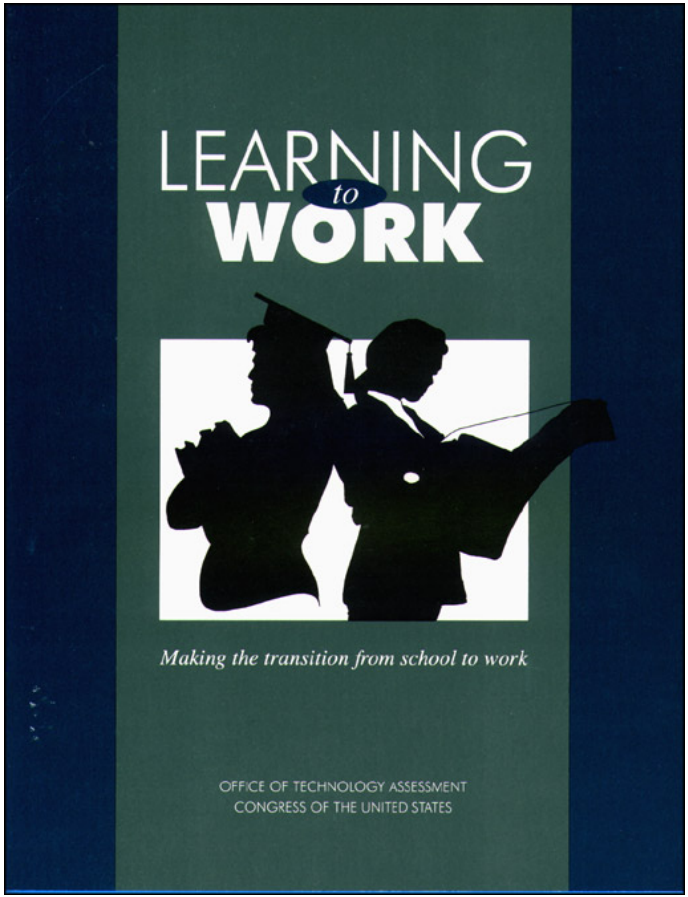
Learning To Work: Making the Transition From School to Work

September 1995

OTA-EHR-637

GPO stock #052-003-01439-4



Author Contacts: To contact the authors of the report, please write or call John Wirt at 234 E Street, NE, Washington, DC 20002, (202-547-7168); or Gregg Jackson at 721 Upshur Street, NW, Washington, DC 20011 (202-882-0375).

Recommended Citation: U.S. Congress, Office of Technology Assessment, *Learning to Work: Making the Transition from School to Work*, OTA-EHR-637 (Washington, DC: U.S. Government Printing Office, September 1995).

Foreword

Over the past decade, public attention has been drawn to the difficulties that many young adults are having in finding their way in the changing economy and earning a decent living. A broad movement is emerging across the country to better connect school with career opportunities and further education to help these young adults succeed. In 1994 Congress responded by passing the School-to-Work Opportunities Act (STWOA), which assists states and localities in establishing comprehensive school-to-work transition systems.

The expansion of work-based learning is one aspect of this reform movement. For those in fields of health where internships are common or in the skilled trades where apprenticeships exist, work-based learning will be a familiar concept, but for many others it will not be. STWOA aims to combine learning in school with learning in the workplace in new ways that make it a common feature of the educational and career preparation of young people.

Soon after the school-to-work legislation was passed by Congress, OTA was asked by the Senate Committee on Labor and Human Resources and the House Committee on Education and Labor (now the Committee on Economic and Educational Opportunities) to assess the potential and problems of work-based learning as a component of school-to-work.

As the report shows, work-based learning has considerable promise but will be difficult to implement. Work-based learning can potentially help students see the relevance of their academic studies later in life, allow students to explore career options, and help them develop needed occupational skills. But the implementation of good work-based learning programs will require considerable effort on the part of schools and participating businesses. Whether many businesses can be recruited to participate remains to be seen.

Throughout this study, the advisory panel, contractors, and many other people were very helpful in developing the issues addressed in the report, identifying sources of information, and providing feedback. OTA appreciates their substantial contributions. Their participation, however, does not necessarily represent an endorsement of the contents of the report, for which OTA bears sole responsibility.



ROGER C. HERDMAN
Director

Advisory Panel

Edward Donley, *Panel Chair*
Former Chairman
Air Products and Chemicals, Inc.
Allentown, PA

Thomas Bailey
Director, Institute on Education and the Economy
Teachers College Columbia University
New York, NY

Sue E. Berryman
Senior Education Specialist
The World Bank
Washington, DC

David Finegold
Policy Analyst
RAND Corporation
Santa Monica, CA

Douglas Fraser
Walter P. Ruther Library
Wayne State University
Detroit, MI

Daniel Gescheidle
President, Educational Foundation
Chicago, IL

Thomas Kane
Economic Studies
The Brookings Institution
Washington, DC

Robert Klabenes
Provost
Oklahoma State University-Okmulgee
Okmulgee, OK

Alan Lesgold
Professor of Psychology
Learning Research and Development Center
University of Pittsburgh
Pittsburgh, PA

Paul Osterman
Alfred P. Sloan School of Management
Massachusetts Institute of Technology
Cambridge, MA

Hilary Pennington
President and Chief Executive Officer
Jobs for the Future
Boston, MA

Hillard Pouncy
Consultant
Wallingford, PA

Marilyn Raby
Director, Curriculum Services
Sequoia Union High School District
Portola Valley, CA

Piedad Robertson
Superintendent and President
Santa Monica Community College
Santa Monica, CA

Nan Skelton
Center for Democracy and Citizenship
Hubert Humphrey Institute
Minneapolis, MN

David Stern
Professor of Education and Executive Director
National Center for Research in Vocational Education
Berkeley, CA

Susan Stucky
Associate Director
Institute for Research on Learning
Palo Alto, CA

Marina v.N. Whitman
Institute for Public Policy Studies
University of Michigan
Ann Arbor, MI

Joan Wills
Director, Center for WorkForce Development
Institute for Educational Leadership
Washington, DC

Note: OTA appreciates and is grateful for the valuable assistance and thoughtful critiques provided by the advisory panel members. The panel does not, however, necessarily approve, disapprove, or endorse this report. OTA assumes full responsibility for the report and the accuracy of its contents.

Project Staff

Clyde Behney
Assistant Director, OTA
Industry, Commerce, and
International Security Division

Denise Dougherty
Program Director
Education and Human Resources

John Wirt
Project Director

Greg Jackson
Senior Analyst

Helima Croft
Research Analyst

OTHER CONTRIBUTING STAFF

Christine Ho
Research Assistant

Tabitha Jay
Research Assistant

Mark Cunningham
Research Assistant

ADMINISTRATIVE STAFF

Cecile Parker[1]
Office Administrator

Linda Rayford
PC Specialist

Beckie Erickson[2]
Office Administrator

Madeline Gross
Inhouse contractor

PUBLISHING STAFF

Mary Lou Higgs
Manager, Publishing Services

Chip Moore
Production Editor

Cheryl Davis
Electronic Publishing Specialist

Chris Onrubia
Senior Graphic Designer

[1] Until July 1995.
[2] Since August 1995.

Contractors

Stephen Barley and Bonalyn Nelson
Stanford University

Kathryn Borman and Richard Lakes
University of South Florida
Georgia State University

Christopher Dede and Matthew Lewis
George Mason University
RAND Corporation

Rosella Gardecki and David Neumark
Michigan State University

Norton Grubb, Norrena Badway, and Jennifer Curry Villeneuve
University of California at
Berkeley

Amy Hightower, Robert Hallock, George Wimberly, John Breckenridge, and Lisa Weiner
Policy Studies Associates, Washington, DC

Priscilla Taylor
Editor, McLean, VA

Margaret Vickers, Riley Hart, and Amy Weinberg
TERC Cambridge, MA

Contents

1 Summary and Findings 1

The Requested Study 1
Rationales for STWOA 3
Work-Based Learning 3
Findings About the Effectiveness of Work-Based Learning 4
Findings About Technology-Assisted Learning 6
Findings About Employer Participation in Work-Based Learning 6
Finding About Possible Incentives for Expanding Employer Participation 7
Findings About STWOA 8

2 Background and Introduction 11

History of Work-Based Learning in the United States 11
Problems With School-to-Work Transitions 14
Overview of STWOA 15
Overview of this Report 16
References 17

3 Processes of Work-Based Learning 19

Experiential Learning 22
Work-Group Learning 23
Mentoring 24
Workplace Instruction 26
Technology-Assisted Learning 28
Conclusion 34
References 34

4 Structuring Work-Based Learning 39

The Students to be Served 39
Objectives 42
Coordination With Schooling 43
Timing, Intensity, Duration, and Progression of Work Experiences 45
Settings of Work-Based Learning 48
Pay for Work-Based Learning 53
Conclusion 53
References 54

5 Work-Based Learning Models and Evidence of Effectiveness 57

Youth Apprenticeships **61**
Clinical Training **65**
Cooperative Education **66**
Other Models **69**
Conclusion **70**
References **71**

6 Employer Participation in Work-Based Learning 73

Data Sources **73**
Growth of Employer Participation **76**
"High-Quality Equilibrium" in Cincinnati **81**
Major Benefits Influencing Employers' Dcisions to Participate **83**
Major Barriers Influencing Employers' Decisions to Participate **87**
Conclusions and Remaining Questions **97**
References **100**

APPENDIXES

A Boxes, Figures, and Tables 103

B Reviewers and Contributors 104

C Contractor Reports Prepared for This Assessment 105

Summary and Findings 1

Congress passed the School to Work Opportunities Act (STWOA) with bipartisan support in May 1994. The legislation aims to improve the preparation of young people for their careers and to enhance the productivity of the American workforce.

STWOA established a five-year effort to foster partnerships among schools, employers, and other stakeholders for the creation of school-to-work transition systems. States and localities will receive seed money to restructure existing education and training programs within the broad framework provided by STWOA. The systems are to include school-based components, work-based components, and activities connecting the two. Work-based learning is intended to foster the students' academic and career development in the context of work experience. The appropriation for STWOA in fiscal year 1995 was $245 million (see box 1-1 for a summary of the legislation).

THE REQUESTED STUDY

The Senate Committee on Labor and Human Resources and the House Committee on Education and Labor (now the House Committee on Economic and Educational Opportunities) asked OTA to examine the potential opportunities and pitfalls of the work-based learning that would be supported by STWOA. The assessment addressed three main questions:

1. What are the alternative models of work-based learning and how effective are they?
2. What new learning technologies could support work-based learning?

BOX 1–1: School–to–Work Opportunities

State and local school-to-work transition systems are to be planned and developed by partnerships of school staff, business leaders, labor representatives, and other interested parties, Governors are given considerable discretion in structuring and administering the partnerships for the state systems. At the local level, the lead entities may be schools, colleges, nonprofit organizations, and chambers of commerce.

STWOA encourages development of school-to-work transition systems that coordinate career orientation, academic and occupational education, high school and postsecondary schooling, work-based learning, and skill credentialing, The legislation specifically divides these elements into the following three components:

I. **School-based Learning**

1. Academic instruction in high school that meets the state standards for all students and the applicable standards of the National Education Goals;
2. Career exploration and counseling, beginning no later than the 7th grade for interested students;
3. Initial selection by interested students of a career major beginning no later than the 11th grade;
4. Instruction that integrates academic and occupational learning;
5. Arrangements to coordinate high school and postsecondary education and training; and
6. Regularly scheduled evaluations of students' personal goals, progress, and needed learning opportunities.

II. **Work-based Learning**

1. Job training and work experiences aimed at developing preemployment skills and employment skills at progressively higher levels, and leading to the award of skill certificates;
2. Broad instruction in "all aspects of the industry, " to the extent practical; and
3. Workplace mentoring.

III. Connecting Activities

1. Activities to encourage employers to participate and to aid them in doing so;
2. Assistance in the integration of school-based and work-based learning, and of academic and occupational instruction;
3. Matching of students with the work-based learning opportunities offered by employers;
4. Liaison among the students, schools, employers, and parents;
5. Assistance for graduates in finding appropriate jobs, getting additional job training, or pursuing further education;
6. Monitoring of participants' progress after they complete the program; and
7. Linkage of these youth development activities with employer and industry strategies for upgrading the skills of incumbent workers.

SOURCE School-to-Work Opportunities Act of 1994, Title I.

3. How can employers be persuaded to provide work-based learning experiences for students?

As a consequence of the request from Congress, this report focuses on work-based learning. it does so, however, within the context of the school-based components and connecting activities of the larger STWOA framework. Unless these other aspects of the framework succeed, work-based learning will be no more effective under STWOA than it has been in the past.

OTA's findings about work-based learning and STWOA are reported in this chapter. The supporting evidence is presented in chapters 3 to 6.

RATIONALES FOR STWOA

At least three perceived problems led Congress to pass STWOA. First, scholars and educators have concluded that because there are few clear pathways between school and careers in the United States, many students are unmotivated in school and spend years bouncing from one low-paying job to another as they look for career opportunities. Second, experts and employers agree that many young people are completing school with low levels of basic academic skills, dysfunctional attitudes and work habits, and little occupational training; as a result, they are inadequately prepared for well-paid employment and career progression. Third, scholars indicate that because of technological changes and international competition, increasing numbers of midlevel jobs now require complex thinking, close teamwork, and the ability to learn continuously while on the job.

STWOA seeks to address these problems by several means. Students are to be offered career exploration and counseling opportunities beginning in the 7th grade so that they will have several years to consider career options and to become familiar with the preparation required for occupations that interest them. Skill standards and certification systems are to be developed to signal the proficiencies required for various occupations and to indicate which students have achieved those proficiencies. Academic work and occupational preparation in schools are to be upgraded and the two are to be integrated so that students can see how academics will be applicable in their work lives. Work-based learning experiences are to extend the academic and occupational instruction of schools, offer opportunities for students to learn the use of tools and equipment found in the workplace, introduce students to the norms of adult work environments, and give them chances to market-test their capabilities. Workplace mentors are to provide guidance and support for the students' intellectual, skill, and career development. And both the school-based preparation and the work-based preparation are to extend in a coordinated manner from high school into postsecondary education.

WORK-BASED LEARNING

Work-based learning is a major component of STWOA. Although learning can occur during any work, in the legislation and in this report the term *work-based learning* refers to learning that results from work experience that is planned to contribute to the intellectual and career development of students. The work experience is to be supplemented with activities that apply, reinforce, refine, or extend the learning that occurs during work, so that students develop attitudes, knowledge, skills, and habits that might not develop from work experience alone.

The STWOA approach to work-based learning generally follows what has been called the *youth apprenticeship* model, though the term is not used in the legislation. This model (outlined in box 1-1) differs from earlier models of work-based learning in several ways that are thought to make it more effective, but its relative efficacy remains to be demonstrated. The *clinical training* model is similar to that of youth apprenticeship, but it rarely includes career exploration elements, it is used primarily at the postsecondary level for study in the medical fields, and it involves unpaid worksite experience. *Cooperative education (co-op)* is similar to youth apprenticeship, but while co-op programs are operated at both the high school and postsecondary levels, they do not span both levels; skill certification is also seldom involved. *School-to-apprenticeships* allow high school vocational education students to begin union and employer apprenticeship programs on a part-time basis during their senior year. *School-based enterprises* are school-owned businesses operated by students who take elective classes designed to develop the needed occupational and entrepreneurial skills. *Career academies* are small, career-oriented "schools within schools" that integrate academics, career exploration, occupational preparation, and sometimes work experience. A

more detailed comparison of these models is provided in chapter 5, box 5-1.

OTA identified five learning processes that are used in work-based learning. *Experiential learning* occurs from students' reflections on their experiences. It can be guided by others who encourage students to observe the workplace astutely and to reflect on those observations. *Work-group learning* occurs when the students are immersed in a work group, interacting with members who assist students to full-fledged participation. *Mentoring* is a one-on-one relationship in which an experienced employee fosters the development of a less experienced person by providing challenges, encouragement, guidance, and resources. *Workplace instruction* is the deliberate conveyance of work knowledge and skills by means of lectures, demonstrations, coaching, or supervision. *Technology-assisted learning,* which is increasingly computer based, has evolved rapidly from simple computerized textbooks to computerized simulations, "intelligent tutors," and other learning tools. Little is known about the relative effectiveness of these processes, but each appears to have advantages and disadvantages.

OTA identified seven forms of computer-assisted learning that appear to have potential for work-based learning. *Career information delivery systems* help students to determine their interests and talents, understand the opportunities and demands of various occupations, and sometimes to identify local job openings. *Computer-based training* presents information, quizzes the students' understanding, and automatically scores the answers. *Business application software* consists of word-processing, database, spreadsheet, accounting, computer-assisted design, and other software that is widely used in workplaces; it often comes with computerized "tutorials" and "help" capabilities. *Hypermedia* are vast collections of text, images, and sound, with indexed linkages between related items. *Intelligent tutoring systems* use "artificial intelligence" to guide students through customized learning paths, tailoring the instruction to each student's knowledge and skills, diagnosing error patterns, and providing customized feedback. *Simulations* are functional models of mechanisms, processes, or systems on which the students can practice operating, repairing, or redesigning. *Computer-supported cooperative learning* allows a group of people to share information and insights, to reach group decisions through a set of structured exchanges, and to engage in collaborative design efforts.

The success of work-based learning under STWOA will depend on the willingness of employers to provide work experiences for students, and this will be costly for employers. In Germany and Japan, where work-based learning for adolescents is extensive, there are strong incentives for employer involvement. In Japan, these incentives are largely internal to companies, whereas in Germany they are embedded in labor laws and the system of industrial relations. No comparable incentives exist in the United States. STWOA seeks to create incentives by having employers participate in the partnerships that plan and control the work-based learning systems and by providing limited assistance to employers in their preparations for work-based learning.

FINDINGS ABOUT THE EFFECTIVENESS OF WORK-BASED LEARNING

A-1. Past work-based learning has yielded mixed results. Evaluations of past programs have found that most students are excited and motivated by work-based learning and that most employers have been quite satisfied with the students. Work-based learning appears to offer students better learning opportunities than the after-school and summer jobs that students find on their own. Yet work-based learning has generally had only small positive effects on the school attendance, grades, graduation rates, and postsecondary enrollments of participating students. And the effects on students' employment, mobility, and earnings during the first few years after graduation have ranged from modestly positive ones to a few small negative results.

A-2. The work-based learning that is intended under STWOA will differ from past work-based learning in ways that might im-

prove its effectiveness. The work-based learning established under STWOA will be part of school-to-work transition systems that are planned with more input from employers, employees, parents, and other stakeholders than has generally been the case for older forms of work-based learning. Work-based learning under STWOA is to be directed more broadly than in the past to career exploration and to the development of good work habits, occupational skills, and problem-solving abilities. It is to be more closely coordinated with initiatives to improve academic instruction, career orientation, and occupational instruction. It will include mentoring to facilitate the young people's personal, intellectual, and occupational development. In addition, students' progress is to be assessed more often and more thoroughly than was common in the past. These differences could improve the effectiveness of STWOA-fostered work-based learning, but they will also make implementation of the work-based learning more complex and problematic.

A-3. Effective work-based learning appears to require considerable effort and coordination on the part of the schools, employers, and intermediary organizations. Effort and coordination are required to recruit and orient employers, to prepare students for the workplace, to match students with work-based learning positions, to give students appropriate training and guidance while in the workplace, to monitor the students' experiences, to assess the students' development, and to provide constructive feedback.

A-4. Though the needs of young people vary considerably, at the high school level work-based learning generally appears better suited for the exploration of careers and development of generic work skills, whereas at the postsecondary level it generally appears well suited for the development of occupational skills. At the high school level, some students have clear occupational objectives and plans to enter the workforce immediately following graduation, but many students are undecided about their career choices, or frequently change their minds, and their parents are reluctant to have them make early decisions. Most high school students who have participated in work-based learning have reported that its main value was as an exploration of careers rather than development of occupational skills. Because the development of occupational skills requires greater effort on the part of employers, the employers are more likely to make the investment for students who are relatively mature, sure of their direction, and close to entering the labor market. Such students provide employers with a better chance of recouping their training costs.

A-5. At the high school level, the quality of work-based learning experiences appears to depend more on the nature of the work experience than on the kind of organization in which the work is done. There is reason to think that the industry, the style of management, the size of the company, and the level of technology are less important than the nature of the work-based learning opportunities at the high school level. Opportunities that appear to facilitate work-based learning include:

- a broad introduction to the company and its industry;
- experiences that are coordinated with the students' school-based instruction;
- a mix of at least some of the following: experiential learning, mentoring, work group learning, workplace instruction, and technology-assisted learning;
- responsibilities of increasing complexity and importance, with the minimum assistance necessary for success;
- chances to exercise both autonomy and teamwork;
- assignments to solve problems, explore, and innovate;
- opportunities to assume some supervisory functions;
- participation in trade, professional, and union events; and
- guidance in reflecting on the implications of the work experience.

A-6. Most work-based learning now occurs in places of employment, but work in other settings could probably supplement those experiences and perhaps partially substitute for

them. School-based business enterprises run by students, community service activities, occupationally-related extracurricular activities such as Junior Achievement, and various work simulations probably could contribute to the occupational development of students. Some of the means used to enhance students' work-based learning experiences might also enhance the learning derived from after-school and summer jobs that many students arrange on their own.

A-7. There has been little research on how work-based learning actually takes place and on how to best foster it. Most studies have focused on evaluating the effects of one model of work-based learning—cooperative education. Even those studies generally have not addressed how variations in the model might affect students. Hardly any attention has been given to the actual experiences of students during their work-based learning and to the ways those experiences contribute to, or hinder, the students' intellectual and occupational development.

FINDINGS ABOUT TECHNOLOGY-ASSISTED LEARNING

B-1. Several forms of technology-assisted learning appear to have potential for facilitating work-based learning. The evaluation evidence suggests that the older forms of computer-assisted learning have speeded the acquisition of knowledge and skills by 24 to 34 percent. Career information delivery systems, computer-based training, and hypermedia have been successfully commercialized and are available in some schools and workplaces. Intelligent tutoring systems, computer-supported collaborative learning, and computerized simulations are mostly in the development and testing stages.

B-2. Some of these technologies are expensive and cannot be easily modified locally; both problems could be reduced by development of better "authoring" tools. It can take several hundred person-hours to prepare the software for one hour of learning assistance. When that is the case, the software must be sold at a high price unless there is a large market for it. Because teachers and supervisors usually cannot modify the instructional systems to accommodate local information or an individual organization's practices, the utility and effectiveness of the systems are limited. Both problems would be reduced if easier-to-use and more powerful "authoring tools" could be developed. These tools would partially automate the development and modification of instructional software.

FINDINGS ABOUT EMPLOYER PARTICIPATION IN WORK-BASED LEARNING

C-1. So far, the rate at which employers are participating in prototypes of STWOA's work-based learning has been growing only modestly in most communities. According to the findings of an OTA survey of 15 high school school-to-work transition projects, the median number of employer participants is 35 per program, and the median growth rate is about six employers per year. Because there are only about two students per employer, this growth translates to an increase of about a dozen students per community per year. Other studies have revealed similar findings. Unless the rates of growth improve significantly, it will take a long time before most school-to-work transition systems can serve substantial portions of students in their communities.

C-2. Most programs have found that it takes considerable time and effort to recruit and retain employers. In the 15 communities included in OTA's survey, it has taken an average of one-half full-time-equivalent staff member to recruit six new employers each year.

C-3. A few communities have recruited large numbers of employers. In a few communities, substantial efforts over many years have been devoted to building strong partnerships between educators and employers in which there are reciprocal commitments to quality on both sides. Employers provide high-quality training and work experience opportunities for one semester or longer in order to attract the best students, while the schools prepare students well so they can secure the good placements. In a few other communities,

large numbers have been achieved by arranging brief work-based learning experiences, such as "job shadowing" experiences in which the student follows one employee around for a half-day.

C-4. Employers' decisions to become involved in work-based learning are influenced by a range of potential benefits and disincentives. The main benefits appear to be recruiting well-trained personnel and contributing to the improvement of education and the community, with the former being of somewhat more importance to employers. The main disincentives appear to be:

- inadequate preparation of students for work placements;
- lack of coordinating support from the work-based learning program;
- the employer's training costs, which include student wages and the time and effort of supervisors and mentors;
- regulatory restrictions and extra insurance costs, which include child labor and safety laws and general liability and worker's compensation insurance;
- organizational resistance to work-based learning from management or other employees in the company; and
- economic uncertainty, due to slowdowns in the local economy or changes in a company's business fortunes.

All these disincentives appear to be of roughly equal importance to employers.

FINDINGS ABOUT POSSIBLE INCENTIVES FOR EXPANDING EMPLOYER PARTICIPATION

D-1. Inasmuch as the disincentives enumerated in C-4 are of about equal importance to employers, policies aimed at inducing employer participation should be directed at several of the barriers simultaneously. One policy alone, such as providing strong coordinating support or a training wage, is unlikely to be very effective.

D-2. Better preparation of students probably would expand employer participation in work-based learning. About one-quarter of the employers in OTA's survey reported some problems with the quality of preparation that students received before their work experience, and 16 percent of the employers said that lack of student reliability was the most important disincentive to participating in work-based learning. By reliability, employers primarily mean dependability, responsibility, and initiative for getting work done. The OTA survey results are consistent with other research findings.

D-3. Coordinating assistance, provided by the school or an intermediary organization, could be an inducement to employer participation. Nineteen percent of employers in the OTA survey said that lack of coordinating support was the most important disincentive to work-based learning. More than 60 percent of employers rated coordinating assistance as being "very" or "critically" important. Coordinating assistance typically includes helping the employer plan and start a work-based learning program, screening students and matching them with employers, providing troubleshooting and technical assistance to individual supervisors and worksite mentors, and coordinating student placements. It is through these coordinating services that long-term partnerships between employers and school systems are built.

D-4. Although evidence on the issue is mixed, some financial inducements to reduce employers' training costs might expand employer participation in work-based learning. Employers consistently report that the time required of supervisors and mentors of work-based learning students is a much larger cost than the wages paid to the students. Although employers have not responded to federal tax credits for employment of disadvantaged young adults, available research indicates that student wage subsidies have been effective in increasing employer participation in some work-based learning programs. Nineteen states are currently planning to implement one or more of the following:

- state subsidies or tax credits for employers' costs of training students,
- subsidies for the development of training facilities to be used by more than one company,
- grants for the training of students by outside vendors, or
- other training cost subsidies.

Evaluation of the effects of these inducements on employer participation is needed and will require comparisons across states.

D-5. Regulatory reform and insurance pools might expand employer participation, especially in some states and localities. In other cases, providing employers with authoritative information about regulatory and insurance issues may be sufficient. Child labor and safety laws are determined both by the federal and by the state governments, and general liability and worker's compensation insurance are regulated by states and provided by many different companies, thus creating substantial differences among the states and localities. Many fears that employers have about regulatory restrictions and extra insurance costs might be allayed by providing them with authoritative information about the actual restrictions and costs in their communities. States in which employers are found to be having difficulties with regulatory restrictions could review child labor laws and safety regulations to determine whether modification would facilitate work-based learning while retaining their intent. States could also create special entities to provide employers with information about actual insurance costs and to pool the costs of insurance.

D-6. Much remains to be learned about strategies for creating partnerships between businesses and schools that will accelerate the growth of employer participation in work-based learning. Growth in employer participation may or may not speed up as a result of state and local efforts to build comprehensive school-to-work transition systems. Evaluations that compare communities having large increases in employer participation with other communities are needed to identify strategies for expanding employer involvement by an order of magnitude or more. Otherwise, work-based learning is unlikely to succeed in the near future. States that have ambitious efforts under way to adopt specific incentives and to forge partnerships between business and education at the state level would be good places to look for communities to evaluate. In the absence of such research, the fate of work-based learning under STWOA may largely ride on whatever leadership is forthcoming from the business community.

FINDINGS ABOUT STWOA

E-1. STWOA is a coherent approach for dealing with the problems posed by the changing workplace, the lack of career paths, and the poor preparation of youth for careers. There are several reasons to think that STWOA systems, if implemented as intended, could improve the school-to-work transition for youth. These reasons include:

- The systems are to provide more extensive career exploration and counseling than has previously been available to most students.
- The systems are to upgrade both academic and occupational preparation in schools, and integrate both so that the importance and applicability of academic skills is more apparent to students.
- The systems are to mobilize workplaces to provide work-based learning that reinforces students' schooling, expands and extends the career exploration and occupational preparation of students, offers mentoring for students' personal and career development, and provides students with progressively more challenging work experiences.
- The systems are to adopt skill standards and skill certification procedures for many occupations, signaling to students the needed proficiencies of various occupations and signaling to employers which students have reached those proficiencies.

E-2. The implementation of STWOA will be difficult. STWOA is to foster systemic school reform targeted at major improvements in both aca-

demic and career preparation, but more modest attempts at reform during the past decade have had troubled histories. Successful implementation will require effective partnerships between businesses and schools—institutions that operate with different cultures and have little experience working together. STWOA systems are to provide students who choose a career major in high school with instruction that integrates academic and occupational learning, and this will require organizing and teaching the curriculum in ways that differ substantially from those used in the past. High-quality work-based learning opportunities will require the investment of considerable time and resources by participating employers. Unprecedented coordination will be required within the school curriculum, between schools and participating workplaces, and between high schools and postsecondary institutions. STWOA will require the development of skill standards and the introduction of new assessment processes that accurately signal proficiencies needed for employment and fairly reflect young people's knowledge and skills. Finally, parents and students will need to be convinced of the merits of these new arrangements, and many may respond initially with skepticism.

E-3. There is ambiguity in STWOA about the extent to which all students in a community should be included in a school-to-work system, and this ambiguity could impede implementation. Congress apparently intended to support the development of school-to-work transition systems that would be well suited for almost *any* interested students, including those who are disabled and those who are academically gifted, but some people have suggested that *every* student should participate. Practitioners are justifiably concerned that if STWOA is directed primarily at students who are not headed to four-year colleges, it will be stigmatized as a system for less able youth. The fact that work-based learning is offered by some prestigious prep schools suggests that it can benefit academically gifted students. If, however, states require every student to take courses that integrate academics and occupational education or to engage in work-based learning, some educators, parents, and community members may object strenuously.

E-4. Programs using approaches similar to that of STWOA generally have served substantial portions of minority youth, but some gender stereotyping by occupation is apparent. There had been fears that minority youth might tend to be excluded from work-based learning, but several studies of these early programs indicate this has not been the case to date. Most boys and girls, however, have received education and training in occupations that are common for their gender.

E-5. A few prototypes of STWOA have reported that large proportions of their high school graduates have enrolled in postsecondary education, but whether most of these students were adequately prepared to complete college programs is unknown. In some programs serving predominantly inner-city youth, 85 to 92 percent of the seniors have reported plans for postsecondary enrollment, and in three programs that tracked the students, 69 to 84 percent actually did enroll in postsecondary programs. Very few of the evaluation reports that OTA examined presented data on students' high school achievement, and several employers expressed concern to OTA staff about the low level of students' basic skills. The impressive postsecondary enrollment rates probably reflect stimulation of students' desire to seek further education and the provision of more guidance on college admissions. Perhaps many of the students will make it through the postsecondary program because of the motivation and work habits they have acquired in the programs, but for those students who fail, there could be considerable disillusionment.

E-6. Even the best school-to-work transition programs have required at least five years of implementation and refinement to operate effectively. Neither theory, nor research, nor expert advice appears sufficient to assure quick success, perhaps because success is partly dependent on establishing a reputation with employers, parents, and students, and that takes time.

E-7. Evaluating the effects of STWOA systems on students' success and workforce productivity will require more than a decade, but interim assessments can provide important information. If the systems are given a few years to refine their operations and if students are then followed from the 7th grade (when career exploration and counseling are to begin) through at least one or two years of postsecondary education, a decade will pass before the first cohort receiving the full treatment enters full-time employment. Ideally, the progress of the students in the work world would then be followed for another decade to determine the long-term effects on their career success and on workplace productivity. In the interim, it will be useful to assess several matters, including:

- whether the intended STWOA system components and coordination among them are successfully implemented;
- how many students are being served by the systems and what their characteristics are;
- whether students' attendance, discipline, course taking, grades, test scores, and other assessments of progress show upward trends;
- whether evaluations of students' work-based learning are promising;
- whether high school graduation rates and postsecondary enrollment rates rise;
- whether substantial portions of the students do earn the applicable skill certificates; and
- the extent to which employers expand, contract, or terminate their participation.

Both interim and long-term evaluations will require program operators and students to cooperate with the data collection, and that is by no means assured.

Background and Introduction 2

Work-based learning is any learning that occurs when a person is working, but in this report the term is used more narrowly to mean learning that results from students' experiences in a workplace or surrogate workplace that are planned at least partly for students' career orientation and occupational development. Work-based learning includes opportunities to "shadow" employees for a few hours or days, to learn what they actually do. It may involve opportunities to assist various employees for a week or so, to gain some experience in several different jobs. It can provide work experience outside places of employment, as in community service settings or in school-based enterprises that produce goods or services. It sometimes includes opportunities to participate in formal workplace instruction designed to develop specific knowledge and skills. It often includes opportunities to assume a job or a volunteer work assignment for a semester or longer, with orientation and continuing guidance from a supervisor, to learn general work skills and specific occupational skills while also producing goods or services. It may entail holding a planned sequence of increasingly demanding jobs, in one or more workplaces, that are designed to contribute to career development. Work-based learning can also encompass participation in various forms of work simulations.

HISTORY OF WORK-BASED LEARNING IN THE UNITED STATES

Apprenticeships have been traced back as far as the Code of Hammurabi in the 18th century B.C. (9). The code required artisans to teach their crafts to the young. Until the middle of the 19th century, most young people learned about work by working alongside

their parents or in an apprenticeship with another adult. Apprenticeships flourished during the early history of the United States. Young people were apprenticed from about the age of 14 until the age of 21. The master practitioner was responsible not only for their occupational training, but also for their housing, food, clothing, general development, and sometimes a small stipend. In turn, the apprentice worked for the master practitioner about 60 hours per week (16).

Apprenticeships declined during the Industrial Revolution, when mass production and its division of labor reduced the need for skilled craftspeople (10). In the early 20th century, unions and businesses established formal apprenticeship programs in an effort to maintain high-quality workmanship in the skilled trades (7,10). The programs usually involved several years of full-time work, on-the-job training, and additional classroom instruction in theory for a few hours per week. The pay generally increased as the participants progressed, and successful completion of the apprenticeship resulted in "journeyman" status. These apprenticeship programs expanded dramatically in the years following World War II (20). In 1994, there were 315,054 people receiving training in federal and state registered apprenticeship programs (20). The programs cover about 800 occupations, but three-fourths of all apprentices are in just 30 occupations, and about half of all apprentices are preparing for work in the construction trades (11). The mix of full-time work, on-the-job training, and additional instruction in theory remains similar to that established in the early part of the century.

Although formal schools are known to have operated as early as 4,000 years ago in China, widespread schooling is a relatively new development (25). Several forces contributed to the rapid expansion of schools in the United States during the 19th century. The decline of family homesteads and self-employed craftsmen, and the rise of factories, meant that boys could no longer work alongside their fathers to master skills. The urbanization of the population and improvements in transportation made it much easier to assemble many students in one building. Advances in printing technologies dramatically lowered the cost of books. The advent of mechanization, industrialization, and regional commerce increased the demand for accurately transmitted information, and thus the need for a workforce that could read and write. Rising incomes made families less dependent on the labor of children, and thus permitted extended periods of schooling. High rates of immigration to the United States during the 19th century resulted in a widespread need for instruction in the English language and a public desire to "civilize" and "Protestantize" immigrant children. In addition, advocates for child welfare supported schooling as a means of countering the exploitation of child labor (4,5,8).

