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ABSTRACT

Increasing shortages of skilled workers have resulted in numerous changes and innovations in vocational-technical education (VTE). The overriding objective of these changes/innovations is to improve youths' work readiness. At the secondary level, school systems have adopted business-sponsored programs and integrated them into curricula. Efforts to improve education and make it more responsive to business and industry needs are evident in all of the following elements of the U.S. VTE system: high schools, community and technical colleges, apprenticeship programs, private and technical schools, and federal job training programs. Numerous new organizations and programs have been established to accomplish one or more of the following goals: improve integration of secondary and postsecondary VTE and integration of academic education and VTE; promote consistency, quality, and state-of-the-art currency in VTE curricula; and develop new and stronger connections between business and VTE institutions. Central among such efforts are tech prep or "2+2 articulation" programs and curriculum improvement/coordination efforts to increase employer participation in explicating changing job skill needs and eliminating duplication and waste in existing VTE programs. Legislation to facilitate these reform efforts by changing funding formulas, supporting tech prep, and increasing integration of academic education and VTE is now under consideration. (MN)

The Conference Board

Report Number 964

Innovation and Change in Voc-Tech Education

Increasing interest and support for vocational-technical education are resulting in:

- *expansion of tech-prep and applied technology programs*
- *business taking more responsibility for curriculum improvement*
- *new legislation to ensure program modernization*
- *full integration of technical and academic subjects*

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Innovation and Change in Voc-Tech Education

by Seymour Lusterman and Leonard Lund

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From the President

American workers gain their occupational competence through an extensive, complex and loosely integrated system of vocational education that blends federal, state and community roles, and comprises a variety of public and private institutions and programs. It is a system that involves business both as a customer and a participant in planning, program development and advocacy.

Whatever its limitations, the vocational education system has supported business activities of great size, scope and sophistication. However, in this era of global competition, its ability to meet the challenges of new technologies and changing demographics remains to be seen.

This report describes the state of the U.S. vocational-technical education system and the ways in which it is changing to meet the new needs of both its students and their future employers. Our thanks go to the many business and trade association executives and to the educators and government officials who provided us with the information and insights that made this report possible.

PRESTON TOWNLEY
President and CEO

Executive Summary

Shortages of skilled workers will become increasingly common in the years ahead as the job market's need for higher levels of competence is frustrated by education system deficiencies coupled with unfavorable demographic trends—fewer workers entering the work force each year, a growing proportion of whom are from disadvantaged groups. Strategies for dealing with these problems include measures to increase work force participation among women, retirees, the discouraged unemployed, and others, and to shape immigration policy to the nation's skills needs. Central to the efforts is an attempt to improve the work-readiness of the young by improving the delivery of knowledge through such programs as applied learning, and by a broadened view of career education and education channels.

New Business-Education Linkages

At the secondary level, school systems have adopted business-sponsored programs and integrated them into curricula. Some courses are taught at business sites by company personnel certified as vocational-technical education teachers. Business connections with community colleges have broadened, facilitated by state agencies and other groups, and customized training for companies has burgeoned. Business and post-secondary institutions have created joint facilities-sharing training ventures.

The Vocational-Technical Education System

The U.S. vocational-technical education system comprises public and private institutions. These include publicly funded high schools, two-year colleges, apprenticeship programs, private trade and technical schools, community and area skills centers, and federally funded programs for the unemployed, disadvantaged and handicapped. Skills training is also provided by public and private employers and by the armed forces.

High schools. Many job skills that could once be acquired through secondary school voc-tech courses now require more advanced education and training. High schools still provide essential preparation for entry into a variety of craft, automotive, office, health-care and other occupations. Student participation in high school vocational education—believed to have peaked nationally in 1982—has dropped sharply in many states. This decline is attributed to raised academic course requirements as well as to tight education budgets.

Community and technical colleges. These institutions have grown in importance as providers of higher education in the United States. Vocational-technical education has become one of their major roles, though they also continue to prepare students for transfer to four-year colleges. In addition to regular occupational programs, a sizable number tailor training to the needs of local businesses.

Apprenticeship programs. Apprenticeships have expanded to many of the new technical occupations, and the total number of occupations recognized by the Federal Bureau of Apprenticeship and Training has increased markedly. Despite this, the number of apprentices has held fairly steady.

Private trade and technical schools. About 3,000 private schools provide training in more than 100 occupational areas, though many are not accredited by the

The term *voc-tech* is employed throughout this report as convenient "shorthand" and because it is the most comprehensive term to date. Other terms used here, such as occupational ed, career ed, and tech ed, emphasize that the content and delivery of training for work has evolved since its inception.

National Association of Trade and Technical Schools. Private schools register less than a fifth of the nearly five million enrolled in post-secondary voc-tech education, although they account for well over two-thirds of federal grants and loans to voc-tech students.

Government programs. Federal training programs, briefer and more flexible than most institutional instruction, are designed to serve disadvantaged groups. The *Job Training Partnership Act* (JTPA) is the government's principal training program, but serves less than five percent of the eligible population. Other federal programs include the Job Opportunities and Basic Skills Training Program and the Job Corps. Numerous state programs also serve older youth, unemployed adults, the disadvantaged and the handicapped.

Innovation and Change

A host of new organizations and programs have come into being to accomplish one or more of the following: (a) improve the integration of secondary and post-secondary voc-tech education, and of academic and voc-tech education; (b) promote consistency, quality and state-of-the-art currency in voc-tech curricula and bring greater efficiency to their design and dissemination; (c) develop new and stronger connections between business and voc-tech education institutions.

Educational integration. Programs to mesh third- and fourth-year high school curricula with the occupational programs of two-year colleges—known as "Tech Prep" or "2 + 2 articulation"—enjoy broad support in education, government and business circles. Supporting this enterprise are important new curricula, such as "Principles of Technology," taught at more than 1,200 institutions in 47 states. The same program has also developed "Applied Mathematics;" "Applied Communications;" and "Applied Biology/Chemistry." All are written at an eighth-grade vocabulary level and designed to be either "infused" into vocational courses or taught as individual courses.

Curriculum improvement and coordination. Voc-tech curriculum improvement has been pursued along two main lines: (1) more effective employer participation in the explication of changing job-skill needs; and (2) melioration of duplicative and wasteful features of our highly decentralized education system. Some specific means include:

- the creation in the states of private sector Technical Committees charged with voc-tech curriculum development and review responsibilities;
- fashioning of curricula and skills inventories intended for nationwide use by several trade associations and other businesses; and
- formation of a national clearinghouse to promote and assist curriculum sharing among states.

Curriculum interchange, and a measure of standardization, are also promoted by national and state testing organizations.

The Future of Vocational Education

Vocational training "in new dress" offers a viable alternative to general education courses. Improved occupational and technical training through magnet programs, career academies and Tech Prep programs will better equip many students for life and work.

This view has received strong support among legislators and business leaders. The newly reauthorized, amended, and retitled, *Carl D. Perkins Vocational and Applied Technology Education Act* makes changes in governments' role and conception of voc-tech education. In Arizona, for example, state legislators and business leaders have altered the process for providing training for work in that state. Most important, vocational training is viewed increasingly not as alternative education for the less educable, but as a means of providing the well-trained work force this nation will need to again become a top competitor in the world's economy.

Vocational Education in Transition

A widening gap between the supply and demand for skilled workers is threatening the vitality and competitiveness of U.S. business. Manufacturing and service industries are calling for ever-greater numbers of technically sophisticated employees as computerization, robotics, automation and other technological improvements take over the workplace. Skills shortages are emerging already, and as a U.S. Department of Labor study shows, the fastest employment growth in the years ahead will be in occupations requiring higher knowledge and skills (see Table).

Young people once gained occupational skills by working side-by-side with their elders. Such an informal system of work preparation is no longer adequate for the evolving workplace. Even unskilled workers require greater literacy, computation, and problem-solving skills than workers had in the past. Yet, as a U.S. Office of Education study noted: "Too many persons leave our educational system at both the secondary and collegiate levels unequipped with the vocational skills, the self-understanding and career decision-making skills, or the work attitudes that are essential for making a successful transition from school to work."

