



# Integrating Occupational Safety and Health Information Into Vocational and Technical Education and Other Workforce Preparation Programs

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The high rates of injury among young workers are a pressing public health issue, especially given the demand of the job market for new workers. Young and new workers experience the highest rates of occupational injuries of any age group.

Incorporating occupational safety and health (OSH) information into the more than 20 000 vocational and other workforce preparation programs in the United States might provide a mechanism for reducing work-related injuries and illnesses among young and new workers. We

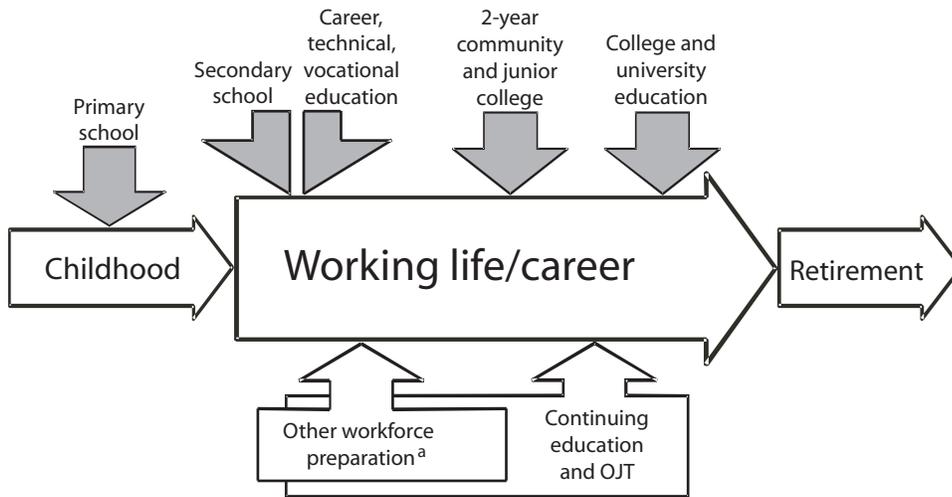
assessed the status of including OSH information or training in workforce preparation programs and found there is an inconsistent emphasis on OSH information. (*Am J Public Health*. 2005;95:404–411. doi:10.2105/AJPH.2004.047241)

**IN THE UNITED STATES, A** variety of programs exist to prepare young people for work and careers. These include schools and programs dedicated to career and technical education, commonly known as vocational education. Other training approaches include school-to-work

programs and apprenticeships, career academies, career cluster initiatives, and various other federally and privately supported programs that deliver skills training (Figure 1, Table 1). The practice of incorporating occupational safety and health (OSH) information and training (about hazards and risks of work) into vocational and other training programs has not been widely recommended, and the extent to which this occurs has not been assessed.<sup>6,14–16</sup> We review what is known about the status of incorporating OSH into vocational, career, and other technical training. The benefits

are believed to include increased job/career knowledge, safer work behaviors, increased competence when dealing with high-risk occupational situations, and reduced incidence of occupational injuries and illnesses.

Safety and health conditions for vocational students during their training and in their subsequent careers overlap with the larger issues of safety and health risks for young workers. Work is a common part of the lives of many adolescents. It has been estimated that between 70% and 80% of teenagers work for pay at some time during their high



Note. OJT = on-the-job training.  
<sup>a</sup>Other workforce preparation includes school-to-work, Workforce Investment Act programs, apprenticeship programs.

**FIGURE 1—Programs for preparing people for work and career.**

education.<sup>24</sup> However, the bulk of investment and policy direction for vocational education lies within state control. An estimated 11 million vocational and technical students are attending 20 000 programs in the United States.

The wide coverage of vocational education offers a unique opportunity to reach significant numbers of workers with OSH information. The US Office of Vocational and Adult Education reports that virtually every high school student takes at least 1 vocational or career education course, and 1 in 4 students takes 3 or more courses in a single program area.<sup>25</sup> In addition, one third of college students are involved in vocational programs, and as many as 40 million adults engage in short-term, postsecondary occupational training.<sup>25</sup> The delivery of OSH as a fundamental part of vocational education may set the tone for having these students adopt safe work practices as part of their orientation toward work. Most people aged 20 to 65 years spend one third of their waking hours at work. Yet little time is spent educating workers about the health impact that work can have on their lives and the various ways that they can minimize its negative effects. If students receive OSH information or training as part of secondary and postsecondary vocational education, this may be the only time many workers are exposed to this information.