As soon as formal schooling had become universal, reformers and critics attacked it as ill-suited to the needs of many students. As early as the mid-1800s, there were complaints about the emphasis on humanities and the didactic pedagogy. One of the most common criticisms was that traditional academic education was not preparing students for adult life, especially for their work lives (14). A few educators responded by establishing the programs that are the precursors of modern work-based learning programs.

In the 1820s several schools were established to teach industrial arts. Some were operated by charitable organizations for orphans; others were established by organizations of craftspeople for their members (1). Manual labor academies appeared at about the same time. These academies hired out their students to local businessmen to give the students practical experience and to reduce the tuition costs. During the late 1800s, high schools of "mechanical arts" and "trade education" were established to keep young people in school and to prepare them for their work lives (1). These schools devoted about half the day to teaching academic skills and half the day to teaching specific trades in the schools' laboratories. That arrangement, which has endured to this day, has long been known as high school "vocational education." In 1913, at the behest of employers in Dayton, Ohio, The Cooperative High School was established. It allowed advanced students to spend part of their day working and being trained by em-

ployers. This was, and is still, known as "cooperative education" (2,6).

In the 1870s the president of the Massachusetts Institute of Technology observed that his institution had been producing engineers who were well educated but unskilled. To remedy this shortcoming, he introduced shop courses that taught the use of tools and manual skills that engineers commonly applied in the field (1). In 1906, the University of Cincinnati adopted cooperative education for its engineering college, with students rotating between a week of classes and a week of workplace experience (13). These two approaches, incorporating practical skill training within schools and coordinating schooling with outside practical experience, have endured in American education.

Cooperative education spread to several other engineering colleges and then, in 1921, Antioch College became the first liberal arts college to adopt it (13). By 1940, some 30 institutions of higher education offered cooperative education. By 1970, the number had expanded to more than 200, and by 1980 there were 1,028 programs with approximately 200,000 students—about 3 percent of the number of full-time enrolled students in the United States (13).

In 1977 and 1978, the U.S. Department of Labor funded eight demonstrations of what were then called youth apprenticeships but now are often called school-to-apprenticeship programs. High school seniors in vocational education programs were given the opportunity to start union and employer apprenticeship programs on a part-time basis. Most went to school half time and participated in the apprenticeship program for 20 to 30 hours per week. This model did not gain popularity. In 1989, the Department of Labor estimated that only about 1,500 high school students were involved in school-to-apprenticeship programs (24).

For the past decade, the German Marshall Fund of the United States has supported study trips by American educators, business leaders, elected officials, and journalists to examine the apprenticeship systems of Germany and other European countries. The foundation has also supported trips by European counterparts to the United States for the exchange of ideas about school-to-work transitions and workforce development.

During the late 1980s and early 1990s, the W.T. Grant Foundation's Commission on Work, Family, and Citizenship, and its successor, the American Youth Policy Forum, published about 20 reports that identified problems in the preparation of youth for adulthood and employment, described various proposals for addressing those problems, organized public discussions of policy alternatives, and took federal and state policymakers on field visits to innovative programs. Several reports dealt with school-to-work transitions, youth apprenticeships, and other forms of work-based learning for young people (12,18,26,27).

In 1991, Jobs for the Future, a nonprofit organization with foundation funding, began providing support for several innovative school-to-work transition programs with work-based learning. The programs generally coordinated career orientation, academic and occupational education, and work-based learning, with the aim of preparing young people to assume entry-level semiskilled jobs upon graduation or to proceed on to postsecondary education and training. In 1992, the U.S. Department of Labor provided support to six states and several local jurisdictions for the development of school-based "youth apprenticeships" with characteristics similar to those of the immediate foregoing programs, although a few included at least one year of postsecondary education as an integral part of the program. In 1992, the Council of Chief State School Officers provided support to five states for similar purposes (17).

The School-to-Work Opportunities Act was largely inspired by these efforts of the 1980s and early 1990s, but the legislation extends these precedents in at least three ways:

1. It strives to link improved preparation for work with current academic reform efforts.
2. It calls for more comprehensive services over a longer period of time than was generally proposed in the past.
3. It seeks to establish school-to-work transition systems operated by partnerships of schools, employers, and other community organiza-

tions, rather than innovative programs operated and controlled primarily by the schools, employers, or unions (19).

PROBLEMS WITH SCHOOL-TO-WORK TRANSITIONS

Congress enacted STWOA and included a work-based learning component mainly to address three problems confronting school-to-work transitions in the United States: rapid changes in technology and organization of business and industry, obscured career pathways for youth, and the generally poor quality of career preparation offered to youth in this country.

Rapidly Changing Workplaces

Experts suggest that vast changes in how work and technology are organized within companies are leading to new kinds of work environments where there is a need for a flexible workforce, teamwork, and continual learning on the job. Rapid advancements in technology have changed the nature of the workplace, which now often requires the generation, manipulation, and interpretation of text, graphs, and other symbolic information. Furthermore, increased international competition, coupled with technological advancement, has shortened production cycles and spurred customization in many workplaces. Thus in order to compete effectively in the market, workers must learn new technologies and techniques continually introduced into the workplace, and be flexible and able to work as a team (3).

To encourage young people to acquire the intellectual and social skills they need to perform productively in the workplace, STWOA calls for:

- high academic standards of performance for all students,
- the integration of academic and occupational learning to motivate academic achievement by demonstrating its relevance in the workplace, and
- work-based learning to develop skills that are advantageously learned in the workplace and to reinforce knowledge that is acquired in school.

Obscured Career Pathways

Many scholars and educators have concluded that employers have few ways of signaling career opportunities to young people. In addition, students have few ways of discerning the available options in various occupations and industries and the preparation required for them. Clear career pathways can encourage early and continuing career exploration, structure career choices for students at various points in their lives, and generate motivation to work hard in pursuit of one's objectives. Career "signposts" can inform young people of their progress, and counseling can assist them in making their decisions (15).

STWOA is designed to foster clear career pathways by:

- providing career exploration and counseling beginning no later than the 7th grade;
- allowing selection of a career major no later than the 11th grade;
- arranging work-based learning opportunities to give students experience in different career areas;
- providing mentoring for personal guidance and support; and
- establishing skill standards and certification systems to signal occupational skill requirements and to recognize the attainments of students.

Generally Poor Preparation of Youth for Careers

American youth have generally been poorly prepared for careers because of the gap between academic and career preparation. Historically, students in the "general" track are characterized as not prepared for anything; vocational education students are typically not expected to achieve academically or to pursue promising careers, and college-bound students are seen as having little knowledge of the workplace and work experience.

STWOA aims to bridge the gap between academic and work-related education by:

- making school-to-work transition systems part of statewide comprehensive education reform,
- stressing the importance of rigorous academic standards for students,
- using work environments to build students' knowledge and skills and to demonstrate how both are related to work and careers,
- using career counseling and mentors to encourage all students to obtain at least some postsecondary education or training, and
- connecting high school programs to postsecondary schools that have strong programs of academic and occupational education.

OVERVIEW OF STWOA

In the spring of 1994, Congress passed the School-to-Work Opportunities Act (STWOA) with bipartisan support. The legislation aims at improving the productivity and competitiveness of the nation's workforce and preparing young people for rewarding and satisfying work lives (19).

STWOA does not seek to establish programs but rather to develop comprehensive statewide and local systems for facilitating school-to-work transitions (Public Law 103-239, Sec. 3[1]). STWOA directs seed money to interested statewide collaborations of the governor, state agencies, and representatives of the private sector (Title II, Subtitle A, Sec. 203). At the local level, the activities are to be undertaken by partnerships of educators, employers, employees, and students (Sec. 4[11] and Title III, Sec. 301). STWOA also calls for coordination of the systems with other education and training activities undertaken with federal support (Title II, Subtitle B, Secs. 213[c] and [d][6]). The main provisions of STWOA were summarized in chapter 1, box 1-1.

STWOA received widespread support from numerous business, labor, education, and other organizations (21). Business associations supporting it included the Business Roundtable, National Alliance of Business, National Association of Manufacturers, and U.S. Chamber of Commerce. Labor organizations included the AFL-CIO, Service Employees International Union, and the United Association of Journeyman and Apprentices of the Plumbing and Pipefitting Industry. Educational organizations included the American Federation of Teachers, American Association of Community Colleges, Council of Chief State School Officers, National Education Association, and National Parent-Teacher Association. Other organizations supporting the bill included the National Governors' Association, National Association of Counties, National Conference of State Legislatures, and U.S. Conference of Mayors.

There was some congressional opposition to STWOA. Several members considered the anticipated costs (the first-year authorization was for $300 million) to be imprudent at a time of large federal deficits. Others thought that the federal government ought to reduce the number of its more than 150 job training programs and better coordinate the remaining ones, rather than adding another one. The House wanted to require that the work experience be paid, while the Senate opposed that provision; the conference compromise specified that preference be given to proposals that include paid work experience. A few members and experts thought that the objective of the legislation could not be achieved unless all the services for youth began no later than the 9th grade, but the act specifies that many of the services do not have to begin until the 11th grade. Some educational associations opposed giving the governors wide latitude in administration of STWOA, preferring it to be handled by state and local education agencies, but they did not prevail. Several people were concerned that the local systems might tend to avoid enrolling students at risk for academic failure, while others warned that the systems would suffer if they were stigmatized as being primarily for those students. Several experts were concerned about the provision calling for states to develop skill certificates, suggesting that this task was better left to national organizations so as to minimize duplication of effort and to allow the recipients of the certificates nationwide mobility, but the provision was unchanged (21,22,23).

Despite these concerns, STWOA passed. The legislation authorizes $300 million for fiscal year 1995 and such sums as may be necessary in the fiscal years 1996 through 1999. A sum of $245 million was appropriated for fiscal year 1995, and the Administration requested $400 million for fiscal year 1996.

The National School-to-Work Opportunities Office, which is jointly staffed by the Department of Education and the Department of Labor, is administering STWOA. STWOA calls for four types of grants:

1. **State Development Grants** support efforts to plan statewide systems of school-to-work transitions (Title II, Subtitle A). All states, the District of Columbia, and Puerto Rico have already received these grants.
2. **State Implementation Grants** support implementation of the plans (Title II, Subtitle B). Eight states were awarded five-year grants in 1994. For the first year, the grants ranged from $2 million to $10 million. The amounts were to double in the second year and then drop substantially over each of the three following years. Another 17 to 20 states are scheduled to receive grants in the fall of 1995.
3. **Federal Implementation Grants to Local Partnerships** support the development and implementation of school-to-work transition systems by local jurisdictions (Title III). Thirty-six of these grants were awarded in 1994, in amounts from $184,280 to $1.2 million. Recipients were to receive up to four additional years of support, depending on performance and availability of funds. Grants are to be made to additional applicants in late 1995.
4. **National Programs Grants** support research, evaluation, technical assistance, dissemination, and other cross-cutting efforts (Title IV). A contract of $3 million per year for a "Learning Center" to provide technical assistance and facilitate exchanges among the grantees was awarded in the summer of 1995, and a contract of $1.3 million per year for a five-year evaluation is scheduled to be made in August or September 1995.

As of August 1995, the House appropriation bill would limit the 1996 funding for STWOA to $240 million and the Senate had not yet acted on the appropriation. In addition, there are bills pending that would consolidate STWOA with other federal job training and workforce development programs, scale back federal support for the programs, and give the states broad discretion in designing and administering the consolidated programs (H.R. 1617 and S. 143). S. 143 has been incorporated with changes as Title VII of S.1120.

Some observers believe that if the consolidation bills are enacted, the states will continue with reforms similar to those supported by STWOA because these reforms are a promising response to serious problems and because several states had begun the reforms before passage of STWOA. Other observers fear that fierce fights for declining funding will break out at the state level, and the STWOA-like reforms will loose to older programs which have larger and better organized constituencies.

OVERVIEW OF THIS REPORT

The remainder of this report is organized into four chapters. Chapter 3 describes and analyzes the apparent advantages and disadvantages of five learning processes that can be used in work settings: experiential learning, work-group learning, mentoring, workplace instruction, and technology-assisted learning. Chapter 4 discusses various ways that work-based learning can be structured with respect to the types of students who are served; the program objectives; the coordination with schooling; the timing, intensity, duration, and progression of work-based experiences; the settings of work-based learning; and the issue of payment for students. Chapter 5 describes various models of school-to-work transition programs with work-based learning, and summarizes the evidence on their effectiveness. These models are youth apprenticeships, clinical training, cooperative education, school-to-apprenticeship programs,

school-based enterprises, and career academies. The models vary in the ways that they are structured, but each can use any of the five work-based learning processes. Finally, chapter 6 considers the factors that influence whether or not employers will participate in work-based learning programs.

REFERENCES

1. Barlow, M.L., *History of Industrial Education in the United States* (Peoria, IL: Chas. A. Bennett Co., Inc., 1967).
2. Barton, P., Educational Testing Service, Princeton, NJ, personal communication, July 1995.
3. Berryman, S.E., and Bailey, T.R., *The Double Helix of Education and the Economy* (New York, NY: Institute on Education and the Economy, Teachers College, Columbia University, 1992).
4. Bowles, S., and Gintis, H., *Schooling in Capitalist America: Educational Reform and the Contradictions of Economic Life* (New York, NY: Basic Books, 1976).
5. Cohen, D.K., "The American Common School: A Divided Vision," *Education and Urban Society* 16(3):253-261, 1984.
6. Corson, W., and Silverberg, M., *The School-to-Work/Youth Apprenticeship Demonstration: Preliminary Findings* (Princeton, NJ: Mathematica Policy Research, 1994).
7. Cremin, L.A., *The Transformation of the School: Progressivism in American Education, 1876 - 1957* (New York, NY: Vintage Books, 1964).
8. Cuban, L., Department of Education, Stanford University, Stanford, CA, "Public School Teachers Using Machines in the Next Decade," unpublished contractor report prepared for the Office of Technology Assessment, U.S. Congress, Washington, DC, October 1994.
9. Danaher, E., "Apprenticeship Practice in the United States," Stanford, CA: Stanford University, Graduate School of Business, 1945.
10. Edwards, K.R., "Background Information on Apprenticeship in the United States," unpublished paper presented at the *Federal Committee on Apprenticeship Meeting*, Washington, DC, Nov. 29-Dec. 1, 1994.
11. Hamilton, S.F., *Apprenticeship for Adulthood: Preparing Youth for the Future* (New York, NY: Collier Macmillan Publishers, 1990).
12. Hamilton, S.F., and Hamilton, M.A., *Opening Career Paths for Youth: What Needs to Be Done? Who Can Do It?* (Washington, DC: American Youth Policy Forum, 1994).
13. Hartley, M.P., "The Legacy: A History of Cooperative Education," *50 Views of Cooperative Education,* 5th ed., D.C. Hunt (ed.) (Detroit, MI: University of Detroit and ANR Pipeline Co., 1987).
14. Kanter, H., and Tyack, D.B., *Work, Youth, and Schooling: Historical Perspectives on Vocationalism in American Education* (Stanford, CA: Stanford University Press, 1982).
15. MacFarland, L., and Vickers, M., "The Contexts and Rationale for the Reform of Vocational Education and Work-Based Learning," *Vocational Education and Training for Youth: Toward Coherent Policy* (Paris, France: Organization for Economic Cooperation and Development, 1994).
16. Mercer, N.A., "Apprenticeship," *Encyclopedia Americana* (Danbury, CT: Grolier, Inc., 1986).
17. Reisner, E.R., et al., *Using Youth Apprenticeship to Improve the Transition to Work* (Washington, DC: Council of Chief State School Officers, 1993).
18. Rosenbaum, James E., et al., *Youth Apprenticeship in America: Guidelines for an Effective System*, Washington, DC: William T. Grant Foundation Commission on Youth and America's Future, 1992.

19. School-To-Work Opportunities Act of 1994, May 4, 1994, Public Law 103-239.
20. Stang, N., Program Analyst, Bureau of Apprenticeship and Training, Employment and Training Administration, U.S. Department of Labor, Washington, DC, fax to Christine Ho, Office of Technology Assessment, U.S. Congress, Washington, DC, Aug. 9, 1995.
21. U.S. Congress, House of Representatives, Committee on Education and Labor, *H.R. 2882, School-to-Work Opportunities Act of 1993*, hearing, Sept. 29, Oct. 20, 27, 1993, Serial No. 103-57 (Washington, DC: U.S. Government Printing Office, 1994).
22. U.S. Congress, House of Representatives, *School-to-Work Opportunities Act of 1994*, Conference Report, H. Rpt. 103-480 (Washington, DC: U.S. Government Printing Office, 1994).
23. U.S. Congress, Senate, Committee on Labor and Human Resources, *The School-to-Work Opportunities Act of 1993*, hearing, Sept. 28 and Oct. 14, 1993, Serial No. 103-457 (Washington, DC: U.S. Government Printing Office, 1993).
24. U.S. Department of Labor, Employment and Training Administration, "Work-Based Learning: Training America's Workers." (Washington, DC: U.S. Department of Labor, 1989).
25. Wilds, E.H., and Lottice, K.V., *The Foundations of Modern Education* (New York: Holt, Rinehart, and Winston, 1970).
26. William T. Grant Foundation Commission on Work, Family, and Citizenship, et al., *States and Communities on the Move: Policy Initiatives to Create a World-Class Workforce* (Washington, DC: 1991).
27. William T. Grant Foundation Commission on Work, Family, and Citizenship, *The Forgotten Half: Pathways to Success for America's Youth and Young Families* (Washington, DC: 1988).

Processes of Work-Based Learning 3

OTA has identified several processes by which knowledge, skills, attitudes, and habits develop during work-based learning. These processes are experiential learning, work-group learning, mentoring, workplace instruction, and technology-assisted learning. The first can occur solely at the learner's initiative, but all the rest involve intentional efforts by others to contribute to the young person's development.

Work-based learning generally differs from school-based learning in a number of ways. In school, students are involved primarily in individual activities, whereas in a work setting the students often undertake activities with other members of the work group. In school, students are engaged primarily in mental activities, whereas in a work setting the students combine those abstract activities with concrete ones. In school, students are directed toward developing competencies that are believed to be generalizable, whereas in a work setting most learning focuses on specific tasks, equipment, and procedures. Finally, in school, students generally use few tools, whereas in the workplace the use of tools is pervasive (53). Several examples of work-based learning activities are described in box 3-1.

Good work-based learning has an authenticity that probably cannot be replicated in school-based learning. The students are expected to assume adult responsibilities, working in adult peer groups united by a common enterprise of producing goods and services. To succeed, the students depend on their co-workers, and the co-workers, in turn, depend partly on the students. The students must learn to use unfamiliar equipment, follow specific work procedures, and adapt to the norms of the workplace. They must coordinate both abstract thinking and hands-on activity. They must also learn to deal with the emotional pressures that

BOX 3–1: Examples of Work–Based Learning Activities

- Help an experienced employee: The student helps an experienced employee with various tasks. The student usually begins doing the simplest and least critical parts of the job, and gradually moves up to the more skilled activities. The experienced employee explains, demonstrates, and guides the student in practicing.
- Work under close supervision. The student assumes work responsibilities under close supervision. The supervisor may provide orientation to the responsibilities, directions, feedback on performance, warning of impending problems, correction of mistakes, encouragement, and advice on handling unexpected contingencies.
- Work with minimum supervision: The student works with minimum supervision, usually after proving himself or herself when working under close supervision.
- Participate in a "community of practice": The student participates in informal exchanges of reformation and assistance among employees with similar responsibilities. At first, the student is generally the beneficiary of such exchanges, but with growing experience the student becomes increasingly a contributor.
- Participate in "occupational communities": The student participates in professional organizations, industry associations, or unions that span more than one organization. The student may read the communities' publi - cations, attend their meetings, and socialize with their members.
- Explore and innovate: The student seeks to develop superior work procedures, and then tests, refines, and incorporates them into his or her work. The procedures may also be adopted by other workers or throughout the organization.
- Orient, tram, and supervise: The experienced student orients, trains, and supervises entering students and perhaps other entering employees.

SOURCE Off Ice of Technology Assessment, 1995.

result from high production goals, rush orders, equipment breakdowns, nasty supervisors, feuding colleagues, irate customers, business slowdowns, and the possibility of layoffs.

"If you've accomplished this program, you could do anything. ANYTHING. Try and stress me out—you couldn't do it. "-Student (28).

Work-based learning yields knowledge, skills, attitudes, and habits that arise from interaction with the organizational structure, equipment, materials, work procedures, and personalities of a given workplace. An OTA contractor has identified seven types of knowledge and skill that are necessary for most work (5):

1. **Sensory interpretation** involves making inferences based on colors, shapes, patterns, sounds, smells, tastes, and tactile clues—perceived directly or with the aid of instruments. For example, machinists who use the latest numerically controlled machine tool still listen for minute changes in pitch and tone that indicate problems in how the cutting surfaces are contacting the raw materials. X-ray technicians make three-dimensional inferences from two-dimensional film images.
2. **Sensorimotor dexterity** is the "feel" for the instruments, materials, and techniques used in a given occupation—not just familiarity but, rather, tactile sensitivity. For instance, laboratory technicians learn that when pipetting a cell culture, just the right touch is required to avoid destroying the sample.
3. **Tricks of the trade are** plans of action that have been developed by practitioners from a combination of experience, tacit understanding, and formal scientific knowledge. For instance, sonographers, when scanning for the presence of a suspected gallstone, know that they can most easily identify the problem by rolling the patient on his or her side and looking for the stone to "drop" on the screen.

4. **The local history of problems** is the accumulated knowledge of the causes, timing, and fixes of problems that have recurred over a period of time. For example, workers may have learned that a particular piece of equipment will tend to malfunction in unusually hot temperatures.
5. **Work style** is the set of work roles, social skills, norms, and customs that guide how work is conducted. For instance, emergency medical technicians generally adopt a decisive, improvisational, and coolly detached work style to cope with the life-threatening and chaotic circumstances under which they work. Work styles vary considerably among occupations and organizations. Even for a given occupation, there will be modest differences across organizations and sometimes across work groups within a single facility.
6. **Coordinating activities** organize and focus the general knowledge, technical expertise, and organizational status of different persons involved in a work task. For instance, emergency medical technicians often must work closely with fire fighters and police officers at emergency scenes, sometimes directing the coordination and sometimes responding to the directions of others.
7. **Linguistic skills** involve the use of occupational jargon and its translation for nonspecialists. Automotive technicians use terms such as "dogging," "traming," "zerk," and "chuggle," when talking among themselves, but must translate those terms into common English terms when talking with customers.

Although school-based occupational education can contribute to the development of each of these types of knowledge and skills, it is rarely able to fully prepare students for the workplace. Schools cannot afford to have all the equipment and tools that young workers must learn to use. Students often underestimate the importance of knowledge and skills until they experience their use in a real workplace. The requisite knowledge and skills will vary from one workplace to another, and even among different work groups within a given facility. And the latter four types of knowledge and skills just described require complex interactions with other employees.

In addition to having several advantages, work-based learning has some potential disadvantages. Workplaces are organized for efficient production, distribution, and customer service, not for efficient learning. American businesses historically have provided relatively little training for their nonmanagerial employees and have encountered difficulties in preparing incumbent employees for new technology (61,66). The supervisors and mentors may be preoccupied with other responsibilities and unable to give the students the necessary encouragement, guidance, and feedback. The easiest thing to do with low-skilled young people is to give them the menial work that nobody else wants to do. Although important lessons can be learned from such work, most students will master the lessons in a matter of weeks and learn little thereafter. Even when a conscientious effort is made to provide the young people with a variety of learning opportunities, several of the types of knowledge and skills cited above are likely to be partly idiosyncratic to a given workplace, and thus mastery of these in one worksite is not likely to yield adequate preparation for other worksites.

One researcher noted, "Students do not seem to be held to authentic workplace standards across the board, although that seems to be the goal of each employer" (28).

STWOA anticipated most of these problems, but that does not assure they will be effectively countered. STWOA calls for work-based learning to include "a planned program of job training and work experiences (including training related to pre-employment and employment skills to be mastered at progressively higher levels)" (Public Law 103-239, Title I, Sec. 103[a][2]). It calls for the provision of technical assistance and services to employers to help them design the work-based learning and to train workplace mentors (Title I, Sec. 104[3]). The work-based learning is to in-

clude a "broad introduction, to the extent practicable, in all aspects of the industry" (Title I, Sec. 103[5]). And the work-based learning and school-based learning together are to prepare the youth to earn "a portable, industry-recognized credential" of skill (Title I, Sec. 103[a][2[and Sec. 4[22]).

Five work-based learning processes (experiential learning, work-group learning, mentoring, workplace instruction, and technology-assisted learning) are discussed here. OTA found no reliable evidence on the extent to which each of the processes is used in work-based learning or on their relative effectiveness. Because each appears to have both advantages and disadvantages, the richest learning experiences probably will involve combinations of several. Although STWOA broadly stipulates the objectives and content of the work-based learning, it leaves the actual processes to the discretion of the state and local systems, with the exception of mentoring, which is required. In addition, the various models of work-based learning that are discussed in chapter 5 are not differentiated by the processes of work-based learning that they use. Each model can use any of the processes.

EXPERIENTIAL LEARNING

In the broadest sense of the term, experiential learning occurs when students learn from activities that are unintentionally instructive. When students observe how things are done in the workplace, reflect on the reasons for those practices, assume new roles and note their consequences, encounter a problem in their work and manage to solve it, or experiment with improving some work procedure, they are engaged in experiential learning.

Whereas the benefits of experiential learning are widely recognized in the adage "Experience is the best teacher," the shortcomings are also recognized in the quip "The school of hard knocks is a good teacher, but the tuition can be steep." Experiential learning is limited by the range of firsthand experiences available to the student, it is often slow, it can easily lead to false inferences, and it can result in harm to the learner or hazards to others (58). Hardly anyone becomes proficient in the use of word processors without some instruction or reference to a manual. And few people would volunteer as subjects for nurses who are experientially learning to draw blood.

Work-based learning programs often try to guide experiential learning in ways that harness the benefits and minimize the limitations. One way of doing this is to encourage experiential learning only after conveying the fundamentals and alerting students to common hazards by other means of learning. A second way is to provide structure to the experiential learning that will focus and accelerate it, for example, the use of learning plans that specify the objectives and sequence of the workplace activities. A third way of optimizing experiential learning is to supplement it with exercises that help students reflect on their experience. In some programs the students are asked to keep a journal of their work experience; in other programs the students attend a seminar that helps prepare them for their work-based learning experiences, deal with problems that may arise, reflect on what they have learned, and consider the social, economic, and ethical contexts of work.

Todd

Todd had been doing well in the worksite, and had earned the affection of his supervisor and co-workers. But he repeatedly failed to complete the assignments for the school seminar that accompanied the work experience, and school officials eventually removed him from the program. The supervisor was dismayed, and responded by hiring him back as a regular part-time employee (67).

The Cambridge Rindge and Latin School requires enrollment in such a seminar for all juniors and seniors participating in internships. The students study the historical and social aspects of work, reflect on their work experience in writing, and plan their end-of year projects (67).

LaGuardia Community College in New York City has developed an elaborate series of seminars

to accompany its cooperative education work assignments. The seminars foster exploration of careers, development of intellectual and occupational skills, and reflection on the social and ethical aspects of work. When students are nearing eligibility for work-based learning, they attend a 12-hour preparation course that introduces them to the co-op program, helps them assess their interests and skills, requires them to establish objectives for their career and work assignments, and prepares them for the job search process (23). During the first semester of work-based learning, the students attend an evening or weekend seminar to plan activities in the workplace that will deepen their understanding of how the organization is structured and operated. These activities might include preparing organization charts, identifying leadership styles, describing the document flow, and analyzing ethical dilemmas. During the second semester of work, the students engage in several career exploration exercises and develop strategies for deriving maximum learning from their work experience. These strategies include seeking challenging assignments, coping with hardship, and requesting feedback on one's strengths and weaknesses. During the third semester of work, the seminar helps the students prepare a research paper that draws on the theory they have studied and the work experience (23).

WORK-GROUP LEARNING

Work-group learning is an immersion approach to work-based learning. The learning comes from sharing the activity and the distributed knowledge of the group. Members of the group model the work procedures and exert pressure on each other to enforce the established norms. They attend to important cues from their colleagues and supervisors and ignore the unimportant ones. They converse—asking questions, responding, and offering unsolicited information necessary for the group's work. They tell "war stories" about work crises, their responses, and the outcomes. They help each other. They call on outside resources when appropriate, and they coordinate with the other work groups (47).

Newcomers to a work group usually begin on the periphery, where the tasks are short and easy, the costs of errors are small, and their responsibility for the activity as a whole is small. As the newcomers master the simpler tasks, they are given more complex ones, thus moving from the periphery to the center of activity (39). Full participation in a work group is characterized by having the ability to access and contribute to the group's collective memory, knowing when to disregard the rules, being recognized as an "old hand," and having power to affect the life of the group in important ways. Learning enables new people to enter work groups and to move toward full participation.

Several types of work groups can be important to work-based learning opportunities. The first is an occupationally heterogeneous face-to-face work group, for example, a physician's office that has a receptionist, a part-time bookkeeper, two nurses, and a physician. The members of the group have complementary skills and responsibilities. A second type of work group is an occupationally homogeneous face-to-face group, for example, the equipment repair department of a large hospital, which would be staffed with several electronic technicians who share responsibilities, though there may be some specialization according to individual skills and preferences. A third type of work group is an occupationally homogeneous group composed of people within a given organization who seldom work face to face, but communicate and associate informally to share expertise and to experience camaraderie. The second and third types of work group are increasingly referred to as "communities of practice."

Another type of work group includes professional and trade organizations, the chambers of commerce, unions, computer-user groups, and informal groups of people engaged in similar occupations. The members of these groups generally do not work together, but they engage in similar work, have common values and perspectives toward their work, and engage in social relationships that meld leisure activities and the

expansion of work knowledge and skill. These are sometimes referred to as "occupational communities."

Work groups offer many opportunities for learning the types of work knowledge and skills discussed earlier. New members can observe experienced members using their tricks of the trade. The means of accessing the local history of problems can be overheard in conversations, observed, or explained at the newcomer's request. In one airline operations room it was observed that the staff addressed their questions aloud to the whole room, and anyone who knew the answer responded (32). The jargon of a work group and skill in translating it for nonspecialists can be gleaned by overhearing conversations and by listening to pointers from the experienced members. The coordination of work tasks can be learned by observation and by trial and error.

Adoption of the prevailing work style is crucial to avoiding trouble and to becoming a full member of a work group. For example, a routine-obsessed and fastidiously clean work style is necessary for medical technicians who deal with cell cultures that can easily be contaminated (4). New employees may receive formal orientation to the key elements of the work style, but subtleties are learned by observing the experienced workers, interacting with them, asking questions, feeling peer pressure, and sometimes suffering sanctions.

Two scholars have observed, "Work would be practically impossible and unbearably stressful if practitioners could not rely on one another to supply needed information" (5). That reliance provides reciprocal incentives for learning and for facilitating learning. Newcomers depend on the older members, but the older members will eventually have to rely on the newcomers.

Sometimes the messages that work groups convey to new members are too subtle to be detected; at other times the demands of the group can overwhelm the novice. In addition, the lessons learned from work groups are not always positive. The productivity and efficiency of work groups can range from low to high. Some groups resist all change, and others perpetuate racial and gender discrimination. Participation in a good work group can be a great learning experience; participation in a bad work group may teach dysfunctional lessons.

MENTORING

Mentoring is a relationship in which a more experienced person facilitates the broad development of a less experienced person on a regular basis and over an extended period of time. Mentoring in work-based learning can be directed primarily toward occupational development, but usually it is equally directed toward intellectual, personal, and social maturation. The mentors in work-based learning may be responsible for:

- acquainting the students with the formal rules and informal norms of the workplace;
- introducing the students to the people and resources outside the immediate work area;
- inculcating positive attitudes and work habits;
- guiding the students in development of work knowledge and skills;
- encouraging and helping the students to undertake challenges;
- encouraging the students to reflect on their experiences;
- serving as a confidant in times of stress;
- providing empathy, support, and encouragement when the students encounter difficulties;
- providing sympathetic but realistic feedback;
- helping the students to view things from other people's perspectives;
- serving as a protector, facilitator, and advocate;
- introducing the students to occupational and industry associations;
- helping the students plan for subsequent education and training; and
- serving as a personal and professional role model.

One example of mentoring that is aimed at intellectual and occupational development is provided in the following account:

> He [Peter, the mentor] lets him [Richard, the student,] first grapple with a problem and stretch his resources, but intervenes before Richard gets frustrated. When Richard does come for help, he is not automatically given the

> solutions, because Peter sees that as counterproductive in two ways. First, problems have several solutions. And second, solving the problem is not the primary purpose of the dialogue for Peter; it is also to give Richard new ways to approach the problem so that in the future he might become yet more resourceful because of a bigger knowledge base and understanding of the variables in the problem (27).

STWOA specifies that the work-based learning "shall include . . . workplace mentoring" (Title I, Sec. 103[a][3]). In addition, each student is to be provided with "a school site mentor to act as a liaison among the student and the employer, school, teacher, school administrator, and parent of the student, and if appropriate, other community partners" (Title I, Sec. 104[2]).

Indirect support for the benefits of mentoring comes from at least four lines of research. Several studies of unusually effective adults have found that they more often report having had a mentor than do less successful adults (33,43,54). Considerable evidence indicates that children who do well despite a deprived childhood have had the benefit of at least one caring and attentive adult (21,56,68). Research indicates that the extent of student contact with college faculty is associated with college success (2,13,50,62,69). And a review of more than 100 reportedly successful programs for at-risk youth concluded that their distinguishing features were intensive individualized attention by one or more adults and communitywide prevention and support services (17). These studies, however, generally have not controlled for the possibility that young people who establish strong relationships with adults may have been psychologically and socially stronger than others before establishing those relationships.

There is only scant mention in the literature about negative effects of mentoring. One of the few substantive discussions of possible adverse effects is from the literature discussing the mentoring of adults. It suggests that although mentoring relationships can be quite positive experiences, they can sometimes be ambiguous, conflictual, and disappointing; they can minimize the protégé's contacts with others; they can create an illusion of great caring that subsequently is shattered; and they can lead to sexual exploitation (5). The frequency of these problems is not reported.

Over the past decade many programs have used volunteer mentors as buddies, confidants, and role models for disadvantaged youth. There are credible accounts of how these mentoring relationships transformed the lives of some floundering youth, but the overall picture has not been encouraging. The programs have frequently had difficulty recruiting and retaining adequate numbers of mentors (20,27,44;45). Only about one-third to two-thirds of the matches become significant relationships (20). For those few programs that have been rigorously evaluated, the programs have shown little or no effect on the students' school attendance, academic achievement, graduation rates, or enrollment in postsecondary education (29). When the volunteer mentoring has been combined with tutoring or college orientation, the results have been only modestly better (9,44,51,). None of these evaluations report the potential problems mentioned earlier. Rather, the disappointing results appear to have been due to difficulty in establishing and maintaining good mentoring relationships, and to limited effects even when good relationships are established.

In contrast, the four-year-long Quantum Opportunities Program (QOP)—with mentoring done by full-time paid staff, in combination with supplementary academic assistance, developmental activities, community service options, and financial incentives—had very strong effects in four out of the five sites that succeeded in implementing the program. The program resulted in a 50 percent increase in high school graduation rates, almost a threefold increase in postsecondary enrollments, a 37 percent drop in childbearing, and a 50 percent drop in arrests (24,25). These improvements are among the largest ever found for a youth development program. Given the array of services, it is impossible to know the extent to which mentoring contributed to the outcomes, but

several observers agree that the personal ties with the supportive adults were an important element.