Levels of literacy and numeracy are rudimentary for many young people. Too few attain basic knowledge in science, technology, and other fields sufficient for training in specific occupations. While the economy still offers jobs for those poorly prepared in the basics, these opportunities have been shrinking steadily for a decade. Moreover, as one prominent educator noted, "Vocations change their character so rapidly that the most appropriate preparation for today's workplace is an ability to adapt to new kinds of jobs that may not have existed when one was in school. The best possible vocational training is to cultivate general abilities to communicate and learn."[1]

Population trends are expected to exacerbate the effects of educational deficiencies of workers. The growth of the potential work force is slackening. Demographers estimate that the average annual rate of job entrants between now and the end of the century will be less than half of what it was during the late 1970s—1.2 percent as compared with nearly 3 percent. An increasing proportion of this smaller group will be drawn from minority and disadvantaged populations. One report warned, "Although we face a nationwide need for more workers, minorities are concentrated in our central cities where fewer jobs are available. This

Employment Projections, 1986 to 2000* (Moderate Growth Projections)

Major Occupational Group	*1986*	*Projected 2000*	*Percent change 1986-2000*
Total employment	111,623	133,030	19.2
Technicians and related support workers	3,726	5,151	38.2
Service workers, except private household workers	16,555	21,962	32.7
Salesworkers	12,606	16,334	29.6
Executives, administrative and managerial workers	10,583	13,616	28.7
Professional workers	13,538	17,192	27.0
Precision production, craft, and repair workers	13,924	15,590	12.0
Administrative support workers, including clerical	19,851	22,109	11.4
Operators, fabricators, and laborers	16,300	16,724	2.6
Private household workers	981	955	-2.7
Farming, forestry, and fishing workers	3,556	3,393	-4.6

*The Conference Board and the Bureau of Labor Statistics, U.S. Department of Labor, Projections 2000, Bulletin No. 2302, Washington, DC, U.S. Government Printing Office, 1987.

[1] E.D. Hirsch, Jr., "The Primal Scene of Education," *New York Review of Books*, March 2, 1989.

mismatch, combined with the widespread deficits in academic skills and job experience of many of these potential workers does not auger well for the employment of either poorly educated minority group members or others who lack solid workplace skills."[2]

Adopting New Concepts of Vocational-Technical Education

The collision of the need to meet more demanding work force skills with currently inadequate skill training facilities poses a major threat to the nation's future economic competitiveness. While education reform has been given extensive attention, most of this attention has been focused upon the inadequacies of elementary and academic high schools. Vocational schools, whose continued existence, or validity, have long been a source of friction among educators, have not been weighty participants.

Yet there are notable successes in training young people for occupations and careers in a variety of venues. Modern vocational or occupational schools, such as Metrotech in Phoenix, Arizona, provide a wide assortment of career choices. For example, at Metrotech a student might prepare for a career in restaurant management or associated jobs (the school has three eating places run by the students which are open to the community). The school also has a bakery and laundry serving the restaurants, an automotive center (which services all the school system vehicles), a travel agency, a credit union and a day-care center—all regular businesses in which students work and learn. The school also boasts a state-of-the-art computer design and graphics department which serves the whole school system while it trains young people in drafting and design. The school's home repair and construction department has a contract with the city to have students repair and maintain the homes of the elderly poor. The combination of applied learning and real work experience has reduced the dropout rate and produced graduates who can meet the needs of local employers.

Magnet schools, not usually considered vocational or occupational-type schools, today represent a growing movement in education for preparing young people for specialized careers. Long respected as schools for the gifted and talented (primarily in science and technology, and performing arts), more and more magnet schools are being created to serve the career interests of average students. Utilized recently as a means for racially integrating schools, the magnet school concept has been chosen to attract students with particular career goals and talents, who would find such schooling more relevant because of the association with a particular occupation and the specialized curriculum. Thus, the formerly termed "commercial high school" that trained generations of clerical workers, has been replaced by a "High School for Business Careers"—with curriculum and teaching assisted by a business advisory board—which educates young people for entry-level management positions.

In many instances, the changing needs of occupations have led to the upgrading of vocational schools, so that they can meet current needs as preparers for the more complex work requirements. Just as "manual training" is no longer an adequate representation for vocational training, neither is the latter title appropriate. Rather it has been replaced by other terms such as vocational-technical education, occupational education, career education, work-based education, tech-prep education and several varieties of these, which intentionally represent broader concepts.

Skills for the Evolving Workplace

What are the core skills that students need to function successfully in the contemporary workplace? First are good academic skills. Says Sue Berryman of Columbia University: "Perhaps the most profound educational implication of computers in the workplace is that they force a replacement of observational learning with learning acquired primarily through symbols, whether verbal or mathematical." Changes in the economy "increase the need for higher order cognitive thinking, even for jobs that we usually conceive of as low skill."

A second need, says Dr. Berryman, is the ability "to know how to learn; in other words, how to organize social and technological resources to transform what is unfamiliar into the mastered. This process requires knowing how to identify the limits of one's own knowledge, how to ask germane questions, how to penetrate poor documentation, and how to identify sources of information." Finally, "changes in the economy require teamwork and the ability to resolve conflicts," according to Dr. Berryman.[3]

A study conducted jointly by the U.S. Department of Labor and the American Society for Training and Development identifies seven skills groups as follows:

- The Foundation: knowing how to learn;
- Competence: reading, writing and computation;
- Communication: listening and oral communication;

[2] *The Forgotten Half*, William T. Grant Foundation Commission on Work, Family and Citizenship, November, 1988, p. 30.

[3] *Education and the Economy: A Diagnostic Review and Implications for the Federal Role*, Dr. Sue E. Berryman, Director, Institute on Educating and the Economy, Teachers College, Columbia University, New York; a paper prepared for the Seminar on the Federal Role in Education, The Aspen Institute, Aspen, Colorado, July 31—August 10, 1988.

- Adaptability: creative thinking and problem solving;
- Personal Management: self-esteem, goal setting motivation, and personal/career development;
- Group Effectiveness: interpersonal skills, negotiation, and teamwork;
- Influence: organization effectiveness and leadership.[4]

The current emphasis on basic and generic skills needed in the workplace poses new challenges for primary as well as upper-level schools—and for academic as well as vocational programs. How to teach some of these skills is a vexing question to many educators; "the tough challenge ahead for educational research, policy, and practitioner communities," one says.

Most occupations in the evolving workplace will require a solid education foundation. Yet, the nation's schools, nearly everyone agrees, are *not* doing their job.

Commissions, government agencies, independent scholars, research centers, business organizations, legislators and political candidates—and most recently, the Education Summit Conference convened by President Bush and the Governors of the 50 states—say that education in the United States is in a state of crisis and have proposed a variety of approaches to restructure it. These include:

- the creation of national goals and standards;
- less bureaucracy and more school-based management;
- longer school days and years;
- revised standards for teacher accreditation;
- early-intervention programs for at-risk children;
- state-assured basic funding for schools in poor areas; and
- strengthened business-school partnerships.

Particular jobs call for their own levels and configurations of basic competencies, and an individual's promotability and long-range value to an employer will depend upon whether he or she possesses them. But from a practical standpoint employers also require that entrants into the labor force have specialized work skills.

Employers' current focus on basic and generic skills is based on two sources of frustration. One is the difficulty in finding people who are trainable even for entry-level jobs. The other is that many of those who do have entry-level technical skills lack certain of the basic competencies necessary for effective participation in the workplace. One executive says: "If nothing else, give us the basic skills. If possible, give us more because we don't want to do any more training than we absolutely must."

The nation's principal providers of voc-tech education are its publicly supported high schools and two-year colleges. Efforts to improve the system center on these institutions. But other strategies as well are being followed for dealing with U.S. skills shortages. They focus on adults and aim to ensure an adequate pool of skilled workers. These efforts include:

(a) retraining those whose skills are made obsolete or unmarketable by technological change. Much of the nation's retraining is conducted by employers. But such in-house training, voc-tech education experts say, is often uneconomic. Even the largest firms may have too few employees to conduct cost-effective company-based training. Now, however, a network of private and publicly supported resources is available to them throughout the country.