In 1998, the National Institute for Occupational Safety and Health (NIOSH) examined the results of an unpublished survey

school years.<sup>17,18</sup> Bureau of Labor Statistics data reveal that between 1996 and 1998, a monthly average of 2.9 million workers aged 15 to 17 years worked during school months, and 4.0 million worked during summer months.<sup>18</sup> Overall, young workers aged 16 to 19 years have twice the injury rate of workers of all ages.<sup>19,20</sup> An average of 67 workers per year younger than 18 years died from work-related injuries during 1992–2000. In 1999, an estimated 84 000 teenaged workers required treatment in hospital emergency departments.<sup>16</sup> In a survey of youths aged 14 to 16 years who have been injured while working, 54% reported having no instruction on how to avoid injuries or how to work safely with the equipment they used.<sup>14,21</sup> Direct and indirect costs of occupational injuries to teenaged workers have been

estimated to be approximately \$5 billion annually.<sup>22</sup>

Although much vocational and technical education typically takes place when students are in high school, what they may learn in these programs sets the foundation that may affect their work experiences for many years to come. Moreover, the nature and organization of work is changing. Young and new workers can expect to change jobs and employers many times during their working lives.<sup>23</sup> Presumably, these changes will lead to an increased likelihood of encountering new or different hazards or risk scenarios, suggesting the importance of an ongoing application of generic OSH knowledge.

Vocational and technical education and other forms of workforce preparation are not confined to young workers. These programs also serve adult workers, who

may change careers at various times in their working lives.

### VOCATIONAL, CAREER, AND TECHNICAL EDUCATION

Vocational, career, and technical education (defined in Public Law 105-332<sup>2</sup>) has traditionally been designed to provide individuals with the academic and technical knowledge and skills the individuals needed to prepare for careers. Vocational education includes competency-based applied learning that contributes to the individual's academic knowledge, higher-order reasoning, and problem-solving skills; work attitudes; general employability skills; technical skills; and occupation-specific skills. In 2002, the federal government spent approximately \$1.288 billion on vocational and adult edu-



**TABLE 1—Workforce Preparation Programs and OSH Aspects: United States**

Workforce Preparation Programs	Legislation/Body	Purpose	OSH Aspects
Vocational, technical, and career education	PL 105-332; Sec 3 (29) <sup>1</sup>	Provide individuals with academic and technical knowledge and skills for careers.	Included in textbooks, <sup>2</sup> government materials, but not a part of teacher certification.
Career clusters	US Dept of Education; National Association of State Directors of Career Technical Education Consortium	Develop comprehensive curriculum frameworks for 16 career clusters. <sup>3,4</sup>	Effort to ensure that OSHA and EPA standards incorporated in knowledge and skills required for each cluster.
National skill standards	PL 103-227 <sup>5</sup>	Develop core competency for jobs in 15 economic sectors.	OSH topics included in core competencies for manufacturing. <sup>6</sup> Skill standards complement existing voluntary standard for OSH training by the American National Standards Institute. <sup>3,4</sup>
School-to-work <sup>7</sup> programs	School-to-Work Opportunities Act <sup>7</sup>	Ensure that young workers acquire knowledge and skills to make effective transition from school to career-oriented work. <sup>3,4,7</sup>	No information found on OSH topics.
Workforce Investment Act <sup>8</sup> programs	Job Training Partnership Act <sup>9,10</sup>	Bring jobless persons into permanent unsubsidized, self-sustaining employment by training, basic education, job counseling, and placement. <sup>9,11</sup>	No information found on OSH topics.
Apprentice programs	National Apprenticeship Act <sup>12,13</sup>	Prepare individuals for careers in skilled crafts and trades.	Active union and industry programs for incorporating OSH topics in apprentice training programs.

Note. OSH = occupational safety and health; OSHA = Occupational Safety and Health Administration; EPA = Environmental Protection Agency.

conducted by the University of Cincinnati in 1996. The survey polled 50 state departments of education on “vocational education requirements for occupational safety and health” (R. Nester, written communication, 1998). Of the 50 state departments of education, 30 responded. Safety and health requirements for vocational education were mandated by only 40% of the responding states. Although 87% of the respondents indicated that students were evaluated for OSH knowledge in some fashion, the extent and depth of the evaluation was at the discretion of the instructor. Preparation and certification of

teachers in OSH was not a requirement for renewing the licenses of vocational education teachers. As for surveillance of injuries and illnesses related to vocational programs, less than half of the responding states (43%) required some form of reporting (R. Nester, written communication, 1998). Historically, the practice of including OSH in various workforce preparation programs in the United States has involved textbook writers and publishers, teachers and advisory committees, local school district boards, state–county–municipality regulators, the US military, school insurance companies, federal agencies and organizations in-