There are reasons to think that the workplace mentoring anticipated in STWOA will have advantages over the community-based mentoring programs just described. Workplace mentoring will be more convenient because the mentors will be the students' supervisors or other experienced employees, and will not have to travel to and from the protégés' homes or deal with the frustration of unanswered phone messages (a common problem in community-based mentoring programs). There will be a core of common interest as the young person tries to adapt to a work environment in which the mentor is well established. The mentoring can be provided as needed, rather than on a prearranged schedule. In addition, the mentoring is to serve a broad cross section of youth, not just disadvantaged youth, who generally have the greatest needs and often are the most difficult to assist (20).

Although the highly successful QOP had a very limited work-based learning component, it is similar in several respects to the mentoring that is to be provided under STWOA. QOP used mentoring in the context of other educational and developmental activities. It used mentoring to address the current needs of the youths and to raise their horizons. And it provided mentoring and other services on a sustained basis for several years.

A review of several ethnographic and case studies of school-to-work transition programs has identified mentoring as commonly associated with student development. The authors conclude:

> Of unquestionable importance is the "vet," "master teacher," or skilled mentor who situates learning in authentic practice; has adequate resources; establishes a culture of achievement; and understands how roles/relationships in the workplace progress over time to enhance the growth and development of the novice (7).

OTA staff found only one formal evaluation of mentoring in work-based learning. Although it is based solely on the perceptions of the young people's development, measured by students' and mentors' responses on a rating form, both groups agreed that mentoring contributed to the youths' knowledge about workplace rules and behavior, to their ability to follow directions and take initiative, and to improvements in their communication skills (18).

Several tentative lessons for implementing worksite youth mentoring can be drawn from the general literature on mentoring and from the demonstrations cited earlier:

- Mentoring appears to work best when professional staff help prepare the mentors and protégés for mentoring and give them continued support after the match-up (10,46,51).
- Matching of mentors with young people on the basis of race/ethnicity and gender does not appear as important as popular opinion has suggested, but there should be an effort to assure personal compatibility and correspondence in interests (30,46,51).
- Mentors should be prepared to listen and provide emotional support to the protégés (20).
- Limited evidence suggests that relatively immature youth need a great deal of encouragement and guidance to develop and maintain responsible behavior, whereas more mature youth will benefit from a focus on career and occupational issues (18).
- The mentoring should also help the youth explore new experiences, make contacts, assume responsibility, gain self-discipline, learn job-seeking skills, and solve personal problems (10,18,46).

WORKPLACE INSTRUCTION

Workplace instruction includes formal lectures and presentations to large groups, informal talks and demonstrations to small groups, and the coaching of individuals. The training may be provided by management, supervisors, expert employees, or outside consultants.

One of the challenges facing American businesses is to prepare new and incumbent employees to deal with rapid change and complex technology. Skills in innovating, organizing, troubleshooting, problem solving, and continuous learning are needed to face these challenges. The rest of this section discusses a new approach for

developing complex cognitive skills such as these. This approach has come to be called "cognitive apprenticeship" (12).

The cognitive apprenticeship approach was first used in school settings to teach advanced skills in subjects such as reading, writing, and mathematics. The approach has not yet been used extensively in work-based learning, but it appears to have potential for improving the teaching of intellectually demanding workplace skills.

Cognitive apprenticeship involves three phases: modeling, coaching, and exploration. Although these phases may be introduced in that order, the mastery of complex skills often involves moving back and forth among the three phases.

The expert usually begins by modeling the entire complex skill in the context that it would be used, and then may repeat several components of it. Because cognitive functions cannot be directly observed and often cannot be correctly inferred by observing a person's behavior, the expert usually gives a running commentary while modeling the skill. Producing such commentary often takes some practice, because experts rely heavily on "tacit knowledge and processes" of which they are not fully conscious.

In the coaching phase, the expert guides the student through the practice of the skill. The guidance can be in the form of verbalizations, physical assistance, and emotional encouragement. Through repeated trials and successive approximation, the student gradually reaches mastery and automaticity. The initial guidance may be substantial, but once the student begins to grasp the skill, the guidance is reduced to the minimum necessary for the student to succeed with effort. Directions are replaced with hints and questions; continuous feedback and detailed debriefings are replaced with occasional comments; and effusive encouragement may be replaced with a more reserved respect.

The extent of guidance is deliberately reduced so as to require the student to develop and rely on his or her own resources. These resources include monitoring one's own performance and correcting shortcomings in performance. These capabilities are so critical to mastery and maintenance of complex skills that the expert will deliberately guide their development during the coaching phase.

To help monitor the student's progress, the expert may ask the student to think out loud when practicing. The expert's own running commentary during the modeling phase serves as an example of how to do this.

The student is prepared for the exploration phase by being given increasingly complex tasks and more broadly defined assignments. In the exploration phase itself, the expert encourages the student to choose problems he or she can tackle with the knowledge and skills already acquired. The student is asked to set the objectives, frame the questions, and define the problems. At first, exploration usually results in the student's "reinventing the wheel," but as he or she becomes more knowledgeable and proficient, exploration sometimes results in innovative products, services, or work processes.

The cognitive apprenticeship approach has not yet been used enough in workplace instruction for its effectiveness to be determined. Its obvious strength is the emphasis on developing the complex cognitive skills that are thought to be increasingly needed in the workplace—an emphasis that is missing from some other forms of training. A potential limitation is that this emphasis on development of complex skills is at the expense of the acquisition of extensive knowledge, which has been found to be important for expert performance in varied situations (22,60). As a result, the approach probably should be supplemented by other instruction, except when the students are already quite knowledgeable.

When cognitive apprenticeship strategies have been used in developing advanced reading, writing, and mathematics skills in schools, they have been moderately more effective than traditional approaches (12,34,55). One of the reviews, however, found that the effects were greater when the approach was combined with didactic teaching (55).

TECHNOLOGY-ASSISTED LEARNING

Technology-assisted learning is based on a wide range of equipment ranging from VCRs to computers. This section focuses exclusively on computer-based technologies because they have undergone the most profound changes over the past decade and appear to hold considerable promise for work-based learning and school-to-work transitions. Computer-assisted learning can help prepare students for work-based learning, assist them during work experiences, and supplement those experiences.

Computers, the software they use, and their peripheral displays permit many forms of computer-assisted learning. Although the functioning varies considerably, computer-assisted learning generally offers several advantages: Substantial expertise can be enlisted in the planning and preparation of instruction, and then delivered each time the instruction is reused. The assistance can be used as needed and when most convenient. There can be considerable interaction, allowing the students to actively apply what they have learned. Students can proceed at their own pace, follow paths of their own choosing, stop or backtrack when necessary, and review their past performance. The students' understanding can be tested frequently and corrective feedback can be provided immediately. Increasingly, the technology can identify error patterns and tailor instruction to the students' knowledge, skills, and preferred learning proclivities.

Technology-assisted learning also has several drawbacks: Most forms have high initial costs for preparation of the software; one recent study found that an average of 228 person-hours were required to create one hour of computer-based training (52). Widely commercialized software can cost as little as $50, but custom software sometimes costs several hundred thousand dollars. Some of the software cannot be modified by teachers or supervisors to accommodate local information or an individual organization's practices. Technology-assisted learning lacks the human touch that encourages students and sometimes inspires them. And the technology is changing so rapidly that obsolescence is assured every few years, although older equipment and software can be used in a diminished capacity for many years after it has become dated.

In addition, many schools and small workplaces are ill-prepared to make widespread use of technology-assisted learning. They lack the necessary electrical service, telephone lines, and network wiring. They also frequently do not invest in the staff training and support needed to make good use of the technology (64,66).

The reviews of research on various computer-assisted learning technologies have repeatedly found that students generally learn more in less time than is the case with traditional teaching (3,19,37). The evidence on cost-effectiveness also is generally favorable (19,41). It should be noted that most of these reviews are of technologies used five to 15 years ago, which are most comparable to the career information delivery systems and computer-based training that are described in the next section. Less is known about the effectiveness of the other technologies discussed there. Yet, over the past decade the cost of computer equipment has dropped dramatically; as a result, the cost-effectiveness of all forms of computer-assisted learning has improved rapidly.

Technology-assisted learning for work-based learning relies on products targeted at one of four markets: high school and college students who are engaged in career orientation and occupational preparation, incumbent workers who need to upgrade their skills, experienced workers who use computers as tools in their work, and the entire computer-using population. School-to-work transition systems and work-based learning do not yet amount to a distinct market. That situation might change in the future, but even if it does not, the other four expanding markets will drive further developments and refinements that will be of use for work-based learning.

OTA, with the assistance of contractors, has identified the following computer-based technologies that appear to have good potential for use in work-based learning: career information delivery systems, computer-based training, intelligent tu-

toring systems, hypermedia, computer-supported collaborative learning, computerized simulations, and business applications software (15). Although each is discussed separately here, two or more of the technologies are sometimes combined.

Career Information Delivery Systems

A recent survey identified 25 computer-based career information delivery systems (48). Most of them help students assess their interests, aptitudes, and generic work-related skills. Some use the results of those assessments to suggest occupations that might be good choices for the students. Most provide a wealth of information on hundreds of occupations. The information usually covers the nature of the work, working conditions, range of earnings, training requirements for entry and advancement, and job prospects. Some provide information on local job prospects and local training providers. Some also give guidance and training in searching for jobs (15).

Career information systems have evolved considerably over the past two decades and are likely to continue progressing, but several limitations currently prevent widespread use. The limitations include expensive software that generally is available only at some schools and training organizations, systems that are not particularly attention-grabbing and thus require self-motivated students, the need for modest computer fluency to operate the systems, a lack of connection to state and national job listings, and little assistance directed at helping students weigh the advantages and disadvantages of alternative occupations that they have selected as good prospects. Because of these limitations, it is often suggested that students should use the systems with the assistance of a well-trained guidance counselor. There also has been little rigorous evaluation of the effectiveness of these systems (15).

Computer-Based Training

Although this term is sometimes used broadly to refer to all forms of computer-assisted learning used for occupational development, it is also used more narrowly to mean instruction that takes the student through a didactic presentation of concepts, facts, and skills, interspersed with tests and immediate feedback. Simple computer-based training was first developed in the 1960s. It is like a textbook with frequent quizzes that are automatically scored. A student who does poorly on a quiz is told to go back and repeat the module. More sophisticated computer-based training offers students some opportunities to choose among alternative approaches to instruction, such as a careful explanation or a quick review.

Computer-based training is well suited to transferring knowledge of facts and specific procedures, and both are widely needed in the workplace. Reviews of the extensive research on the use of computer-assisted learning that is similar to computer-based training suggest that it has reduced learning time by some 24 to 34 percent (37).

Computer-based training generally cannot judge constructed responses such as a sales speech or a creative solution to a problem, and it has very limited potential for developing teamwork skills. In addition, local teachers and workplace mentors generally cannot modify the presentations or add new modules.

The development of simple computer-based training can require as little as 10 hours of preparation per hour of instruction, but sophisticated training can require 100 to 228 hours for an hour of instruction (14,52). The high costs can be justified when traditional training is very expensive or dangerous, or when the computer-based training can be used by large numbers of students with little assistance from teachers.

Computer-based training is already well commercialized, but development costs and the inability to modify the instruction locally are major barriers to wider use. Several vendors have developed “authoring” tools that partially automate the development of the software and make it modifiable by teachers, but these tools allow only a very limited set of instructional strategies.

Intelligent Tutoring Systems

Intelligent tutoring systems apply "artificial intelligence" for the purpose of effectively guiding human learning. The tutors are designed to detect what the learner knows, compare that knowledge with what is to be taught, create an optimal learning path, recognize patterns in the learner's errors, and provide error-specific feedback. For instance, if a learner is having difficulty, the tutor might try another approach that appears to be more appropriate, provide explanations of why certain answers are wrong, and give the learner more encouragement.

A prominent example of intelligent tutors is provided by SHERLOCK. This system trains Air Force electronic technicians to diagnose problems in a complex device used to service the avionics of F-15 jets. SHERLOCK displays on the computer screen depiction's of the device, schematic diagrams of the electrical circuits, and system documentation. The tutor "creates" a fault in one or more of the circuits of the device and asks the trainee to locate the problem. The trainee selects the circuit diagram he or she thinks should be tested, marks where the probes of the diagnostic equipment are to be placed, "activates" the equipment, and receives simulated readouts. After considering the readouts, the trainee decides whether there is a fault in that tested part of the circuit. The process is usually repeated many times, attaching the probes to various circuits, until the trainee determines the location of the fault. If the trainee is clearly misdirected or proceeding inefficiently, the computer provides feedback and guidance based on constant monitoring of the progress. In addition, whenever the trainee wants help, the computer will provide it (38).

Intelligent tutors are well suited to developing complex skills. When connected to mechanical devices manipulated by the learner, such as control panels and steering wheels, intelligent tutors can help students develop psychomotor skills. They can also be used to teach social interaction skills, such as customer service strategies, using video clips to model customers and expert customer service agents. Intelligent tutors generally cannot, however, judge the adequacy of a complex response such as a memo or graphic design, although some progress is being made along these lines.

Intelligent tutors are relatively new, and few have been well evaluated. Of those few, some have demonstrated dramatic results. A system for teaching college students a computer programming language was found to be 30 to 40 percent more effective in 30 to 60 percent less time (1). With just 20 to 25 hours of use, SHERLOCK allowed the average novice technician to achieve troubleshooting proficiencies exceeding the average for senior technicians with years of experience (40). The effectiveness of SHERLOCK is due partly to the speed with which the simulations can be "worked" by the novice technicians, partly to the "intelligence" of its tutor, and partly to the fact that the system deals with complicated problems that occur so infrequently that some senior technicians have never encountered them.

The cost of developing intelligent tutors is very high because of the diagnostic, modeling, and tailored-response capabilities of the systems. Several efforts are under way to reduce the cost by developing "common architecture's," reusable software codes, or "authoring" tools, but none has yet proved to be of general use. Another barrier to widespread use is the fact that the systems usually cannot be modified by the teachers or worksite personnel. Though some stunning examples of intelligent tutors have been developed, considerable advances will be needed if intelligent tutors are to be widely commercialized (15).

Hypermedia

Hypermedia comprises a vast collection of text, still images, animation, video, voices, sounds, and music, with linkages among all related items. Rather than providing a learning path, it presents the student with a "knowledge web" to navigate. Hypermedia relies largely on experiential learning, with some applications providing moderate guidance to the students..

Apple Computer has developed its ARPLE database to familiarize new and experienced sales-

people with the vast and ever-changing catalogue of its own products and third-party software for Apple machines. Multilevel menus access background information, instructions, competitive analyses, "slide show" presentations, and demonstrations of various software. The CD-ROM version is distributed to approximately 5,000 Apple employees and 25,000 retailers. A survey of field employees judged ARPLE to be the best means they have for keeping informed about new products (36).

The Institute for Learning Sciences at Northwestern University is combining hypermedia with an intelligent tutoring system to teach social studies and journalism skills to high school students.. The "Broadcast News" program gives students a rough draft of a television news story and access to a hypermedia database that includes video clips and reference works. Students are asked to edit the video and voiceover to eliminate bias, correct factual errors, and fill in missing details. The students mark the parts of the text that they wish to change and then select among many offered options. At any time the students can query the hypermedia database, selecting questions they want answered by experts, browsing among reference works, and examining a collection of video clips. An "artificially intelligent supervisor" evaluates the students' edited versions of the story, provides detailed feedback, and determines whether the stories are ready for prime time. If so, the system allows the student to act as anchor of the news broadcast. The system also creates a video of each student's broadcast, which then can be compared with videos by other students and with professional news presentations of the same event (35).

Hypermedia can provide huge amounts of easily accessible information and can accommodate students' varying preferences for text, audio, and graphic presentation of information. It allows all the students to seek answers they need while bypassing other information. It is also relatively inexpensive to prepare, and often can be modified by local teachers and supervisors. Until recently, hypermedia databases have been stored on the hard disks of computers or on CD-ROMs and videodisks. The Internet and the forthcoming National Information Infrastructure will allow anyone with a properly equipped $1,500 microcomputer and a telephone line to access huge collections of data, text, and graphics in the world's libraries.

Hypermedia has several shortcomings. The systems are essentially passive, and to make good use of them, students must be goal oriented and able to work in an unstructured environment. Even then, failure to select effective search strategies can leave the student browsing through large quantities of low-priority information. "Webcrawler" and "knowbot" software is currently being developed to assist in the searches, but good knowledge of both the subject matter and the indexing system will probably remain important to conducting well-targeted and thorough searches. In addition, some developers have focused more on the pizzazz of impressive graphics than on the substance of the database.

The research on hypermedia suggests that navigating these systems builds the valuable information-finding and information-filtering skills that are increasingly necessary for effective functioning in high-tech workplaces. Independent learners do well with hypermedia, but those who need structure and guidance may flounder (15).

Hypermedia, as a reference mechanism, is already commercialized. As a tool for learning complex concepts and skills, it will need to be linked to other technologies, such as intelligent tutoring systems, and efforts to do that are still in the developmental phases (15).

Computer-Supported Collaborative Learning

Computer-supported collaborative learning is accomplished by an array of technologies, most prominently, "groupware" decision support systems, collaborative design tools, and telecommunications. These technologies allow a group of people to exchange information and insights, reach group decisions through a set of structured exchanges, and collaborate on work projects. With telecommunication links, the group can include people who are geographically dispersed.

At the University of Illinois, students studying to be teachers spend a semester scattered across the state, practice teaching under the guidance of experienced teachers. E-mail, electronic bulletin boards, remotely accessed databases, and computer conferencing allow the students to contact their professors for advice and to discuss problems and solutions with their peers (42).

The advantages of computer-supported collaborative learning include its handling of speech, writing, and even design; the sharing of knowledge and skills; the opportunity for psychological support among similarly situated persons; and considerable flexibility within the frameworks established by the tools. Some users, however, express frustration with the constraints imposed by the frameworks.

Computer-supported collaborative learning could play an important role in school-to-work transition systems by:

- linking the workplaces with the schools;
- helping the partnerships in their planning activities and allowing them to remain in contact between time-consuming meetings;
- helping school officials and teachers coordinate with the workplace supervisors and mentors;
- allowing students in the workplace to access the various resources of the school;
- permitting school staff to monitor students' progress with fewer trips to the workplace; and
- allowing students to take work-based learning assignments far from school, while remaining in contact with their teachers and peers.

The evaluations of computer-supported collaborative learning suggest that it helps the students see things from multiple perspectives, builds their interpersonal communication skills, and lends intellectual and emotional support. The technologies overcome the constraints of time and place that are inherent in face-to-face communications, but they do not convey the power of direct human contact (15). According to some recent studies, exchanges that promote individual learning in a group may not necessarily produce the best group performance (49).

Telecommunications technologies are rapidly being commercialized. Only a few groupware and collaborative design tools are on the market, but others will follow and their evolution is expected to be swift (31).

Computerized Simulations

Computer simulations range from simplified representations of reality to realistic synthetic environments that envelop the user with visual, auditory, and kinematic stimuli. Some are designed to be used by one person at a time; others can be used by groups, even with participants thousands of miles apart.

Classroom Inc. has prepared simulations of a bank, a hotel, and a medical center that introduce middle-school and high school students to the world of work and reinforce their academic skills. In the Chelsea Bank simulation, three or four students are trained as a team in the bank procedures for a teller. Then the team works as a bank teller in eight scenarios of problematic transactions, including a sweet old lady wanting to deposit a postdated check, a derelict wanting to cash a large check, a friend of the teller wanting a small favor that violates bank procedures, and a rude customer giving the teller more cash than is recorded on the deposit slip. The team must choose among four possible responses to each scenario, and anticipate the consequences of the choice for the customer, the bank, and the teller. Then the team is debriefed about the correct choice and the likely consequences of each possible response. After mastering the teller scenarios, the team works as a customer service representative in seven more scenarios. Selecting the correct responses requires comprehending and applying the bank procedures, making simple computations, understanding the service and business aspects of banking, putting aside personal concerns when appropriate, using critical thinking skills, applying high ethical standards, and engaging in problem solving. Working through the full simulation takes about twenty 50-minute periods, but a number of related research, writing, and computational assignments can be added (11).

Caterpillar Corporation has developed an earth-moving equipment simulator that includes a real steering wheel, gearshift, levers, pedals, and other controls. The visuals are computer generated and provided by a head-mounted display that is worn like a helmet (65).

The general advantages and disadvantages of simulations are discussed in chapter 4 in the section on the "settings" of work-based learning. For computer-based simulations, research has found that students with a naive conception of the simulated phenomena and those who learn best in a well-structured environment tend to flounder and become frustrated (15). In remotely connected group simulations, participants become less inhibited than in face-to-face groups; shy people communicate more and risk "dumb" questions, but politeness also declines (59). Moreover, some users become addicted to computer simulations (8,63).

The Office of Technology Assessment recently examined virtual-reality technologies for combat simulation and concluded that the advances have been rapid, costs have been cut by about half every two years, and the products of military investments have numerous commercial applications (65). The challenges that were identified by OTA included inadequate telecommunications infrastructure for distributed simulations, difficult and time-consuming preparation of the software, and the need for improved visual displays.

Gamelike simulations that rely on text can be developed at modest cost. Those that create realistic visual and audio effects are expensive to develop, and those that add kinematic effects are still experimental. Gamelike simulations are already available on the Internet, but dialing up immersive simulations will require major advances in telecommunications technologies (15).

Simulations for widely used skills, or ones whose traditional development involves considerable risk or expense, are likely to evolve rapidly during the rest of the decade. Smaller or less lucrative markets will probably experience less progress until advances in "authoring" tools reduce the costs of developing the software.

Business Applications Software

Perhaps the most dramatic advance in computer-assisted work-based learning is a result of the business world's rapid switch from expensive mainframes to inexpensive microcomputers for word processing, typesetting, database, spreadsheet, computer-aided design, and other business applications. A computer that 15 years ago cost $500,000 and used $50,000 worth of software can now be duplicated for a few thousand dollars. Fifteen years ago it could cost $100 per hour for a student to practice using a mainframe software package; now it costs less than $1 per hour to practice with more powerful software on a microcomputer. As a result, schools and colleges can easily afford to give students an introduction to widely used business application software packages, and employers can easily afford to have the students practice and improve their skills in the workplace.

Most business application software now comes with computerized tools to help people learn how to use the program. These include computer-assisted training, help systems that explain how to execute specific functions, and the ability to undo one or more steps when things go awry. Microsoft Word, in a bid to win over WordPerfect users, prepared a help menu with WordPerfect terminology that retrieves explanations of how to execute the same functions in Word.

"Some students have taught themselves to use software that their supervisors do not know how to use."—Researcher's observations at a worksite (67).

Although these tools are welcome and occasionally have a clever twist, they have rarely made use of the sophisticated computer-assisted learning technology that is now available. The computerized "tutorials" that accompany the software generally do not have the "smarts" of the intelligent tutoring systems described earlier. The help mechanism usually requires selecting the correct term for a desired function (which is sometimes

unknown to the befuddled user) instead of allowing the user to specify a term and having the machine automatically access the corresponding function. In addition, the "undo" functions sometimes apply only to the last command or two, while mistakes often are not apparent until after several commands have been executed. Despite these shortcomings, further progress in the learning aids built into business software is likely. New companies continue to introduce add-on products, and the big developers continue to incorporate more assistance.

The Future of Technology-Assisted Work-Based Learning

A recent OTA report documented that schools have been slow to incorporate technology-assisted learning (64). There are at least three forces that are likely to accelerate the adoption of computer-based learning in workplaces. First, computers are now common throughout many workplaces. Second, today's $1,500 microcomputer has about five times the speed, RAM, and hard-disk storage capacity as a similarly priced microcomputer of just five years ago. Third, learning software is evolving from simple computerized textbooks to a variety of more sophisticated tutors, hypermedia with navigators, collaborative learning systems, and simulations.

Computer-assisted learning is not a magical guarantee of learning success. Some software has given visual effects precedence over content; some alleged "artificial intelligence" has been closer to artificial stupidity; and some software is "buggy" and operates improperly. Nevertheless, the advances have been impressive and are likely to continue.

CONCLUSION

There is little evidence concerning the relative effectiveness of the five identified work-based learning processes, but each appears to have different advantages and disadvantages. Guided experiential learning requires flexibility on the part of the guide, but can help the students hone their experiential learning strategies for life-long use. Mentoring is time-consuming, but provides the students with comprehensive support, assistance, and feedback over a sustained period of time. Work-group learning is sometimes too subtle or overwhelming, and low-performing groups can teach students the wrong lessons, but this learning process requires few additional resources and conveys essential knowledge and skills that often are not taught by other means. Normal workplace instruction often conveys facts and simple procedures efficiently, whereas cognitive apprenticeships are a time-consuming but potentially powerful means of developing complex intellectual skills. Finally, technology-assisted learning is sometimes inflexible and expensive, but it has produced some dramatic results and hardware costs are declining rapidly.

Extensive research has shown that most people, both adults and youths, are not adept at transferring skills learned in one situation to different situations (16). This is good reason for locating students' training for work within workplaces, but the lack of transfer also ominously suggests that no preparation will be adequate for a rapidly changing world, and that career success will require continuous learning. Because learning skills, like other skills, do not generalize well (16), it appears desirable for students to become adept with many processes and contexts of learning.

REFERENCES

1. Anderson, J.R., et al., "Cognitive Tutors: Lessons Learned," *Journal of the Learning Sciences* 4(2):167-207, 1995.
2. Astin, A.W., *Four Critical Years: Effects of College on Beliefs, Attitudes, and Knowledge* (San Francisco, CA: Jossey-Bass, 1977).
3. Bangert-Drowns, R.L., Kulik, J.A., and Kulik, C.C., "Effectiveness of Computer-Based Education in Secondary Schools," *Journal of Computer-Based Instruction* 12(2):59-68, 1985.
4. Barley, S.R., and Bechky, B.A., "In the Backrooms of Science: The Work of Technicians in Science Labs," *Work and Occupations* 21:85-126, 1994.

5. Barley, S.R., and Nelsen, B.J., Stanford University, Stanford, CA, and Cornell University, Ithaca, NY, "The Nature and Implications of Infrastructural Technological Change for the Social Organization of Work," unpublished contractor report prepared for the Office of Technology Assessment, U.S. Congress, Washington, DC, May, 1995.
6. Baum, H.S., "Mentoring: Narcissistic Fantasies and Oedipal Realities," *Human Relations* 45:223-245, 1992.
7. Borman, K.M., and Lakes, R., University of South Florida, Tampa, FL, and Georgia State University, Atlanta, GA, "Review of Ethnographic Research Related to School-to-Work," unpublished contractor report prepared for the Office of Technology Assessment, U.S. Congress, Washington, DC, May 1995.
8. Bruckman, A., *Identity Workshops: Emergent Social and Psychological Phenomena in Text-Based Virtual Reality* (Cambridge, MA: Massachusetts Institute of Technology, 1992).
9. Cave, G., and Quint, J., *Career Beginnings Impact Evaluation: Findings from a Program for Disadvantaged High School Students* (New York, NY: Manpower Demonstration Research Corp., 1990).
10. Churchill, A., Morales, D., and O'Flanagan, M.K., *School-to-Work Toolbook: School-to-Work Program Tools* (Boston, MA: Jobs for the Future, 1994).
11. Classroom, Inc., *The Chelsea Bank Teacher's Guide* (New York, NY: 1994).
12. Collins, A., Brown, J.S., and Newman, S.E., "Cognitive Apprenticeship: Teaching the Craft of Reading, Writing, and Mathematics," *Knowing, Learning, and Instruction: Essays in Honor of Robert Glaser,* L.B. Resnick (ed.) (Hillsdale, NJ: Lawrence Erlbaum Associates, 1989).
13. DeCoster, D., and Brown, R., "Mentoring Relationships in the Educational Process," *Mentoring Transcript Systems for Promoting Student Growth,* R. Brown and D. Decoster (eds.) (San Francisco, CA: Jossey-Bass, 1982).
14. Dede, C., Professor in Graduate School of Education, George Mason University, Fairfax, VA, personal communication, July 1995.
15. Dede, C., and Lewis, M., George Mason University, Fairfax, VA, and Rand Corp., Santa Monica, CA, "Assessment of Emerging Educational Technologies That Might Assist and Enhance School-to-Work Transitions," unpublished contractor report prepared for the Office of Technology Assessment, U.S. Congress, Washington, DC, May 1995.
16. Detterman, D.K., and Sternberg, R.J., *Transfer on Trial: Intelligence, Congition, and Construction* (Norwood, NJ: Ablex Publishing, 1993).
17. Dryfoos, J., *Adolescents At-Risk: Prevention and Prevalence* (New York, NY: Oxford University Press, 1990).
18. Evenson, J.S., *Mentors and Students in the Workplace: Workplace Mentorship* (San Francisco, CA: Far West Laboratory for Educational Research and Development, 1982), ERIC ED246181.
19. Fletcher, J.D., and Orlansky, J., "Cost Effectiveness of CBI in Defense Training," unpublished paper presented at the Annual Meeting of the American Educational Research Association, San Francisco, CA, 1986.
20. Freedman, M., *The Kindness of Strangers: Adult Mentors, Urban Youth, and the New Voluntarism* (San Francisco, CA: Jossey-Bass, 1993).
21. Garmezy, N., "Stress Resistant Children: The Search for Protective Factors," *Recent Research in Developmental Psychopathology,* J.E. Stevenson (ed.) (Oxford, UK: Pergamon, 1985).
22. Glaser, R., "Education and Thinking: The Role of Knowledge," *American Psychologist* 39:93-104, 1984.
23. Grubb, W.N., and Badway, N., University of California, Berkeley, CA, "Linking School-Based and Work-Based Learning: The Implications of LaGuardia's Co-op Seminars for

School-To-Work Programs," unpublished contractor report prepared for the Office of Technology Assessment, U.S. Congress, Washington, DC, June 1995.

24. Hahn, A., *Evaluation of the Quantum Opportunities Program (QOP): Did the Program Work? Executive Summary* (Waltham, MA: Brandeis University, Heller Graduate School, 1994a).
25. Hahn, A., *Evaluation of the Quantum Opportunities Program (QOP): Did the Program Work? A Report on the Post Secondary Outcomes and Cost-Effectiveness of the QOP Program (1989-1993)* (Waltham, MA: Brandeis University, Heller Graduate School, 1994b).
26. Hamilton, S.F., and Hamilton, M.A., "Learning at Work," *Youth Apprenticeship in America: Guidelines for Building an Effective System*, J.E. Rosenbaum, et al. (eds.) (Washington, DC: William T. Grant Foundation Commission on Youth and America's Future, 1992).
27. Hamilton, S.F., and Hamilton, M.A., *Teaching and Learning on the Job* (Ithaca, NY: Human Development and Family Studies, Cornell University, 1991).
28. Hollenbeck, K., *In Their Own Words: Student Perspectives on School-to-Work Opportunities* (Washington, DC: Academy for Educational Development, 1995).
29. Huisman, C., *Evaluation Report: Student Mentoring Program 1989-1992* (Portland, OR: Oregon Community Foundation, 1992).
30. Jacobi, M., "Mentoring and Undergraduate Academic Success: A Literature Review," *Review of Educational Research* 61:505-532, spring 1991.
31. Joch, A., "Herd Instincts," *BYTE* 20(8): 83-85, August 1995.
32. Jordan, B., "Technology and Social Interaction: Notes on the Achievement of Authoritative Knowledge in Complex Settings" (Palo Alto, CA: Institute for Research on Learning, April 1992).
33. Kanter, R.M., *Men and Women of the Corporation* (New York, NY: Basic, 1977).
34. Karweit, N., "Contextual Learning: A Review and Synthesis," unpublished paper, Center for Social Organization of Schools, The Johns Hopkins University, Baltimore, MD, 1995.
35. Kass, A., Dooley, S., and Luksa, F., *The Broadcast News Project: Using Broadcast Journalism as a Vehicle for Teaching Social Studies*, Research Publication 40 (Evanston, IL: Institute for the Learning Sciences, Northwestern University, 1993).
36. Kind, S., ARPLE Team, Apple Computer Company, Cupertino, CA, e-mail message to Christine Ho, Office of Technology Assessment, U.S. Congress, July 28, 1995.
37. Kulik, J.A., "Meta-analytic Studies of Findings on Computer-based Instruction," *Technology Assessment in Education and Training*, E.L. Baker and H.F. O'Neil (eds.) (Hillsdale, NJ: Lawrence Erlbaum Assocs., 1994).
38. Lajoie, S.P., and Lesgold, A., "Apprenticeship Training in the Workplace: Computer-Coached Practice Environment as a New Form of Apprenticeship," *Machine-Mediated Learning* 3:7-28, 1989.
39. Lave, J., and Wenger, E., *Situated Learning: Legitimate Peripheral Participation* (Cambridge, England: Cambridge University Press, 1994).
40. Lesgold, A., "Assessment of Intelligent Technology," *Technology Assessment in Education and Training*, E.L. Baker and H.F. O'Neil (eds.) (Hillsdale, NJ: Lawrence Erlbaum Assocs., 1994).
41. Levin, H.H., "The Economics of Computer-Assisted Instruction," *Peabody Journal of Education* 64(1):52-66, 1989.
42. Levin, J., et al., "Teaching Teleapprenticeships: A New Organizational Framework for Improving Teacher Education using Electronic Networks," *Machine-Mediated Learning* 4(2 & 3):149-161, 1994.

43. Levinson, D.J., et al., *The Seasons of a Man's Life* (New York, NY: Ballentine, 1978).
44. McPartland, J.M., and Nettles, S.M., "Using Community Adults as Advocates or Mentors for At-Risk Middle School Students: A Two-Year Evaluation of Project RAISE," *American Journal of Education* 99:568-586, 1991.
45. Mecartney, C.A., Styles, M.B., and Morrow, K.V., *Mentoring in the Juvenile Justice System: Findings from Two Pilot Programs* (Philadelphia, PA: Public/Private Ventures, 1994).
46. Moloney, T.W., and McKaughan, M., *Mentoring: Lessons Learned* (New York, NY: The Commonwealth Fund, 1990).
47. Nelsen, B.J., and Barley, S.R, "Toward and Emic Understanding of Professionalism Among Technical Workers—Working Paper" (Philadelphia, PA: National Center for the Educational Quality of the Workforce, University of Pennsylvania, 1993).
48. Olsen, G.T., *Career Information Delivery Systems Inventory and Needs Assessment*, California Occupational Information Coordinating Committee (Sacramento, CA: California Occupational Information Coordinating Committee, 1993).
49. O'Neil, H.F., and Chung, G.K., University of Southern California and University of California at Los Angeles, "Effectiveness of Group Processes Within a Networked Union-Management Negotiation Simulation" unpublished paper prepared in 1995 to be presented at the *Annual Meeting of the American Educational Research Association*, April 1996.
50. Pascarella, E.T., and Terenzini, P.T., "Patterns of Student Faculty Information Interaction Beyond the Classroom and Voluntary Freshman Attrition," *Journal of Higher Education* 48:540-552, 1977.
51. Pringle, Beverly, et al., *Peer Tutoring and Mentoring Services for Disadvantaged Secondary School Students* (Washington, DC: Policy Studies Associates, 1993).
52. Reinhardt, A., "New Ways to Learn," *Byte* 20(3):50-71, March 1995.
53. Resnick, L.B., "Learning In School and Out," *Educational Researcher* 16(9):13-20, 1987.
54. Roche, G.R., "Much Ado About Mentors," *Harvard Business Review* 57:14-16**,** 1979.
55. Rosenshine, B., and Meister, C., "Reciprocal Teaching: A Review of Nineteen Experimental Studies, Technical Report No. 574" (Urbana, IL: Center for the Study of Reading, May 1993).
56. Rutter, M., and Giller, H., *Juvenile Delinquency: Trends and Perspective* (New York, NY: Guilford Press, 1983.)
57. School-To-Work Opportunities Act of 1994, May 4, 1994, Public Law 103-239.
58. Shulman, L.S., and Keislar, E.R., *Learning by Discovery: A Critical Appraisal* (Chicago, IL: Rand McNally, 1966).
59. Sproull, S., and Kiesler, S., *Connections: New Ways of Working in the Networked World* (Cambridge, MA: MIT Press, 1991).
60. Sticht, T., "Functional Context Education, Workshop Resource Notebook" (San Diego, CA: Applied Behavioral and Cognitive Sciences, Inc., March 1987).
61. Tan, H., *Private Sector Training in the United States* (New York, NY: Institute on Education and the Economy, Columbia University, Teachers College, 1989).
62. Tracey, T.J., and Sedlacek, W.E., "The Relationship of Non-cognitive Variables to Academic Success: A Longitudinal Comparison by Race," *Journal of College Student Personnel* 26:405-410, 1985.
63. Turkle, S., *The Second Self: Computers and the Human Spirit* (New York, NY: Simon and Schuster, 1984).
64. U.S. Congress, Office of Technology Assessment, *Teachers and Technology: Making the Connection*, OTA-EHR-616 (Washington, DC: U.S. Government Printing Office, April 1995).
65. U.S. Congress, Office of Technology Assessment, *Virtual Reality and Technologies for*

Combat Simulation—Background Paper, OTA-BP-ISS-136 (Washington, DC: U.S. Government Printing Office, September 1994).
66. U.S. Congress, Office of Technology Assessment, *Worker Training: Competing in the New International Economy*, OTA-ITE-457 (Washington, DC: U.S. Government Printing Office, 1990).
67. Vickers, M., Hart, R., and Weinberg, A., Technical Education Research Centers (TERC), "The Work-Based Learning Experiences of Students in Two Boston-Based Youth Apprenticeship Demonstration Sites," unpublished contractor report prepared for the Office of Technology Assessment, U.S. Congress, Washington, DC, June 1995.
68. Werner, E.E., and Smith, R.S., *Vulnerable But Invincible* (New York, NY: Adams, Bannister, Cox, 1989).
69. Wilson, R.C., et al., *College Professors and Their Impact on Students* (New York, NY: Wiley, 1975).