(b) attracting into the work force, and training, people who are not actively seeking jobs (e.g., the unskilled and discouraged unemployed, non-working women, and the handicapped). The full implementation of this strategy involves a wide range of measures beyond education and training. Attention is also being given, in the reform of both federal welfare and the tax system, to the imperatives of work force participation.

(c) reversing early-retirement trends, encouraging longer work careers, and providing part-time employment opportunities to retired persons. The outlook for this option is not good. Encouraged by corporate downsizing and personal opportunity and choice, the trend toward early retirement continues unabated. A 1987 projection by the Labor Department sees a net loss of a million workers in the 60 and over age group by the year 2000.[5]

A Changing System

Important changes have taken place in the voc-tech education system during the past couple of decades. The increased need for higher skills, brought on by changing technology, has propelled two-year colleges into playing a major role. Innovative programs have evolved in numerous secondary schools, but state funding of voc-tech education at that level has fallen, as has, many believe, program quality.

Many new organizations and programs have emerged to promote better integration of occupational education at secondary and post-secondary schools and of

[4] *Workplace Basics: The Skills Employers Want*, The American Society for Training and Development and the U.S. Department of Labor, Employer and Training Division.

[5] Bureau of Labor Statistics, U.S. Department of Labor, Projections 2000, Bulletin No. 2302, Washington, DC: U.S. Government Printing Office, 1987.

vocational and academic education; and to improve voc-tech curricula and facilitate sharing of these among schools and school systems. Others are trying to forge closer links between schools and businesses.

Efforts to improve this system center on meshing the vocational curricula of high schools and two-year colleges, on improving the integration of occupational skills training with education in the basics, and on creating a new generation of course materials in technology and science. Among the more promising developments are "Tech Prep" programs and new technically oriented curricula that link career education at secondary and postsecondary levels. An important side benefit of these programs is that they provide the setting and context for the teaching and enhancement of basic skills, particularly in math.

Contributing to initiatives to promote consistency and quality in voc-tech education are a disparate group of state education departments, curriculum developers, trade associations and businesses. Current indications are that corporate America has begun to do even more to assist the reform of voc-tech education. Venturesome business leaders, such as the Arizona Business Council, have shown that substantive improvements can be made in career education. In other localities, business connections with community colleges are forming to promote the "2 + 2" programs in local schools, to retrain workers for more complex jobs, and to introduce new technologies. While not yet a nationwide movement, these initiatives lead the way toward a deeper business engagement in improving the work-readiness of the young.

New School-Business Linkages

As business and vocational education institutions recognize their shared interests, some of the traditional barriers of inertia and mistrust between them have eroded. Secondary school systems have adopted business-sponsored programs and integrated them into curricula. Some of these are conducted at business sites and use company personnel as teachers. Business connections with community colleges have been evolving rapidly, facilitated by state agencies and other groups created for that purpose. Customized training for companies has also burgeoned. Business and post-secondary institutions have created joint facilities-sharing, education and training ventures, while individual firms and industry groups are working with qualified two-year colleges to introduce new technologies to smaller businesses and to train company personnel in their use.

Barriers and Constraints

The voc-tech education system is not corporate America's primary education interest; financial support is meager. Even if all contributions to secondary schools and to two-year colleges went for occupational programs—which is by no means the case—they would amount to only about 4 percent of all corporate giving to education. The fact that voc-tech education institutions are publicly supported does not explain this lack of interest; since at the four-year level, corporate dollars go equally to public and private colleges. Nor is voc-tech education often an issue for corporate lobbying, public service advertising, talks by top executives, or other forms of advocacy.

Clearly, basic educational reform is almost universally perceived to be the more fundamental issue. But there are secondary reasons as well for the relative corporate inattention to voc-tech education. For one thing, the voc-tech education system seems to some business people to have worked reasonably well, though skills shortages are becoming more common and more serious. Second, bigger firms tend to be at some distance from voc-tech institutions. As one executive commented: "Like managers at most other companies, ours are not aware of the value of community colleges. They're not where we go for new workers. We look for people who already have some experience." Moreover, the kinds of skills acquired in secondary school programs are usually more appropriate to smaller businesses. (Firms such as automobile and electronic goods manufacturers, however, do have a major stake in voc-tech programs which arises out of their need for service networks.)

Educators are also part of the "two worlds syndrome"—likely to be unfamiliar with business and its needs, and often unsympathetic to the idea that they have a responsibility to the local economy. One executive said: "Many community college administrators in our state comply only minimally with the state law mandating vocational programs: they are much happier with their four-year transfer role." It is often suggested that the interest of school administrators is also discouraged by what one executive calls the "cost-benefit dilemma." The state funding a school receives is based, to a significant degree, on numbers of students enrolled. But by virtue of the expensive equipment required, the costs per voc-tech student are likely to be far higher than for those registered in academic programs.

Business-Sponsored Career Education Partnerships

Nonetheless, companies do have a long history of assisting voc-tech schools. They participate in curriculum advisory roles, donate equipment, offer summer internships and training programs for teachers and students, and take part in work-study and cooperative education programs. More venturesome companies and industry groups have also entered into partnerships with voc-tech institutions. Some have conceived new programs

that have been adopted by public schools and integrated these into their curricula and systems, and are sharing with the schools responsibility for financing, management and execution.

The Arizona experience. The Arizona Business Council's activities are a good example of business leadership and successful partnering. Created four years ago to work with the State Department of Education, the Council has succeeded in getting four additional business people appointed to the State Board of Vocational and Technical Education, giving the business community a greater role in decision making in education. They also convinced the State to adopt a methodology, or set of procedures, developed by one of its founding members, Harry Hollick of Intel Corporation, in turning his company around. These procedures include: (1) creating a vision or goal of what is to be achieved; (2) developing measurements and milestones to assess progress toward the goal; and (3) defining the operating roles that all of the participants will have in the effort; in effect, figuring out who is responsible for what—what is the state role, what is the local role.

In addition, the Council formed task forces in several industries prominent in Arizona's economy—electronics, hospitality, machining, and others. Each task force began to help shape an industry curriculum, provided in-service training for teachers and contributed employees, technology, curriculum materials, and financial support. The task forces also sponsored pilot programs in voc-tech schools throughout the state, establishing discrete programs by grade: exploratory courses in science for seventh and eighth graders; applied academics for ninth and tenth graders which provided hands-on technical training with a basic skill such as math and English; and for the eleventh and twelfth graders, intensive job preparedness training. In some of the programs, students also had the opportunity to gain job experience through summer and part-time employment. After 18 months of experience, the drop-out rate in 36 vocational and technical pilots was 7 percent, compared to a state norm of 37 percent. Members of the Arizona business community report that the graduates from the pilot programs are superior to past industry hirees.

Career academies. Another example of business-school partnerships to provide career-readiness training in high school are the various academies conducted by the National Academy Foundation. An outgrowth of the pilot Academy of Finance program initiated by the American Express Company, the National Academy Foundation now conducts academy programs in financial services, and tourism and travel. New academies in manufacturing science, and in public service careers have recently been inaugurated in response to a demand by other industries for such specialized training.

The Academy of Finance is a two-year comprehensive academic program for public high school students. The Academy of Finance was conceived in 1982 as a partnership between American Express (and Shearson Lehman, an affiliate) and the New York City Board of Education as a way of preparing inner-city high school students for careers in the rapidly expanding financial services industry. The pilot Academy was created in one school, with an enrollment of 35 students. In 1990, 45 schools in 20 American cities have an Academy of Finance. In addition, 14 schools in 8 cities host an Academy of Travel and Tourism. Almost 250 business firms are partners in the Finance Academies providing financial support, instruction, curriculum planning and summer jobs.

The Academy's National Director has described the Academy of Finance program as follows: "The public school system picks up 50 percent or more of the cost, and local financial institutions the balance. The design is simple: Students are recruited during their sophomore year [in high school] after an official recruiting process in which the private sector participates. They start the first of the program's ten components in their junior year. These courses for which the Academy has prepared its own curriculum and trained the public school teachers, are in addition to the students required course work."