involved in OSH, and parents’ organizations. Major textbook publishers in the United States often include in each vocational and technical book an introductory section or chapter on the hazards of the trade.<sup>25–27</sup> Depending on the occupation, vocational education teachers generally use 1 to 2 weeks at the beginning of the school year to review hazards and their controls. Each state department of education has developed competencies for their teachers to meet every school year. These competencies include OSH. However, in some cases, vocational and technical education teachers may have had little or no OSH training. A survey

conducted among 200 teachers of vocational education identified factors that would predict their adoption of a potential vocational training safety curriculum.<sup>28</sup> Those identified as having the “intention to adopt” the curriculum were teachers with the greatest interest in and awareness of adolescent safety education, the organizational climate, and the relative advantages of the new curriculum over the old one.<sup>28</sup> Overall, there is practically no literature that assesses the role and value of OSH training in vocational education.<sup>29–31</sup> More broadly, however, a rich literature has been identified that demonstrates the long-term effec-



tiveness of OSH training in workplace training contexts.<sup>32–39</sup> Most of the studies identified in this literature were observational rather than experimental in design (i.e., individuals or work groups were not randomly assigned to training vs no training conditions). Therefore, the validity of some of the findings may be influenced by self-selection. Nonetheless, there is a consensus on the importance and effectiveness of workplace training.<sup>14,39–41</sup>

## RISKS AND HAZARDS IN VOCATIONAL/TECHNICAL SCHOOLS

Reviewing the integration of OSH information into vocational and technical training begins with considering the school-related injury or illness risks that exist for students and teachers. No comprehensive statistics have been published on injury or illness rates in vocational schools or among vocational students and their teachers. Yet anecdotal reports can be found. At a recent international meeting, a vocational construction teacher from Quebec concluded that on average, 1 student per year in Quebec province had a finger amputated during training.<sup>42</sup> This prompted the teacher's school to develop an active safety and health program. In the United States, the Fair Labor Standards Act—largely unchanged for decades—defines work activities prohibited for young workers through 17 nonagricultural and 11 agricultural hazardous occupations orders. The skills for some of these occupations are taught in

vocational and technical education programs. Consistent with the Institute of Medicine recommendations in the report *Protecting Youth at Work*,<sup>14</sup> NIOSH reviewed the hazardous occupations orders in light of current data and literature.<sup>43</sup> In addition to recommending revisions and additions to hazardous occupations orders, NIOSH made recommendations regarding apprentice and student-learner exemptions in cases in which supervision and training could reasonably be expected to protect young workers from the hazards. NIOSH also called for research into the effectiveness of youth OSH training programs to help ensure that exemptions for apprentice and student-learner programs are effective in facilitating a safe training environment.<sup>44</sup>

## OTHER WORKFORCE PREPARATION

Vocational and technical education is part of a wide range of programs for workforce preparation in the United States. These programs respond according to different pressures or labor market needs.<sup>45,46</sup> Young people who do not have appropriate career preparation will experience enormous difficulty in getting jobs, or they will take dead-end jobs that offer low status and little training and are inadequate to support a family.<sup>47</sup> At least 5 efforts in the United States represent frameworks that counter this so-called downward spiral of the youth labor market and promote workforce preparation. These are the national skill standards, career

clusters, school-to-work activities, the Workforce Investment Act, and apprentice programs. Some of these complement and support one another.

### Skill Standards

At the national level, the national skill standards (Public Law 103-227)<sup>48</sup> are a comprehensive approach to achieving skill competencies. The National Skill Standards Board has organized specifications for workforce preparation and adopted a framework of 15 economic sectors to direct its work on developing skill standards for curriculum, certification, and employment. In 1997, NIOSH became a participant in the national skill standards efforts and supported the integration of OSH into the core and concentration skill standards for each sector.<sup>6</sup> The first skill standard to use OSH information in core competencies involved manufacturing. Overall, 20% of the language in the manufacturing skill standards pertains to OSH. Although the federal law that established the National Skill Standards Board has expired, the work is still ongoing and will likely affect the curricula of vocational, technical, and other training institutions that strive to produce competitive, competent, skilled, and qualified workers and professionals. The national skill standards also complement the existing national voluntary standard for OSH training developed by the American National Standards Institute.<sup>49</sup>

### Career Clusters

Another approach to promoting workforce preparation is the

career clusters initiative. Since 1996, the US Department of Education's Office of Vocational and Adult Education and states have been working together to develop and implement comprehensive curriculum frameworks for 16 career clusters.<sup>3,4</sup> A project initiated in 2002 was designed to ensure that the Occupational Safety and Health Administration (OSHA) and the US Environmental Protection Agency standards be (1) consistently incorporated into the knowledge and skills in the 16 career clusters; (2) linked to related academic standards, especially science standards; and (3) supported by curriculum resources to improve schools' instruction in safety, health, and the environment. This project is being conducted in cooperation with the National Association of State Directors of Career Technical Education Consortium and various federal partners, including OSHA, NIOSH, the US Environmental Protection Agency, and the US Department of Education.