Structuring Work-Based Learning

4

Work-based learning can be structured in various ways. The systems can vary in respect to the student populations that are served; the learning objectives; the level and means of coordination with school-based instruction; the timing, intensity, duration, and progression of the work experiences; the settings in which the work-based learning takes place; and the payment or nonpayment of the students. Each feature is discussed in this chapter. Variations in these features distinguish several models of work-based learning that are discussed in the next chapter.

THE STUDENTS TO BE SERVED

Work-based learning programs can be mandatory for all students, optional but suited for all students, or optional and targeted at a subset of students. In the last two cases, the criteria for determining whether interested students will be allowed to participate may be strict or lax. And in all three cases, the programs can choose to emphasize, or not to emphasize, the matching of students with employers' wishes. These choices will significantly affect the character of the work-based learning and probably its success.

Although the "Findings" section of STWOA indicates that the legislation was prompted partly by problems in the noncollegiate labor market, the legislation refers to serving "all students" at least 12 times (35). Some people have interpreted that term to mean that *every* student should participate in the system. Others have said the term means that the systems should be suitable for *any* student—from disabled ones to academically gifted ones—but that participation should be voluntary.

Congress contributed to the confusion by defining "all students" in a manner that does not clarify which of the two meanings was intended. The statute states, "The term 'all students' means both male and female students from a broad range of backgrounds and circumstances. . . ." (Public Law 103-239, Sec. 4[2]). Congress also included language in the act supporting both positions in this dispute. The specified purposes of the act include creation of "statewide School-to-Work Opportunities systems that . . . are part of comprehensive education reform" and establishment of "a universal, high-quality school-to-work transition system," both of which suggest all-inclusiveness (Secs. 3[a][1] and [2]). At the same time, "all students" is often used in contexts such as "offer opportunities for all students" or "provide all students with equal access" which do not imply compulsion (Sec. 3[a][1][C]); Title I, Sec. 101[5]). In addition, the act specifies that career awareness services and selection of an initial career major are to be available to "interested" students, which clearly indicates that Congress did not intend all the components of STWOA to be compulsory (Title I, Sec. 102[1] and [2]).

The people responsible for implementing the STWOA-supported systems are concerned that the systems will be stigmatized if they are perceived as primarily serving students who normally would not be bound for college. That fear appears justified, but any effort to preclude the stigma by designing compulsory systems is likely to elicit a backlash from those parents who do not want their children to make early career decisions and who fear that occupational preparation in high school and work-based learning will hurt their children's chances of going to college (2,30,39).

An alternative approach is to develop systems that provide attractive learning opportunities for students of various abilities and interests. There is good reason to think that some of the most academically talented students will welcome career exploration and work-based learning opportunities. The prestigious Phillips Academy, in Andover, Massachusetts, requires all students to work two periods a week at the school (31). In addition, more than half of the students there select community service activities, and a modest number choose a one-semester internship working in the U.S. Congress. Thomas Jefferson High School for Science and Technology, a public magnet school in Alexandria, Virginia, with more than 90 National Merit Semifinalists each year, releases interested seniors in the afternoon to do research at local scientific and engineering organizations (37).

The criteria for permitting students to undertake work-based learning assignments can be lax or demanding. Those who urge lax entry standards say that students who have low academic achievement or have displayed problem behavior are the ones who most need a second chance in a different kind of learning environment. Those who urge high standards say that employers will stop participating if presented with slow or troublesome students. There are also some who suggest that although work-based learning should be open to lower-achieving students, it is important to have stronger students participate so that work-based learning does not become stigmatized as a "low track" or "dumping ground," as has often been the case for vocational education programs.

The screening criteria that some schools apply include age, grade level in school, attendance record, disciplinary record, completion of prescribed courses, recommendation of an instructor or guidance counselor, grade point average, test scores, and the student's motivation for work-based learning as indicated by special essays or interviews. Some school-to-work transition programs apply several criteria and some have none. When the criteria are applied, the standards are seldom more than moderate. For instance, one inner-city high school program requires an 85 percent attendance rate and a C average or better; a high school program in metalworking requires a C average or better and completion of two courses each in math, laboratory science, and language arts, before starting the work-based learning component (17). The highest standards OTA found were for an electronics and telecommunications program, cosponsored by a large high-tech company, which required a grade point average of at least B. In the first year of the program, however,

there were not enough applicants who met that criterion, and the standard had to be lowered, at least temporarily (8).

There had been concern that employers would insist on high screening standards, and some scholars and educators worried that those standards would preclude the participation of many minority students (24,36). Recent studies suggest this has not been the case. One study of 12 programs found that the proportion of participants with mostly C or lower grades in math ranged from 29 to 80 percent, and the proportion subject to at least one disciplinary action ranged from 10 to 60 percent (30). In another study of 10 programs, the proportion of African American and Latino students ranged from 7.1 percent to 85.4 percent of the participants, with an overall average of 62 percent (17). In addition, OTA staff repeatedly heard employer representatives, especially those from large companies, state that one of their incentives for participating in school-to-work transition programs was to recruit promising minority students as permanent employees.

There has also been concern that employers' preferences would funnel girls into gender-stereotyped occupations and would minimize opportunities for disabled students. The available evidence does show that male and female participants in work-based learning tend to be in occupations traditional for their gender (8,17), but it is unclear whether that situation reflects the preferences of the employers or other factors, such as the guidance provided by the schools or the preferences of the students and their parents. OTA did not find data on the participation of disabled students except in programs that were designed specifically to serve such students (33).

Almost all of the studies that have investigated employers' satisfaction with work-based learning students have found it to be high (13,22). A recent study of 10 programs that are broadly inclusive found high satisfaction among employers (17). Another study of 16 high school programs that are similarly inclusive found that the school coordinators and employers reported few problems with disadvantaged or low-achieving students, and that none of the programs was planning to tighten the criteria for participation (30).

The widespread satisfaction of participating employers does not necessarily mean that all work-based learning assignments should be open to any interested student. OTA staff visited some programs that were broadly inclusive and others that had moderate standards. In both cases there appeared to be a high degree of satisfaction among the employers who were participating, but the types of job assignments differed. Where low-achieving students were common, they tended to be helping incumbent employees or learning tasks that did not require strong basic skills—tasks such as measuring blood pressure and installing drywall. Higher standards for achievement were common in work-based learning for precision machining and electronics technicians, where the students were participating in rigorous and expensive training programs.

One coordinator told OTA staff flatly that she could not arrange and retain work-based learning in electronics without setting standards that many students in her career center could not currently meet. More than one employer, clearly committed to continued participation, indicated that the students' academic shortcomings, especially in math, had slowed their training during work-based learning or made it more of a burden for the staff. And one manager of a large plant in Appalachia, who was helping to establish a youth apprenticeship program, announced firmly that the schools would have to ratchet up the academic standards.

Maria

Maria, a 17-year-old from a Spanish-speaking family, speaks impeccable English and is poised beyond her years. She has accumulated enough high school credits to graduate at the end of her junior year, and is headed to a well-known university to become a dietitian. This spring she assumed a work-based learning assignment in a hospital kitchen where she undertook a range of functions. The kitchen sometimes prepares cakes for special events, and because Maria likes to bake, she volunteered to prepare one. She was given a recipe and told to triple it. She did not know how to calculate the correct proportions, and the mentor had to show her.

SOURCE: Office of Technology Assessment field visit.

OTA staff visits to work-based learning sites also revealed another side of the selection issue. Over and over again, the students, the school coordinators, and the employers told of how low-achieving and mid-achieving students had risen to the challenge of their work-based learning assignments. Many achieved commendable records of punctuality despite difficult commutes; many mastered skills and fulfilled responsibilities that they had not thought possible; and many acquired new career objectives and an understanding of what would be necessary to achieve them.

Some work-based learning programs can probably thrive without standards for participation, but it is doubtful that any can survive without matching students with employers' wishes. Some civic-minded employers will accept weak students and be willing to give them extra help, whereas others will not make that effort. As a result, programs have some flexibility, but they cannot be oblivious to the expectations and needs of the participating businesses.

Employers are not passive players in the matching process. Some rely on the school coordinator to make the match, but will refuse inadequate students. Some interview each proposed student before giving final approval. And some interview two or three candidates for each opening.

A recent study of youth apprenticeship programs found that employers who had participated in the program for a year or two reportedly became more willing to take a chance with young people who had obvious weaknesses—especially if they had interviewed them (17). Another study, however, found that programs that served substantial numbers of economically and academically disadvantaged youth generally raised their selection standards after the first year of operation in the hope of reducing problems in the workplace and attrition rates (8).

While school coordinators and employers are screening students, the students are also screening employers. They use information provided by the school coordinators and by students who have returned from work-based learning assignments. One co-op coordinator in Cincinnati observed, "There's nothing that can kill a program quicker than students coming back and complaining about their co-op job. . . . The students really talk to one another about these things—how much they make, what they're doing, and so forth" (13).

Although there are tradeoffs with respect to screening standards, there may also be an important opportunity. If employers create work-based learning positions that are highly attractive to students and then gradually raise their minimum requirements, the schools and students may rise to the challenge. In such cases, both the students and the employers would benefit.

OBJECTIVES

Work-based learning can be directed primarily toward academic enhancement, career exploration, occupational development, or employers' production. The priorities will affect the benefits to students and to participating employers.

Work-based learning can contribute to academic learning in at least three ways. It can motivate learning by demonstrating the importance of academic skills in the workplace, by building work habits and self-discipline in the workplace that

transfer to school, and by raising aspirations and understanding of the prerequisites for achieving those aspirations (5,20,26). Work-based learning can also reinforce and extend academic learning by requiring students to apply their academic skills to the tasks of the workplace.

"I've seen some people who aren't satisfied with their jobs. That's helped me to learn that I should take my education as far as I can so that I won't be doing just anything to survive."
—Student (17)

Work-based learning can contribute to career orientation in many ways. Experience in a productive work environment can help develop young people's attitudes and work ethic. A period of job rotation—when the students assist in several different jobs and departments—can introduce the students to the realities of various jobs and help them determine which are most congruent with their abilities, interests, and goals. Iterations of training and progressively more challenging responsibilities can introduce students to "working your way up." Work-based learning also can provide personal contacts and references that will be useful when the young people seek other job opportunities.

Work-based learning can address a number of aspects of occupational development. Preemployment readiness instills the attitudes, habits, and skills required in every job, such as punctuality, reliability, adaptability, responsibility, relating well to others, following directions, perseverance, initiative, and loyalty. Occupational skills used to be defined by the capacity to carry out specific tasks common to a given occupation, but as many American organizations have adopted flatter organizational structures, flexible production, and continuous quality control, occupational skills are now often considered to include competencies in resource allocation, teamwork, the organization and use of information, systems thinking, and the use of technology (43). Organization-specific procedures are the rules, practices, and norms that vary some from workplace to workplace. Problem solving and creative thinking allow an employee to deal effectively with nonroutine events and to develop new products and processes. Understanding of an industry encompasses a knowledge of the economic, technological, production, and marketing structures that influence the companies within a given industry.

Productive activities give students the satisfaction of having contributed to the creation and distribution of real goods and services and meeting real-world standards. Productive activities are also an employer's payback for the expenses of providing career orientation and occupational development. Without some contribution to the workplace production, it is unlikely that many employers would long participate in work-based learning, especially when they are required to provide substantial training.

STWOA stipulates that the work-based learning should focus on all four objectives—academic development, career orientation, occupational development, and production. It also seeks to prevent narrowly focused training and the use of students as cheap labor. The legislation specifies that work-based learning is to include not only "work experience" but also "instruction in general workplace competencies," "training related to pre-employment and employment skills to be mastered at progressively higher levels . . . relevant to the career majors of students and lead[ing] to the award of skill certificates." Students are to be given "broad instruction, to the extent practicable, in all aspects of the industry" (Title I, Sec. 103[a]) The act also indicates that the school-to-work transition systems are to help students view "a broad array of career opportunities," "identify and navigate paths to productive and progressively more rewarding roles in the workplace," and "attain high academic and occupational standards" (Sec. 3[a]).

COORDINATION WITH SCHOOLING

Work-based learning can be closely or loosely coordinated with school-based instruction. Good coordination can create synergistic effects be-

tween the classroom instruction and the work-based learning experiences.

The coordination can be directed at several purposes. It can help assure that students have the academic and occupational skills that are necessary to meet the expectations of the employers and to benefit fully from the work-based learning. It can allow the schools to structure their instruction to benefit from student interests that are sparked by the work-based learning experiences. It can permit teachers to extend and reinforce what has recently been learned during the work-based learning. And it can allow the work-based learning supervisors and mentors to reinforce and extend what has recently been taught in school.

Several strategies are used to achieve coordination. The school systems and employer community may plan the school-based and work-based learning together. In some cases, representatives of both also manage the program together. Schools and employers may exchange several staff members for a day or longer, so that each person can gain a realistic sense of the other's environment. A school and an employer sometimes negotiate a written training agreement specifying the general responsibilities of each party. The school coordinator, the worksite supervisor, and the student may also negotiate a written training plan that indicates the sequence of school-based preparation, work-based learning activities, and the skills to be mastered by the student at various points in time. If several students will be in one workplace, one employee may be appointed to handle coordination with the school. High schools may adopt flexible scheduling, such as early morning and late afternoon classes to accommodate "parallel" worksite schedules, and many colleges must offer certain courses more often than they would otherwise do, to make them available to all students on "alternating semester" work schedules (13). In addition, the school coordinator may periodically visit the worksite to observe the students' activities and to talk with the supervisor or mentor.

"My veterinarian tries to follow [the training plan] and there are things for which she's said, 'If I didn't know you were supposed to do this, I would never have told you to go ahead and do it'." —Student (14)

There are a number of activities that teachers can use to build on the students' varied work-based learning experiences. These include having students write essays about their experiences, encouraging students to discuss issues they have encountered in their workplaces, and having them engage in self-study of topics that they will soon need for their respective worksite assignments. Similarly, the workplace supervisors and mentors can ask the students what they are covering in school, and give assignments that require application of that material. As discussed in chapter 3, some schools offer an "integrative seminar" that helps students prepare for the work-based learning, deal with problems encountered in the workplace, undertake research in their worksite, and reflect on the implications of the work experience for their future schooling. Schools of the future might rely heavily on computerized tutorials and simulations that would permit highly individualized "on demand" learning, which could further facilitate coordination (9).

OTA was not able to locate evidence of the relative effectiveness of various coordination strategies. The existing literature, some of which is discussed in chapter 5, amply demonstrates that coordination of school-based and work-based learning is difficult to accomplish but important for the effectiveness of the program (2,3,8,30, 32,33,39). One of those studies discerned four practices that appeared to be associated with better coordination: having teachers visit the workplaces, grouping students in key classes by occupational clusters, giving teachers time to plan new curricula, and encouraging teachers to adapt their curricula frequently (8).

In conversations with the high school coordinators of several school-to-work transition programs, OTA staff found that the coordinators usually had extensive previous experience working in industry, they maintained almost daily contact with the employer community, and they constantly made adjustments to meet the needs of the students, schools, and employers. A recent study of exemplary clinical training and cooperative education programs in two-year colleges reported the same finding (3). And a study of programs in Cincinnati, which appears to have more work-based learning at the two-year-college level than any other city in the country, suggested that "clear expectations on the part of employers and educators alike, established in face-to-face contact and constant discussion . . . appear to be the most common mechanisms of establishing and enforcing the high-quality equilibrium" (13).

Juan

Juan was proud of his accomplishments in school. He was smart; he had studied hard, twice skipped a grade, participated in a school-to-work transition program toward the end of his junior year, and graduated from school at the age of 16. When he applied to college, he was rejected because of his low math score on the SATs. So he enrolled at the local community college, where he is now taking Algebra I and doing well after a difficult start. When an OTA staff member asked teachers at Juan's high school how such a student could graduate without taking Algebra I, they said that it had been a "mistake." Afterwards, the school-to-work program coordinator approached the staffer and said, "The teachers didn't tell you the whole story. I messed up too by not checking his transcript. That won't happen again. Now I check the transcripts of all students entering our program."

SOURCE: Office of Technology Assessment field visit.

STWOA has several provisions that could help facilitate coordination. It specifies that the school-to-work transition systems should be planned and developed by a partnership of schools, employers, and others (Title II, Sec. 203). It calls for the development of a skill certification system, which, if accomplished, should provide a common framework for the schools' occupational curricula and the work-based learning (Sec. 4[22]). It also specifies "connecting activities," including a school mentor to coordinate with the worksite, technical assistance to employers for designing and implementing work-based learning, and linkages with "employer and industry strategies for upgrading the skills of their workers" (Title I, Sec. 104).

TIMING, INTENSITY, DURATION, AND PROGRESSION OF WORK EXPERIENCES

Work-based learning activities can begin as early as the first grade and extend through graduate school. Activities at any point could have potential benefit, but with a limited amount of resources, there will be tradeoffs between the number of grades for which work-based learning is offered and the quality of the experiences.

In the early grades, most work-based learning consists of field trips to workplaces. One elementary school program that provides more than that is called Kids and the Power of Work (KAPOW). Company employees of a participating business take classes of students on a tour of the business and then meet with them monthly throughout the school year to discuss characteristics of different jobs, work attitudes and habits, and the students' career interests. The teachers sometimes build on those sessions, using them as examples in academic course work (18).

At the middle-school or early high school level, students are sometimes given opportunities to "job shadow" an employee for a few hours. They watch the employee go about his or her work and then meet to discuss the job, the required education, and the rewards. Job shadowing is used mostly for motivational and career exploration purposes.

In the early high school years, community service activities are sometimes introduced. The student does volunteer work for charitable or public purposes. The work is intended to develop a sense of civic duty and to introduce generic work skills

and habits. Sometimes the community service is an extracurricular activity, sometimes it is awarded credit toward graduation, and sometimes it is part of a "service learning" course in social studies or civics.

At the high school level, interested students may be given an opportunity to run school-based enterprises that provide goods and services to other students (such as a student bookstore), to the school district (such as a print shop), or to the public. Elective courses are used to prepare the students for the work assignments in the enterprise. Generally the students participate during their later years of high school, but occasionally they can begin in their first or second year.

In the later high school and college years, more intensive work experiences are sometimes offered. In internships, students assume part-time or full-time work positions, usually for only a few weeks or months near the end of their schooling. Work-study programs offer students part-time paid jobs on campus. In cooperative education, there is paid work experience over the last year or two of high school or over the later years of college. The work-based learning is sometimes closely coordinated with the schooling, and sometimes it is not. Clinical training is similar to cooperative education, except that it is almost always closely coordinated with the schooling and with the professional licensing requirements that prevail in the medical fields. Youth apprenticeships closely coordinate schooling and paid work experiences over the last year or two of high school and at least one year of postsecondary education or training, and are aimed partly at preparing students to earn an industry-recognized skill credential.

At the high school level, work-based learning often occurs for several hours, one to five times a week, and may continue on a full-time basis during the summer. In most co-op and youth apprenticeship programs, students spend less time in class than they would otherwise, but some of the programs have minimized the lost class time by rescheduling classes to start earlier or to continue later into the afternoon. When class time is lost, some programs compensate by giving students additional assignments to be done outside class. A common example is keeping a journal of the workplace experiences. When OTA staff visited youth apprenticeship programs, they repeatedly heard students describe how they had adjusted to leaving home at 6 a.m. or to going to bed at 11 p.m. Some scholars worry that the arduous schedules of students in youth apprenticeships are denying them the joys and developmental benefits of extracurricular activities and informal socializing (3).

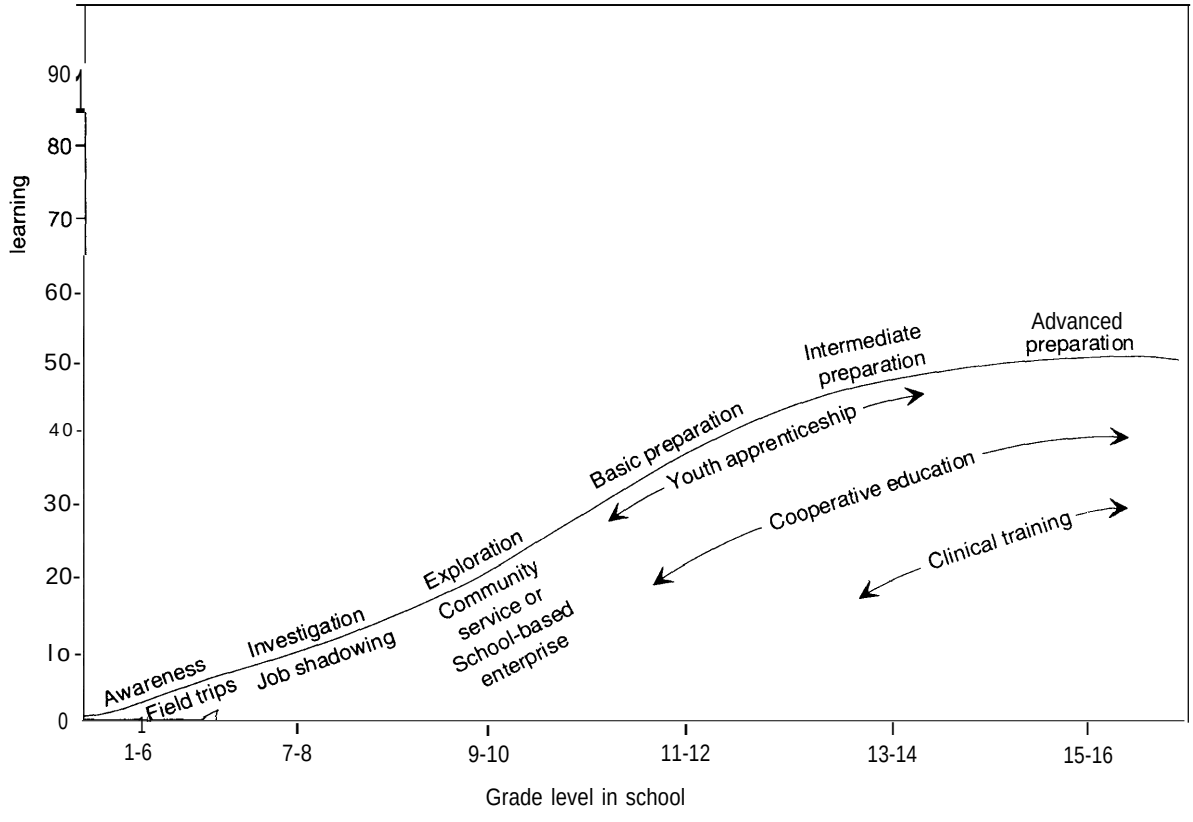
At the college level, the students may alternate between going to school full time and going to the workplace full time, or they may use the parallel pattern common in high schools, going to the workplace on a part-time basis several days a week. In some college programs, participation in work-based learning extends the time that students need to graduate; in others it does not, but may require enrollment during the summer.

In the United States, work-based learning is most pervasive at the graduate-school level. Students seek teaching assistantships and research assistantships for the income they provide and for the opportunities to work closely with a professor. Student editors exercise full control over the selection and editing of articles published in most American law review journals. Medical schools require all students to participate in extensive internships, and a "residency" after graduation is usually required for licensing and board certification.

Figure 4-1 illustrates one hypothetical progression of work-based learning through 16 years of schooling. OTA knows of a few schools that incorporate two or more forms of work-based learning at different grade levels, but none that includes a progression extending from elementary school through college.

Would such a progression be desirable? There is reason to think that some progression of work-based learning could benefit many students. The evaluation studies summarized in chapter 5 consistently show that work-based learning opportunities excite and motivate many young people. The early experiences could introduce them to the world of work, stimulate career exploration, and develop preemployment skills and habits. Work-

FIGURE 4-1: One Possible Progression Through Several Types of Work-Based Learning



SOURCE: Office of Technology Assessment, 1995

based learning in the higher grades is thought to help narrow career interests and develop occupational skills.

It is clear, however, that a progression would require considerable resources. As suggested earlier in the discussion of coordination and again in the next chapter, cooperative education, clinical training, and youth apprenticeships demand significant effort on the part of school staff and workplace coordinators. Even cursory work-based learning experiences aimed at career exploration require substantial time to arrange. For instance, the minimum arrangements required for three-hour job shadowing experiences include recruiting organizations and employees who will participate, setting up the appointments, giving the students commuting directions, informing the students about appropriate dress and conduct, preparing students to ask useful questions, and assuring that students write notes of thanks.

Work-based learning directed at occupational skill development requires considerably more effort on the part of both the schools and the employers. Employers have to orient the students to the workplace rules and procedures, periodically provide them with progressively more advanced training for tools and equipment that may be expensive and dangerous to use, closely supervise their initial work performance after each step up the progression, and periodically evaluate their performance and report it to both the student and the school.

It is doubtful that employers would participate to the extent necessary to support an extensive

progression. This country lacks the labor market structures that, in Germany, Japan, and several other countries, provide incentives for extensive employer participation in work-based learning (21). As chapter 6 discusses, prototype school-to-work transition programs in this country have generally found expanding work-based learning opportunities for high school juniors and seniors to be slow going. It is difficult to imagine how the schools would simultaneously arrange for younger students to have opportunities for workplace field trips, classroom speakers from the world of employment, and job shadowing.

OTA found no evidence to suggest at which grade levels work-based learning might be most cost-effective. There is, however, evidence to suggest that work-based learning prior to high school graduation should generally focus on reinforcing academics, providing career exploration opportunities, and developing generic preemployment skills, whereas work-based learning at the postsecondary level should focus on occupational skill development. Five lines of evidence support this suggestion:

1. Most high school students—even those who have chosen to participate in school-to-work transition programs—are undecided about their career choice or change their minds rapidly (1,2,8).
2. Many parents do not want their children forced into early career decisions (8,33).
3. High school students who have participated in work-based learning generally report that its main benefit has been with respect to career exploration rather than occupational skill development (17,30).
4. Many employers think youth make poor employees (see chapter 6 of this report).
5. Job shadowing and opportunities to assist in a workplace require considerably less effort on the part of employers than do clinical internships and youth apprenticeships that involve substantial skills development.

It is possible that successful school-to-work transition systems will change the first four factors: consequently, some systems that include concerted skill development at the high school level deserve to be tried. But given the hurdles to success, it seems prudent to target most of the systems at more modest goals for the high schools.

A focus on academic reinforcement, career exploration, and generic work skills at the high school level could include some general training and limited work experience. The point is not to avoid training or real work, but rather to reserve the considerable expenditure of time and resources associated with learning semiskilled and skilled occupations until the students are mature enough to make the effort a good investment for everyone concerned—the students, the schools, and the employers. Because students mature at different rates and come to career decisions at different times, flexibility is desirable. Some students may be ready to make good use of intensive training in their junior and senior years of high school, but others may not be ready even by the second year of postsecondary education.

STWOA has no specifications in respect to the timing, intensity, and duration of work-based learning, but it implies that the experiences are to be substantial, by indicating that the systems are to facilitate development of skills "to be mastered at progressively higher levels . . . and lead to the award of skill certificates" (Title I, Sec. 103[a][2]). In addition, interested students participating in school-to-work systems are to select a career major by the beginning of the 11th grade (Sec. 102[2]), but that does not necessarily mean that work-based learning must begin at that point. In addition, the work-based learning is to be relevant to the career major (Sec. 103[2]).

SETTINGS OF WORK-BASED LEARNING

Work-based learning can occur in places of employment (including for-profit firms, private nonprofits, and government agencies), in community service settings, in school-based enterprises, in school-related extracurricular activities, and even in simulated work. OTA found little evidence of the relative effectiveness of these options. Each appears to have advantages and disadvantages. In

addition, as is explained later in this section, there is tentative reason to think that, at the high school level, the setting is less important than the quality of the learning opportunities within the setting.

Places of Employment

Places of employment are not the only places where real work is done, but they are the only places where people are hired to do the work and fired if they fail to do it well enough. For that reason, the workplace provides the most realistic setting for career exploration and occupational development.

Work-based learning can occur in large, medium-size, and small places of employment; in "Tayloristic" and "transformed" organizations; in high-tech and low-tech workplaces, and in expanding and declining industries. Not all, however, are necessarily equally good prospects.

Large organizations offer a greater breadth of opportunities and resources than small organizations, but when structured according to Tayloristic principles, large organizations rely on assembly-line principles and narrowly defined jobs. Small organizations usually give employees more responsibilities and flexibility but less training (42). Most schools with extensive experience arranging work-based learning have found that it takes considerably more work to arrange and monitor one placement in each of 10 small organizations than to arrange and monitor 10 placements in a single medium-size organization. Nevertheless, they continue to recruit small organizations because sufficient numbers of work-based learning opportunities cannot be arranged with the larger ones.

"Transformed" organizations have adopted flatter organizational structures, flexible production, and continuous quality control. Employees are often cross-trained in several occupations, work in teams that have considerable discretion, and are judged by continually raised standards of productivity and quality. All this requires a high degree of continuous learning on the part of all employees (7,41).

Given the importance of learning in transformed organizations, and the move in American business toward this form of organization, it might appear preferable to provide work-based learning in transformed organizations. This is not yet possible on a large scale because many companies have not completed the transformation. In addition, students can be trained more quickly for the narrowly defined jobs of Tayloristic organizations and thus can soon pull their weight in the semiskilled jobs of these organizations.

It is possible, of course, that work experience in Tayloristic organizations makes it difficult for people to adapt later to transformed organizations, but some examples suggest this is not necessarily the case. For instance, the joint GM and Toyota automobile manufacturing facility in Fremont, California, hired the same workers GM had formerly used with Tayloristic management and poor results, and soon reached world-class productivity and quality standards (46).

Inasmuch as the trend toward greater use of technology in the workplace appears likely to continue well into the next century, low-tech workplaces are certainly less preferable for preparing tomorrow's workforce. Yet given the thousands of low-tech workplaces remaining in the country, it does not seem feasible for all work-based learning to occur in high-tech settings. In addition, there is little reason to think that low-tech workplaces could not provide high school students with experiences that develop the good attitudes, work habits, and communication skills that so many employers complain are lacking in young workers (28,34).

Declining industries can be relatively poor prospects for work-based learning. During decline, employers are reluctant to take on students because of budget constraints and the labor problems that the students' presence might create. Layoffs hurt morale and usually elicit some dysfunctional behavior that impressionable youth might imitate. In addition, part of the value of work-based learning consists of the experience, contacts, and references acquired in a given industry, and all of these are of less value when the number of job openings is dropping. Still, the declines in many industries are slow enough that new hires

continue to be made, and some companies may thrive by undertaking dramatic changes in organizational practices and technology.

Coordination of work-based learning in places of employment can pose a considerable challenge. Schools and places of employment are dramatically different types of organizations. Students are usually scattered among several worksites that have different organizational structures, equipment, and operating procedures. Large employers may draw students from several schools, further exacerbating coordination problems. Transporting the students between school and the various workplaces consumes time and has associated costs.

Community Service Settings

Most communities have many opportunities for community service. Students can help care for the elderly in nursing homes, clean and preserve public lands, tutor younger children, feed the homeless, and teach adults how to read. This is real work, often requiring punctuality, perseverance, and the application of academic or occupational skills. Students can be prepared for the work through orientations and training. Their performance can be monitored and guided by supervisors. And their learning can be enhanced by exercises that prompt and guide the students to reflect on their experience.

Many community service organizations rely on volunteers and serve people who cannot afford to pay for the services. As a result, poor or mediocre performance might be tolerated. In addition, because community service organizations usually operate with low budgets and limited staff, opportunities for training and mentoring in such organizations may be limited.

School Settings

Schools can be the site of at least four kinds of work-based learning: school chores, paid jobs for needy college students, student-run school-based enterprises, and occupationally oriented extracurricular activities.

Some schools—mostly private ones—require all students to help with the clerical, cleaning, and maintenance work of the school. This work may develop some basic work habits, but there is usually little focus on career exploration or skills development. Rather, the purposes are to reduce operating costs and to develop students' sense of responsibility to the school community.

Colleges and universities usually provide paid jobs for some of the students requiring financial assistance. The wages are partially subsidized with federal "Work-Study" funds. These jobs are supposed to be relevant to the students' educational or vocational goals, but about half of the jobs are clerical or low skilled ones (38).

Student-run school-based enterprises provide products and services for people other than those who run them. They permit close coordination of classes and the work undertaken by students in the enterprise. They also generally require no extra transportation between the school and the place of work. Some enterprises pay the students. A few generate profits for the school, but most are subsidized.

Participation in extracurricular activities, such as working on a school newspaper, participating in a school band, and playing interscholastic sports is intended mostly as recreation but can give students opportunities to explore career options and develop occupational skills (25). Other activities such as 4-H, Future Farmers of America, Future Business Leaders of America (FBLA), Vocational and Industrial Clubs of America (VICA), Junior Achievement, and Distributive Education Clubs of America (DECA) are specifically directed at developing occupational and entrepreneurial skills. Extracurricular activities probably provide students with more opportunity to exercise initiative and to display creativity than any other form of work-based learning, but they may be weak in developing efficient work habits except when there are competitions that stress speed.

Work-Based Learning in Simulations

Rich learning experiences can come from simulated work. War games have been used for centuries to help train battlefield commanders. The Link Trainer, simulating the cockpit of an airplane and the environment of flight, was first used in 1929 and helped train several generations of pilots (29).

Simulations are operational models of mechanisms, processes, or systems. The systems can be as small as an integrated circuit or as large as the world economy. By operating the model, the learner becomes familiar with how to design, control, or repair the represented phenomena. Most simulations are used for initial training, which is then followed with further training in the real system. Simulations may also be used periodically for brushing up on critical situations that are not frequently encountered during actual work. Simulations can use role playing, games, and mechanical representations. Increasingly they are computer based, such as those briefly mentioned in chapter 3.