"Students in the program take a finance and a finance-related course each term during their junior and senior years and work at a financial services institution at the end of their junior year. They return to high school in their senior year to take more finance courses, a computer class, and an accounting course at a college. They receive a special program graduation with a certificate of financial studies when they complete the ten financial components, the eight high school courses, the internship, and the college component. One additional component of the program is a "finishing school" which covers basic etiquette, ethics, table manners, and dress for the workplace."[6]

In New York, and in most of the other locations, nine out of ten Academy graduates have gone on to college, only 10 percent accepting employment at a financial service company as a priority applicant. A recent survey by the Academy for Educational Development of Academy alumni indicated that the experience was "a critical influence on their career decisions and preparation for their future. . . and. . . particularly beneficial for young women and minority youth. These graduates performed as well (in terms of post-

[6] In a talk at the Conference Board's 1988 Business-Education Conference. See Leonard Lund, *Beyond Business/Education Partnerships: The Business Experience*, Research Report No. 918, The Conference Board, 1988.

secondary education and employment) as did other youth."

A career program for special students. Another example of business-sponsored career education is the supermarket job training program of Wakefern Foods, a holding company for a chain of 37 ShopRite food stores, operated in conjunction with voc-tech schools. Originally designed for handicapped high school students and adults, the program's focus has expanded to include persons at risk, and all those having special needs. It was launched with the Bergen County, New Jersey, voc-tech schools in 1988, and has already been adopted by schools in other parts of the state. By September 1990, Wakefern expects to have spurred the creation of 15 centers in other ShopRite states—Connecticut, New York, Massachusetts and Delaware. A key player, in addition to the company and local voc-tech education institutions and systems, is Cornell University's Food Industry Management Program, which works with the schools in developing curricula.

Classroom training, which occupies students' morning hours, takes place in fully equipped simulated supermarkets at participating schools. Wakefern merchandisers visit and appraise program activities much as they do at local stores. In the afternoons, students train at ShopRite stores. Programs are established only after local store managers, as well as school personnel, understand and commit themselves to the venture. Advisory committees check and report to Wakefern management the quality of local store participation.

All those in the program's first senior class are reported to have found prompt employment, both at ShopRite and other stores. "The program is designed to meet the needs of the food industry, not just ours," Wakefern's Manager of Retail Recruitment says: "Those who complete it carry a certificate of competency they can take anywhere."

Company Classrooms

Some secondary school voc-tech courses have taken up residence at business sites. Under an "off-campus" work-study program of the St. Louis Public Schools, for example, qualified high school seniors who have earned 18 hours of required academic credit by the end of their junior years are eligible to spend their days at a workplace. The Ralston Purina Company, a consumer products manufacturer, became the first company to participate in the program.

Mornings at Ralston Purina are devoted to classroom work, conducted by school-system teachers, in vocational and academic subjects. Students study data and word processing, office calculation, bookkeeping, English and social studies. Afternoons are devoted to job training and work supervised by company personnel. Students—up to a maximum of 40 each year—are paid the minimum wage for 20 hours of work per week and earn six credits for their course work and the internship. Ralston has an excellent record of employing qualified students after graduation. Placement rates for 1988 and 1989 were 39 percent and 63 percent respectively. Six other companies also participate in the St. Louis program.

California has made it possible for employees to teach in company classrooms. One of the 26 states that have enacted "alternative certification" laws that bypass traditional licensing requirements, California's legislation qualifies experienced, job-skilled employees for the state's "designated subject teaching credential."

California has no secondary voc-tech high schools, and vocational courses and enrollments at comprehensive high schools are reported to have diminished in recent years—or "atrophied," in one educator's term—due to increased academic requirements for graduation and cuts in federal funding. But high school students in that state may take "advanced placement" courses in voc-tech subjects at community colleges, or become "concurrently enrolled" for credits at job-preparation or skills centers. Worksite skills centers have been established in Los Angeles under several state and school district programs. Among the firms that have participated in them, some, like Security Pacific Bank, have provided company instructors. The bank trains more than 3,000 students a year at bank offices throughout the state.

Customized Training for Business

Business ties with voc-tech education are based increasingly on customized training, mainly involving community and technical colleges. These activities are sometimes connected with programs to use two-year colleges as instrumentalities for the transfer of new technologies.

Colleges have recognized valuable opportunities in customized training for business—income for the institution; professional development, added pay and enhanced job satisfaction for instructors; and an improved curriculum based on better understanding of employer needs. As colleges have gained experience in this role, their efforts to attract business clients have become more systematic and assertive. One executive says: "There are school people out there who act as though they were with for-profit training houses, thinking competitively, trying to capture their markets—though others still seem to think of their schools as citadels for business to try to penetrate." More business people, similarly, are learning to look to community schools for training assistance.

Programs have also been created, notably by state agencies, to stimulate and assist the business-school connection. States and communities pursue economic vitality and competitive advantage through subsidized research, financial assistance and advice to new businesses, marketing support, venture capital programs, and the like. Assuring prospective and present employers of a supply of skilled workers is another goal purposefully pursued. So, increasingly, is the retraining of current employees.

A number of states have taken steps recently to rationalize, improve, and better market their training resources to businesses. New York, for example, joining such other state Ohio, Georgia, Oklahoma, and Florida, took a step in this direction with the development of its "Employer Specific Training Program" and the adoption of a school-employer brokering system. Employer training needs are served principally through the state's post-secondary institutions, though close behind is the Board of Cooperative Educational Services (BOCES), a state training network serving secondary school students and adults. Helping to bring the two together are 10 regional education centers, the brokering agencies. Their role is to assess employer needs, to identify accessible resources that can serve those needs, and to help assure an effective match between needs and programs. "Business people and educators are uncomfortable in each other's worlds," says New York's head of vocational education: "We work through these brokers because they have learned to walk in both worlds."

Another effort to bring the two worlds closer together was launched in the mid-1980s by the American Association of Community and Junior Colleges and the Association of Community College Trustees—the Keeping America Working (KAW) project. While its stated aim is to promote the resources of two-year colleges to business, KAW's programs are also stimulating the interest of its member-colleges in providing training to local employees.

KAW personnel also perform brokering services, which are a growing facet of the program. "Companies are coming to us for help in forming consortia around common training needs," says a project official, "because of our special knowledge of how to tweak the system and get the best out of it."

The Vocational-Technical Education System

The voc-tech education system in the United States is made up of a variety of public and private institutions and programs. Young people may gain occupational skills at secondary schools, at two-year community or technical colleges, at vocational training centers, and at private trade and technical schools. They may also become apprentices or participate in various federally funded training programs. Many also acquire skills in the armed forces, or in the workplace, from employers who hire them despite their lack of needed skills and take on the tasks of remedial education and training.

Vocational education began early in the present century when a number of states offered it as an alternative to the academic curricula then being provided to a growing, but still relatively small, proportion of youth who attended high school. *The Smith-Hughes Act*, signed into law in 1917 by President Wilson, inaugurated federal support for vocational education, providing $7 million annually to the states for training in agriculture and other vocations. Federal support for vocational education had been part of the American experience since the establishment of land-grant colleges in the Lincoln administration. Over the years, the dollars have grown (though in real terms, they have fallen markedly during the past decade) and the scope of federal involvement widened. *The Carl D. Perkins Vocational Education Act*, signed into law in 1979, renewed in 1984, and reauthorized and amended in 1990, provides funds for program development and evaluation at both secondary and post-secondary levels.

Secondary Schools

Technological change has increased both the knowledge and skills needed for work and the time required to gain such skills. In a simpler era, most young people acquired occupational skills by observing and learning from their elders, by participating in apprenticeship programs, and in the classrooms and workshops of secondary schools. On-the-job learning today is likely to be the culmination of prior education, while apprenticeships have dwindled, and high school training suffices for a diminishing number of occupations. "High schools can no longer put out the fully trained machinists and welders we need to keep our power plants going, or the automotive repair workers to keep our vehicles on the road. Technology has changed these jobs, and we're relying more and more on the community colleges," says a utilities executive.

Nevertheless, secondary school voc-tech education continues to be an essential part of our system. It still trains many young people for direct entry into jobs in the construction trades, automotive repair, office work, health care services, and other occupations. A recent survey shows that voc-tech graduates from high schools do far better in the job market than other non-collegebound students. Moreover, according to another report by the same investigator: "Youth from disadvantaged backgrounds who take vocational courses are more likely to graduate, are less likely to be unemployed, and are more likely to obtain better paying jobs."[1] And high school voc-tech education equips many for more advanced technical training.