### School-to-Work Programs

In 1994, Congress passed the School-to-Work Opportunities Act<sup>7</sup> to ensure that young workers acquire the knowledge and skills necessary to make an effective transition from school to career-oriented work. The potential of the act to provide young workers with critical OSH skills is large and has been recognized, but not realized.<sup>50</sup> In 1998, the Institute of Medicine in *Protecting Youth at Work* recommended the following<sup>14</sup>: (1) the national evaluation



of the School-to-Work Opportunities Act should include a comprehensive assessment of the success of various programs in conveying appropriate and effective workplace safety and health information and training, and (2) those practices found to be effective should continue after the act expired in 2001. We found no reports that described the impact of school-to-work programs on OSH training. However, some school-to-work programs continue.

### Workforce Investment Act

The Job Training Partnership Act of 1982<sup>51</sup> (the forerunner of the Workforce Investment Act) established the largest federally funded civilian training program in the United States.<sup>9,11</sup> The purpose of the Job Training Partnership Act was to bring jobless persons into permanent, unsubsidized, and self-sustaining employment by providing training, basic education, job counseling, and placement. The Job Training Partnership Act has included the Migrant and Seasonal Farmworkers Program, the Native American Program, the Summer Youth Employment Training Program, the Youth Fair Channel, and the Job Corps. In 1998, the Workforce Investment Act<sup>52</sup> (PL 105-220) enhanced the flexibility of the Job Training Partnership Act legislation.

### Apprentice Programs

Apprentice programs are generally considered to be training that is designed to prepare an individual for a career in the skilled crafts and trades. The Code of Federal Regulations<sup>12</sup>

(29 CFR 29) outlines the requirements for registration of acceptable apprentice programs for federal purposes and sets forth labor standards that safeguard the welfare of apprentices.<sup>13</sup> Among the standards is the stipulation that all apprentices receive instructions in safe and healthful work practices, both on the job and in related instructions, that are in compliance with the Occupational Safety and Health Act of 1970 (PL 91-596)<sup>53</sup> and subsequent amendments and appropriate state standards. Graduates of vocational programs often move into apprentice programs.

### STIMULATING OCCUPATIONAL SAFETY AND HEALTH AWARENESS

Various efforts have been initiated to stimulate OSH awareness in vocational and technical education. Since 1996, NIOSH has sponsored OSH awards that are part of the annual Skills USA competition<sup>54</sup> for high school students and 1 award to acknowledge vocational instructors in the Association for Career and Technical Education.<sup>55</sup> More recently, NIOSH developed more than 80 safety checklists for use in vocational schools to assess on-site hazards.<sup>56</sup>

Another pioneering approach to stimulating OSH awareness involves a pilot program in Texas to deliver the OSHA 10-hour construction course to vocational high school students throughout the state.<sup>57</sup> The Texas Engineering Extension Service is partnering with the Texas Industrial Vocational Association to introduce

safety and health training in the public schools.<sup>57</sup> The pilot program involves training vocational instructors as OSHA construction outreach safety and health trainers. Vocational students are trained in the OSHA 10-hour course and receive a completion card from OSHA Region VI, which provides evidence to employers that a prospective employee has received basic safety training.<sup>57</sup>

Useful international models exist for stimulating OSH awareness. For example, Australia has national guidelines for integrating OSH competencies into National Industry Competency Standards.<sup>58</sup> The stated goal of this effort is to raise the level of OSH competence of the workforce in a consistent and cost-effective manner. Internationally, OSH considerations are included in skills competitions among vocational and technical students.<sup>59</sup>

In Europe, there are various examples of integrating or “mainstreaming” OSH into education. The goal of these efforts is to make risk management principles and “OSH thinking” an intrinsic part of the way decisions are made and actions are taken in the workplace. In such an atmosphere, OSH will not be just an “add-on.” Workers and employers will come to the workplace familiar with OSH and risk prevention.<sup>60</sup> Most European Union member states have local or national campaigns to introduce OSH issues into education. Critical conclusions from a 2002 European publication were that risk education and OSH need to be seen as high priorities by

stakeholders.<sup>60</sup> It is not enough simply to create educational materials and provide them to teachers. Teachers and trainers should be specifically trained in risk evaluation and OSH.