The "Assembly Line" simulation has students organize mass production units to manufacture paper automobiles. The teacher specifies the number of cars to be produced in a given period of time. The students must organize the assembly line, train themselves to do the various assembly tasks, and supervise their production run to meet the imposed production and quality standards (16).

Role playing is often used to teach interpersonal skills such as job interviewing and customer service. In one example, the teacher plays an employer and a student plays the applicant interviewing for a job. Then the teacher asks the other students whether they would have hired the applicant and why. Following the discussion, the teacher hands out a list of interviewing pointers, has the students read and discuss them, and proceeds with several more rounds of interviews and critiques of the applicants' performance. As the students get better, the teacher asks more complex questions, becomes condescending, or otherwise gives the students a hard time, preparing them for the worst possible scenarios.

Simulated Medical Cases

High school students at the Oakland Health and Bioscience Academy have to diagnose and prescribe treatments for simulated cases. Small teams are given the medical records of a patient indicating the symptoms and results of initial tests. The students can ask the teacher further questions about symptoms and test results, and the teacher responds as directed in a guide. Each student uses medical encyclopedias, textbooks, and journals to research a hypothesized diagnosis. The students reassemble in their teams to discuss the viability of each hypothesis and to decide which is the correct one. The teacher then tells them the correct answer and explains the "doctor's" reasoning, so that students can compare their own thinking with that of an experienced physician (11).

Some teachers of occupational courses organize and conduct their classes in a manner that partly simulates a workplace. The classroom may be laid out and furnished like a workplace, students may have to "punch in" and "punch out," and they may lose points toward their grade if they are late. In some classes, the students take turns being the office manager—collecting the students' work, grading it, and filing it (10). In a law enforcement program, the students take turns assuming supervisory roles (45). Some teachers help the students "construct an image that the corporate world will find palatable" and have them practice the image when in school (15).

There are several potential advantages to simulated work. The most obvious ones are convenience, safety, and cost savings. The convenience comes from access to work conditions without disruption of real work. In addition, whereas workplaces are structured for production efficiency, simulations can be structured to maximize learning. Simulations eliminate the risks inherent in operating large equipment, working with dan-

gerous substances, undertaking delicate procedures, handling crises situations, and operating a business in the face of competition. They allow students to become competent in meeting the demands of the situation without the risk of harm to people, equipment, and the financial health of the business.

"My teacher treats it like a job. You know, she's the boss. You're her employee, we work for her." —Student (14)

Simulations can accelerate and extend learning in several ways. They can motivate students who are not interested in book-learning but become excited by the active involvement, the sense of realism, a degree of autonomy, and the opportunity for immediate application of their knowledge and skills (16). Simulations can begin by presenting students with simplified representations of overwhelmingly complex systems and then gradually add complications. They can initially operate at less than normal speed and gradually be accelerated beyond normal to "overtrain" the student. They can present students with challenges that are rarely encountered with the real system but pose serious consequences if not handled correctly (16,29). Computerized simulations can store all the input provided by the students and replay it, so that the students can observe their handling of a given situation. They also can compare the students' responses with an expert's handling of the same situation (6).

Simulations also have several disadvantages. If the simulation is too simple, the trainee may be ill-prepared for the real world. A simulation may inadvertently provide additional cues that are unavailable in the real world (29). Simulation may lack the sense of pressure that exists in many workplaces. When used for work-based learning, simulation usually lacks interaction with adults and the positive socialization that may come from that. It may also create false complacency about the dangers involved, because the students are confident of not doing major harm. Conversely, the student may engage in "gaming" the simulation, focusing on maximizing performance by means that would be ineffective or risky in real life. It is also unclear to what extent simulations can develop the attitudes and work habits that are important in the workplace.

The cost of simulations can range from a few dollars to many millions. Flight simulators are among the most costly, but are justified because the cost of operating most jet aircraft is several thousand dollars an hour and mistakes can be catastrophic. Even when the "life cycle" cost of using a simulation is greater than the cost of using the real equipment, the simulation can sometimes be justified by the convenience, risk reduction, and accelerated rate of learning.

Conclusions about Settings

A prudent reading of the research suggests that almost any work in a productive environment can contribute to the occupational development of adolescents, but when the work involves simple tasks that are repeated day in and day out, there will be little learning after the first few weeks or months. Variety, progressive increases in difficulty with the minimum assistance necessary for success, and opportunities for both autonomy and teamwork appear important for sustained learning (4,19,23,26,44). These can be provided in a wide range of businesses and other organizations, including small organizations, Tayloristic organizations (when there is job rotation), low-tech companies, and companies in declining industries. They also can be provided in community service, school-based enterprises, and extracurricular activities. In addition, simulated work can give students a powerful introduction to various work experiences that would otherwise not be available to them.

STWOA does not specify the settings in which the work-based learning is to take place. But the frequent references to partnerships with employers (Sec. 3[a][3]), and the specification that work-based learning must include "broad instruction, to the extent practicable, in all aspects of the industry" (Title I, Sec. 103[a][5]), suggest that Con-

gress was expecting at least some of the work-based learning to occur in places of employment operated by "both public and private employers" (Sec. 4[8]).

Several provisions in STWOA suggest that Congress anticipated that work-based learning could also occur outside of employment. "School-sponsored enterprises" are listed as "permissible" work-based learning activities (Title I, Sec. 103[b]). The states' plans for the school-to-work transition systems are to describe how the systems will be coordinated or integrated with the National and Community Service Act of 1990 (Title II, Subtitle B, Sec. 213[d][6][L]). And the funds from STWOA can be used to "design and implement school-sponsored work experiences, such as school-sponsored enterprises and community development projects" (Title II, Subtitle B, Sec. 215[c][11]).

PAY FOR WORK-BASED LEARNING

Work-based learning can be paid or unpaid. The rate of pay can be the organization's rate for full-time entry employees with the same responsibilities, it can be the minimum wage, and in some cases it may be legal to use a subminimum "training wage." There is sometimes an increase in pay after each year, and a few programs offer bonuses. For students continuing into postsecondary education or training, some employers also provide tuition reimbursement.

The matter of pay for work-based learning experiences was hotly debated during the drafting of STWOA. The House passed a bill requiring paid work-based learning, and the Senate passed a bill with no such stipulation. The conference resolved the difference by specifying that "priority [be given] to applications that require paid, high-quality work-based learning experiences" (Title II, Subtitle B, Sec. 214 [a][2]). In four other places, the act reiterates a preference for paid work-based learning. STWOA also prohibits using federal funds received under the act to subsidize the wages of students in work-based learning or the wages of their mentors (Title VI, Sec. 601[6]).

There were several rationales for paid work-based learning. One was that if employers have to pay the students, they will have an incentive to demand high standards of performance from them (40). Similarly, if the students are paid, they will feel like real employees and rise to the occasion. There was also concern that having students engage in productive activities without pay was exploitative, and would encourage employers to use work-based learning students in place of regular employees. Another reason for pay was that students who rely on earnings from part-time jobs would generally be precluded from participating in unpaid work-based learning.

The main argument against paid work-based learning was that it raises the costs to employers and thus reduces the number of employers who will participate and the number of work-based learning slots that are offered. It was pointed out that, even without payments to students, work-based learning imposes several costs on employers—the costs of planning and coordinating with the schools, the staff time spent training and closely supervising the young people, and the young people's lower outputs when beginning production activities.

OTA found little evidence about the effects of pay on the students. The issue of employer incentives is complex and is discussed in chapter 6. While STWOA strongly encourages paid work-based learning and prohibits the use of federal funds received under the act to reimburse employer expenses, the act leaves the states free to use other mechanisms to reduce employers' costs and to create incentives for their participation. These include state subsidies for students' wages or other expenses, state tax credits, authorization of subminimum training wages, and exemption from having to provide state-mandated benefits and unemployment insurance for the students.

CONCLUSION

Work-based learning can be structured in respect to at least six sets of alternative features. Although there is no definitive evidence about the relative

effectiveness of the alternatives, there are some findings that allow for informed speculations:

- The congressional intent appears to be that the STWOA systems should target a wide spectrum of students but not be compulsory.
- The standards for screening students for work-based learning assignments do not have to be uniformly high, but care should be taken to match students with employers' needs and expectations.
- Work-based learning can be focused on the objectives of academic enhancement, career exploration, occupational development, and productive activities. Although any production work can be a valuable learning experience, after several weeks or months its benefits are likely to decline unless the work involves progressively more challenging tasks.
- Considerable evidence indicates that coordination between the school and the workplace is difficult to achieve. There are two basic approaches to coordination; one involves formal planning and written agreements, and the other involves continuing dialogue between representatives of both institutions. Many highly reputed programs have used both approaches, but a few have used only the latter.
- A progression of work-based learning, beginning in elementary school and extending through college would probably benefit students, but would require extensive resources. Given that the opportunities for work-based learning in workplaces are likely to be constrained, it appears that intensive workplace experiences focusing on occupational skill development should generally be reserved until the postsecondary level.
- Paying students during their workplace experiences appears to have advantages and disadvantages. Payment and nonpayment are both likely to result in tradeoffs.

These six sets of alternative features distinguish among several models of work-based learning. The models are discussed in the next chapter.

REFERENCES

1. Bidwell, C. et al., University of Chicago, "Studying Career Choice: A Pilot Study, Vols. I-III," Washington, DC: Alfred P. Sloan Foundation, 1992.
2. Bragg, D.D., Hamm, R.E., and Trinkle, K., *Work-Based Learning in Two-Year Colleges in the United States* (Berkeley, CA: National Center for Research in Vocational Education, University of California, 1995).
3. Bragg, D.D., and Hamm, R.E., *Linking College and Work: Exemplary Practices in Two-Year College Work-Based Learning Programs* (Berkeley, CA: National Center for Research in Vocational Education, University of California, 1995).
4. Bronfenbrenner, U., *The Ecology of Human Development: Experiments by Nature and Design* (Cambridge, MA: Harvard University Press, 1979).
5. Coleman, J., *Youth: Transition to Adulthood* (Chicago, IL: University of Chicago Press, 1974).
6. Collins, A., and Brown, J.S., "The Computer As A Tool for Learning Through Reflection," *Learning Issues for Intelligent Tutoring Systems*, H. Maddl and A.M. Lesgold (eds.) (New York, NY: Springer, Verlag, 1988).
7. Commission on the Skills of the American Workforce, *America's Choice: High Skills or Low Wages* (Rochester, NY: National Center on Education and the Economy, 1990).
8. Corson, W., and Silverberg, M., *The School-to-Work/Youth Apprenticeship Demonstration: Preliminary Findings* (Princeton, NJ: Mathematica Policy Research, 1994).
9. Dede, C., and Lewis, M., George Mason University, Fairfax, VA, and Rand Corporation, Santa Monica, CA, "Assessment of Emerging Educational Technologies that Might Assist and Enhance School-to-Work Transitions," unpublished contractor report prepared for the Office of Technology Assessment, U.S. Congress, Washington, DC, May 1995.

10. Gaskell, J., *Gender Matters from School to Work* (Toronto, Canada: OISE Press, 1992).
11. Goldberger, S., Kazis, R., and O'Flanagan, M.K., *Learning Through Work: Designing and Implementing Quality Worksite Learning for High School Students* (New York, NY: Manpower Demonstration Research Corporation, 1994).
12. Greenberger, E., and Steinberg, L.D., *When Teenagers Work: The Psychological and Social Costs of Adolescent Employment* (New York, NY: Basic Books, 1986).
13. Grubb, W.N., and Villeneuve, J.C., University of California, Berkeley, CA, "Co-operative Education in Cincinnati: Implications for School-to-Work Programs in the U.S.," unpublished contractor report prepared for the Office of Technology Assessment, U.S. Congress, Washington, DC, May 1995.
14. Hollenbeck, K., *In Their Own Words: Student Perspectives on School-to-Work Opportunities* (Washington, DC: Academy for Educational Development, 1995).
15. Hull, G., *"Their Chances? Slim and None?": An Ethnographic Account of the Experiences of Low-Income People of Color in a Vocational Program and at Work* (Berkeley, CA: University of California, National Center for Research in Vocational Education, 1992).
16. Jamieson, I., Miller, A., and Watts, A.G., *Mirrors of Work: Work Simulations in Schools* (London: The Falmer Press, 1988).
17. Jobs for the Future, *Promising Practices* (Boston, MA: 1995).
18. KAPOW: Kids and the Power of Work (Arlington, VA: Fu Assocs., undated).
19. Kohn, M.L., and Schooler, C., "The Reciprocal Effects of the Substantive Complexity of Work and Intellectual Flexibility: A Longitudinal Assessment," *American Journal of Sociology* 84:24-52, 1978.
20. Lerman, R.I,. and Pouncy, H., "The Compelling Case for Youth Apprenticeships," *The Public Interest* 101:62-67, fall 1990.
21. Lynch, L., *Training and the Private Sector: International Comparisons* (Chicago, IL: University of Chicago Press, 1994).
22. Lynn, I., and Wills, J., *School Lessons: Work Lessons* (Washington, DC: The Institute for Educational Leadership, 1994).
23. Mainquist, S., and Eichorn, D., "Competence in Work Settings," *Adolescence and Work: Influences of Social Structure, Labor Markets, and Culture*, D. Stern and D. Eichorn (eds.) (Hillsdale, NJ: Lawrence Erlbaum Assocs., 1989).
24. McKay, E.G., *The Forgotten Two-Thirds: An Hispanic Perspective on Apprenticeship, European Style* (Washington, DC: National Council of La Raza, 1993).
25. Mihalka, J.A., "Youth and Work," *New Roles for Youth in the School and Community* (Columbus, OH: Charles E. Merrill, National Commission on Resources for Youth, 1974).
26. Mortimer, J.T., "The Transition to Adulthood: U.S. Research on Role Acquisition and Attainment," unpublished paper presented at the *National Research and Policy Symposium on Youth in Transition to Adulthood*, Kananaskis, Alberta, Apr. 25 - 29, 1995.
27. Mortimer, J.T., and Yamoor, C., "Interrelations and Parallels of School and Work as Sources of Psychological Development," *Research in the Sociology of Education and Socialization* 7:221-246, 1987.
28. Napier, D., Missouri University, Columbia, MO, "Work Attitudes and Human Relations in Business: Instructor's Guide," (Jefferson City, MO: Division of Vocational and Adult Education, Missouri State Department of Elementary and Secondary Education, April 1987).
29. O'Neil, H.F., Jr., and Robertson, M.M., "Simulations: Occupationally Oriented" *Encyclopedia of Educational Research*, 6th ed., M.C. Alkin (ed.) (New York, NY: Macmillan Publishing, 1992).

30. Pauly, E., Kopp, H., and Haimson, J., *Home Grown Lessons: Innovative Programs Linking Work and High School* (New York, NY: Manpower Demonstration Research Corp., 1994).
31. Phillips Academy, "Andover," Andover, MA, 1994.
32. Rogers, A., and Hubbard, S., "Case Study Report on Kalamazoo Valley Consortium Education for Employment," unpublished paper, National Institute for Work and Learning, Academy for Educational Development, 1994.
33. Rogers, A., et al., *Learning from Experience: A Cross-Case Comparison of School-to-Work Transition Reform Initiatives* (Washington, DC: National Institute for Work and Learning, Academy for Educational Development, 1995).
34. Ryerson, D.L., "A Review of the Literature: The Transition of Youth from School to Work," C.M. Oinonen (ed.) September 1983.
35. School-To-Work Opportunities Act of 1994, May 4, 1994, Public Law 103-239.
36. Simms, M.C. (ed.), *Youth Apprenticeships: Implications for Black Youth* (Washington, DC: Joint Center for Political and Economic Studies, 1993).
37. Thomas Jefferson High School for Science and Technology, "Mentor Handbook: Mentorship Program," Alexandria, VA, undated.
38. U.S. Congress, General Accounting Office, *Student Financial Aid: Characteristics of Jobs Provided Through the College Work-Study Program,* GAO/HRD-92-72BR (Washington, DC: February 1992).
39. U.S. Congress, General Accounting Office, *Transition from School to Work: Linking Education and Worksite Training,* GAO/HRD-91-105 (Washington, DC: August 1991).
40. U.S. Congress, House of Representatives, *School-to-Work Opportunities Act of 1994*, Conference Report, H. Rpt. 103-480 (Washington, DC: U.S. Government Printing Office, 1994).
41. U.S. Congress, Office of Technology Assessment, *Worker Training: Competing in the New International Economy,* OTA-ITE-457 (Washington, DC: U.S. Government Printing Office, 1990).
42. U.S. Department of Labor, "BLS Reports on Employer-Provided Formal Training" *news release* (Washington DC: Bureau of Labor Statistics, U.S. Department of Labor, Sept. 23, 1994).
43. U.S. Department of Labor, Secretary's Commission on Achieving Necessary Skills, *Learning a Living: A Blueprint for High Performance* (Washington, DC: U.S. Government Printing Office, April 1992).
44. Vygotsky, L.S., *Mind in Society: The Development of Higher Educational Processes,* M. Cole, V. John-Steiner, S. Scribner, and E. Souberman (eds. and translators) (Cambridge, MA: Harvard University Press, 1978).
45. Westra, N., Public Safety Program Manager, Kalamazoo Valley Consortium, personal communication, February 1995.
46. Womack, J.P., Jones, D.T., and Roos, D., *The Machine that Changed the World* (New York, NY: Harper, 1990).

Work-Based Learning Models and Evidence of Effectiveness

5

Although work-based learning for students is not widespread in this country, a number of different models are in use. The youth apprenticeship model encouraged by STWOA is the newest and most comprehensive model, and currently the least used. The clinical training model and the cooperative education model are similar to youth apprenticeships, but somewhat less comprehensive. Each of these three models is described here in relation to the structuring of work-based learning that was discussed in chapter 4. Evaluations of each model's effectiveness are summarized and the likely advantages and disadvantages of the models are described. Three other models are discussed briefly. They are school-to-apprenticeship programs (distinct from "youth apprenticeships"), school-based enterprises, and career academies.

It should be noted that there are no established definitions of these models—instead, they have evolved informally and even experts disagree some on the important characteristics of each. In addition, some work-based learning programs have intentionally modified a model or developed their own. Finally, actual practice seldom coincides exactly with the original intentions. The descriptions provided below are of ideal models, as they are commonly conceived. Key features of these models are summarized in table 5-1.

The effectiveness of school-to-work transition programs with work-based learning can be judged by several indicators. Early indicators include the impressions and reactions of students, teachers, employers, and parents, but these subjective measures sometimes do not coincide with more objective ones. Interim objective measures include the students' rate of participation in various work-based learning activities, school attendance and

TABLE 5-1: Several Models of Work-Based Learning[a]

Model	Students to be served	Objectives of the work-based learning	Means of coordinating the work-based learning with schooling	Grades and hours per week of the work-based learning	Setting of the work-based learning	Payment for work
Youth apprenticeship: The students participate in a coordinated program of school-based and work-based learning that provides career counseling, integrated academic and occupational instruction, training and mentoring in a workplace, progressively higher levels of work experience, and the opportunity to earn an industry-recognized skill credential. The programs extend from high school through at least one year of postsecondary education.	Interested students meeting selection criteria	Academic reinforcement, Career exploration, Occupational development, Productive activity	Joint school and employer planning, Training agreements, Class schedule flexibility, Worksite visitation by school coordinator, Integrative seminars, Skill credentialing	Grades: 11-14 Hours/week: 4-20	Workplaces	Usually
Clinical training: The students undertake a course of occupational study and assume a series of coordinated worksite positions that provide training and unpaid work experience. The course of study, the work experience, and adequate scores on an external examination are required for licensure and subsequent employment in the field.	All students admitted into program of study (mostly medically related occupations)	Occupational development, Productive activity	Joint school and employer planning, Training agreements, Class schedule flexibility, Worksite visitation by school coordinator, Skill credentialing	Grades: 13-16 Hours/week: 10-30	Workplaces	Seldom

Cooperative education: The students engage in a coordinated program of school-based learning and career-related work experience during the later year(s) of high school or college. This is the oldest and most widely used model of work-based learning in the U. S., and actual Implementation varies considerably, especially in respect to the objectives and extent of coordination.	Interested students meeting selection criteria	Career exploration, Occupational development, Productive activity	Training agreements, Worksite visitation by school coordinator,[b] Integrative seminars	Grades: 11-12, 14-16 Hours/week: 6-40[c]	Workplaces	Usually
School-to-apprenticeship programs: In the senior year, the students begin part-time participation in union and employer apprenticeship programs registered with the U.S. Department of Labor.	Interested vocational students meeting selection criteria (mostly skilled trades)	Occupational development, Productive activity	Training agreements	Grade: 12 Hours: 20-30	Workplaces	Usually
School-based enterprises: The students work part-time in a school-owned business and take elective classes that develop the required occupational and entrepreneurial skills.	Interested students meeting selection criteria	Career exploration, Occupational development	Teacher supervision of the enterprises	Grades: 9-12, 13-16 Hours/week: 5-20	Schools[d]	Seldom
Career academies: The high school students attend a small career-oriented "school within a school" focused on one cluster of occupations. It integrates academic learning, career exploration, occupational preparation, and sometimes part-time or summer jobs.	Interested students in the career academy meeting selection criteria[e]	Academic reinforcement, Career exploration, Occupational development	Joint school and employer planning	Grades: 11-12 Hours/week: 4-15	Workplaces	Sometimes

[a] There are varying definitions of these models. In addition, programs sometimes make intentional modifications to the models, and implementation often is not fully consistent with the retentions

[b] Seldom used for liberal arts students at postsecondary level

[c] Some co-op programs have students alternate between full-time schooling and full-time workplace assignments

[d] Also school-managed facilities outside of school sites

[e] Career academies have been established primarily for socioeconomically disadvantaged youth

SOURCE: Office of Technology Assessment analyses, 1995

conduct, course taking, grades, scores on academic tests and occupational performance assessments, graduation rates from high school, adolescent pregnancy rates, crime rates, enrollment in postsecondary education or training, completion of postsecondary education or training, and proportions earning the applicable skill certificates. Employer satisfaction and the extent to which employers expand or contract their participation also are important interim measures. Longer-term student outcomes include employment history, career progression, earnings and benefits, and career satisfaction. Longer-term labor force outcomes include worker productivity and production quality indicators.

"When asked about what happens to students who excel in their [work-based learning] jobs, one supervisor replied, 'We hire them'." (20).

Measures of these characteristics for program participants alone would be inadequate to determine the effects of the programs on students. For that purpose it is necessary to have a comparison group of similar students who are not exposed to the program. Otherwise, there is no way of knowing whether the observed changes in students would have occurred because of natural maturation and other elements of their education.

Ideally, for purposes of assessing the effects of a program, eligible applicants are assigned randomly to the program or to a control group receiving traditional instruction directed at the same objectives, and then the success of the two groups is compared over subsequent years. Although random assignment is desirable from an assessment standpoint, it is unpopular with educators who seek to serve all students with what they consider to be the best available educational opportunities. If, however, the growth in work-based learning positions is slower than the growth in parent and student interest, educators might be persuaded to allocate program admission by lottery.

Randomization has rarely been used in past evaluations of work-based learning. Rather, participating students have been compared with nonparticipants matched on the basis of family background, ability, past performance in school, and other characteristics that are commonly associated with future school performance, postsecondary educational achievement, and early occupational success. These matching procedures can control only for measured characteristics; there are many others, such as initiative, ambition, and foresight, that can affect the outcomes. Such lack of initial comparability between matched groups is particularly likely when the program group is composed of volunteers and the comparison group is composed of those who did not volunteer. Evaluations using such matched comparison groups will often overestimate the positive effects of the studied programs.

For rigorous evaluations, the researchers must have access to large percentages of the students in the programs and in the comparison groups. If several of the programs refuse to participate or if many students in the program group or in the comparison group refuse to participate, the validity of the results can be seriously undermined. In past evaluations of work-based learning, gaining access to programs has sometimes been a problem, gaining access to a large portion of the students has commonly been a problem, and following students for five or 10 years has rarely been accomplished.

These evaluation difficulties are not unique to work-based learning. They are common in the assessment of all types of education and training programs. Occasionally, most of the problems have been overcome, particularly in some evaluations sponsored by the Department of Labor during the past two decades (19), but such success has taken considerable leadership and resources, and often a mandate from the funding source.

Numerous evaluations and their findings are discussed in this chapter. Very few of the evaluations randomly assigned students, many were not able to include large proportions of the students, and none followed students well into their adult employment. Taking into account these limitations, a prudent interpretation of the evidence ac-

cumulated from the cited studies suggests the following findings about past work-based learning:

- School-to-work programs have arranged work-based learning that generally offers more learning opportunities than do the jobs that students find on their own.
- Most students have been excited and motivated by their work-based learning, feeling that it has helped them make better use of their schooling and become better prepared for employment.
- Most employers have been quite satisfied with the students who participate in work-based learning.
- Work-based learning has generally had small positive effects on students' attendance, grades, graduation rates, and participation in postsecondary education, but some of the new youth apprenticeship programs appear to have dramatically increased postsecondary enrollments.
- The effects of work-based learning on employment, career progression, and earnings during the first few years after graduation have been a mix of modest positive ones, no differences, and a few small negative findings. The results for college-level programs have been more positive than those for high school programs, and employment results from the youth apprenticeship programs are not yet available.
- Well-planned and supervised work-based learning requires considerable effort to arrange, coordinate, monitor, and sustain.
- Intermediary groups, especially employer organizations, have often been important in establishing work-based learning programs.
- Programs that have earned a reputation of excellence have done so only after several years of adjustments and fine-tuning.

Each of these findings is supported by two or more studies of several programs. Only the findings in respect to employment outcomes varied substantially among the studies.

YOUTH APPRENTICESHIPS

Students in youth apprenticeships participate in a coordinated learning program with the following key elements:

- school-based learning that provides career counseling, integrates academic and occupational instruction, and extends from the later years of high school through some postsecondary education;
- progressively higher levels of paid work experience, accompanied by training and mentoring; and
- the opportunity to earn an industry-recognized skill certificate.

Youth apprenticeship is the newest model of work-based learning. It is the model that STWOA encourages, although the legislation never uses the term "youth apprenticeship" (Public Law 103-239, Title I, Secs. 101-104). Before passage of STWOA, there probably were only a few dozen programs in the country using this model. Most of those had been established in the early 1990s and had not fully implemented the model by the time the legislation was being considered.

Youth apprenticeship is the most ambitious, coordinated, and sustained model of work-based learning in the United States. It is directed at serving the widest spectrum of students—in terms of academic performance and career interests. The objectives are broader than those of other models, encompassing the reinforcement of academics, exploration of careers, occupational skill development, and productive activities. Youth apprenticeship involves extensive coordination between academic and occupational instruction in school, school-based instruction and work-based instruction, and high school and postsecondary education and training. In fact, youth apprenticeship is the only model that spans the high school and postsecondary levels, providing students with the most extensive progression of learning opportunities. Some other models are used at both levels, but not by a single program.

Youth apprenticeships differ from the apprenticeship programs operated by unions and em-

ployers in several ways. Youth apprenticeships begin serving students in high school and continue to serve them for at least one year of postsecondary education, whereas union and employer apprenticeships are targeted at young adults several years out of high school (the average age of participants is about 25). In youth apprenticeships, the students work part time or rotate between full-time work and full-time schooling, whereas in union and employer apprenticeships the participants generally work full time and take two or three hours of classes each week. In addition, youth apprenticeships use high school and college teachers to provide the formal instruction, whereas the unions and employers often use their own personnel for that purpose.

Evaluation Results

Youth apprenticeships are of such recent vintage that there is little evaluation information available on them. Most of the programs are still in the start-up phase. Only a few have graduated cohorts from high school, and none has operated long enough for those cohorts to progress well into their careers. For those reasons, all the findings in this section should be considered quite tentative and subject to change as the programs refine their operations and become established in their communities.

The U.S. Department of Labor commissioned a preliminary assessment of 15 youth apprenticeships that were begun with its support between 1990 and 1993 (4). At the time of the assessment, a few of the programs were still in the planning stage and had not yet accepted students. It was found that the work-based learning usually began in the junior or senior year and varied considerably in intensity from program to program. In a few of the programs the employers offered a carefully structured sequence of training opportunities but no real work experience. Conversely, when students were given real work experience, they usually received only informal training from their supervisor and only as much as they needed for the work (4).

The biggest difficulty that most of these youth apprenticeship programs faced was arranging enough work-based learning opportunities. Employer associations helped with that task, but individual employers ultimately based their decisions to participate on their perceptions of the costs and benefits.

Coordinating the work-based learning opportunities with schooling proved to be a challenge. The school staff and employers' representatives usually met to discuss expectations at the start of the school year. Continuing communications, either by scheduled meetings or informal communications, were spottier. Only a few schools tried to link their class activities to the work-based learning, and none of the employers made substantial efforts to link the worksite experiences with the students' academic or vocational curriculum. One program twice attempted to develop a detailed training plan to be used by its large employers, but the plans required more staff time, space, and equipment than the employers were willing to commit (4).

In focus groups, sometimes selected randomly and sometimes not, students from these youth apprenticeship programs generally said that the programs encouraged them to study harder in school and to improve their attendance and grades. Many found their schoolwork more interesting because of team project assignments. Some were motivated to study harder in school to assure their eligibility for work-based learning assignments. Students sometimes complained, however, of experiencing delays in the implementation of certain program components, being isolated with the same students for most of their schoolwork, receiving promises about pay rates that were subsequently broken, having to do mostly menial jobs, being paid less than regular employees doing the same work, having to constantly "act like adults," missing after-school social and extracurricular activities, and misunderstanding the postsecondary tuition reimbursement offers of some employers (4).

Jobs for the Future, a nonprofit organization with foundation funding, is supporting 10 innovative school-to-work transition programs with work-based learning. Only two of the 10 had been in operation prior to 1991. Six are youth apprenticeships and the other four include several elements of that model. A self-administered survey, handed in by 226 seniors, about half of those at 8 of the 10 sites, found that 92 percent thought the work-based learning was encouraging good work habits, 83 percent thought it was providing at least some chance to explore career options, 62 percent said they spent one-third or more of their time in the workplace learning new skills, 57 percent reported the assignments to be interesting and challenging most of the time, and 79 percent said they would participate in the program again (6).

A subsample survey of 113 seniors at four of the programs found that they most liked the career exploration aspects of the program and least liked, or found hardest to achieve, the level of skills required for tasks performed at the worksite. More than half of the subsample thought that the program had improved their feelings toward school, and less than 2 percent felt the opposite. The most common suggestion for improvement, offered by 16 percent of the students, was for "better planned activities at worksite that require more involvement by students" (6).

In three of the programs where actual postsecondary enrollments had been tracked, it was found that between 69 and 84 percent of the students had enrolled in some form of postsecondary education or training soon after graduation from high school—rates well above the national average. The program with the highest rate serves an inner-city population where postsecondary enrollments are normally low. In three other programs, between 85 and 92 percent of the seniors in the programs reported they had plans for continuing their education after graduation (6).

Jobs for the Future staff observed that programs that began primarily as workforce improvement efforts have since become "more committed to significant school reform as a precondition for being able to deliver improved career preparation." Similarly, programs that began primarily as school reform efforts have developed a "much more serious commitment to structured, planned learning experiences at the worksite and creative approaches to linking school and work experiences".

The major problems that have been encountered are rigid school schedules using 50-minute periods, entrance requirements of four-year colleges that do not recognize credits for integrated academic and occupational courses or work-based learning, and the high costs of small programs that result from the limited ability or willingness of business to provide work placements and to hire students who have completed the program. Incremental costs are estimated to range from minimal to $2,000 per student, although there may be reductions after the implementation phase is completed and the operations have been scaled up (6).

Case studies of 14 innovative school-to-work transition programs were recently completed by the Academy for Educational Development (10). Nine of the programs were youth apprenticeships or had many of the components of that model. Most of the 14 programs appear to have benefited from strong leadership by a state or local school administrator who provided vision, fostered collaborations, and set high standards while also expecting some mistakes to be made. Similarly, most programs appear to have benefited from the impassioned leadership of a teacher or coordinator who knew curriculum, pedagogy, and the targeted industry; was willing to take risks; and communicated well. Collaborations with business appear essential for expanding the programs. The collaborations took different forms and required substantial investment by both the schools and the industry.

The nature of the work-based learning in these programs varied considerably. Important elements for success appear to be building on local labor market needs, coordinating the school-based learning and work-based learning, allowing students to assume new roles and shoulder responsibility, permitting students to do real work and receive feedback, and encouraging students to reflect on their experiences and engage in self-assessment. Participating businesses apparently

needed and welcomed some orientation and support, particularly for their mentoring roles. Difficulties that were commonly encountered include limited resources for the substantial start-up efforts, limited business participation, the unwillingness of four-year colleges to recognize some of the high school credits earned in the programs, and transportation difficulties in countywide systems and in inner cities that had lost most of their jobs to the suburbs (10).

Another recent study of 16 school-to-work transition programs in high schools, including five youth apprenticeships and nine others with similar components, concluded that most of the programs appear to have induced the students to take more advanced courses. Some of the programs were providing high-quality work-based learning and some were not (9). Economically disadvantaged and low-achieving students were found to be participating with few complaints from employers, teachers, or the students themselves. Most program directors thought that these students would be best served if the work-based learning experiences began in the 9th or 10th grade, rather than in the 11th or 12th grade, because by those later grades sizable portions of the students have become disengaged from school or dropped out. Parents were initially skeptical of the programs, fearing that they would preclude a college education, but many parents whose children participated have been pleased. Students appreciated the work-based learning mostly for the career exploration opportunities.

Planning and development of the programs were very time-consuming, often requiring two years. There were substantial costs for a coordinator, staff planning, curriculum development, staff training, and equipment (sums up to $200,000 are reported, but it is unclear whether those included all, or only part of, the expenses actually incurred). Considerable time was also required to recruit employers and to help them plan high-quality work-based learning activities. For three to five years after implementation, extensive revisions and fine-tuning were required. Operating costs for the school were usually estimated to be somewhat higher than regular schooling because of the time needed to secure the work-based learning positions, to prepare the students for them, and to monitor their progress. These costs do not include the costs that employers incurred.

Intermediary groups such as the chamber of commerce, business and professional groups, and trade associations apparently provided crucial support for many of the programs. Even with their contributions, there appears to be have been a tradeoff between the number and the quality of work-based learning positions that have been arranged. Providing a broad introduction to the organization and industry, planning a progression of training and work experience, coordinating both with the school-based instruction, and providing supervision and mentoring are time-consuming. Often the staff time devoted to these activities costs employers more than the wages paid to the students (9).

Jobs for the Future, drawing on the study just described and on its experience in providing support to several youth apprenticeship programs, inferred 10 guidelines for high-quality work-based learning:

1. The partners should agree on the goals and the means of achieving them.
2. There should be a structured plan for the students' learning in the workplace.
3. The work-based learning should focus on developing broad and transferable skills.
4. The school and workplace staffs should receive orientation and ongoing support as needed.
5. The students should be oriented and prepared for their workplace assignments.
6. The students should receive the support and guidance of a caring adult in the workplace.
7. The school-based activities should help students distill and extend lessons from the workplace.
8. Students learning in the workplace should be documented and assessed.
9. There should be ongoing coordination between the schools and workplaces.
10. Quality control mechanisms should be used (5).

CLINICAL TRAINING

Students in clinical training programs take academic and occupational courses and assume a series of positions that provide work experience and training. The course of study, the work experience, and a passing score on an examination administered by a professional body are usually required for licensure and subsequent employment in the field. Clinical training is used primarily in medical occupations, including several fields of medical technology, in both two-year and four-year colleges.

The clinical training model is moderately selective. It focuses on occupational skill development and production activities in the workplace. There is tight coordination between the occupational course work in school and the training and work assignments in the workplace, and both are partly guided by the licensure requirements. Most programs begin at the postsecondary level. Work assignments involve large numbers of hours—often thousands of hours before one is eligible for licensure. Most of the work is undertaken in hospitals, medical centers, and medical laboratories. Every student in the program must participate in the work-based learning, although the assignments may depend on satisfactory progress in one's class work. The students are seldom paid for their time in the workplace (1,2).