Today, virtually all high school students (97 percent at last count) take at least one course that is classed as vocational, and some voc-tech programs are known as "hobby shops." But half take at least four year-long courses. Data on participation rates in voc-tech education—or in subject-area enrollments—are not available for recent years, but indications are that enrollments peaked in 1982 and have since been level or down slightly. They are known to have dropped sharply in certain states, depressed by effects of the back-to-basics reform efforts. Academic course requirements have been increased, academic competency examina-

Bishop, John, *Vocational Education for At-Risk Youth. How Can It Be Made More Effective*, Center for Advanced Human Resources Studies, New York State School of Industrial and Labor Relations, Cornell University, August 1, 1988.

tions required as a condition for graduation, and various incentives provided for taking extra academic course work. "California is making up for a long period of neglect of the basics, and secondary school voc-tech education is getting hit—it has become worse in all our communities," observes a human resources executive of a firm with multiple operations in that state.

The back-to-basics movement illustrates the kind of controversy that has revolved around voc-tech education from the start. To proponents, voc-tech education has been a constructive response to the reality that not all young people have the taste or aptitude for academic study. Some provision, more effective than general studies, must be made for these young people, they say. One executive interviewed for this study says: "Frustrated, feeling peer group pressure, and not experiencing success, many students drop out. Voc-tech programs can provide them with hands-on skills, with a better start in life than they would otherwise have."

Those who object on principle to secondary school voc-tech education make two points. One, rooted in tradition and still held by many educators, is that public schools move away from their essential charge, and so demean themselves and cheat both their students and their public, as they depart from an academic curriculum. The second is the egalitarian argument that creation of a separate track for those less academically gifted or motivated constitutes the perpetuation of class inequality. While these views and attitudes have not prevailed, they continue to influence public policy as well as the programs of many schools and communities.

Secondary school voc-tech education is faulted today more on grounds of performance than principle. Everyone agrees that quality varies widely from school to school, and even the harshest critics can point to good programs. Programs at area vocational high schools are likely to outperform those at comprehensive high schools. Certain states seem to provide above average programs as do particular communities or schools. But studies have found that, overall, fewer than half of those who complete secondary school voc-tech programs gain employment in the field for which they trained. This can be explained in some measure by the vagaries of the marketplace, the availability of more mature workers, and the tendency for the new graduates to change their minds as they learn more about jobs and the labor market.

But much of the mismatch problem stems from the inadequacies of traditional voc-tech programs. First, it is generally agreed that courses are not updated to reflect current industry practices. By the same token, school equipment, some of it donated by industry because it is obsolete, is not state-of-the-art. The teaching is also outmoded because teachers do not have the opportunity to keep up with industry trends. Tight budgets for education in most states and communities have deterred improvement in recent years. Second, there is often a poor match between curriculum program offerings and changing market needs. Students fail to receive adequate counseling and are trained for occupations with few jobs and little career opportunity.

Improved responsiveness to, and compatibility with, the job market are not the only changes that are needed in secondary school career education. Another goal is the integration of both basic and generic skills with the science or technology of the various occupational fields. Whether students are learning skills that may not require post-secondary education (e.g., various craft, office, and health-care occupations), or those that do, they need an educational base that will make new learning and retraining possible as job requirements change during their working lifetime.

Thus, secondary school curriculum planners face important questions about the character of their offerings: Are curricula in the various skills areas to be targeted narrowly to the needs of major or dominant local employers, or, more broadly, to the whole range of requirements of an occupational category? Are they to prepare students with no more than those skills needed in today's job market, or with competencies that will offer flexibility and facilitate adaptation to new technologies and processes? These questions will need to be answered before students can effectively meet changing work force environments.

Community and Technical Colleges

The most notable development in voc-tech education during the past several decades has been the increasingly prominent role of the two-year colleges. Until the 1960s and '70s, when many of them began to offer vocational curricula, community colleges were a resource through which poorer or less academically ambitious youth could gain post-secondary education credentials before entering the job market or prepare for transfer to four-year colleges. They were more often known then as junior colleges. Technical colleges were created in certain states after World War II—mainly to attract industry—and at first devoted themselves solely to technical training. The distinction between types of two-year institutions has blurred considerably over the years as occupational programs have burgeoned at community colleges. But public technical colleges continue to specialize in vocational subjects. Together, these institutions serve about 4.3 million students.

Today, most of the nation's approximately 1,200 two-year colleges recognize three distinct functions—remediation, academic preparation for transfer to four-year institutions, and voc-tech education. The latter has become the primary mission of most. Community

and technical colleges, moreover, have become the prime purveyors of post-secondary vocational-technical education in the United States, with about 3.6 million students—nearly five times the enrollment of all other sources.[8] Community college students tend to be older than those in four-year colleges. A California commission found an average age of 28 for students in such institutions, a quarter of them with bachelors or advanced college degrees.

Some voc-tech curricula essentially duplicate secondary school programs and are designed for students who did not take these courses in high school. Others offer only advanced technical training for students who have had basic vocational training, and workers requiring upgrading. Most provide both. Even within these categories, quality and technical sophistication vary. However, one estimate is that half or so of the nation's two-year colleges now offer quality technical curricula.

A growing number of these institutions tailor training to the needs of local businesses. In this new role they may help pave the way for the opening of new facilities in their communities or the retraining of workers at existing plants and offices. One state official says: "Most companies are small—and the bigger ones are breaking into smaller and smaller operating units. They lack the economy of scale that would justify doing their own training. But their need for skilled workers is increasing. Meanwhile, a large and extensive system exists out there, one that represents a great investment. Institutions with training capabilities exist in every nook and cranny of the state. The potential match is ideal."

A small but increasing number of community and technical colleges have acquired the capability to transfer technology to smaller businesses. These colleges have established advanced technology centers. Through this form of service to business, as well as their customized training and regular occupational programs and courses, two-year colleges contribute to the work force needs and economic capacity of a growing number of communities.

Private Trade and Technical Schools

While publicly supported high schools and two-year colleges account for the lion's share of enrollments in voc-tech education, and are the central concern of this report, the system's other resources play an important role as well. Private trade and technical schools are the market's response to skills training demand. Among their sponsors are major companies like ITT Corporation and Control Data Corporation, as well as many smaller companies. Proponents of these schools point to their program range, efficiency and cost control, as well as sensitivity to change and to new markets. Critics charge some with overly aggressive marketing, acceptance of students who lack basic skills or other essential attributes, poor program quality, high drop out rates and poor job-placement performance. (An investigation of fraudulent practices, by the Department of Education's Office of Inspector General, is currently underway. A recent New York state study has found abuses at more than half of such schools in that state.) The students at private trade and technical schools represent about 14 percent of all those enrolled in post-secondary voc-tech education, according to the National Assessment of Vocational Education. In 1986 they accounted for 71 percent of federal dollars in grants and loans to voc-tech students.[9]

Studies indicate that the students of private schools are older, poorer, and more likely to be members of minority groups than are community college students. Well over half have been in the work force, laid off, and are in retraining.

A total of 1,100 schools are currently accredited by the National Association of Trade and Technical Schools, and there are also many unaccredited schools. Students at accredited schools are entitled to federal financial aid and other assistance. These schools provide more than 100 major training programs. Most range between one and two years in duration. The bulk of enrollment is in such areas as air conditioning, refrigeration and heating, health, technology, electronics, and auto mechanics.

Apprenticeship Programs

Apprenticeship programs seem to many an ideal skills-training, school-to-work, mechanism. Apprentices earn while they learn; employers gain value and a trained work force. During the past decade or so apprenticeship training in the United States has seen significant changes.

There has been marked growth in the number of occupations recognized as apprenticeable by the Federal Bureau of Apprenticeship and Training—from fewer than 500 during the 1970s to nearly 800 today. The expansion has been into such occupational areas as engineering technician, emergency medical technician, and numerical control machine operator. Aerospace companies, like McDonnell Douglas Corporation and Northrop Corporation, have boosted their apprenticeship programs in recent years. Nevertheless, the number

[8] *Conditions Calling for Educational Reform: An Analysis*, by Edwin L. Herr and Stanley H. Cramer; Monographs on Career Education, U.S. Department of Health, Education and Welfare, Office of Education.