Since 1996, the International Social Security Association has been focusing on the integration of OSH into vocational and technical education.<sup>41</sup> In 2003, the second in a series of international meetings was held in Quebec to address how to better integrate OSH into vocational and technical education. At this meeting, attendees were presented with a protocol entitled the Quebec City Protocol for the Integration of Occupational Health and Safety Competencies into Vocational and Technical Education.<sup>61</sup> The protocol was developed under the auspices of the Commission de la Santé et de la Sécurité du Travail of Quebec and the International Section on Education and Training of the International Social Security Association.<sup>41</sup> The protocol recommended that educational organizations, and specifically the business organizations who must provide OSH education in their own fields, adopt the following principles:

1. The educational institutions' community will strive to develop exemplary practices in the promotion of safety and health and therefore adopt policies and rules to ensure their implementation.
2. Material, equipment, and the environment must satisfy the recognized OSH standards and rules.
3. The elements of OSH associated with each step in the per-



formance of a task must be integrated into the educational process for that step.

4. Mastery of the required knowledge and recommended techniques in OSH must be taken into account during evaluation.<sup>41</sup>

Ultimately, the integration of OSH into vocational and technical education will require collaboration between education and OSH disciplines.

### INTEGRATING OCCUPATIONAL SAFETY AND HEALTH INTO GENERAL SECONDARY EDUCATION

Since 1995, NIOSH has supported efforts to develop OSH curricula for youths through extramural support programs. This support resulted in curricula in use in California and Massachusetts.<sup>15</sup> In 2001, NIOSH contracted with the National Safety Council to explore the elements critical to a comprehensive core curriculum for young and new workers.<sup>62</sup> The effort was built on the examination of the existing OSH curricula for youths and a series of stakeholders' discussions in 3 cities to solicit views on safety training for new and young workers. The focus was on training needs and barriers. From these discussions came the conclusion that in too many cases, current safety training for teenaged workers is nonexistent, ineffective, or based on outmoded safety concepts. Specifically, vocational and technical education programs that may provide safety training as part of

their skills development program are sometimes based on outmoded safety concepts that emphasize, for example, the use of personal protective equipment rather than modern approaches that view safety as a process requiring hazard analysis and remediation.<sup>62</sup> In addition, a formidable disconnect exists between the OSH community and those who are in the best position to provide OSH instruction to new and young workers—including the vocational-technical education community, small business, and so forth. In 2002 and 2003, NIOSH convened a multidisciplinary workgroup to develop a basic OSH curriculum suitable for younger and new workers. The curriculum was built on the existing products created through NIOSH-funded cooperative agreements.<sup>15</sup> In November 2003, a draft of this curriculum was adopted by the Job Corps to help train the 67 000 youths who participate in their programs.

The draft curriculum is designed to educate young workers regarding 6 broad topics:

1. Understanding risks
2. Finding hazards
3. Making jobs safer
4. Dealing with emergencies
5. Knowing your rights
6. Taking action

In a pilot effort that will occur during the 2005 school year, NIOSH is collaborating with the National Association of State Directors of Career Technical Education Consortium to evaluate the curriculum in public high schools. Ultimately, some varia-

tion of this curriculum should be available to the general secondary school system nationwide.

### COMMUNITY-BASED APPROACHES

Community-based approaches to deliver OSH training to teenaged workers also have been demonstrated. In 1995, NIOSH funded 3 projects to prevent injuries to teenagers in the workplace. The projects used community-based approaches to develop and deliver curricula to high school students, provide materials for employees and parents, and develop strategies for providing effective training.<sup>15</sup> Initially, the approach involved bringing together groups within a local community who have interest in or responsibility for the safety and health of young workers. The projects' researchers noted that active participation of diverse community members was necessary to develop a comprehensive educational approach to young workers' safety and to maintain broad-based support. This approach, among other tactics, involved the development of state teams—coalitions of agencies and organizations whose goal was to protect the safety and health of young people in the workplace. Important factors identified by this project were (1) teaching teenagers to recognize their right to a safe working environment and (2) knowing how to identify hazards and negotiate with employers over unsafe conditions. The state team approach has the potential to be evaluated by using state work-