The clinical training model is similar to the youth apprenticeship model but less comprehensive. The main differences are that the objectives of clinical training are more narrowly focused on occupational development and productive activities, the programs do not span the high school and postsecondary levels, and the work experiences are usually unpaid. In addition, youth apprenticeship is a generic model applicable to any occupation, whereas clinical internships have been used almost exclusively in medical fields.

The clinical training model has become the norm for preparation in all the medical occupations—ranging from nurse's aide through medical technologist to brain surgeon. OTA calculations based on data from a recent survey suggest that about 50 to 65 percent of all two-year colleges have at least one program that uses this model, and virtually all the programs are in the medical fields (2). The model is used almost universally in nursing programs in four-year colleges and in medical schools.

The clinical training model appears to be expensive, having much lower students-to-teacher ratios than cooperative education programs in the same institutions. It is common, however, for the industry to partially subsidize the expenses and to provide political support for the programs (1).

Evaluation Results

A major study recently asked two-year college administrators to report on their best health-related program with work-based learning and their best non-health-related program with work-based learning. They were ask to judge "best" on the basis of being in full operation, having a formal structure for linking the work-based learning with the college courses, using innovative approaches, and having a proven track record of preparing students for their career goals (2). The study did not attempt to further assess the nature and extent of the effects on the students, but rather sought to identify common characteristics of the nominated programs.

The most common characteristics of the programs designated as "best" were that they had been in operation for more than 10 years, used the clinical training model for health-related programs, and used the cooperative education model for non-health-related programs (2). More than 80 percent of the clinical training programs used a governing or advisory board with employers on it, had formal agreements with employers, provided career orientation for students, offered remedial and other services to prepare students for work-based learning, coordinated school-based and work-based learning, had regular consultation between college faculty and workplace mentors, engaged in periodic evaluation of student progress, and prepared students for a skills certification process (2).

The college administrators indicated that the highest levels of support for work-based learning

came from local boards and advisory committees, college administrators, business representatives, students, college trustees, and state licensing agencies (2). The lowest levels of support came from four-year colleges, labor unions, and parents. The most serious barriers to the expansion of work-based learning were perceived to be the colleges' lack of staff, time, and funds for arranging and supporting work-based learning; the demands of classroom instruction, which left students little time for work-based learning; and the students' lack of career orientation when entering college (2).

The data from the survey described immediately above were supplemented with expert rankings and a telephone survey of promising candidates to identify eight exemplary work-based learning programs in two-year colleges. The programs selected used the clinical training, youth apprenticeship, cooperative education, or union and employer adult apprenticeship models. These programs were studied further (1). All of the programs had coordinators who had prior experience working in industry and were widely acknowledged as strong leaders. They were known for their political savvy, long work hours, attention to details, setting of high standards, and effective promotion of the program. All of the programs were well funded, often with the assistance of the industry and participating employers. Most of the programs had direct links to an industry group that was important to the local economy. The programs were usually the only source of training in the area for the given occupation, or were overwhelmingly the largest source of that training. The links with employers were both direct and close; communication among program staff and industry personnel was frequent, and the staff (usually the program coordinator) circulated among the workplaces almost daily. These ties often resulted in work-based learning slots for students; donations of supplies, equipment, and expertise; and political advocacy and protection for the program. Most of the exemplary programs:

- used two or more kinds of work-based learning—most commonly, a school-based enterprise for the earlier stages of training and then work-based learning assignments with local employers;
- included mentoring for the students;
- had the students document their own progress with diaries or portfolios;
- had agreements with four-year colleges for transfer of a considerable portion of the credits that students earned in the program; and
- went through five or more years of adjustment before achieving excellence (1).

COOPERATIVE EDUCATION

Students in cooperative education engage in school-based learning that is coordinated with career-related work experience during the later years of high school or college. Participating high school students usually work part time in their senior year (and sometimes in their junior year), often with a shortened school day. In college the students usually alternate between a semester of classes and a semester of work experience, a schedule that accommodates working at sites beyond commuting distance. Co-op students are usually paid for their time in the workplace.

Cooperative education varies considerably in terms of the students who are served, the objectives, and the degree of coordination between the school-based learning and the work-based learning. In some schools participation in the co-op program is offered only to vocational education students, whereas in other schools it is also available to students in the general track and the college preparatory track (16). The formal model is targeted mainly at occupational skill development and production activities, but in practice the objectives can sometimes also target academic enhancement and career exploration. The formal model includes considerable coordination between schooling and the work-based learning, usually by means of written agreements, worksite training plans, and periodic visits to the worksites by the school's co-op coordinator. Because these means of coordination require considerable staff time, some schools forgo one or more of them.

At the college level, the co-op programs are usually moderately selective, requiring a minimum grade point average. In engineering and business departments, co-op tends to be focused on occupational skill development and production activities. For liberal arts majors, the focus is more often on career exploration and production activities. The engineering and business departments tend to coordinate the courses and work-based learning experiences more than do the liberal arts departments. Colleges often make co-op work experiences available from the sophomore year through the senior year. Many award limited credit toward graduation for the co-op work assignments, requiring students to enroll year-round or to complete an extra year of schooling before graduation. Students may apply for jobs with different employers each semester, or remain with one employer who is to provide a progression of training and work responsibilities.

Although the cooperative education model is similar to the youth apprenticeship model in several respects, co-op programs often focus more narrowly on the objectives of occupational development and work experience, academic and occupational courses in school are seldom integrated, skill certification is not common, and individual co-op programs rarely span the high school and postsecondary levels.

Several recent studies suggest that although about half of all high schools offer co-op programs, only about 8 percent of graduates have participated in them (15,16,17). It appears that one-third to two-thirds of the two-year colleges have co-op programs, but only about 2 percent of the students participate (2,17). A recent survey indicates that about half of the engineering technology departments in two-year colleges and two-thirds of the science technology departments offer cooperative programs or other work-based learning, but the survey did not ask about the percent of students participating (3). Co-op programs are generally voluntary, but a few colleges require all students, or all those in certain programs of study, to participate.

Evaluation Results

Cooperative education is the oldest and most widely used model of work-based learning, and the most extensively researched. The results of evaluations at the high school and college level are discussed separately in this section.

The High School Level

A recent review of the research and evaluations of high school cooperative education found that former co-op students report favorable opinions of the experience, believing that the programs helped them to apply themselves in school, remain enrolled until graduation, quickly secure full-time jobs after graduation, and find jobs consistent with their career interests (13). One study compared the quality of co-op work assignments with part-time jobs that students arrange on their own and found that the co-op students considerably more often reported having jobs that required the application of academic skills, offered opportunities to learn new things, involved contact with adults, and provided good supervision. The studies that examined the subsequent employment and earnings of co-op students relative to similar non-co-op students have found a mix of positive, null, and small negative results. The largest earnings benefits accrued to students who were employed by their former co-op employer.

The review by Stern and associates concludes with their inferences about how to maximize the positive effects of high school co-op. These include having written agreements between the school and the employers that specify the responsibilities of each; using a written training plan for each student specifying the progression of activities and objectives to be achieved; and having a co-op coordinator in each school with responsibility for finding suitable job assignments, orienting students, negotiating training plans, and monitoring the students' workplace activities (13).

The U.S. General Accounting Office examined high school and two-year-college cooperative education programs nominated as being of "high

quality" by researchers and practitioners (16). GAO identified several program characteristics that were common in the programs and appear to have been important for success. The characteristics are participation by employers who are willing to providing training in occupations with promising career paths, screening of applicants to assure that they are prepared to meet employers' expectations, training plans with ambitious and specific learning objectives, and, for high school students, close monitoring of the worksite activities by school representatives. GAO also speculated that skill standards and certification, which are not common in cooperative education, would provide useful targets for the training plans and assessment of student progress.

Barriers to expanding cooperative education that were identified by the GAO study include parents' fears that co-op participation would hurt their children's chances of college admission, employers' lack of knowledge about cooperative education, insufficient school staffing, and difficulties in transportation to and from the worksites. Despite these considerations, GAO concluded that "high-quality cooperative education programs show strong potential to enable the United States to better compete in global markets by improving work-force preparation and facilitating youths' transitions from schools to work" (16).

A recent study interviewed employers who had participated in 18 high school work-based learning programs, most of which used the co-op model. The study found that the employers were quite pleased with the students and thought that almost all had been productive workers (7). The employers participated partly as a community service, partly as a way to recruit permanent employees, and partly as a way of filling low-paid part-time positions with good workers.

The estimated effects of high school co-op on employment and earnings have varied considerably from one evaluation to another, probably because the quality of the high school programs varied considerably. High school co-op programs have a widespread reputation for varying from well-planned learning sequences for conscientious students to hastily arranged escapes for students unengaged in school. In addition, it is possible that the program elements of high school cooperative education are not powerful enough to have consistent effects on the students' subsequent labor market success.

The College Level

One of the most dramatic changes in American education over the past three decades has been the sevenfold expansion of enrollment in two-year colleges, which now totals more than 5 million students (18). Despite this trend, most research on cooperative education at the postsecondary level has been in four-year colleges. Those studies have repeatedly found that participation in college-level cooperative education is associated with the establishment of more realistic career goals, higher academic achievement, increased self-confidence, more "savvy" about the world of work, and better job-seeking skills (23). An estimated 40 percent of college co-op graduates take jobs with their former employers, and co-op students tend to have somewhat higher starting salaries in their first job after graduation (23). As with most evaluations of work-based learning, these probably have not fully accounted for initial differences in the co-op and non-co-op students.

Co-ops and internships that combine classroom learning with real-world experiences were among the most appealing features to students when choosing a college or university. —Finding from a survey of 10,000 high school junior and seniors (8).

A study of students at four two-year colleges found that those in cooperative education reported considerably more learning opportunities in their work experience than those in non-co-op jobs, even when the comparisons were limited to jobs in the same occupations (15). For instance, co-op students more frequently reported that their job was related to their career interests (74 percent vs. 43 percent), that the job was challenging (74 percent vs. 55 percent), that the job provided chances

to apply what they were learning in school (69 percent vs. 45 percent), and that they were learning things that would be useful in their future work (75 percent vs. 55 percent). The co-op students, however, also reported making an average of one dollar per hour less than did other college students holding part-time jobs.

A 1977 congressionally mandated national study of cooperative education programs at two-year and four-year colleges found that co-op and non-co-op students had similar background characteristics; co-op students and employers expressed strong support for the co-op program; the co-op jobs of students helped pay their college expenses; and more co-op students than non-co-op students reported acquiring job skills as they progressed through college, securing jobs in the field of their training and consistent with their career interests, avoiding unemployment, and having greater projected life-time earnings (22).

OTHER MODELS

The following three models differ more from youth apprenticeships than do clinical training and cooperative education. Still, they offer instructive examples with respect to coordination, settings, and screening.

School-to-Apprenticeship Programs

In school-to-apprenticeship programs, high school seniors in vocational education programs participate part time in union- and employer-run apprenticeship programs. The school program is rarely altered, but a school coordinator usually screens students for maturity and conduct. The students often earn some credits toward graduation and are paid at the same rate as full-time participants in the apprenticeships.

School-to-apprenticeship programs concentrate on occupational development and production in the workplace. There is generally little coordination between the school-based and work-based learning except that most students take vocational education courses in the field of their apprenticeship. The work-based learning is usually more intensive than in the other models, running 20 to 30 hours per week.

In 1977 and 1978, the U.S. Department of Labor initiated eight school-to-apprenticeship demonstrations, which were variously referred to as New Youth Initiatives in Apprenticeship or Youth Apprenticeship Projects. The evaluation was limited to the first three cohorts of students, who were compared with a group of similar students. The apprenticeship students were generally quite enthusiastic about the program. Employers were also quite satisfied and their participation increased over each of the three successive years. About half of the participating students left the apprenticeships within a year following high school graduation—well before completion. Participating students had more stable employment and reported higher job satisfaction than the comparison group, although they earned about the same wages (21).

School-Based Enterprises

In school-based enterprises the students work part time in school businesses that produce goods or services for people other than the students involved. The activities have included manufacturing, auto repair, construction, publishing, retailing, and child care. Students acquire the necessary occupational and entrepreneurial skills in elective classes. The students usually start in entry-level positions and may move up into more skilled positions and the managerial ranks. Participants earn credits toward graduation and sometimes are paid.

School-based enterprises focus on academic reinforcement, some career exploration, and occupational development. Coordination is facilitated by the school's control over both the classroom courses and the work-based learning in the enterprise, by the location of the enterprise on the school grounds or nearby, and by the fact that the teachers of the occupational courses often supervise the enterprise. Students usually work in the enterprises during their later years of high school or during college. Enterprises give the students more opportunities to assume managerial or

entrepreneurial roles than they have in regular places of employment.

Stern and associates recently reviewed the literature on school-based enterprises (1994) and conducted 16 case studies. They found many anecdotal accounts of how students became more engaged in school, extended their academic skills by applying them in the enterprise, and acquired basic work habits and specific occupational skills. Many enterprises were found to have endured for years, although others did not. The review, however, did not find any rigorous evaluations of the effects that the programs had on the students' academic and occupational development, on their subsequent schooling, or on their employment and career success (14).

There have been cases in declining communities where the school-based enterprises have taken over failed stores and run them successfully, to the delight of the townspeople who were saved long drives to distant shops (14). In other cases, the enterprises have sold services that had previously not been offered by private businesses or public entities. But usually the enterprises sell goods or services that compete with local businesses, and the business owners have sometimes complained of unfair competition because the enterprises use public buildings and personnel, and sometimes unpaid student labor. Strategies that have been used to minimize complaints include seeking the support of local business associations, operating on a small scale, not advertising, and setting prices that do not undercut competitors (14). If school-based enterprises were to become widespread and to involve substantial proportions of high school students, it is doubtful that those strategies would suffice.

Career Academies

In career academies, high school students attend a small career-oriented "school within a high school." Each academy focuses on one cluster of occupations, integrating college-prep academic education, occupational preparation, and career orientation. The program of study is developed with the assistance of local employers. Employees from nearby companies serve as speakers, field trip hosts, and sometimes as mentors for the young people. Coordinated part-time jobs and summer jobs may be offered, usually in the senior year. Some graduates directly enter employment and others continue on to postsecondary education.

Career academies were developed primarily to serve economically disadvantaged or poorly performing students, and they continue to be targeted at those groups. The academies concentrate on enhancement of academic achievement, exploration of careers, and development of occupational skills. Career academies are increasingly adopting work-based learning, but it is often limited to a few weeks during the school year or to a summer job.

The first career academy was started in the late 1960s. There has been modest growth since then, and in 1992 scholars estimated that there were about 150 in the country (12).

A 1992 review of four evaluations of 14 career academies found mixed results. The dropout rates at the career academies were 7 to 15 percentage points less than the rates for the matched comparison groups, and there was some evidence that the lower dropout rates resulted from better attendance and grades. A year or two later, however, there was little or no difference in the percent of students employed, although the largest study did find that the employed academy graduates worked an average of 3 to 4 hours per week more than the employed comparison students. Two evaluations found that academy graduates were much more likely to be enrolled in postsecondary education, one found them much less likely to be enrolled, and the fourth found no difference (12).

CONCLUSION

Prior models of work-based learning have motivated students, pleased employers, and often had small positive effects on grades, graduation rates, and postsecondary enrollments. Their effects on early employment have been more mixed, and their long-term effects on employment and career satisfaction have not been assessed.

The youth apprenticeship model that is to be used in STWOA is more ambitious, coordinated, and sustained than prior models of work-based learning. These differences make the work-based learning component of STWOA potentially more effective than prior models. The focus is not just on training, but on the broad development of young men and women. The work-based learning is not just for a year or two, but is to progress over several years. And the work-based learning is to be coordinated with several enhancements in schooling.

The differences between the youth apprenticeship model and the prior models also present daunting challenges to the implementing organizations. Ambitious goals are more difficult to achieve than modest ones. Comprehensive systems are more expensive to operate than simple and short programs. The extent of coordination that STWOA calls for between members of the partnerships, between academic and occupational instruction, between school-based and work-based learning, and between high schools and postsecondary institutions is probably unprecedented in the history of American education and training programs.

Can the states and local jurisdictions meet these challenges? Probably not on their own, but if schools join in strong partnerships with American business and labor, it might be possible.

REFERENCES

1. Bragg, D.D., and Hamm, R.E., *Linking College and Work: Exemplary Practices in Two-Year College Work-Based Learning Programs* (Berkeley, CA: National Center for Research in Vocational Education, University of California, 1995).
2. Bragg, D.D., Hamm, R.E., and Trinkle, K., *Work-Based Learning in Two-Year Colleges in the United States* (Berkeley, CA: National Center for Research in Vocational Education, University of California, 1995).
3. Burton, L., and Celebuski, C., "Technical Education in Two-Year Colleges," (Washington, DC: National Science Foundation, 1995).
4. Corson, W., and Silverberg, M., *The School-to-Work/Youth Apprenticeship Demonstration: Preliminary Findings* (Princeton, NJ: Mathematica Policy Research, 1994).
5. Goldberger, S., Kazis, R., and O'Flanagan, M.K., *Learning Through Work: Designing and Implementing Quality Worksite Learning for High School Students* (New York, NY: Manpower Demonstration Research Corp., 1994).
6. Jobs for the Future, *Promising Practices* (Boston, MA: 1995).
7. Lynn, I., and Wills, J., *School Lessons: Work Lessons* (Washington, DC: The Institute for Educational Leadership, 1994).
8. Maguire Associates, Inc., "Student Priorities in Picking a College," *America's Best Colleges: 1994 College Guide*, M. Elfin (ed.) (Washington, DC: U.S. News and World Report, 1993).
9. Pauly, E., Kopp, H., and Haimson, J., *Home Grown Lessons: Innovative Programs Linking Work and High School* (New York, NY: Manpower Demonstration Research Corp., 1994).
10. Rogers, A., et al., *Learning from Experience: A Cross-Case Comparison of School-to-Work Transition Reform Initiatives* (Washington, DC: National Institute for Work and Learning, Academy for Educational Development, 1995).
11. School-To-Work Opportunities Act of 1994, May 4, 1994, Public Law 103-239.
12. Stern, D., Raby, M., and Dayton, C., *Career Academies: Partnerships for Reconstructing American High Schools* (San Francisco, CA: Jossey-Bass, 1992).
13. Stern, D., et al., *School-to-Work: Research on Programs in the United States* (Washington, DC: Falmer Press, 1995).
14. Stern, D., et al., *School-Based Enterprise: Productive Learning in American High*

Schools (San Francisco, CA: Jossey-Bass, 1994).

15. Stern, D., et al., "Quality of Work Experience as Perceived by Two-Year College Students in Co-op and Non-Co-op Jobs," *Journal of Cooperative Education* 28(1):34-47, 1992.
16. U.S. Congress, General Accounting Office, *Transition from School to Work: Linking Education and Worksite Training*, GAO/HRD-91-105 (Washington, DC: August 1991).
17. U.S. Department of Education, Office of Educational Research and Improvement, Office of Research, *National Assessment of Vocational Education: Final Report to Congress, Volume III, Program Improvement: Education Reform*, prepared by D. Boesel, M. Rahn, and S. Deich, OR-94-3502-III (Washington, DC: U.S. Government Printing Office, July 1994).
18. U.S. Department of Education, Office of Educational Research and Improvement, National Center for Education Statistics, *Digest of Education Statistics*, 1993, NCES 93-292 (Washington, DC: U.S. Government Printing Office, October 1993).
19. U.S. Department of Labor, *What's Working and What's Not* (Washington, DC: U.S. Department of Labor, 1995).
20. Vickers, M., Hart, R., and Weinberg, A., Technical Education Research Centers (TERC), "The Work-Based Learning Experiences of Students in Two Boston-Based Youth Apprenticeship Demonstration Sites," unpublished contractor report prepared for the Office of Technology Assessment, U.S. Congress, Washington, DC, June 1995.
21. Williams, G.D. et al., *Report on Impacts: Study of New Youth Initiatives in Apprenticeship* (Washington, DC: CSR Incorp., 1981).
22. Wilson, J.W., "Excerpts from the Commentary," *Cooperative Education—A National Assessment: Executive Summary and Commentary* (Boston, MA: National Commission for Cooperative Education, undated).
23. Wilson, J.W., "Research in Cooperative Education," *Journal of Cooperative Education* 24(2-3):77-89, winter-spring 1988.

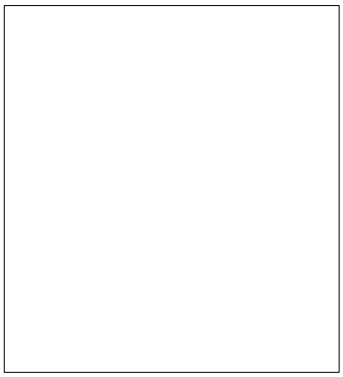
Employer Participation in Work-Based Learning

6

Because the eventual success of STWOA depends on recruiting large numbers of employers to provide work-based learning placements for students, Congress asked OTA to investigate how employers can be encouraged to provide those work-based learning experiences. This chapter reports on the current growth rates of their participation in work-based learning and on the factors affecting their willingness to participate.

Unlike school-to-work systems in several European countries, STWOA is notable for providing no financial incentives and few other direct inducements for employer participation. OTA investigated whether sufficient incentives already exist or whether policymakers need to alter the incentive structure.

The first section describes the data sources on which the chapter is based. The second section considers the rate at which employer participation in work-based learning is growing and analyzes the strategies being employed to recruit employers in two cities, Boston, Massachusetts, and Kalamazoo, Michigan. The third section focuses on one city, Cincinnati, Ohio, where work-based learning for postsecondary students has successfully gone "to scale," and asks whether this experience could be replicated elsewhere and at the high school level. The fourth section considers the benefits to employers of participating in work-based learning programs, and the fifth section considers disincentives to participation. A final section summarizes the main findings of the chapter.



BOX 6-1: OTA's Employer Survey

OTA's telephone survey of employer participation in high school work-based learning was conducted in March and April 1995 A sample of 15 work-based learning programs in 10 states was selected through a two-step process from all programs in the country known to conform generally with the definition of youth apprenticeship discussed in chapters 1 and 5. First, 21 work-based learning sites exhibiting diversity by the age of the work-based learning program, duration of students' work experience, type of entity coordinating the work-based learning, number of student participants, urbanicity, and type of industry predominating in the community were identified, From this group, 15 sites were chosen where the program coordinator reported in a telephone interview that the work-based learning program Involves a progression of work experiences spanning two or more grades, requires work plans that detail a student's planned work experience, provides at least 50 hours per year of work-based learning experiences, requires a designated school or workplace mentor or supervisor, and is sponsored at least in part by a school or school district, In line with these criteria and comments of the coordinators, 10 of the sites were classified as youth apprenticeships, 3 as career academies, and 2 as "other"

Stern estimated that no more than a few hundred such youth apprenticeships and career academies existed in 1992-93 (46), Therefore the OTA sample probably includes a significant proportion of all the STWOA prototypes in the country with two or more years of operating experience,

The programs that were selected and the total number of employers that were involved, as reported by the coordinators, are shown in table 6-1, The date shown is the date reported by the coordinators as "when the program began, " In some cases, the date is probably when the host institution was established

For each program, interviews were conducted with the coordinator and a minimum of five employers nominated by the coordinator, Information was obtained from both groups of respondents about the community context; the numbers of students and employers involved in different types of work-based learning activities today, three years ago, and planned for 1995-96; strategies for recruiting employers; and the factors affecting employers' decisions to participate, In addition, employers were asked about the characteristics of their company and the likely effectiveness of alternative policies of inducing employer participation with external incentives,

The survey was administered to 86 employers in the 15 school-to-work transition programs. Fifty-four of these employers were participating in one of the programs at the time of the interviews, 19 were former participants, and 13 were once invited but refused to participate, The sample includes a range of employers of different sizes in different industries.

SOURCE: Office of Technology Assessment, 1995, based on reference 23,

DATA SOURCES

The analyses of employer participation in the chapter are based on data from several different sources. One is an OTA telephone survey of employer participation in work-based learning in 15 communities, the second is OTA case studies in three cities, and the third is results from existing national and regional employer surveys, case studies, and focus-group research.

OTA's survey differs from most previous surveys in that it included both participating and nonparticipating employers and was designed to compare the relative importance of different factors influencing employers' decisions to participate in work-based learning. The telephone survey is described in box 6-1, and the work-based learning programs that were surveyed are listed in table 6-1. Because the sample of communities and

TABLE 6-1: School-to-Work Transition Programs in OTA's Survey

Program and community	Year "program" began	Number of employers participating in 1994-95
Pickens County Youth Apprenticeship (Easley, South Carolina)	1992-93	80
Fox Cities Education for Employment Council (Appleton, Wisconsin)	1992-93	30
Southern Maine Region Youth Apprenticeship Program (Cumberland County, Maine)	1992-93	24
York County Area Vo-Tech (York County, Pennsylvania)	1992-93	14
Industrial Modernization Center (Lycoming County, Pennsylvania)	1991-92	23
Pasadena Graphic Arts Academy (Pasadena, California)	1991-92	6
Oakland Health and Bioscience Academy (Oakland, California)	1990-91	150
Career Partners, Inc. (Tulsa, Oklahoma)	1989-90	14
Kent County Technical Center (Kent County, Michigan)	1989-90	2,070
Baltimore Academy of Finance (Baltimore, Maryland)	1988-89	35
Education for Employment Consortium (Kalamazoo, Michigan)	1986-87	792
Partnership Project (Portland, Oregon)	1984-85	30
Academy of Finance (New York, New York)	1982-83	50
Dauphin County Technical School (Harrisburg, Pennsylvania)	1970-71	43
Calhoun Area Technical Center (Battle Creek, Michigan)	1970-71	53

SOURCE Office of Technology Assessment, 1995, based on reference 23

employers is small, the results should be considered tentative.

OTA's case studies of work-based learning were conducted in Boston, Cincinnati, and Philadelphia. These were selected because of the substantial success that has apparently been achieved in each city in recruiting employers for work-based learning. Kalamazoo was studied using existing case study materials and a telephone interview with the director of the program (24,41).

The chapter also draws heavily on four other studies of employer involvement in school-to-work transition programs:

1. Lynn and Wills of the Institute for Educational Leadership surveyed 224 employers participating in cooperative education in 18 different high schools in six metropolitan areas across the country (34).
2 Decision Information Resources (DIR) surveyed 70 employers in Texas who are involved in workforce development programs involving high school youth (48,49).
3. Zemsky of the Center for the Educational Quality of the Workforce conducted eight focus groups of employers in a cross section of cities across the country; these employers were asked about their attitudes toward youth and youth apprenticeships (54).
4. The Manpower Research and Development Corporation (MRDC) interviewed the program staff of 15 school-to-work transition programs about their experience with employer recruitment and reported the results as part of a larger evaluation (40).

Each of the studies has important limitations. All of the survey samples are small, so that care must be taken not to ascribe importance to small differences among groups. None of the studies includes comparable samples of both participating and nonparticipating employers. Some studies focus on only one type of work-based learning, while others cover several types. One is limited to a single state, while the others are based on sites from across the country. None is based on strati-

fied, randomly selected samples of employers, so the results are not statistically representative. Nevertheless, many of the survey questions are similar among the studies, and where there is overlap, the results are very similar. This consistency allows for additional confidence in the chapter findings despite the limitations.

The study by Zemsky has shown that nonparticipating employers' attitudes toward work-based learning may be very different from those of participating employers (54). In that study, employers in a cross section of eight large and small communities across the country with little or no experience with work-based learning were brought together in focus groups to discuss their attitudes toward hiring youth and participating in youth apprenticeship programs. Their views about young people, the bureaucracy of school systems, and the potential value of participating in work-based learning were much more negative than those expressed by employers in OTA's survey and in the other studies, which primarily questioned participating employers. The employers who took part in Zemsky's study were openly angry about the lack of discipline and self-control among youth and essentially had no interest in participating in work-based learning programs.

How can this gulf in attitudes between participating and nonparticipating employers be explained? One possibility is that once employers become involved in work-based learning, their perceptions change. Another view is that the gulf in attitudes reflects real differences among employers that are essentially unchangeable (54). Neither case inspires much optimism that the future recruitment of employers will be very easy.

GROWTH OF EMPLOYER PARTICIPATION

STWOA aims to expand business participation in work-based learning to the point that all students choosing to participate in school-to-work programs would have work-based learning experiences. If a sizable proportion of the high school student population is to be served, hundreds of thousands of new employers must be recruited.

STWOA's principal strategy for employer recruitment is to encourage the formation of partnerships among schools, employers, community colleges, and other community institutions at the state and local levels (see box 6-2). These partnerships are intended to engage employers in collaborative efforts to initiate and develop school-to-work transition systems so that they feel they have an important stake in the outcomes. The connecting activities called for in the legislation are intended to provide employers with any assistance they may need to participate in the partnerships and to coordinate efforts between school systems and employers. The STWOA legislation specifically prohibits the use of federal funds for wage incentives or the employment of work-based learning students as substitutes for incumbent workers.

The rates at which student and employer participation have grown in communities where such partnerships have been formed were investigated in OTA's survey by asking the 15 program coordinators about changes in the number of employers and students participating in their prototype school-to-work transition systems over the past two school years.

The main finding is that the median growth rate of employer participation in the 15 programs in the past two years has been *six employers per year.* In 1992-93, the median number of employers involved in the 15 programs was 23 and in 1994-95 the median was 35 employers.

This increased employer participation translated into a median increase of *11 students per year* in the 15 programs, from a median of 80 students per program in 1992-93 to a median of 100 students per program in 1994-95.[1] This is a growth rate of about 14 percent per year. With these small starting sizes and rates of growth,

[1] While the median increasd by 10 students per year, the actual median increase per program was 11 students per year.

BOX 6-2: Employer Recruitment Strategy of STWOA

STWOA's main strategy for employer recruitment is encouraging the formation of partnerships among schools, employers, community colleges, and other community Institutions at the state and local levels, to initiate and develop school-to-work transition systems The employer-educator partnerships are intended to evolve into mutually rewarding relationships. Some hope that a long-term by-product of these relationships will be broadened mutual understanding on the part of the business and the education communities.

Techniques for building these partnerships and for recruiting employers used by school systems and connecting organizations include informing employers of the economic benefits of participation, exercising moral suasion, generating peer pressure among employers to become involved, and appealing to the collective interests of employers.

The connecting activities that are required by the legislation are intended to support the formation of these partnerships by providing employers with a number of services. These services include assistance to employers in planning a work-based learning program, in training mentors and supervisors to work with students, in matching students with the work-based learning opportunities of employers, and in helping students who have completed their program to find jobs or to continue their education

The only other provisions in the legislation that bear on employer participation in work-based learning are restrictions against using any STWOA funds for wage subsidies for students or mentors, against using trainees to displace permanent employees, and against providing work-based learning positions when any other employees are on layoff from the company.

SOURCES: School to Work Opportunities Act of 1994, May 4, 1994, Public Law 103-239, and reference 23

many years will be required for school-to-work transition systems to reach substantial proportions of all the students in the school districts in which those systems are located.

These growth rates may accelerate in the future because of the passage of STWOA and state system-building efforts encouraged by it. Seventy percent of the project coordinators in OTA's survey said that employers are "more willing to participate in work-based learning" today than they were three years ago. More than 90 percent of the program coordinators are planning to increase the number of student and employer participants in their programs. The projected increase for 1995-96 is 35 students per prototype, or about three times that prior to STWOA. However, even if this higher rate can be achieved, work-based learning will take many years to reach substantial scale in most communities.

Although the median number of employers per prototype is only 35, the range is broad. Three of the prototypes in OTA's sample reported 150 employers or more, and two had fewer than 20. The remaining 10 are clustered between 20 and 50 employers. Of the three larger sites, one had 150 employers, one had 792, and one claimed more than 2,000 (23).[2]

The program with 792 employers is the Kalamazoo Valley Education for Employment Consortium in Kalamazoo County, Michigan. This program is described in box 6-3. In this community of nine school districts and one community college, substantial progress has been made in developing a full-fledged school-to-work transition system. The system sequence includes the selection of a career major, preparation of a career plan, traditional vocational education, and several types of work-based learning opportunities.

[2]The 2,000 employers were reported for the Kent County Technical Center; this number includes employers who have agreed to provide work-based learning experiences but are not yet doing so.

BOX 6-3: Kalamazoo Valley Education for Employment Consortium

In 1985, nine school districts in Kalamazoo County, Michigan, the local community college, and the intermediate school district formed the Kalamazoo Valley Education for Employment Consortium (EFE) to help students maximize their employment potential and to increase the contribution of education to the economic development of the county. The EFE Consortium was initially created to coordinate vocational-technical education, but has expanded into a school-to-work transition system of integrated academic and career preparation activities extending from elementary school through 12th grade. The system is organized into 15 "career clusters, " each with its own business and industry advisory committee,

EFE allows any student in any school the option of attending any career preparation programs in any of the other schools. In 1994-95 there were 3,965 students in grades 11 and 12 in the nine school districts. Over 2,241 of these students participated in EFE activities in 1994-95, which is an increase of 303 since 1992-93 and 452 since 1990-91.

EFE provides students with a progression of career development and program choices within the overall system. The system components include:

- Career guidance—Major emphasis is placed on career guidance, which starts with career awareness activities in elementary school. In the 8th grade, guidance counselors meet with students to help them develop a four-year Educational Development Plan (EDP), which the students update annually until they graduate. Every 8th grader is also given the opportunity to visit the local community college (Kalamazoo Valley Community College), where they learn about broad career alternatives from faculty and business and industry representatives. The counselors receive extensive training in career counseling and meet together monthly as a single group across the nine school districts to discuss problems and issues,
- "Mentorship''---In the 10th grade, students have the opportunity to job-shadow for a half day with a volunteer from a local company. By the end of the 10th grade, students choose a career cluster as part of their EDP. Growth in this component of the EFE program has reached the point where 757 students, or about 45 percent of all 10th grade students in the county, had mentorships in 1994-95.
- Worksite-based education—Over 216 students participated in worksite-based education programs in 1994-95. These programs, which start in the 11th grade, are conducted at the site of a local employer. Programs were offered in health, law enforcement, hospitality, and plastics during 1994-95, In 1995-96, a new program will be added in paper technology. The model for these worksite-based programs is provided by the Health Occupations. In the Health Occupations, classroom space and supporting instructors are provided by the Borgess and Bronson Hospitals, but the lead instructors are selected and trained by EFE. The first year combines two hours per day of intensive academic study and core skills learning with ten job-shadowing experiences. The academic subject matter is taught to emphasize health applications—for example, each physiological system studied (the circulatory system) is accompanied by training in a diagnostic procedure (taking blood pressure). In the second year, students choose a more specific occupational area within the health field. They spend three days a week working for an employer in an unpaid, year-long externship and two days a week in classes at the offsite facility. Students may then chose to continue on for a third year at the postsecondary level.
- Cooperative education—Approximately 160 of the 1,887 students enrolled in school-based, career-technical education programs participate in paid, cooperative education with 102 different employers in 1994-95 in grades 11 and 12. Most of these are technical programs, including tech-prep options that allow students to continue with their career preparation at the postsecondary level.

(continued)

BOX 6-4: Cooperative Education in Two-Year Colleges in Cincinnati

Cooperative education in Cincinnati was begun in 1906 by the dean of engineering at the University of Cincinnati. It spread to the Ohio College of Applied Science (OCAS) in 1937 and to Cincinnati State and Community College in the late 1960s. For students in the associate degree programs of these two institutions, participation in co-op is required. There are two patterns: the "alternating model, " in which a student goes to school for a 10- to 13-week term and then works for an employer for the same length of time, repeating the cycle two to six times, and the "parallel model, " in which the student splits the day between school and work.

