, student support, and postsecondary education paths; career themes for integrated learning and student engagement; learning opportunities in the community; small learning environments; and considerable contact with adults.

- *Saunders Trades and Technical High School* in New York uses the Tech Prep program in partnership with postsecondary institutions. Programs of study are offered in technological, vocational, and occupational sciences. In small learning environments, students work with the same teachers for three years in a career major. Alternative assessments such as student projects are widely used. Of graduates, 95% enter postsecondary education.
- *The Bergen Academies* in New Jersey use a career academy program geared toward college preparation. Seniors locate internships with a wide range of employers in nearby New York City. Of 1998 graduates, 100% entered 4-year colleges.
- *Sussex Tech High School* in Delaware, using the HSTW model, offers programs in career areas such as business and industrial/engineering technologies. The school features an integrated academic and occupational curriculum leading to postsecondary education. Postsecondary entry in 2001 was 87%.

Policymaking Implications

As the Perkins Act faces reauthorization, the following factors will shape the future of WBE.
- *Standards-based reform* and closing the achievement gap will drive education policy for years to come, making it necessary to align current education laws with NCLB.
- *Tight budgets* are here to stay. WBE stakeholders must ask, "How can we innovate using the money we have?" Fiscal pressure will grow as other federal laws compete with Perkins for reauthorization.
- The federal government will increasingly require research demonstrating *programs' effectiveness* in boosting student performance. Programs must have an evaluation component or collect outcome data. Evidence that WBE increases standardized test scores and other factors related to achievement would help support programs.
- The appropriate *federal role in supporting youth and high schools* will come under review. The administration wants to better understand how current programs serve youth and to identify effective practices for disadvantaged youth.
- *The Program Assessment Rating Tool*, comprised of assessment criteria on program performance and management, will be used to rate many education programs, beginning in 2004. The tool could profoundly affect future WBE funding.

In this context, advocates must clarify how WBE fits into the larger agenda of helping youth succeed. For example, WBE offers connections with caring adults and service opportunities, which are increasingly recognized as important for youth. Advocates should make sure that these benefits are considered in discussion of education policies. Finally, some political realities pose serious threats to WBE, while others provide opportunities. It is time to link WBE to mainstream reform efforts and demonstrate how WBE can help students succeed. ⌘

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