place injury data, but such evaluations have not yet occurred.<sup>15</sup>

### CONCLUSIONS

Although the various approaches (vocational education, career clusters, school-to-work, curricula, skill standards, apprenticeships, and community-based approaches) all have intuitive appeal as useful means for enhancing young and new workers' safety and health, little quantitative information exists on (1) the extent of OSH training provided within these programs and (2) the effectiveness of the program for reducing occupational injuries and illnesses. Ultimately, efforts to evaluate incorporating OSH into vocational-technical education and other workforce preparation programs will require studies that evaluate programs in a systematic manner. Additionally, training alone will not lead to reducing the incidence of occupational injuries and illnesses. Young workers face limitations in their ability to put into practice what they learn in training programs because they lack experience, and sometimes self-confidence, to raise safety and health issues. There is also need for management commitment to OSH.<sup>56,60–62,69</sup> Without such commitment, training will not be a sufficient preventative because employer investment in controls is the first line of protection.<sup>63</sup>

Ultimately, no one in the United States should enter the labor market without an awareness of safety and health risks and methods for dealing with them effectively. Future working generations should be equipped



by their training with a genuinely preventive knowledge base that empowers them to participate fully in designing safe workplaces that meet the challenges of an evolving global economy.<sup>60</sup> ■

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### References

1. Carl D. Perkins Vocational and Technical Education Act of 1998, 57 *Federal Register* 36724 (1992) (codified at 34 CFR §400).
2. US Department of Education. Office of Vocational and Adult Education. The Carl D. Perkins Vocational and Applied Technology Education Act, Public Law 105-332. Available at: <http://www.ed.gov/offices/OVAE/CTE/perkins.html>. Accessed July 29, 2003.
3. Carl D. Perkins Vocational and Technical Education Act of 1998, *Report to Congress on State Performance, Program Year 2000-2001*. Washington, DC: US Department of Education, Office of Vocational and Adult Education; 2003.
4. Department of Education. Career clusters—cooperative agreements; notice inviting applications for new awards for fiscal year (FY) 2001. 65 *Federal Register* 235 (2000).
5. National Skill Standards Board (NSSB), a provision of the National Skill Standards Act of 1994, Section V of the Goals 2000: Educate America Act of 1994, 20 USC §5931-5939 (1994).
6. Palassis J, Schulte PA, Sweeney MH, Okun AH. Enhancing occupational safety and health through the national skills standards. *Int J Occup Environ Health*. 2004;10(1):90-98.
7. School to Work Opportunities Act of 1994, 20 USC §5931-6251 (1994).
8. Workforce Investment Act of 1998, 20 CFR §660-670 (1998).
9. Ruttenberg R. Federal job training programs: a summary of major activities. Report prepared for participants of the NEIHS Awardee Meeting. Estes Park, Colo, April 20, 1999. Available at: [http://www.wetp.org/Wetp/public/downloads/HASL\\_99dnfile.HTM](http://www.wetp.org/Wetp/public/downloads/HASL_99dnfile.HTM). Accessed December 23, 2004.
10. Job Training Partnership Act of 1982, 59 *Federal Register* 45815 (1994) (codified at 20 CFR §626-628).
11. Bloom H, Orr LL, Cave G, Bell SH, Doolittle F, Lin W. *The National JTPA Study. Overview: Impacts, Benefits, and Costs of Title II-A*. Bethesda, Md: Abt Associates for the US Department of Labor; March 1994.
12. National Apprenticeship Act of 1937, 29 USC §50, 42 *Federal Register* 10139 (1977) (codified at 29 CFR 29).
13. National Guidelines for apprenticeship standards. Washington, DC: US Department of Labor; June 13, 2003; Bulletin 2003-19.
14. Institute of Medicine. *Protecting Youth at Work*. Washington, DC: National Academy Press; 1998.
15. *Promoting Safe Work for Young Workers*. Washington, DC: National Institute for Occupational Safety and Health; 1999. DHHS (NIOSH) publication 99-29-141.
16. *Preventing Deaths, Injuries and Illnesses of Young Workers*. Washington, DC: National Institute for Occupational Safety and Health; 2003. DHHS (NIOSH) publication 2003-128.