Co-op is ingrained in the culture of the colleges, employers, and community. "They have had close to 100 years to practice, " says one college coordinator, "and consequently the community is used to the Idea. " The Cincinnati economy is robust and diversified, but retains a strong engineering and manufacturing base.

Many employers in Cincinnati view co-op as a major way of "growing their own new people. " In the words of one manager, co-op helps companies avoid "hiring mistakes" and teaches students the technical knowledge and work skills specific to a business. Co-op placements improve students' resumes and enable students see first hand whether they like the companies. Many companies in Cincinnati are so eager to get co-op students that they aggressively recruit them on the college campuses.

Employers know that if they do not provide good-quality jobs with good learning opportunities, they will not be able to compete for the best students. The students learn where the best placements are by talking among themselves. The community college coordinators know that if they do not provide students who are well prepared, the employers will rapidly lose interest.

Employers tend to hire their co-op students as permanent workers when they graduate. More than 93 percent of OCAS students have found employment within 10 weeks of graduation, most of them with their co-op employer. Based on the size of graduating **classes** and the labor market, a plausible estimate is that co-op students account for about one-third of all new hires at the subbaccalaureate level in the Cincinnati area. In many companies, a substantial proportion of all employees are former co-op students. As a result, most people understand and are familiar with co-op—and this familiarity helps to perpetuate the demand for co-op students.

Co-op is sustained by an informal culture of close working relationships between the employers and college coordinators. They stay in constant touch with each other over issues of screening and matching students for placements, the changing needs of employers, the progress of individual students, and the need for changes in the college curriculum.

This whole system is maintained without wage subsidies or any other inducements for employers, and without any formal or regulatory apparatus, such as formal contracts, skill standards, or a local regulatory organization. The only external incentive that is operating benefits the colleges rather than the employers; state policies allow colleges to continue receiving state formula aid while students are at the worksite. That is the greatest lesson of the Cincinnati case: that work-based learning can be accomplished at the post-secondary level, under the right conditions, without external incentives for employer participation. These conditions are a strong commitment to high-quality occupational preparation by the educational institutions; a stable funding source for the activities of the co-op coordinators; a parallel commitment by employers, particularly when they are committed to "grow your own" programs; and a consistency between the work-based and school-based components created by ongoing interaction between educators and employers.

SOURCE Off Ice of Technology Assessment, 1995, based on reference 21

Although 1,271 students and 792 employers in the Kalamazoo area were involved in some form of work-based learning in 1994-95, only about 312 of these students and 180 of the employers were participating in cooperative education or what are called externships, where an appreciable amount of time is spent in workplaces. These 312 students constitute only 7 percent of all 11th- and 12th-graders in the county. Most of the other students and employers were involved in job-shadowing experiences that occur in the 10th grade and last for only a few hours (see box 6-3).

Much of the numerical growth in employer involvement in work-based learning in Kalamazoo over the past two years—from a total of 403 employers in 1992-93 to 792 in 1994-95—has been in these job-shadowing experiences. The number of outside employers involved in the externships and cooperative education has remained about the same or increased slightly.

A total of four full-time-equivalent staff members are employed to recruit employers for both the job shadowing and externship activities. All of the student placements in these externships are unpaid (27).

Another example of a school-to-work transition program that has achieved substantial success in recruiting employers for work-based learning is the well-known ProTech Youth Apprenticeship program in Boston, Massachusetts. Since the 1970s, the Boston Private Industry Council (PIC) has created the Boston Jobs Collaborative and the Boston Compact, served as the governing board for the administration of Job Training Partnership Act programs in the city, and launched a number of citywide human resources development strategies. The PIC launched ProTech in 1991 and has worked aggressively ever since to expand it (23). ProTech started with five employers in one sector (all hospitals) and 75 students. By 1992, the program had gained only one employer, but the number of students had increased to 108. By the 1994-95 school year, ProTech had 21 employers in three industry sectors (health, finance, and utilities and communications) employing 375 students. The overall average growth rates for participation between 1992 and 1994 were therefore 7.5 employers per year and about 135 students per year. ProTech's goal is to increase the number of participating employers to 100 within three or four years (23).

Most of the employers involved in ProTech are large, so the number of students placed with each additional employer has been considerably greater than average. Progress in increasing student involvement for a new ProTech program in environmental services has been slower because the companies are small and each takes only one student. Despite ProTech's fast growth, the 375 students currently receiving work-based learning represent only 6 percent of the 6,600 juniors and seniors in the Boston public high school system (8).

The recruitment of employers for ProTech has required considerable effort. Employers rarely volunteer to participate; they have to be persuaded to do so. The PIC's industry coordinator, who is primarily responsible for employer recruitment, is a retired banker, whose private-sector background gives him influence with employers. Fourteen "career specialists" spend part of their time assisting the industry coordinator with employer recruitment. The career specialists also coordinate student placements with participating ProTech employers, visit each student regularly, and provide troubleshooting and technical assistance.

Recruitment initially involves meeting with the chief executive officers of a selected group of companies in an industry sector and familiarizing them with the ProTech program. These meetings are typically followed by meetings with individual companies to answer questions, persuade, obtain commitments to participate, and agree on the number of slots to be provided. In recruiting employers, the PIC draws on the relationships that it has built with employers through the Boston Compact and other initiatives. Despite these contacts, ProTech has needed at least the equivalent of one full-time employee—if not more—to recruit the 7.5 new employers per year.

To determine the level of effort devoted to employer recruitment in the 15 programs surveyed by OTA, the coordinators were asked to report the total amount of staff time spent on employer recruitment in full-time-equivalent (FTE) staff

years. Not including the Kalamazoo response, the coordinators reported using a mean of 0.47 FTE year of staff time per annum to recruit employers (23). Including the 4 FTEs spent on recruiting in Kalamazoo would increase this average to 1.15 FTEs. Eleven of the program coordinators reported spending between 0.2 and 0.8 FTE year of staff time per year on the task.

In summary, an average of at least *one-half FTE year of staff time* has been required in school-to-work programs to recruit half a dozen employers per year and to provide about a dozen additional students with work-based learning experiences. Some programs have done considerably better than this, but some have found it even harder to recruit.

Ultimately, the goal must be to increase student participation in work-based learning. Strategically, there are at least three possible ways to do this: to increase the number of student placements per employer, to increase the number of employers per industry area, and to increase the number of industry areas per school-to-work transition system. Growth may be easier to achieve in some of these ways than in others.

According to OTA's survey, the median number of students per employer in work-based learning programs is two, and this number is apparently difficult to increase even marginally. An average of about two was found by Lynn and Wills for cooperative education (34). MDRC said that most employers take "less than three" placements (40). Attracting larger employers would increase this rate, but the number of larger employers in a community is typically limited. In the OTA survey, employers with more than 300 employees provided placements for an average of 20 students each, whereas employers with fewer than 40 employees placed, on average, only 1.7 students each. But nationwide, fewer than 1 percent of firms employ more than 250 people, and about 50 percent employ between 20 and 250 employees.[3]

"HIGH-QUALITY EQUILIBRIUM" IN CINCINNATI

One city where work-based learning has succeeded, at least at the postsecondary level, is Cincinnati, Ohio. Work-based learning operates extensively and with little government involvement, as described in box 6-4. Both two-year colleges in the area and the University of Cincinnati offer co-op. A large number of employers provide co-op placements. This situation has created a "high-quality equilibrium" in which there is competition among colleges for good work placements and between employers for good students. This competition serves to maintain high standards: The colleges make a great effort to prepare students for the work-based assignments and match them well with employers' needs, and employers strive to provide good learning opportunities.

The Cincinnati experience shows that once cooperative education is up and running, incentives can exist for employers to continue participating, but it does not show how such incentives can be created in areas where work-based learning is currently rare. Once cooperative education becomes a mainstream recruitment method, companies have incentives to continue participating because it provides them with access to a good source of the best students. The fact that cooperative education has continued at a high level for a long time in Cincinnati indicates that these incentives are self-sustaining. The only external support for employer participation is provided by state policies that allow the colleges to receive the same formula aid per student whether a student is enrolled or at the worksite. In effect, this provides state support for the connecting activities of the co-op coordinators in the colleges.

[3] Unpublished data from the Covered Employment and Wages Program of the U.S. Department of Labor, Bureau of Labor Statistics. *Firm* is defined in these data as a set of one or more business establishments sharing a single federal Employer Identification Number.

BOX 6-4: Cooperative Education in Two-Year Colleges in Cincinnati

Cooperative education in Cincinnati was begun in 1906 by the dean of engineering at the University of Cincinnati. It spread to the Ohio College of Applied Science (OCAS) in 1937 and to Cincinnati State and Community College in the late 1960s. For students in the associate degree programs of these two institutions, participation in co-op is required. There are two patterns: the "alternating model, " in which a student goes to school for a 10- to 13-week term and then works for an employer for the same length of time, repeating the cycle two to six times, and the "parallel model, " in which the student splits the day between school and work.

Co-op is ingrained in the culture of the colleges, employers, and community. "They have had close to 100 years to practice, " says one college coordinator, "and consequently the community is used to the Idea. " The Cincinnati economy is robust and diversified, but retains a strong engineering and manufacturing base.

Many employers in Cincinnati view co-op as a major way of "growing their own new people. " In the words of one manager, co-op helps companies avoid "hiring mistakes" and teaches students the technical knowledge and work skills specific to a business. Co-op placements improve students' resumes and enable students see first hand whether they like the companies. Many companies in Cincinnati are so eager to get co-op students that they aggressively recruit them on the college campuses.

Employers know that if they do not provide good-quality jobs with good learning opportunities, they will not be able to compete for the best students. The students learn where the best placements are by talking among themselves. The community college coordinators know that if they do not provide students who are well prepared, the employers will rapidly lose interest.

Employers tend to hire their co-op students as permanent workers when they graduate. More than 93 percent of OCAS students have found employment within 10 weeks of graduation, most of them with their co-op employer. Based on the size of graduating **classes** and the labor market, a plausible estimate is that co-op students account for about one-third of all new hires at the subbaccalaureate level in the Cincinnati area. In many companies, a substantial proportion of all employees are former co-op students. As a result, most people understand and are familiar with co-op—and this familiarity helps to perpetuate the demand for co-op students.

Co-op is sustained by an informal culture of close working relationships between the employers and college coordinators. They stay in constant touch with each other over issues of screening and matching students for placements, the changing needs of employers, the progress of individual students, and the need for changes in the college curriculum.

This whole system is maintained without wage subsidies or any other inducements for employers, and without any formal or regulatory apparatus, such as formal contracts, skill standards, or a local regulatory organization. The only external incentive that is operating benefits the colleges rather than the employers; state policies allow colleges to continue receiving state formula aid while students are at the worksite. That is the greatest lesson of the Cincinnati case: that work-based learning can be accomplished at the post-secondary level, under the right conditions, without external incentives for employer participation. These conditions are a strong commitment to high-quality occupational preparation by the educational institutions; a stable funding source for the activities of the co-op coordinators; a parallel commitment by employers, particularly when they are committed to "grow your own" programs; and a consistency between the work-based and school-based components created by ongoing interaction between educators and employers.

SOURCE Off Ice of Technology Assessment, 1995, based on reference 21

MAJOR BENEFITS INFLUENCING EMPLOYERS' DECISIONS TO PARTICIPATE

While cases such as Boston, Cincinnati, and Kalamazoo indicate that success can be achieved, they do not provide much systematic knowledge of the underlying reasons for employers' decisions to participate in work-based learning. Knowledge of these reasons is needed to develop more effective strategies for expanding employer involvement that can be reliably employed in different community contexts. If strategies cannot be found that are significantly more effective than those currently being employed in most communities, the extent of work-based learning in school-to-work transition systems will remain extremely limited. An important policy issue is whether external inducements beyond persuasion and coordinating assistance will be needed.

A general framework for understanding employers' reasons for participating in work-based learning can be constructed by identifying the benefits of and barriers to participation. Presumably, employers will participate only up to the point at which the costs of overcoming the associated barriers are perceived to be less than the value of the benefits received. In this section, the benefits perceived by employers are analyzed; in the next section, the barriers are considered.

Broadly speaking, work-based learning provides participating employers with two main benefits: to contribute to the improvement of education and the community and to recruit new personnel. Employers' specific reasons for contributing to the improvement of education and the community can range from altruism and philanthropy to public relations or other self-interested goals. In recruiting new personnel, companies may similarly be motivated primarily by their own needs for new workers, or by goals of working collectively with other companies to expand the pool of workers available to their whole industry.

It is important to distinguish among these altruistic, self-interested, and collective motivations for employer involvement in work-based learning because of their implications for the extent to which the government may need to be involved in the development of work-based learning and to provide external inducements to recruit employers on the scale envisaged in STWOA (2). If most employers participate in work-based learning primarily for philanthropic reasons of improving education and the community, the prospects for the future expansion of work-based learning are much dimmer than if they are motivated primarily by collective or self-interested needs for recruiting new personnel.

To gauge the relative importance of these different benefits and motivations, the OTA survey asked current and former employers to respond to a single, randomly ordered list of possible reasons for their participation in work-based learning. (Paraphrased versions of the actual statements are shown in table 6-2.) Employers were asked to respond in two different ways: to select the "strongest benefit" (most important) of work-based learning among all of the factors listed, and to rate each factor as either a "primary benefit," "strong benefit," "minor benefit," or "not a benefit" of work-based learning. The first response method provides the clearest estimate of the relative importance of the factors, whereas the second provides information about secondary choices.

Improvement of Education and the Community

It is often suggested that most employers who work with educators and students do so primarily out of a sense of civic duty (2). Lynn and Wills show that, among employers who are currently participating in cooperative education, more than 70 percent "strongly agree" or "somewhat agree" that they participate in order to perform a community service (34). Pauly and associates reached similar conclusions in MDRC's study of 15 school-to-work transition programs (40). Neither of these studies assessed the relative importance

TABLE 6-2: Benefits of Employer Participation in Work-Based Learning

Benefit	Percent of employers selecting: as a strong or primary benefit	as the strongest benefit
Employee recruitment	**60**	**66**
Concern about current or future skill shortages in industry	85	15
Opportunity to train future employees (for the company)	77	15
Need for higher-skilled entry-level workers	81	12
Current labor shortage	51	10
Opportunity to attract minorities to the company	47	6
Reduced costs from screening of potential employees	39	4
Opportunity to attract young workers for aging workforce	58	3
Opportunity to observe or try out potential employees	60	1
Opportunity to attract women to the organization	42	0
Desire to contribute to effort supported by other employers	62	0
Education and community improvement	**76**	**25**
Concern about the quality of education	77	7
Desire to become involved in school improvement	86	7
Creation of goodwill in the community toward the company	64	4
Opportunity to "network" with schools	73	3
Opportunity to invest in the community	82	3
Contribution to company's positive image in the community	74	1
Other[c]	—	**10**

NOTE: There were a total of 54 usable responses from current employers and 19 from former employers (Percentages may not sum to 100 due to rounding)

[a] The figures shown are the percentages of employers' ratings in which the benefit was selected as being of "strong" or "primary" rather than of "no" or "little" importance to their participation.

[b] The figures shown are the percentages of current and former employers who selected the benefit as the most important to their participation in work-based learning.

[c] Employers could select "Other" rather than a specific item from the list read to them.

SOURCE: Office of Technology Assessment, 1995, based on reference 23

that participating employers place on the community service in comparison with recruitment goals, or explored the underlying motivations of employers for participating.

In OTA's survey, nearly two-thirds chose recruitment goals as their most important reason for participating, while only one-quarter chose educational and community improvement goals. At the same time, about three-fourths said that educational and improvement goals were a "strong" or "primary" benefit of work-based learning, and somewhat fewer said that recruitment goals are a "strong" or "primary" benefit.[4] OTA interprets these two sets of responses to mean that *recruitment is the most important benefit of employers who are currently involved in work-based learning* or have been involved in the past, but that improvement of education and the community also are quite important.

[4] The percentage of $_{\text{employers}}$ rating each of these goals as a strong or primary benefit was measured by computing an index consisting of the total number of factors rated by employers as a strong or primary benefit divided by the total number of ratings.

Employers also report that doing their civic duty redounds to their own interests to a certain extent. Current and former employers believe that their public image and community relations are improved by participating in work-based learning, but they attach much less importance to such benefits than to the more altruistic reasons for participating. This is indicated by the results in table 6-2 showing that 17 percent of companies cited altruistic reasons related to education and the community improvement as the most important benefit of participation while only 5 percent cited "creation of goodwill in the community" and "contribution to the company's positive image in the community."[5] Employers also rated these latter two factors as "primary" or "strong" benefits about half as often as they did the more altruistic reasons for participation.

It is possible, of course, that employers tend to underrepresent their interest in public relations and to overrepresent their altruism when answering a survey questionnaire.

It can be argued that employers' concern about the quality of education and desire to become involved in school improvement are also self-interested. This would be so if they see their involvement as a good way of eventually improving the quality of entry-level workers available to them in the labor market. However, the link between improving schools and actually being able to hire better-qualified workers is long and indirect, and the success would benefit many employers in a community and not just those who participate.

OTA's survey also allows some comparison of the extent to which current and former employers differ in their views of the importance of contributing to the improvement of education and the community. Although the number of former employers in OTA's sample is not large, the data show that former employers consider recruitment goals to be significantly more important than current employers do, and that they rate improvement of education and the community as far less important. Whereas 30 percent of current employers consider philanthropic goals as the most important benefit of work-based learning, only 10 percent of former employers do. This suggests that employers who drop out of work-based learning programs after once participating place somewhat higher priority on the economic benefits of work-based learning for their own company than do employers who continue to provide placements.

There are at least three implications of the finding that self-interested goals of recruitment are more important to employers—but not greatly so—than philanthropic goals of improving education and the community:

1. The finding offers more hope for the future expansion of employer participation than would be the case if goals of improving education and the community predominated. The number of yet unapproached employers who would be willing to participate in work-based learning for philanthropic reasons only is likely to be small, at least relative to the number of employers that will be needed to provide work-based learning to substantial numbers of students. The number who will be willing to participate if work-based learning provides both philanthropic and practical business benefits should be larger.
2. Whether employers view the benefits of personnel recruitment alone as greater than their perceived costs of participation cannot be determined from the OTA survey. If they do not, the only employers who might participate are those who also value the civic improvement benefits of work-based learning.
3. The finding suggests that, initially at least, strategies of employer recruitment should be directed at convincing employers of both the opportunity for personnel recruitment and for contributing to community improvement that work-based learning offers. This dual appeal

[5] An additional 3 percent cited "opportunity to 'network' with schools."

could be one important aspect of "building a partnership" for work-based learning between educators and employers.

Recruitment Needs

Just as employers may have philanthropic or self-interested motives for wanting to improve education and the community, their reasons for recruitment can be either self-interested or collectively oriented, toward expanding the pool of qualified workers available to their industry. The distinction is important because if employers are interested only in recruiting personnel for their own companies, they may be less willing to participate in work-based learning where they are engaged in a cooperative effort.

An example of collective support is the Wisconsin youth apprenticeship in printing. Printing is a large and growing industry in Wisconsin; this growth has created a need for more printing assistants and other technical personnel who can install, operate, and maintain the increasingly sophisticated equipment coming into the industry. In response, leaders in the printing industry formed a consortium involving several companies, local school systems, and community colleges. The companies first established skill standards, identifying the capabilities required to enter the industry. Then the responsibility for providing the training necessary to develop these capabilities was divided up among the companies, school systems, and community colleges involved, so that the supply of trained people and the costs are proportionately shared. The students get to see several companies and colleges in the course of their apprenticeships and the companies get to see many different students. Large companies no longer have to be concerned about lost training costs due to turnover because a sufficient worker supply is maintained within the industry. The collective benefits are clear in this situation, where each company, especially smaller ones, could not support such comprehensive training on its own (53).

Recruiting High-Skilled Workers

Of all the different recruitment factors listed in table 6-2, those concerning current or future skill needs are rated as most important. The four most frequently cited motives were: "concern about future skill shortages in the industry," an "opportunity to train future employees (for the company)," a "need for higher-skilled entry-level workers," and a need to meet "current labor shortage." Three of those factors refer to companies' individual needs for personnel, and the fourth refers to the needs of the industry as a whole. In addition, employers' "desire to contribute to effort supported by other employers" ranked last (it was not selected by any employers). In general, employers apparently see less value in joining with other companies to recruit new personnel for their industry than they do in proceeding on their own.

Some indication of the reason for this finding is also evident in the results in table 6-2. Few employers see the opportunities to screen potential employees or to try them out before hiring them to be important benefits of participation, despite the associated reduction in training costs. More see the opportunities for training future employees and meeting skill needs as the most important benefit. This suggests that reduced training costs, one of the main potential advantages of collective approaches to training, apparently do not figure very prominently in employers' analyses of the benefits of work-based learning. Research might be done on what employers' collection efforts might achieve.

Recruiting Minorities and Women

Only 6 percent of employers cited the recruitment of minorities as being their chief reason for involvement in work-based learning, but more than 40 percent rated such recruitment as a strong or primary benefit of work-based learning. Although no employer rated the recruitment of women as the most important reason for participating in work-based learning, it was rated as a strong or primary benefit by about the same percentage.

Several of the Cincinnati employers interviewed by OTA said that they rely solely on cooperative education for college recruitment of permanent hires, and clearly stated that they use cooperative education for diversifying their work forces. As one Cincinnati employer said, "Co-op gives us the competitive edge in recruiting in that we identify people early on, especially minorities and females: We're going to identify them in their freshmen or sophomore year and not wait. They're not going to be there as seniors to recruit (if we wait)."

Recruiting Low-Cost Labor

Most studies indicate that some employers are motivated primarily by the desire to fill part-time positions at low wages. Lynn and Wills found that more than 25 percent of employers interviewed were "quite forthright" in saying that cooperative education was a way to fill part-time positions with good, low-paid workers (34).

It can also be the case that components of both high and lower quality work-based learning exist side-by-side within the same program. In the lower quality component, students' learning experiences are oriented more to production, while in the higher quality component they are oriented more to student learning and development. Cincinnati provides an example of this. There is some evidence from the OTA case study that the quality of the work-based learning in the "alternating" mode of cooperative education in Cincinnati, where students alternate between school and work from one quarter to the next, is higher than in the "parallel" mode, where students spend half a day in school and half in the workplace. Employers in the parallel mode are more likely to view placements as a source of efficient labor for production, and to provide fewer structured learning experiences. Employers in the alternating mode are more likely to view the cooperative education students as future workers for the company, and to provide them with supporting educational activities and job rotation. In effect, there may be two equilibria alongside each other in Cincinnati, one of higher quality than the other (21).

MAJOR BARRIERS INFLUENCING EMPLOYERS' DECISIONS TO PARTICIPATE

In deciding whether to participate in work-based learning, employers weigh the benefits of participation against the costs of overcoming the associated barriers. These barriers can be clustered into the following categories:

- *economic uncertainty*, attributable to slowdowns in the local economy or changes in a company's business fortunes that limit the availability of jobs;
- *training costs*, which include any student wages paid and the valuation of the time spent by supervisors and mentors planning work-based learning activities and working with the students;
- *organizational resistance* to work-based learning within the company from management or other employees;
- *regulatory restrictions and extra insurance costs*, which include child labor and safety laws and general liability and worker's compensation insurance;
- *lack of support from the work-based learning program* and difficulties in working with the programs and school systems; and
- *inadequate preparation of students* for work-based learning placements.

The main finding from OTA's survey is that all of these barriers are of roughly equal importance to employers. As shown in the right-hand column of table 6-3, none of the six barriers appears to predominate or to be clearly less important than the others. The only possible exception is regulatory restrictions and insurance costs, which were reported as least important by employers.

This finding implies that no policy narrowly targeted at one of these barriers would substantially affect the growth of employer participation in work-based learning. This finding is consistent with the STWOA strategy of expanding employer participation by building partnerships, which in-

TABLE 6-3: Barriers to Employer Participation in Work-Based Learning

Barrier	Percent of employers selecting: as a strong or primary barrier[a]	as the strongest barrier[b]
Economic uncertainty	**23**	**9**
Slowdown in local economy		
Downsizing or restructuring within the company		
Training costs	12	17
Wages of supervisors or mentors to operate a program		
Employee staff time required to plan and start the program		
Loss of newly trained employees		
Student wages paid		
Resistance from within the company	12	14
Lack of top management support		
Opposition of employees		
Opposition of union		
Regulatory restrictions and insurance costs	9	6
Worker's compensation insurance		
Child labor law regulations		
Safety regulations		
General liability insurance		
Lack of support from the work-based learning program	13	23
Lack of technical assistance and troubleshooting support		
Unreliable scheduling of student placements		
Inflexibility of work-based learning program model		
Bureaucracy of school system or work-based learning program		
Poor quality of young workers	9	**16**
Unreliability		
Low skills or productivity		
Other[c]	—	14

NOTE: There were a total of 54 usable responses from current employers and 19 from former employers. (Percentages may not sum to 100 due to rounding.)

[a]The figures shown are the percentages of employers' ratings in which the barrier was selected as being of "strong" or "primary" rather than of "no" or "little" importance to their participation.

[b]The figures shown are the percentages of current and former employers who selected the barrier as the most important to their participation in work-based learning.

[c]Employers could select "Other" rather than a specific item from the list read to them.

SOURCE: Office of Technology Assessment, 1995; based on reference 23..

volves developing several aspects of the relationship between employers and schools over a period of time. States, employers, and school-to-work transition programs in local communities could each take steps to lower some or all of these barriers.

Economic Uncertainty

Economic uncertainty is a barrier to work-based learning when either general economic hard times, falling product demand, or internal changes

(such as restructuring) reduce the possibilities of companies offering work-based learning opportunities to students. Although economic uncertainty is rated in the OTA survey as the chief barrier to work-based learning by only 9 percent of employers, it is rated as a strong or primary factor by more than 23 percent of them (see table 6-3). This is a higher proportion than was reported for any of the five other groups of factors. This implies that economic uncertainty may be a more important secondary barrier to employer participation in work-based learning than all others, in the same way that improving education and the community was found to be nearly as important a benefit of employer participation as recruitment. Employers' ratings of the importance of this factor are likely to vary greatly over time as business conditions change.

The National Center on the Educational Quality of the Workforce found that companies, particularly older and larger ones experiencing the most downsizing, were uninterested in any youth apprenticeship initiative that might divert attention from the immediate task of making their enterprises leaner and more concentrated on their market strengths (54). In the DIR survey, "job availability" was ranked as the most important of the financial barriers (49). In the federal Youth Entitlement Demonstration Program, which guaranteed disadvantaged young people a job if they stayed in school and offered wage subsidies to employers to provide jobs, more than 40 percent of the employers who refused to participate reported that they did so because they lacked jobs (3).

In European countries where large school-to-work systems are part of the "social partnerships" that exist, governments increase subsidies to employers in times of economic downturn, and employers tacitly agree to maintain or even to increase the number of work-based learning placements available at such times (19). In Germany, apprenticeship slots in the *Handwerk* sector are increased when employers in the commercial sector are unable to take as many apprentices (44).

The partnerships between schools and employers encouraged in STWOA could serve similar purposes. Indeed, they have done so in the case of ProTech. When student placements were threatened by hospital restructuring, most of the slots were restored following conversations between ProTech and hospital administrators.

Training Costs

Training costs include the direct costs of wages paid to students during training and the costs of providing them with the training they receive. In the case of work-based learning, these latter costs include the wages paid to supervisors, mentors, and any other employees who spend time planning and managing the work-based learning program or providing instruction.

Supervision Costs

Supervision costs include time spent by supervisors guiding the work of students and time spent by mentors in counseling and assisting the students. The main distinction between supervisors and mentors is that supervisors have responsibility for managing and assessing students' performance as part of the work-based learning program, whereas mentors advise students on personal and job-related matters (27). Often these tasks overlap.

Finding or developing worksite personnel who have the necessary management, teaching, and counseling skills presents a challenge for work-based learning programs (27). Performing these tasks for high school students is very different from working with older entry-level workers, because often the students are being introduced to the adult world and the work of the company at the same time. Conflicts between the production responsibilities of the worksite personnel and the need to train or mentor the students are inevitable (40). Some of these supervision costs may be borne by individual employees. One worksite supervisor interviewed by Policy Studies Associates said that "my boss doesn't pat me on the back," adding that her work with ProTech did not come up in her performance review (23).

Program Start-up and Management Cost

A related category of costs is the time spent by employer staff in planning a work-based learning

program, getting it organized and started, and managing it on a continuing basis. Many decisions have to be made about how students will be selected and matched with positions, what the content of their learning experiences will be, who will be responsible for any instruction that is provided, and how mentors and supervisors will be selected and trained.

Another time-consuming task is developing individual student learning plans, which are used in some programs to structure each student's work-based learning experience and its relationship with school-based activities. The plans typically specify the student's learning objectives and the methods used to assess achievement (27). Each plan has to be tailored to the individual student and the individual employer.

Six participating employers in the Craftsmanship 2000 youth apprenticeship program in Tulsa, Oklahoma, spent more than a year planning and deciding on the core curriculum for a four-year program in machining (40). Early on, the six companies discovered that they had six very different definitions of what they wanted.

ProTech gives potential employers an "employee involvement sheet" that outlines the "baseline" commitment required to implement the program. This minimum, not accounting for any student supervision or mentoring, is estimated to be 65 hours per year of employer staff time.

Student Wages

Student wages are one component of training costs, especially the portion paid during time devoted to learning rather than productive activity. One source reports that the students who are paid receive $5 to $8 per hour (27). Thirty-seven percent of the students served in the 15 programs surveyed by OTA are unpaid (23).

Work-based learning practitioners generally estimate supervision and management cost to be much greater than the cost of student wages. The first indication of this view came from discussions in a focus group of employers involved in several well-known youth apprenticeship projects, which was conducted by the National Alliance of Business (38). The participants reported that the most expensive element of youth apprenticeship was the time supervisors spend planning and the time "front-line workers" spend as mentors for students. OTA was unable to locate analyses based on actual accounting to verify these costs.

Employers in the OTA survey ranked supervisor and staff time as having essentially the same cost as loss of newly trained workers. The employers surveyed by DIR rated student wages as the least important of eight financial costs considered, including supervision and program planning (49). Eighty-six percent of employers in the DIR survey said that student wages were of "little or no" importance to their decisions to participate in work-based learning. In comparison, 60 percent said that supervision costs and time were of "little or no importance." Evaluators of the Department of Labor's In-School Youth Apprenticeship Program concluded that the subsidy of $2,100 per student offered to employers had little effect on their willingness to participate (18). On the whole, employers were more attracted by the program's emphasis on screening and training of entry-level workers than by the subsidies offered.

Effectiveness of Training Cost Subsidies

There is a widely held opinion among experts in the United States that financial incentives intended to reduce training costs would have little effect on employers' participation in work-based learning. To support this conclusion, some observers cite the negative experience with using wage incentives in federal programs to encourage employers to hire out-of-school youths or economically disadvantaged workers (1). As discussed below, however, there are some reasons to be skeptical about this inference concerning work-based learning, and some evidence directly from work-based learning programs suggests that financial incentives may be effective.

Evaluation results generally show that federal tax incentives have not significantly affected the hiring or training decisions of employers (4). Several studies of the Targeted Jobs Tax Credit program show that employers use most of the credits

to pay the salaries of people who would have been hired anyway. According to one of these evaluations, 70 percent of workers for whom credits are claimed would have been hired even without the subsidy (7). In the Youth Entitlement Demonstration mentioned earlier, the proportion of employers willing to provide jobs for disadvantaged youth increased from only 5 percent to 18 percent when the wage subsidy was doubled from 50 percent to 100 percent (3). However, these young people were identified as being disadvantaged by the fact that they were eligible for the subsidies, and may have been stigmatized as a result. The unfavorable response of employers to job applicants who are eligible for government programs serving disadvantaged people has been shown in a controlled experiment in Dayton, Ohio, where employers proved to be significantly less likely to hire disadvantaged workers when they knew that the workers were eligible for a generous wage subsidy (11).

The implications of these evaluation results for work-based learning are unclear. It is dangerous to generalize from employers' responses to wage incentives for one population group and purpose to other populations and purposes. For example, the evaluation evidence suggests that employers' response to wage incentives targeted on disadvantaged groups is related to their unfavorable perceptions of that population. Work-based learning under STWOA is not targeted at disadvantaged students.

The lack of employers' enthusiasm for wage incentives in federal programs may also partly reflect their fears of becoming embroiled in red tape. Once the government grants tax privileges, it insists on inspections and imposes rules that can be cumbersome to deal with. There is some evidence that employers may feel that the complications involved in wage incentive programs make them not worth the effort (4).

There is also some contradictory evidence showing that financial incentives can affect the training behavior of employers. A new evaluation of a state-financed program in Michigan shows that one-time grants to employers for the training of incumbent workers have significantly increased the amount of training provided (26).

The evidence available from research on work-based learning programs is piecemeal but suggests that financial incentives of different kinds may be effective. One source of evidence is the surveys of work-based learning on which this chapter is based. The responses of employers to some questions on these surveys indicate that they might respond to financial incentives for work-based learning. For example, in the DIR survey of employers in Texas, over 89 percent said that "tax credits for training initiatives" would be "likely" or "very likely" to increase youth employment opportunities, and more than 90 percent said that wage subsidies would increase youth employment opportunities. Yet, this was the same group of employers who overwhelmingly responded that student wages were of "little or no importance" to their participation in work-based learning.

In the OTA survey, over 55 percent of employers similarly said that tax incentives for work-based learning would be a "very important or primary" incentive affecting their decisions to become involved in work-based learning, but less than 20 percent rated supervision and mentoring time and student wage costs as having a "strong or major" influence on their decisions to participate (23).

There is also some anecdotal evidence from the policies of school-to-work programs suggesting that financial incentives may have a role to play. Wage subsidies have been used in the Oakland Career Academies program to provide short-term work experiences for students (40). Students are paid with special city funds or, in some cases, funds from the Job Training Partnership Act, so that employers have no wage costs. Employers' responses to the summer jobs component of the Oakland program has been very positive. Most of the employers interviewed by Mathematica Policy Research staff in their current study of youth apprenticeship programs said that they would have offered many fewer or no summer jobs to the students, if they had had to pay wages

TABLE 6-4: Employer Incentives That States Have Implemented or Intend to Implement in Their STWOA Strategies (as of July 1995)

Incentive	Number of states
Training costs	
Provide or support mentor/supervisor training	28
Subsidize incumbent worker training for companies that train youth	9
Provide grants/vouchers for vendor-provided training of youth	5
Support development of facilities to be used by multiple firms	5
Wage incentives	
Allow state tax credit for student wages	5
Establish a training wage	4
Subsidize student wages	4
Allow state tax credit for costs of training students	3
Regulatory relief or insurance	
Grant child labor law exemptions	7
Grant worker's compensation relief	3
Administrative corporation	
Create administrative corporation to pool insurance and worker's compensation, and administer wages	8

NOTE Fifty states plus D C responded

SOURCE Office of Technology Assessment, 1995, based on reference 10

(43). In the Wisconsin youth apprenticeship program in printing mentioned earlier, employers receive a 50 percent wage subsidy, which they may keep or give to the consortium office (53). The Siemens Corporation reduced the number of hours that students in its youth apprenticeship program spend at the worksite when the company learned that an expected grant from the Department of Labor could not be used to defray the cost of student stipends (14). In OTA's survey, nine of the 54 current employers are receiving a student wage subsidy, a subsidy for worker's compensation, or a reimbursement for staff time spent planning or mentoring. And as noted earlier, 37 percent of the students in OTA's sample are unpaid, which is a clear wage incentive for employers (23).