[9] Final Report, Volume I, *Summary of Findings and Recommendations*, National Assessment of Vocational Education, United States Department of Education, July 1989.

The German Apprenticeship System

U.S. executives see themselves increasingly handicapped by the deficiencies in the nation's labor market as they compete with global businesses. Other countries, many executives believe, have better systems of work preparation than ours—as well as better learners. The German apprenticeship system, in particular, has been viewed with interest and envy. As early as 1912, a Chicago business group sent an emissary to study and report on its workings. Here are some of the key features of the German system.

The students. Upon completion of the tenth grade, students in West Germany who do not intend to go on to a university, or other higher education program, may either enter a full-time vocational institution or an apprenticeship program that includes some part-time schooling. Schooling is compulsory until age 18. At present, about half of all 16 to 18 year olds are in apprenticeship programs. These are entered into formally by contract, signed by parents as well as students.

The employers. Germans see apprenticeship positions as no less an entitlement of young people than schooling. Employers are expected to carry the basic responsibility. A 1982 study found that about 10 percent of firms engaged in "business and commerce" and 40 percent of those in the "crafts and handwork sector" had apprentices. Participating firms pay their apprentices about half of what they pay skilled workers, and give them at least 18 days of paid vacation. German law also requires employers to join and finance "chambers"—entities that set and enforce standards for training in more than 400 occupational areas. In 1976, in order to spur employer participation in the apprenticeship system, and to help finance alternative school-based vocational education, the federal government passed legislation creating a payroll tax to support apprenticeship programs should supply of openings fall short of demand.

Part-time voc-tech students. Apprentices normally spend one to one-and-a-half days a week in school, though "block instruction" of five to six weeks on a full-time basis twice a year has become a popular alternative. In addition to courses relating to their occupational specialities, students study German, social studies and other academic subjects—as well as any mathematics that may be involved in their vocational areas. The skills and knowledge attained by students is tested through examinations developed by the various chambers—an arrangement that ensures the relevance of curricula to employer needs.

Limitations. Critics of the German system, within and outside of that country, see some of the same deficiencies as others do of secondary school voc-tech education in the United States. Those entering the system are principally from the lower social and economic groups, and are said to be pressed at too early an age to make occupational choices—often in very narrowly specialized fields. Later these choices become difficult to change. One recent study also finds that "new technologies have to be very extensively used before they can be absorbed into the official training programs."

Can this system, or any of its parts, be grafted onto the American System? The question, asked periodically for nearly 80 years, is perhaps answered in a recent report by Great Britain's Institute of Manpower Studies. Analyzing the findings of a study of occupational education systems in Germany, Japan, and the United States, its authors find each country's educational objectives to be different. "Moreover," they observe, "the cultural assumptions on which policy decisions are made are so different that even identical decisions in any two countries would almost certainly produce different results." Thus, they recommend to British planners to avoid "the danger of copying separate elements of someone else's system in the hope that they will produce the same results in the UK."

The reader interested in more information about the German system is referred to a thoughtful and comprehensive article written by Stephen F. Hamilton, Cornell University. Entitled "Apprenticeship as a Transition to Adulthood in West Germany," it appeared in the February 1987 issue of the *American Journal of Education*, and has been a source for this summary.

of apprentices in the country has only held steady at between 250,000 and 300,000.

Still another development has been the integration of apprenticeship programs into the curricula of some high schools. Students begin to gain credits toward apprenticeship certificates during their last year of school. Proponents of the apprenticeship system expect wider use of this approach and its extension to community colleges.

The U.S. Department of Labor, which provides services to existing apprenticeship programs and assists in the creation of new ones through its Bureau of Apprenticeship and Training, is seeking to revitalize this training mechanism and extend it to new industries and occupations. Apprenticeship programs are created by employers—either through collective bargaining agreements or, more often, on their own initiatives. The number of employers with these programs continues to be small. Among the reasons for low participation, Labor Department officials believe, are employers impressions that apprenticeship programs are relevant only to organized trades and industries (i.e., those that require union participation) and their fear that apprentices will be hired away by other firms. Formal apprenticeship programs, moreover, can be expensive for individual employers to establish and maintain.

As part of its effort to overcome these constraints, in December 1987 the U.S. Department of Labor launched

Apprenticeship 2,000 "as a public dialogue" and research initiative. The program's conclusion is that "the apprenticeship method of experimental learning has proven effective at all skills levels and is particularly well-suited for technical training and retraining." It is proposed, therefore, that "the *apprenticeship concept*, rather than the apprenticeship system, be expanded beyond its traditional boundaries." (See Box for information on the German apprenticeship system)

Federal and State Programs

The federal government's principle training programs are designed to serve the economically disadvantaged. They differ from institutional instruction in that they are shorter-term and flexible in length. The *Job Training Partnership Act* (JTPA) is the centerpiece of the federal effort. This program, in 1982, replaced the much criticized Comprehensive Education and Training Administration (CETA) but was funded at far lower levels than CETA had been. Geared to train disadvantaged older youths and adults for private sector jobs, JTPA gives decision-making responsibility for the administration of federal block grants to private industry councils (PICs). Each PIC, made up of at least 51 percent private sector representation, is responsible for the activities of a service delivery area within its state.

Estimates are that JTPA serves less than 5 percent of the population eligible to participate in its programs. The programs range widely in quality and design. It has often been criticized for "creaming"--training the most readily employable. A comprehensive evaluation of JTPA, made in 1989 by a committee of business, labor, and education representatives, offered 28 recommendations for improving the program. Leading the list are proposals that would orient JTPA toward training, remediation and other support services for those most seriously disadvantaged (e.g., out-of-school youth and adults lacking in basic skills--reading or computing below the eighth grade level), welfare recipients "who have shown sustained dependency" and in-school youth at risk of dropping out.

The Job Corps, another major federally funded program, has been characterized by a recent study commission as "a program of proven effectiveness."[10]

The group also reports, however, that it "serves about one percent of the young people actively seeking work and only a small fraction of the high-risk population the Job Corps was designed to serve." A new federal program, JOBS (Job Opportunities and Basic Skills Training Program), enacted as part of the Family Support Act of 1982, provides training for welfare recipients.

At the state level, high school and community college vocational education is often complemented by area vocational centers, special skills centers, and the like, for high school drop-outs, older youth and adults. Such programs often share the facilities, instructional personnel and management of vocational schools. In North Carolina's Human Resources Development program, for example, the state's community colleges are used to recruit, train, and find jobs for unemployed workers in their service areas. California's Regional Occupation Program, which is geared to serve disadvantaged youth, provides training at high schools as well as separate centers.

Participation in these training and remediation programs is not always easy, or even feasible, for many of those out of the labor force. They may face transportation difficulties, day-care needs, and a variety of family and personal problems. A New York program called ACCESS, Ohio's Full Service Center, and Job Centers in Wisconsin are among pioneering "one-stop shopping" ventures--state efforts to integrate training into a comprehensive service setting. The first of a projected network of regional ACCESS centers opened in Utica, New York, in the spring of 1989; state planners expect 18 to be in operation by 1992. Under a local lead agency, all key community groups are required to cooperate in developing, and signifying their assent to a regional plan, before state start-up grants are provided. The groups include local Chambers of Commerce, social services organizations, school administrators, and civic officials.

[10] *The Forgotten Half: Non College Youth in America*, An Interim Report on the School to Work Transition, Youth and America's Future: The William T. Grant Foundation Commission on Work, Family and Citizenship, January 1988

Innovation and Change

National efforts are underway to tie together voc-tech education programs at secondary and post-secondary institutions, and to better integrate such programs with academic curricula. The educator's term for this process is "articulation." Articulation refers to joint program development by a number of institutions and groups towards a specific educational goal. In relation to voc-tech education, the key cooperating parties are employers and the teachers and administrators of both secondary and post-secondary institutions. Articulation has three principle goals: (1) a better mesh between the content of materials taught during the last two years of high school and at two-year colleges to prepare students for skilled and technological occupations—often referred to as "Tech Prep" or "2 + 2" articulation; (2) a new generation of course materials in technology and science; (3) improved integration of occupational skills with basic education. All of these goals are incorporated in the newly enacted *Carl D. Perkins Vocational and Applied Technology Education Act Amendments of 1990.*

A number of articulation programs already exist around the country. One of the earliest was in Hampton, Virginia, an area dominated economically by such enterprises as the naval shipyards and the National Aeronautics and Space Administration's Langley Research Center. Business, high school and community college leaders developed a "master technician" program, designed to prepare students for the variety of electronic skills needed by local employers. The program's success is attributed to committed business participation, both by top executives, and at the plant manager and supervisory level, ensuring that curricula address the specific competencies required by employers.