17. Light A. *High School Employment. National Longitudinal Surveys Discussion Paper*. Washington DC: US Department of Labor, Bureau of Economic Research; 1995: iii. Report NLS 95-27.
18. Steinberg L, Cauffman E. The impact of employment on adolescent development. In: Vasta R, ed. *Annals of Child Development*. London, England: Jessica Kingsley Publishers; 1995:136.
19. *Report on the Youth Labor Force*. Washington, DC: US Department of Labor, Bureau of Labor Statistics; 2000:58-67.
20. *NIOSH Worker Health Chartbook 2004*. Washington, DC: National Institute for Occupational Safety and Health; 2004. DHHS (NIOSH) publication 2004-146.
21. Knight EB, Castillo DN, Layne LA. A detailed analysis of work-related injury among youth treated in emergency departments. *Am J Ind Med* 1995;27:793-805.
22. Miller T, Waehrer GM. Cost of occupational injuries to teenagers, United States. *Inj Prev* 1998;4(3):211-217.
23. Greenspan A. The evolving demand for skills. Presented at: the National Skills Summit; March 26, 2001; Washington, D.C. Available at: [http://www.dol.gov/\\_sec/skills\\_summit/p1s3.htm](http://www.dol.gov/_sec/skills_summit/p1s3.htm). Accessed May 20, 2004.
24. US Department of Education. Office of Vocational and Technical Education Web site. Career and technical education. Available at: <http://www.ed.gov/about/offices/list/ovae/pi/cte/index.html>. Accessed September 16, 2003.
25. Althouse AD, Turnquist CH, Bracciano AF. *Modern Refrigeration and Air Conditioning*. Tinley Park, Ill: The Goodheart-Willcox Co; 1996.
26. Althouse AD, Turnquist CH, Bowditch WA, Bowditch KE. *Modern Welding*. Tinley Park, Ill: The Goodheart-Willcox Co; 1997.
27. Toboldt WK, Richardson TL. *Autobody Repairing and Refinishing*. Tinley, Ill: The Goodheart-Willcox Co; 1993.
28. Nester R. *Adolescent Occupational Safety and Health in the Vocational Technical Environment: the Relationship of Organizational Climate, Safety-Awareness Concern-Interest, and the Characteristics of the Innovation to the Intention to Adopt a Safety Curriculum* [PhD thesis]. Cincinnati, Ohio: University of Cincinnati; 1999.
29. Passmore DL, Chinoda M, Paine R, Mohamed DA. Epidemiology of work injuries among former participants in vocational education. Paper presented at: the Annual Meeting of the Northeast Educational Research Association; October 1991; Ellenville, NY.
30. Riesenber LE. An investigation of the agricultural education background for accident involved and non-involved farm tractor and machinery operators in Minnesota. University of Minnesota, 1980. National Agricultural Safety Database. Available at: <http://www.cdc.gov/nas/docs/d000601-d000700/d000651/d000651.html>. Accessed July 29, 2003.
31. Wilkins JR 3rd, Engelhardt HC, Bean TL, Beyers MV, Crawford JM. Prevalence of ROPS-equipped tractors and farm/farmer characteristics. *J Agriculture Safety Health*. 2003;9(2):107-118.
32. Hantula DA, Rajala AK, Brecher EG, DeNicolis-Bragger JL. The value of workplace safety: a time-based utility analysis model. *J Organ Behav Manage*. 2001;21:79-98.
33. Cohen A, Colligan MJ. *Assessing Occupational Safety and Health Training*. Washington, DC: National Institute for Occupational Safety and Health; 1998. DHHS (NIOSH) publication 98-145.
34. Perkins R. Evaluation of an Alaskan marine safety training program. *Public Health Rep*. 1995;110:701-702.
35. Kinn S, Khuder SA, Bisesi MS, Woolley S. Evaluation of safety orientation and training programs for reducing injuries in the plumbing and pipefitting industry. *J Occup Environ Med*. 2000;42:1142-1147.
36. Birkner LR, Birkner RK. Creating value with health and safety. *Occup Hazards*. 1997;59:57-58.
37. Rinefort FC. *A Study of Some of the Costs and Benefits Related to Occupational Safety and Health* [PhD dissertation]. College Station, Tex: Texas A&M University; 1976.
38. Rinefort FC. A new look at occupational safety. *Personnel Administrator*. November 1977:29-36.
39. *Workplace Safety and Health Training: Report from the 1999 National Conference*. Washington, DC: National Institute for Occupational Safety and Health; 2004. DHHS (NIOSH) publication 2004-132.
40. Keyserling WM. Occupational safety: prevention of accidents and



overt trauma. In: Levy BS, Wegman DH, eds. *Occupational Health: Recognizing and Preventing Work-Related Disease*. 3rd ed. Hagerstown, Md: Lippincott Williams & Wilkins; 1995:105–119.