Twelve states are also in the process of implementing wage incentives of different kinds as part of their STWOA strategies. As shown in table 6-4, five states are implementing policies allowing tax credits for student wages. Three states are implementing policies that allow states tax credits for training costs other than student wages—for example, supervisor wages or mentoring time. Four states are directly subsidizing student wages, and four are establishing a training wage (1 O). (Several states are implementing more than one of these wage incentives.)

The fact that 12 states are planning to implement wage incentives indicates that they have concluded that wage costs are significant enough to employers to influence their decisions. Appropriations will be required from state legislatures to implement these financial incentives.

In addition, 28 states are implementing some form of support for supervisor and mentor training, and five states are in the process of establishing grant or voucher programs to enable employers to purchase training for students. Some of these policies may involve financial support, while others may be primarily concerned with technical or other forms of direct assistance. Five other states are planning to support central facilities for training mentors and supervisors (10).

Several states also plan to create shell corporations for the administration of wage payments to students and the pooling of insurance, which could reduce the administrative burdens on employers. These corporations will act like temporary agencies, paying students out of funds received from employers. Any financial incentives would then be deducted from the amounts that employers are billed. Schools are to certify that students are receiving the agreed-upon work-based learning opportunities.

Not counting support for mentor training, a total of 19 states intend to implement at least one of the training cost or wage incentives shown in table 6-4, or to create an administrative corporation.

These new state policies provide an opportunity to obtain reliable information about the effectiveness of incentives for work-based learning. The best way of obtaining this information would be to conduct an evaluation within a common framework, allowing comparisons to be made across the states to the extent possible. Of particular interest are the relative effectiveness and the administrative feasibility of financial incentives directed at supervision costs in comparison to those directed at student wages. Experimental evaluation designs might be difficult to introduce because they would require random assignment of incentives, but the collection of longitudinal information within a common framework of analysis should prove valuable.

Regulation and Insurance Costs

Some employers perceive federal and state child labor and occupational safety laws as barriers to work-based learning. Insurance costs also deter some employers, who expect them to be higher when young people are employed. OTA's survey shows that although these barriers are of great importance to some employers (6 percent selected one of them as being the most important barrier affecting their decision), most employers view them as less significant than training costs and other types of barriers. More than 75 percent of the employers surveyed by OTA said that child labor laws, safety regulations, and insurance costs had no effect on their decisions to participate in work-based learning.

DIR found that employers in Texas are divided over the importance of the regulatory and insurance cost barriers. Approximately half of the employers in the DIR survey rated child labor laws, safety laws, worker's compensation, and general liability restrictions as being "highly" or "moderately important," while the other half said they were of "little or no importance." This is a surprising finding in light of the fact that Texas has been severely criticized in the past for its weak child labor law and enforcement (48).

Child Labor and Safety Laws

Child labor laws aim to eliminate the exploitation of young people and to reduce their risk of injury and death in the workplace. The laws typically restrict the age at which a young person may be employed (generally not under 14 years of age), the hours per week of employment, and the types of work that may be performed. For example, employment in manufacturing may be precluded for persons who are under the age of 15 or up to age 18 where there is dangerous machinery. Child labor laws pose barriers to work-based learning when placements are restricted without good reason or when employers have a mistaken impression that jobs are precluded for people under a certain age when in fact they are not (31). The U.S. Department of Labor and the states are gradually changing child labor and safety regulations to allow more "student learning" and to facilitate reasonable exceptions (49).

The evidence on the importance of child labor laws is very mixed, which is not altogether surprising considering the variety of legislation (9). Some states' rules are stricter than federal laws, while others are more permissive. Enforcement of the law also varies widely between states. Perceptions of these laws may vary between participating and nonparticipating employers; nonparticipating employers in Zemsky's focus groups often commented on the need to change child labor laws, usually to enable young people to work longer hours (54).

Some employers in Zemsky's focus groups also said that the Occupational Safety and Health Act acts as a deterrent to involvement. Companies with more than 11 employees are required to maintain accident records, and those with many accidents may be inspected and fined. From discussions in focus groups of employers, DIR concluded that many respondents who perceived OSHA regulations to be a barrier thought that there were specific provisions for youth under 18 years of age. In fact, neither OSHA nor the Work-

er's Compensation Act contains any specific provisions pertaining to youth (49). In the focus groups, other employers who were more knowledgeable about the law suggested that hiring immature and inexperienced young people would jeopardize the safety of their workplaces and thus increase the employers' risk of being penalized by OSHA. This view reflects a subjective aspect of the regulatory process that may be troublesome for work-based learning: Accidents are deemed to be serious violations of the law when there is "a substantial probability that a death or serious physical harm could result and that the employer knew, or should have known, of the hazard" (49). For example, a co-op supervisor in one program does not refer students under age 18 to an employer who uses any hoisting equipment, because of uncertainty regarding the employer's liability if the student were involved in an accident with such equipment (40).

Worker's Compensation

Some employers worry that their insurance costs will increase if a student is injured on the job. Under the Worker's Compensation Act, insurance premiums are not directly affected by the number of minors employed in the workplace, but there is an "experience modifier" that is heavily affected by frequency of injuries. Rates are computed according to a classification of the work environments and this experience rating. Employers fear that youth are more likely to injure themselves on the job and thus negatively affect the ratings. Small employers are the most concerned because one accident affects their experience rating much more than it does that of a large employer. In these circumstances, the real barrier to work-based learning may not be worker's compensation insurance but employers' lack of knowledge of the actual injury rates for young workers in their industry and state.

General Liability Insurance

General liability insurance covers third parties who are injured on a business' premises or become ill as the result of using that business' product. Of those employers surveyed by DIR, virtually the same number thought that this matter was of no importance as thought that it was extremely important, with little opinion in between. Whether the costs of general liability insurance actually rise when employers participate in work-based learning, or whether some employers simply believe this, is unclear. In the same way that inexperienced workers in an occupation are much more at risk of injuring themselves or others, no matter what their age, it may be that young people are more likely to be responsible for third-party accidents than other workers. The real questions are how insurance companies take the presence of work-based-learning students into account in setting rates, and whether employers know (or are able to find out) what the effects of work-based learning will be on their rates. DIR interviewed a number of insurers in some depth and came to the conclusion that it is difficult to say what their policies are with respect to the presence of youth in the workplace.

The administrative corporations being set up in some states to pool insurance and administer student wages may provide a good solution to these problems. Under an administrative corporation, students are not legally employees of their firms and thus the insurance rates of the firms cannot go up. For any insurance that is needed, the corporation would have the bargaining power to command good rates from insurance companies and the resources to understand the basis for rates. The administrative corporation could also assemble reliable information for employers about child labor law and safety regulations and make it available to employers. Critics of these administrative corporations are concerned that they could, in effect, become suppliers of low-cost temporary help in competition with other temporary help agencies in the community, and other workers in general.

Organizational Resistance Within the Company

The decisions employers make about participation in work-based learning may also be affected by forces internal to companies. Permanent em-

ployees sometimes resent work-based learning students, feeling that they are being undercut by low student wages or that the students are receiving better training opportunities (40). Lack of support from top management can also deter employees from committing themselves to work-based learning.

What stands out in OTA's survey results is that these organizational barriers are much more important to former participants and nonparticipants than to current participants. Only 8 percent of the latter reported them as their chief barrier, compared with 33 percent of former participants and 42 percent of nonparticipating employers. Because of the way the questionnaire was worded, the results are ambiguous with respect to whether employers were citing their reasons for dropping out of work-based learning or for deciding whether to participate in the first place.

The obvious implication is that employer recruitment strategies should cultivate support for work-based learning among both top management and other workers within the company. Some states are offering subsidies for incumbent worker training as one means to avoid employee concerns about work-based learning (see table 6-4).

Support from the Work-Based Learning Program

The characteristics of students participating in work-based learning and the nature of coordinating support provided to employers also are major influences on employers' decisions. These two factors will be discussed together because they both can be affected by the school side of the work-based learning programs. Lack of support from the school-based side of the work-based learning program was ranked by 23 percent of employers as the most important barrier, while 16 percent said that student characteristics were the major deterrent (table 6-3).

The support required by employers can be provided in many different ways. In many school-to-work transition programs, much of it is provided by a so-called connecting organization. Connecting organizations are introduced to bridge what can be a very wide gap between the schools and the employers. The connecting organization may be the local private industry council, the local chamber of commerce, a nonprofit educational assistance organization, the regional unit of a state school system, or a community-based organization.

This support takes several forms. Providing initial assistance to the employer in planning and setting up a work-based learning program at the worksite has already been discussed. A second form is making sure that students are well prepared for their work experiences and screening them for placements with different kinds of employers. Some employers only require students to have general work skills, while others expect certain levels of academic and relevant technical skills. All agree that general work preparation is important. One program director said that when he asked a student to confirm his appointment to job-shadow the president of Marriott Hotels, the student called the president, said, "Confirming my job shadowing," and hung up the phone. The program director commented, "We knew then that we had some work to do" (27).

A third activity is matching students who are ready for work experience with employers and job placements. If the students are a good match for the company, employer willingness to provide placements improves. Students are usually asked for their preferences, but the final selections are made by the employer, the school, or the connecting organization. ProTech students have two-week rotational assignments for one semester before they enter their placement. This system allows students to gain an overview of the whole enterprise and to make informed choices of the kind of placement they want, thus improving their commitment to their eventual placement. It also allows supervisors to size up the candidates.

A fourth means of support is providing technical and troubleshooting assistance to workplace supervisors, who may need advice on working

TABLE 6-5: Forms of Coordinating Support Provided to Employers

Form of coordinating support	Percent of programs providing this support	Percent of employers rating support as "very" or "critically important"
Prescreen students for reliability	93	91
Troubleshoot for and offer technical assistance	93	68
Provide scheduling coordinator	80	59
Prescreen students for technical knowledge	80	46
Prescreen students for commitment to further work	80	25

NOTE: The number of employers responding was 86 and the number of programs was 15

SOURCE: Office of Technology Assessment, 1995, based on reference 23.

with students or assistance if problems arise with particular students. Two important additional activities involve scheduling student placements. One is coordinating the students' and employers' schedules so that students are in school when they are required and in the workplace when supervisors are available to work with them and can observe important work activities when they occur (40). Another is coordinating the timing of student placements so that employers have just the number of students they need when they need them.

On the basis of OTA's survey, employers are generally pleased with the support they are currently receiving from work-based learning programs but there are some problems. Although 23 percent of employers surveyed reported that lack of coordinating support is the most important barrier to work-based learning, more than 70 percent of current and former employers ranked "lack of technical assistance and troubleshooting support" and "inflexibility of the program model" as not an issue. More than 60 percent of employers surveyed said that "school system bureaucracy" is not an issue. Nearly all of the dissatisfaction that was reported lies in the "unreliability of scheduling student placements." Employers are clearly looking for smooth coordination of student availability for placements and dependable coordination of students' schedules with the schedules of supervisors and other employer personnel. More currently participating employers think that school system bureaucracy is a problem than do former participants and nonparticipating employers.

Employers in the OTA survey were also specifically asked to rank the relative value of five different kinds of support from the work-based learning program. As shown in table 6-5, employers place the greatest value on the screening of students for "reliability." By reliable, employers mean students who are prompt and dependable, work hard, take initiative, and take responsibility for their efforts (12,54). Technical assistance and troubleshooting support from the program are nearly as important as student reliability. The screening of students for post-training commitment to working for the company is not given much weight.

On the whole, employers also appear to be pleased with the quality of students they are receiving from work-based learning programs. More than 75 percent of the employers in OTA's survey reported no problems with the quality of the preparation that students received prior to their work experiences—which is consistent with other research findings.[6] For example, Lynn and 'ills

[6] In OTA's survey more than 75 percent of current and former employers reported that lack of student productivity (meaning not having the skills necessary to be productive in the workplace) and "prior, unsuccessful experiences with students" had no effect on their decision to participate in work-based learning.

have found that more than 90 percent of employers participating in high school cooperative education either "agree" or "strongly agree" (the top two of five categories) with the statement that they are "satisfied with the quality of the students (34)." But 16 percent of the employers surveyed by OTA said that lack of student reliability is the most important disincentive to participating in work-based learning. None rated "lack of student productivity or skills," which was the other aspect of student preparation considered, as the most important factor (see table 6-3).

Among Texas employers, DIR found that the "quality of students' work skills preparation" and "educational preparation" were more important than the "characteristics of young workers." About 40 percent of employers said that work skills and general education preparation were of "high importance," and about 20 percent said that "student characteristics" were of "high importance" to their participation in work-based learning (48). However, because of the way the questions were worded, it is not possible to tell whether these results indicate that employers view a lack of these skills as a barrier to employer participation in work-based learning or that employers were indicating their criteria for selecting students.

CONCLUSIONS AND REMAINING QUESTIONS

The expansion of employer participation in work-based learning presents a major challenge for the implementation of STWOA. Building the school-to-work transition systems envisaged by the legislation will require substantial growth in the number of employers who are willing to devote substantial staff time and other resources to develop high-quality work-based learning opportunities for students. In the absence of such growth, the work-based learning component of STWOA will not be realized unless school-based enterprises, community service learning, computer technology, or other forms of work experience are substituted for employer-provided work experience and are shown to effectively replicate the critical learning experiences of actual workplaces.

Summary of Findings

So far, the growth of employer participation in prototypes of STWOA work-based learning program has been modest in most communities and considerably less than what will be required to reach substantial numbers of students in most communities in the near future. OTA's survey of 15 high school programs that have been operating since 1992 or longer indicates that the median growth rates are about six employers and about a dozen students per year per program.

Achieving these growth rates has required considerable amounts of time and effort from school staff or a connecting organization, to contact employers and build partnerships between education and the business community. In OTA's survey an average of approximately one-half of a full-time-equivalent staff person's time has been required to recruit these six new employers each year. This level of staff effort represents a sizable marginal cost relative to the number of additional students served.

Employers' decisions to become involved in work-based learning are influenced by a wide range of potential benefits and barriers, as they have been called in this report. Employers report participating in work-based learning for two main reasons: to recruit and train new employees for their company or the industry and to contribute to the improvement of education and the community. The main potential disincentives to participation are lack of coordinating support from the work-based learning program, training costs, inadequate preparation of students for work placements, organizational resistance to work-based learning from management or other employees, economic uncertainty, and regulatory restrictions and extra insurance costs.

According to the results of OTA's survey, employers perceive the recruitment of new personnel to be a somewhat more important benefit of work-based learning than the betterment of education

and the community. This finding offers more promise for expanding employer involvement in work-based learning in the future than would be the case if civic contributions were the predominant reason for employers' participation; the direct economic benefit of personnel recruitment is likely to entice many more nonparticipating employers than are the altruistic benefits.

OTA's survey also shows that none of the disincentives to participation in work-based learning predominates or appears to be significantly less important than the others. This implies that inducements narrowly focused on overcoming one of these disincentives are not likely to be very effective; hence, strategies focused on overcoming multiple barriers should be pursued. The STWOA strategy of encouraging partnerships between school systems and employers is consistent with this finding.

Limitations

It is important to recognize the limitations of this chapter. One weakness is that the number of nonparticipating employers included in the OTA survey was very small (only 13). As a result, the findings of the survey concerning the benefits and barriers of work-based learning to currently and formerly participating employers cannot be generalized to all employers. The perceived benefits presumably exceed the costs to employers who are currently participating. Any nonparticipating employers who are contacted in the future may not have the same perceptions. As was discussed earlier, Zemsky's focus group results were that nonparticipating employers hold very negative attitudes toward young people (54). This would clearly make them very unwilling to participate.

In OTA's survey, formerly participating employers proved to be similar to currently participating ones except in the instances that have been noted. Generally the formerly participating employers appear to be even more economically oriented than the currently participating ones.

A second limitation is the chapter's concentration on employer recruitment at the secondary level. Many employers may be more willing to become involved in work-based learning at the postsecondary level. As discussed in chapter 4, postsecondary students are more employable, and it may be easier for employers to recoup the cost of training them.

A third limitation is that the analysis in this chapter has not taken into account variations in the mix of work-based learning. Under STWOA, communities are encouraged to develop "systems" of work-based learning involving a progression of training and work-experiences, as illustrated in figure 4-1. It is much easier for employers to provide students with cursory work experiences, such as job shadowing, which typically lasts for only a half a day, than it is to provide the much more extensive forms of work-based learning, such as youth apprenticeships. Consequently, the growth of employer involvement in work-based learning is likely to depend on the mix of different types of work-based learning in a community's school-to-work transition system, as the Kalamazoo example illustrates.

A fourth limitation is that variations in responses among employers of different size, industry sector, and other characteristics are not reported. The OTA survey was administered to a cross section of employers of different sizes and industries, but the small sample size precludes reporting results for different subcategories. Employers' perceptions of the benefits and liabilities of work-based learning appear to vary considerably with such characteristics (34).

The fifth limitation is that the chapter focuses mainly on the growth rate of employer participation in work-based learning rather than on the quality of worksite learning experienced by students. Quality is harder to measure but certainly critical to the effects of work-based learning on students' long-term employment prospects. The kinds of training received in the workplace and the kinds of jobs performed by students are two indicators of quality. Because approximately one-half of all high school students work in some capacity already, simply gaining some low-quality work experience will not have the positive impact intended by STWOA.

Needed Research on Strategy for Building Partnerships

The critical question raised by the findings in this chapter is whether strategies can be identified or developed for greatly increasing the rate of growth of employer participation in high-quality programs of work-based learning. Three apparent examples in Boston, Cincinnati, and Kalamazoo have been described in this chapter, but there is no conclusive evidence about the program quality in any of these cities. Other examples need to be identified and carefully studied to provide guidelines for building successful partnerships between business and education. Intensive case studies will probably be needed to identify these strategies. Strategies for increasing typical growth rates by an order of magnitude or more are needed to achieve significant progress in the near future. States with strong employer recruitment strategies under STWOA may provide important cases to study.

The success of work-based learning may largely depend on the level of leadership forthcoming from the business community. Work-based learning was included in STWOA to help bridge the gap between employers and schools. If enough business leaders step forward to encourage industry participation, significant progress may be made. If not, the growth of employer participation may continue to be slow, and the bridges intended between schools and business may not be built.

The introduction of external inducements for employer participation also could turn out to be critical for the successful growth of worksite learning. Perhaps an American style of work-based learning requiring no external business incentives can emerge, but perhaps it cannot. Cincinnati provides an example of a place where no external business incentives exist, but the colleges receive funding from the state for the coordinating support they provide to employers—which amounts to an incentive for employer participation. Any future case studies of strategies should be carefully chosen to allow comparative judgments to be made about varying inducement structures.

Implications from Foreign Countries

It may be instructive to look at the inducements in foreign countries where work-based learning for young entrants into the labor market is extensive. In Japan, young people are prepared for careers through processes of work-based learning that are largely internal to firms and not influenced by government interventions. This work-based learning occurs through job rotation, participation in problem-solving teams, and successive episodes of formal, on- and off-the-job training. Through these processes, young workers develop both the technical and "white-collar" skills they need to progress within a "family" of occupations in their company (28). Companies make these training investments in young workers because of the institutions of lifetime employment that have been adopted by industry over the years (33). Companies have also established contractlike relationships with schools to gain ready access to well-prepared students, thereby creating strong incentives for high standards of academic achievement within the school system, not unlike the incentives for quality apparently operating in Cincinnati (42).

In Germany, the incentives for the apprenticeship system are embedded in the society's system of industrial democracy that has evolved over the years. This system is oriented to the high-value-added production of diverse, customized goods and services, requiring high skill levels to succeed. It is based on a "social partnership" among business, unions, and government that controls many aspects of the economy and society, including relations between management and labor at the national, state, and local levels, as well as within companies. The web of relationships that has been created bears on the apprenticeship system. It includes the long-term financing of industry, nationally determined wages for most occupations and industries, a chartered structure of industry associations and works councils, legal requirements on all companies with five or more employers to hire professional trainers (*Meister*), union involvement in setting aside certain jobs for apprenticeship training, low training wages and

several other policies. These institutional relationships create a system of incentives in which large and medium-size companies must train apprentices because that is the least costly way of gaining access to the best-qualified workers, whereas smaller companies train because the training wage and other incentives make it profitable for them to do so (44). Even so, only one small company in five in Germany participates in the apprenticeship system, whereas nearly all large companies and most medium-size firms do. Still, more than one half of apprentices are trained in small companies (44,45).

In the absence of incentives such as those in Japan or Germany, it remains an open question whether large-scale systems of work-based learning can exist in the United States. The issue is not whether the United States should adopt the Japanese or German systems because manifestly it cannot. Rather, the question is whether an American-style apprenticeship system with very few external incentives, such as the one that apparently exists in Cincinnati or that may eventually be fully implemented in Boston and Kalamazoo, can be replicated on a national scale or whether a system of incentives will be needed.

REFERENCES

1. Bailey, T., "Can Youth Apprenticeship Thrive in the United States?," *Educational Researcher* 22(3):4-10, 1993.
2. Bailey, T., "Barriers to Employer Participation in School-to-Work Transition Programs," *Classrooms and Workplaces: Employer Involvement in School-to-Work Transition Programs*, T. Bailey (ed.) (Washington, DC: Brookings Dialogues on Public Policy, Brookings Institution, 1995).
3. Ball, W.C., et al., "Participation of Private Businesses as Work Sponsors in Youth Entitlement Demonstrations," New York, NY: Manpower Research and Demonstration Corp., 1981.
4. Barnow, B., Chasnorov, A., and Pande, A., "Financial Incentives for Employer-Provided Training: A Review of Relevant Experience in the U.S. and Abroad," Washington, DC: Urban Institute Press, 1990.
5. Barton, P.E., "Partnerships Between Corporations and Schools," Washington, DC: National Commission for Employment Policy, 1983.
6. Barton, P.E., "Employers and High Schools: The Fit Between Learning and Working," New York, NY: The Committee for Economic Development, March 1984.
7. Bishop, J., and Montgomery, M., "Does the Targeted Jobs Tax Credit Create Jobs at Subsidized Firms?" *Industrial Relations* 32: 289-306, fall 1993.
8. Boston Public Schools, Guidance Department, Personal communication, June 1995.
9. Beyer, D., "Understanding and Applying Child Labor Laws to Today's School-to-Work Transition Programs," *Center Focus*, No. 8, Berkeley, CA: National Center for Research in Vocational Education, April 1995.
10. Brown, D.E., and Brown, P., National Governors' Association, Employment and Social Services Policy Studies Division, Education Policy Studies Division, "State Progress in School-to-Work System Development," Washington, DC, July 29, 1995.
11. Burtless, G., "Are Targeted Wage Subsidies Harmful? Evidence from a Wage Voucher Experiment," *Industrial and Labor Relations Review* 39(1):105-114, 1985.
12. Committee for Economic Development, *An Assessment of American Education: Views of Employers, Higher Educators, the Public, Recent Students, and Their Parents*, New York: Louis Harris Associates, 1991.
13. Conor, T.B., "Work-based Education: School to Work," Kalamazoo County Education for Employment Consortium, Jan. 10, 1994.
14. Corson, W., and Silverberg, M., *The School-to-Work/Youth Apprenticeship Demonstration: Preliminary Findings* (Princeton, NJ: Mathematica Policy Research, 1994).
15. Farrar, E., and Copollone, A., "The Business Community and School Reform: The Boston Compact at Five Years," Madison, WI: Na-

tional Center on Effective Secondary Schools, School of Education, University of Wisconsin, March 1988.
16. Flynn, E., "Employer Participation in the School-to-Work Transition," *Commentary*, 17-23, spring 1994.
17. Fraser, B.S., et al., *Minor Laws of Major Importance: A Guide to Federal and State Child Labor Laws*, Academy for Educational Development for U.S. Department of Education, Dubuque, IA: Kendall/Hunt Publishing Company, January 1994.
18. Glover, R., "Collaboration in Apprentice Programs: Experience with In-School Apprenticeships," *1984 Yearbook of the American Vocational Association* (Arlington, VA: American Vocational Association, 1983).
19. Glover, R., et al., "School-to-Work Transition in the U.S.: The Case of the Missing Social Partners," College Park, MD: Center for Learning and Competitiveness, School of Public Affairs, University of Maryland, June 1994.
20. Goldberger, S., Kazis, R., and O'Flanagan, M., "Learning Through Work: Designing and Implementing Quality Worksite Learning for High School Students," New York, NY: Manpower Demonstration Research Corporation, January 1994.
21. Grubb, W.N., and Villeneuve, J.C., "Co-operative Education in Cincinnati: Implications for School-to-Work Programs in the U.S.," unpublished contractor report prepared for the Office of Technology Assessment, U.S. Congress, Washington, DC, May 1995.
22. Hershey, A., and Silverberg, M., "Employer Involvement in School-to-Work Transition Programs: What Can We Really Expect?" unpublished paper presented at *The Association for Public Policy and Management Conference*, Washington, DC, October 1993.
23. Hightower, A., Hallock, R., and Breckenridge, J.S., Policy Studies Associates, Washington, DC, "Employer Participation in Work-based Learning," unpublished contractor report prepared for the Office of Technology Assessment, U.S. Congress, Washington, DC, July 1995.
24. Hollenbeck, K., "The Employment and Earnings Impacts of the Targeted Jobs Tax Credit," Kalamazoo, MI: W.E. Upjohn Institute, 1991.
25. Hollenbeck, K., "In Their Own Words: Student Perspectives on School-to-Work Opportunities," Washington, DC: National Institute for Work and Learning, Academy for Educational Development, June 1995.
26. Holzer, H.J., "Are Training Subsidies for Firms Effective?: The Michigan Experience," *Industrial and Labor Relations Review* 46(4):625-636, July 1993.
27. Jobs for the Future, *Promising Practices* (Boston, MA: 1995).
28. Koike, K., "Human Resource Development and Labor-Management Relations," *The Political Economy of Japan*, Vol. 1, K. Yamamura and Y. Yasuba (eds.) (Stanford, CA: Stanford University Press, 1987).
29. Koike, K., "Learning and Incentive Systems in Japanese Industry," *The Japanese Firm: Sources of Competitive Strength*, M. Aoki and R. Dore (eds.) (Oxford, England: Oxford University Press, 1994).
30. LeGrande, L., "The Targeted Jobs Tax Credit," Congressional Research Service, 87-616E, 1987.
31. Lightner, S., and Harris, E.L., "Legal Aspects of Youth Apprenticeships: What You Should Know," unpublished paper, 1994, ED 368 081.
32. Lynch, L., "Payoffs to Alternative Training Strategies at Work," *Working Under Different Rules*, R.B. Freeman (ed.) (New York, NY: Russell Sage Foundation, 1994).
33. Lynch, L., *Training and the Private Sector: International Comparisons* (Chicago, IL: University of Chicago Press, 1994).
34. Lynn, I., and Wills, J., "School Lessons: Work Lessons," Washington, DC: Institute for Educational Leadership, 1994.
35. McNeil, P.W., "The Role of Industry Associations in School-to-Work Transition, New York, NY: Manpower Research and Demonstration Corp., 1993.

36. McNeil, P.W., and Kulick, C.D., "Employers' Role in School-to-Work Opportunities," Washington, DC: National Institute for Work and Learning, 1995.
37. National Alliance of Business, "Youth Apprenticeship: Business Incentives, Problems, and Solutions," Summary—Business Focus Group Meeting on Youth Apprenticeship, Washington, DC, 1993.
38. National Alliance of Business, "How School-to-Work Works for Business," Annapolis, MD, 1994.
39. Osterman, P., "Strategies for Involving Employers in School to Work Programs" *Classrooms and Workplaces: Employer Involvement in School-to-Work Transition Programs*, T. Bailey (ed.) (Washington, DC: Brookings Dialogues on Public Policy, Brookings Institution, 1995).
40. Pauly, E., Kopp, H., and Haimson, J., "Home-Grown Lessons: Innovative Programs Linking School and Work," New York, NY: Manpower Demonstration Research Corporation, 1994.
41. Rogers, A., and Hubbard, S., "Case Study Report on Kalamazoo Valley Consortium Education for Employment," Washington, DC: Academy for Educational Development, Oct. 31, 1994.
42. Rosenbaum, J.E., and Kariya, T., "From High School to Work: Market and Institutional Mechanisms in Japan," *American Journal of Sociology* 94(6):1334-1365, May 1989.
43. Silverberg, M., Mathematica Policy Research, Princeton, NJ, personal communication, Aug. 15, 1995.
44. Soskice, D., "Reconciling Markets and Institutions: The German Apprenticeship System," *Training and the Private Sector: International Comparisons*, L. Lynch (ed.) (Chicago, IL: University of Chicago Press, 1994).
45. Steedman, H., "The Economics of Youth Training in Germany," *Oxford Economic Journal*, 103:1279-1291, September 1993.
46. Stern, D., *School-to-Work Programs and Services in Secondary Schools and Two-Year Public Postsecondary Institutions* (Berkeley, CA: National Assessment of Vocational Education, University of California, Berkeley, School of Education, 1992).
47. Stern, D., et al., *School-to-Work: Research on Programs in the United States* (Washington, DC: Falmer Press, 1995).
48. Strauss, R., Jackson, R., and Simmons-Neal, M., "Employer Incentives and Technical Assistance," Policy Report, Houston, TX: Decision Information Resources, Inc., August 1994.
49. Strauss, R., Jackson, R., and Simmons-Neal, M., "Employer Incentives and Technical Assistance," Final Report, Houston, TX: Decision Information Resources, Inc., January 1995.
50. U.S. Congress, Office of Technology Assessment, *Worker Training: Competing in the New International Economy*, OTA-ITE-457 (Washington, DC: U.S. Government Printing Office, 1990).
51. U.S. Department of Education, Studies of Education Reform, Office of Research, Office of Educational Research and Improvement, *Minor Laws of Major Importance: A Guide to Federal and State Child Labor Laws*, prepared by B.S. Fraser, I. Charner, K.L. Rose, S. Hubbard, and S. Menzel (Dubuque, IA: Kendall/Hunt Publishing Co., January 1994).
52. U.S. Department of Labor and U.S. Department of Education, "School-to-Work Opportunities and the Fair Labor Standards Act: A Guide to Work-based Learning, Federal Child Labor Laws, and Minimum Wage Provisions," Washington, DC, 1994.
53. Wisconsin Department of Public Instruction, School-to-Work Office, personal communiciation, August 1995.
54. Zemsky, R., "What Employers Want: Employer Perspectives on Youth, the Youth Labor Market, and Prospects for a National System of Youth Apprenticeships," Working Paper No. 22, Philadelphia, PA: National Center for the Educational Quality of the Workforce, 1994.

Appendix A: Boxes, Figures, and Tables

A

BOXES

Chapter 1
1-1: School-to-Work Opportunities Act

Chapter 3
3-1: Examples of Work-Based Learning Activities

Chapter 6
6-1: OTA's Employer Survey
6-2: Employer Recruitment Strategy of STWOA
6-3: Kalamazoo Valley Education for Employment Consortium
6-4: Cooperative Education in Two-Year Colleges in Cincinnati

FIGURES

Chapter 4
4-1: One Possible Progression Through Several Types of Work-Based Learning

TABLES

Chapter 5
5-1: Several Models of Work-Based Learning

Chapter 6
6-1: School-to-Work Transition Programs in OTA's Survey
6-2: Benefits of Employer Participation in Work-Based Learning
6-3: Barriers to Employer Participation in Work-Based Learning
6-4: Employer Incentives That States Have Implemented or Intend to Implement in Their STWOA Strategies
6-5: Forms of Coordinating Support Provided to Employers

B Appendix B: Reviewers and Contributors

Nancy Adelman
Policy Studies Associates

Paul Barton
Educational Testing Service

Howell Baum
University of Maryland

Charles Bidwell
University of Chicago

Ellen Biler
Academy for Educational Development

William Bloomfield
School & Main (Career Beginnings)

Deborah Bragg
University of Illinois

David Brown
National Governors' Association

Lawrence Burton
National Science Foundation

Peter Cappelli
University of Pennsylvania

Ivan Charner
Academy for Educational Development

Tom Conor
Kalamazoo Education for Employment Consortium

Jack Conway
Community Housing Association of Sarasota

Diana Durret
North Central Regional Education Laboratory

Kenneth Edwards
International Brotherhood of Electrical Workers

Phyllis Eisen
National Association of Manufacturers

Cheryl Evanciew
The University of Georgia

Robert W. Glover
University of Texas

Andrew Hahn
Brandeis University

Samuel Halperin
American Youth Policy Forum

Stephen Hamilton
Cornell University

Madeline Hemmings
National Association of State Directors of Vocational Education

Kevin Hollenbeck
W.E. Upjohn Institute

J.D. Hoye
School-to-Work Opportunities Center

Dwayne Hunt
Comstock Auditorium

Lawrence Hutchins
Aurora, CO

Polly Hutchinson
National Commission for Cooperative Education

Russell Jackson
Decision Information Resources, Inc.

Peter Joyce
National Alliance of Business

Richard Kazis
Jobs for the Future

Jeffrey King
The German Marshall Fund of the United States

Jacob Klerman
Rand Corporation

Kenneth Komoski
EPIE Institute

Hilary Kopp
Jobs for the Future

Dawn Krusenark
American Federation of Teachers

Rene Leger
Roosevelt Renaissance

Bret Lovejoy
American Vocational Association

Lisa Lynch
Tufts University

Laurel McFarland
The Brookings Institutionn

James McKenny
American Association of Community Colleges

David Meyers
Mathematica Policy Research

Richard Murnane
Harvard University

John Niles
Executive Board of Education
Commonwealth of Massachusetts

Harry O'Neil
University of Southern California

Tom Owens
Northwest Regional Education Laboratory

Glenda Partee
American Youth Policy Forum

Lois Ann Porter
Boston Private Industry Council

Beverly Pringle
Policy Studies Associates

Lawrence Rosenstock
Rindge School of Technical Arts

Tony Sarmiento
AFL/CIO

Brian Shea
Training Technology Resource Center

Marsha Silverberg
Mathematica Policy Research

Karen Springer
Cooperative Work Experience Education Association

Nevzer Stacey
School-to-Work Opportunities Office

Cathleen Stasz
Rand Corporation

James Stone
University of Minnesota

Neil Sullivan
Boston Private Industry Council

John Tobin
Seimens Corporation

Mark Troppe
KAPOW

Raymond J. Uhalde
U.S. Department of Labor

Mary Weirsema
Kalamazoo Education for Employment Consortium

Daniel Wiltrout
Council of Chief State School Officers

Robert Zemsky
The University of Pennsylvania

Appendix C: Contractor Reports Prepared for This Assessment

Stephen Barley and Bonalyn Nelson, Stanford University, "The Nature and Implications of Infrastructural Technological Change for the Social Organization of Work," July 1995.

Kathryn Borman, University of South Florida, and Richard Lakes, Georgia State University, "Review of Ethnographic Research Related to School-to-Work Transition," May 25, 1995.

Christopher Dede, George Mason University, and Matthew Lewis, Rand Corporation, "Assessment of Emerging Technologies That Might Assist and Enhance School-to-Work Transitions," May 1995.

Rosella Gardecki and David Neumark, Michigan State University, "Early Labor Market Experiences and Their Consequences for Adult Labor Market Outcomes," June 1995.

W. Norton Grubb and Norena Badway, University of California, Berkeley, "Linking School-Based and Work-Based Learning: The Implications of LaGuardia's Co-op Seminars for School-to-Work Programs," June 1995.

W. Norton Grubb and Jennifer Curry Villenuve, University of California, Berkeley, "Co-operative Education in Cincinnati: Implications for School-to-Work Programs in the U.S.," May 1995.

Amy Hightower, Robert V. Hallock, George Wimberly, John S. Breckenridge, Lisa K. Weiner, Policy Studies Associates, "Employer Participation in Work-Based Learning," July 14, 1995.

Margaret Vickers, Riley Hart, and Amy Weinberg, Technical Education Research Centers (TERC), "The Work-based Learning Experiences of Students in Two Boston-Based Youth Apprenticeship Demonstration Sites," May 17, 1995.