The meshing of curricula among different levels of institutions yields benefits beyond instructional efficiency. Business advisory activities become simpler and more effective. As one educator comments: "Vocational education is highly fragmented, with community colleges, high schools and various kinds of skills centers often running similar programs. Articulation provides a framework and system: employer input about skills needs at any point of entry—a community college program, for example—is transmitted to the other parts of the system."

A leading education executive in North Carolina, a state often identified with economic development through training, says this about Tech-Prep: "I am convinced that no other model of education holds more promise for addressing the new education requirements of our economy. Where we have implemented the program in North Carolina, it has captured the imagination and aspirations of large numbers of often neglected general studies students. It has reinvigorated the whole idea of career education. And it has created a new and profound connection between high schools and community colleges."

Dealing with Technical Change

"The Principles of Technology" is the first of a series of courses developed jointly by the Center for Occupational Research and Development (CORD) in Waco, Texas and the Agency for Instructional Technology (AIT) in Bloomington, Indiana. The project's overall goal is to help meet the projected need for a high tech work force.

CORD was created about a decade ago to develop curricula for new and emerging technologies, to promote their adoption, and to help others plan programs for dealing with technical change. The analyses of work force needs on which CORD's curricula are based rely critically on employer inputs. These are gained through site visits, in-depth interviews with technicians and their supervisors, business participation in design and advisory committees, and surveys that assess the willingness of employers to hire graduates of two-year programs. The project may soon include financial aid.

A spokesperson says: "Our philosophy is that of being out front with emerging technologies before there is a demand for technicians. It takes five years to develop a curriculum, train teachers, and get it into the schools. There is little money for these efforts, and in the future we may see industry funding them."

"Principles of Technology" is a two year course in "Applied Physics" for high school juniors and seniors, its development is supported by a CORD-organized consortium of 46 states. Students who complete it are expected to be well prepared for further technical training at a community college, technical school or industrial training center, or by an employer. Pilot-tested only as recently as September 1984, the course is now being taught in 47 states, in over 1,200 institutions, to about 30,000 students. In 1988, the American Association for the Advancement of Science cited it as the best technical physics curriculum available. "Science teachers are increasingly interested," one voc-tech education official notes, "but an investment in equipment is necessary."

Other courses—"Applied Mathematics," "Applied Communications," and "Applied Biology/Chemistry"—have also been developed through state consortia organized and managed by CORD, and with the participation of AIT. Like "Applied Technology," they target secondary school voc-tech students as their primary audience, but are also being used at post-secondary training sites. At least one company is using "Applied Mathematics" to train employees. AIT-CORD suggests that these courses, which are written at an eighth grade vocabulary level, can be "infused" into vocational courses or taught alone for credit—by vocational or academic instructors—or by teams that include both.

"Principles of Technology" and the other AIT-CORD courses aim to improve the quality of occupational preparation—and at the same time, as their sponsors explain, to "maintain the academic rigor necessary to meet some of the increased requirements for high school graduation." They are expected to have other benefits as well—benefits that education reformers believe can also be achieved by improving existing curricula. These include:

First, courses should be based on current knowledge, use state-of-the-art equipment, be attuned to the job market, and be interesting—vital attributes for motivating students and reducing drop-out rates. Early experience confirms these expectations.

Reformers argue, second, that these courses require, and provide the setting and context for the teaching and enhancement of basic skills—in math, particularly, but language and other work-related generic areas as well. A state voc-tech education official says: "What we're finding is that more-of-the-same doesn't always work for students who are failing. More math, more reading—they're sick of it. But if you can somehow connect the remedial with the occupational into a program where students get both, and get the mutual reinforcement, maybe you've got something stimulating and motivating."

This assumption has been validated by the National Assessment of Vocational Education, which reports: "An examination of change in math scores during the eleventh and twelfth grades for a nationally representative sample of students from the high school class of 1982 revealed that vocational courses in applied mathematics (e.g., business math, vocational math) and vocational courses that included substantial math content (e.g., electronics, drafting, accounting, agricultural science) were associated with significant gains in math learning."[11]

Curriculum Improvement and Coordination

This nation's decentralized system of education places the responsibility for creating and maintaining secondary school vocational programs and curricula on each of the 50 states, and on innumerable schools and school districts. But the opportunities this arrangement presents for responding to local needs and conditions often are not realized. Programs and curricula do not meet market needs, and courses are out of date or poorly taught. Moreover, there is waste and inefficiency because of the need for independent planning at numerous places for similar or identical purposes. "Area vocational schools in metropolitan regions offer curricula for similar occupations without any reference to what is offered in other such schools in the same area. Adjoining school systems offer occupational programs without regard to what is offered in the other school systems. Each type of school and each school system is busily engaged, with the help of industry representatives and advisory committees, in 'rediscovering America' with respect to development of curricula, courses of study, and instruction materials."[12] This observation, made in 1967, is no less true today.

Business participation. As participants on local advisory committees, employer representatives have been valuable contributors to voc-tech curriculum development. But educators and business executives interviewed for this study say the quality of the help and guidance they provide is often less than ideal. As one educator put it: "There is no systematic way of getting the right and the best business people on curriculum

[11] Final Report, Volume I, *Summary of Findings and Recommendations*; National Assessment of Vocational Education, United States Department of Education, July 1989. The Assessment was mandated by Congress in the *Carl Perkins Act of 1984*.

[12] Samuel L. Burn, *Industry and Vocational-Technical Education*, McGraw Hill Book Company, 1967.

committees. Companies too often allow themselves to be represented by public affairs or community relations people, who are ill-equipped to spell out job-skill particulars, rather than by the plant managers and supervisors who really know what's needed. School instructors, for their part, run advisory committees in their spare time; they may also want to keep control, gather people with whom they're comfortable, maintain the status quo."

Both school administrators and company managers, it seems clear, need to push for suitable business representation. For example, the head of employment training for the Bay Area Council a business organization, urges member firms to:

- designate a community college liaison—someone who will promote company interests in the program development of those community colleges that serve it, and ensure proper presentation on their advisory committees;
- invite teachers from these colleges to internal staff meetings in order to expand their understanding of company needs; and
- work with other businesses in creating specific program development workshops.

Another need is for more curriculum development and planning guidance to be done at state, and national, or multi-state levels. Education professionals recognize this need but are also quick to point out that the range of skills needed for certain occupations may vary from one state or community to the next and that centrally developed materials may sometimes have to be modified and adapted to local conditions.

State curricula and guidelines. The degree of control exercised by state voc-tech departments and the amount of help they offer to vocational schools vary markedly. Curricula are not developed by all states, and in others they are not equally comprehensive. Nor is local compliance with state guidelines uniformly monitored.

In a number of states—Oklahoma, West Virginia, Virginia, Maryland, Kentucky and Missouri, for example—all voc-tech curriculum development is done at the state level. On-going efforts in such states produce new courses and materials, and revise older ones. Other states have created curricula in certain of the skills areas taught by their schools but not in others—and in a few states, all curriculum development is local.

States normally contract with outside providers for new curricula—principally universities and community colleges. Use of state-developed curricula is never mandatory. But local schools rarely deem it either convenient or politic to look elsewhere—or to develop their own curricula—and in states that have introduced state-wide testing of students, they would, as one state voc-tech education director says, "be foolish not to use our curricula."

Even states that do not provide curricula offer their schools various other kinds of help. One significant mode of assistance is access to information about and materials developed in other states. Under a program developed in 1972 each state has a liaison representative who performs this function.