41. Bassi LJ, Ludwig J. School-to-work programs in the United States: a multiform case study of training, benefits, and cost. *Ind Labor Relations Rev*. 2000;53:219–239.

42. International Social Security Association. International Section on Education and Training in the Field of Prevention of Accidents. Presented at: 2nd International Seminar in Occupational Health and Safety Training; October 6-10; 2003, Quebec City, Quebec. The Quebec City Protocol is available at: <http://www.iapa.on.ca/pdf/maquetteang22sept.pdf>. Accessed December 16, 2004.

43. Miller ME, Bush D. Review of the Federal Child Labor Regulations: updating hazardous and prohibited occupations. *Am J Ind Med* 2004;45(2):218–221.

44. National Institute for Occupational Safety and Health (NIOSH). Recommendations to the US Department of Labor for changes to hazardous orders. May 3, 2002. Available at: <http://www.cdc.gov/niosh/docs/NIOSHRecsDOLHaz/pdfs/DOL-recomm.pdf>. Accessed December 23, 2004.

45. Hoachlander G. Toward a new framework of industry programs for vocational education. Paper prepared under contract for the Office of Vocational and Adult Education. U.S. Department of Education; November 1998. Available at: <http://www.mprinc.com/pubs/summary.asp?pubID=88>. Accessed December 23, 2004.

46. Levesque K, Lauen D, Teitelbaum P, Alt M, Librera S. *Vocational Education in the United States: Toward the Year 2000*. Washington, DC: US Department of Education, National Center for Education Statistics; 2000. NCES 2000–029.

47. Rosenbaum J. *Beyond College for All: Career Paths for the Forgotten Half*. New York, NY: Russell Sage Foundation; 2001.

48. National Skill Standards Act of 1994: Section V of the Goals 2000: Educate America Act of 1994, 20 USC §5931–5939 (1994).

49. American National Standards Institute. *American National Standard (ANSI) Z490.1-2001, Criteria for Accepted Practices in Safety, Health, and Environmental Training*. Des Plaines, Ill: American Society of Engineers; 2001.

50. Davis L, Pollack SH. School-to-

Work Opportunities Act. *Am J Public Health*. 1995;85:590–591.

51. Job Training Partnership Act of 1982, 59 *Federal Register* 45815 (1994) (codified at 20 CFR §626–628).

52. Workforce Investment Act of 1998, 20 CFR §660–670 (1998).

53. Occupational Safety and Health Act of 1970, 29 USC §651–678 (1970).

54. SkillsUSA Web site. SkillsUSA championships. Contest descriptions. Available at: <http://skillsusa.org/contests.html>. Accessed December 17, 2003.

55. ACTE Online. ACTE/NIOSH School Lab Safety Award. Available at: <http://www.acteonline.org/about/awards/awards-niosh.cfm>. Accessed December 17, 2003.

56. National Institute for Occupational Safety and Health. *NIOSH Safety Checklist Program for Schools*. Washington, DC: Centers for Disease Control and Prevention; 2003. DHHS (NIOSH) publication 2004–101.

57. Texas Engineering Extension Service (TEEX). New Releases. TEEX Initiative is taking OSHA safety training into Texas high schools. Available at: <http://www.careersafeonline.com>. Accessed December 16, 2004.

58. *1998 Edition National Guidelines for Integrating Occupational Health and Safety Competencies into National Industry Competency Standards [NOHSC: 7025(1998)]*. 2nd ed. Canberra ACT, Australia: National Occupational Health and Safety Commission; 1998.

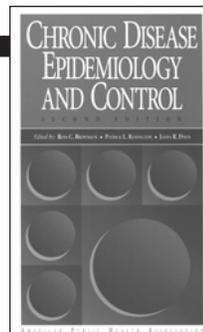
59. WorldSkills Web site. Available at: <http://www.worldskills.org>. Accessed May 20, 2004.

60. Skinner P. Views expressed during the roundtable discussion. In: *Learning About Occupational Safety and Health* [newsletter]. Bilbao, Spain: European Agency for Safety and Health at Work; 2002. *Forum*; issue 8.

61. The Quebec City Protocol. Official position statement. Available at: <http://www.iapa.on.ca/pdf/maquetteang22sept.pdf>. Accessed December 16, 2004.

62. National Safety Council. Final Report of Contract with the National Institute for Occupational Safety and Health. August 9, 2003.

63. A public health approach to preventing occupational diseases and injuries. Weeks JL, Levy BC, Wagner GR, eds. *Preventing Occupational Disease and Injury*. Washington, DC: American Public Health Association; 1991:45–51.



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