Technical committees. Under the *Perkins Act of 1984*, each state created a Council on Vocational Education with five of its seven members from the private sector. The Councils were charged with various advisory and program evaluation functions. The *Perkins Act* also called on the states to establish "a limited number of technical committees," also with business and trade membership, "to advise the council and board on the development of model curricula to address state labor market needs."

The work done by the state technical committees to guide curriculum developers has gotten mixed reviews. On the one hand, as noted in a study report jointly sponsored by the National Alliance of Business and a consortium of the State Directors of Vocational Education, their very existence provides formal access of business to vocational education. On the other hand, studies have found their work to be perfunctory in many states and often limited to a small number of occupation areas. A state vocational education executive comments: "When the Perkins Act became law in 1984, the Technical Committees seemed a dream come true. They were greatly weakened, however, by the Department of Education's regulations, which for example, only required two committees per state and didn't really call for a dynamic relationship between business and education."

The 1990 amendments to the *Perkins Act* direct that funding for vocational and applied technology education go to local school systems rather than to the State, reserving for the State 8.5 percent, instead of the previous 13 percent for State programs and leadership activities. In view of these changes it is problematic whether Technical Committees will continue to function, or whether their function will be adopted by business organizations, as in Arizona.

In New York, the curriculum system was highly decentralized until about seven years ago, but now there is a strong central authority. Until 1983, according to the State's director of vocational education, New York provided secondary schools with no occupational education curricula. Those offered now were developed over a three year period in the early 1980s. "Our aim," this official says, "was to develop curricula more broadly based than those typically being used in the state and to include both academic competencies and core skills that would cut across a variety of occupa-

tions while retaining the traditional job-specific nature of vocational education training." More recently, Technical Committees created in conformity with the *Perkins Act* requirements, have carefully reviewed, revised and updated curricula for the State's two principal curriculum areas—health care and business occupations.

New York is also one of a number of states that have developed proficiency examinations that test the competencies gained by students completing each curriculum. New York's vocational education director says: "These tests are a way of guaranteeing business and industry that students completing each program have a certain set of knowledge and skills."

New national and multistate resources. A variety of resources that have come into existence only in recent years now also provide significant help to local, and often to state curriculum development efforts. These are consortia and other organizations that offer curricula, course outlines, instructional materials, skills inventories and competency tests, or that coordinate the dissemination of information about such developmental work.

Efforts have been growing on a number of fronts to provide or promote the development of national curricula and centralized program guidance to voc-tech education institutions and planners. For example, through the Carl Perkins Act of 1984, Congress established a National Council on Vocational Education and required it to provide to state and school education administrators, as well as to Congress, the President and the Secretary of Education, information about the kinds of occupational competencies currently needed by various industries for entry-level and sustained productive employment. The Council reported, in April 1989, on three occupations that it identified as "the fastest growing and most rapidly changing"—electronics, health care, and construction![1] Its report estimated employment growth during the next five to ten years in the three occupations, and then described briefly the skills each will require, the kinds of equipment students will have to be able to handle, and the resources that will be needed at training facilities. The report also included advice to educators on training methods and procedures, a review of the training materials and other aids available from industry sources, and "other information" that might be helpful. Research and report preparation for each occupation was done by a working group that included industry representatives.

Trade associations. State and national trade associations provide funds, scholarships, instructional materials and equipment to voc-tech programs. Their key role, however, is contributing to curriculum and course planning, a role too rarely and too superficially played, many in the field believe. "National trade associations should be developing inventories of skills needs for jobs in their industries," the executive director of the National Association of State Director of Vocational Education says. "We have been promoting this principle for five years." But, association managers say, limited funds and personnel are inhibiting program development.

Private programs. Private entrepreneurs have also been involved in course development. In 1986, the Advanced Center for Technology Training (ACTT) launched such an effort. This organization is the North American licensee for programs developed by the more-than-century-old, London-based Organization for Rehabilitation Through Training (ORT). ACTT offers "technology literacy" courses that are designed "to span the gap between basic skills training and job specific training." One is a 90-module program called Foundation of Technology Systems. More specialized ACTT courses include robotics, electronic measurement and statistical process control, and fiber optics. Work stations with mini-computers and other hardware designed to give students hands-on experience are integral to these courses. Several community colleges have had their teachers trained by ACTT personnel, and have introduced ACTT courses, with related equipment and texts. A number of major companies have also employed ACTT both for the training of current personnel and the retraining of dislocated workers.

Competency testing. Competency tests—reflecting criteria of knowledge and skill—are used both to determine and to certify a student's achievements. They have been developed by a growing number of states, and by business and education providers, as another way to promote state-wide curriculum standards of quality and consistency.

According to a 1988 study, thirteen states currently provide competency tests for students completing occupational curricula, another seven are in the process of developing such programs, and ten are considering them. Practices vary among the testing states. In some, the use of tests is mandatory for local schools and districts—in others voluntary. Some test states cover all occupational areas that are relevant, others cover only the most important or popular ones.

Competency testing and certification are often available to students in states that do not perform this function. For example, a 47-state consortium called the National Occupational Competency Testing Institute (NOCTI) was organized in 1973. NOCTI's original mission was to provide tests for candidate teachers of occupational subjects. It does so today in 57 skills areas. Forty-six states use its tests for teacher certifica-

[1] *Occupational Competencies*, National Council on Vocational Education, April 1989.

tion, NOCTI reports, and others are expected to do so.

NOCTI now has tests for students as well. Measures of "job-ready entry-level achievement" are available in more than 65 occupations. They are used by over 700 schools and school districts.

Coordination and curriculum sharing among the states. States often share the costs and effort of developing curricula and course materials through a variety of national and regional consortia. The Center for Occupational Research and Development gained the support and participation of 46 states for the "Principles of Technology" and the other courses it developed with The Agency for Instructional Technology.

States also make available to each other curricula they have developed independently. "A great deal of sharing occurs," an educator closely involved in this process comments, "but not enough." For one thing, some states don't want to pay the prices that developers ask to offset their costs. Another factor is sheer possessiveness or competitiveness on the part of some developing states. Their attitude is: "we spent a lot of money on this, why should we share it?" And then there are administrative hindrances: the state sharing network depends on individual state liaison representatives, who may be busy or simply "inefficient."

To further promote and assist sharing among the states, a clearinghouse called the National Network for Curriculum Coordination in Vocational and Technical Education was created in 1971. Usually known as the "National Network," it collects and disseminates materials. Six regional curriculum coordinating centers service clusters of states—each state linked to its regional group through its state liaison representative. Intra-state coordination and service is also provided by various state agencies.

The Future of Vocational-Technical Education

The name change for vocational education to Vocational and Applied Technology in the amended *Carl D. Perkins Act* "...is more than symbolic," Congressman August Hawkins noted, "for not only does it imply that we need more up-to-date and relevant education activities and job training, but it also signifies the emergence of a genuine transformation in the way we prepare students for the world of work... [it] represents a monumental step toward enhancing the education and occupational training that the workers of tomorrow will receive."[14] And Congressman William Ford added, "We have to stop teaching courses called 'vocational education,' that have no practical application in the modern, more sophisticated workplace, and direct our education resources toward the future."[15] These comments reflect the attitude change contained in the newly amended *Perkins Act* which made major adjustments in the Federal government's approach to vocational education and, collaterally, the approach of states and localities. The major features of the new legislation include:

(1) A change in the funding formula from a State controlled program to one funding local educational agencies, area schools and community colleges based on their share of students, especially the poor and handicapped.

(2) Support for the Tech-Prep program, a combined high school-postsecondary (2 + 2) program providing a 2-year degree in some technical area.

(3) The integration of both academic and occupational skills, with an emphasis upon applied academic studies.

(4) Provisions for new programs in vocational counseling, for research and data collection programs, for accountability measures, and for annual Presidential recognition awards.

Termed "the most thorough revision of the Federal vocational education law in 25 years," the new law incorporates leading concepts that have been part of the more successful programming in voc-tech education. Most important, it signals that vocational education in the future will be aimed at meeting the nation's work force needs, rather than at providing alternative education opportunities for young people.

[14] *Congressional Record*, Sept. 13, 1990, pp. H7512-H7513.
[15] Op. cit., pp. H7517-H7518.

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