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ABSTRACT

The objectives and development of the skill standards movement were examined along with 22 pilot projects that were undertaken as part of an effort to promote the development of a national system of voluntary industry-based skill standards. First, the past and present of the skill standards movement and certification practices were analyzed along with selected models of skill and skill certification (the skill components and professional models, skills and certification in craft occupations, and certification of Secretary's Commission on Achieving Necessary Skills and generic skills). Next, the skill standards pilot projects were studied, and the study findings were synthesized into the following recommendations regarding goals/evaluation, substantive content, and governance of skill standards programs: clarify the movement's goals; make skills standards systems consistent with the broader, more "professionalized" role of workers in innovative workplaces; continue the important progress already achieved in involving employer organizations and associations; strengthen partnerships between employer organizations and schools; and strengthen the involvement of workers and worker representatives in the skill standard system's governance structure. Appended are four charts detailing existing industry-based standards and possible levels of academic-vocational integration, workplace integration, and organization of skill standards. Contains 58 references. (MN)

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National Center for Research in Vocational Education

University of California, Berkeley

MAKING SENSE OF INDUSTRY-BASED SKILL STANDARDS

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MAKING SENSE OF INDUSTRY-BASED SKILL STANDARDS

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EXECUTIVE SUMMARY

The skill standards movement has emerged from a conviction that technology and market changes have caused significant modifications in the types of skills and behaviors needed by workers on-the-job. This conviction has motivated a broad education reform movement that involves changes in curriculum and pedagogy and seeks to tie education more closely to the emerging needs of the workplace. Industry-based skill standards are believed to be a crucial component of that movement. Advocates not only argue that skill standards will strengthen the educational system but that they will also become a critical part of reform efforts in the workplace. Working together, educators and employers will get a chance to reexamine not only their relationships with each other, but activities within their own institutions. As a result of the growing conviction that skill standards can make a significant contribution to improving both education and work, the 1994 Goals 2000: Educate America Act established a National Skill Standards Board to promote the development of a national system of voluntary industry-based skill standards. Even earlier, starting in 1992, the U.S. Departments of Labor and Education established twenty-two pilot projects to help lay the groundwork for a national system.

The fundamental goal of this report is to contribute to the development of a skill standards system. It does that in several ways. First, it provides some basic information about the skill standards movement and the pilot projects that will be helpful to groups trying to introduce or improve standards systems. Second, it seeks to raise some basic questions about the purpose of such a system. We argue that there are short-term goals which focus on improving the flow of information among schools, students, and employers. There are also long-term goals that place skill standards within the context of broad efforts to reform schools and workplaces. While both sets of goals are important, the nature and governance of skill standards systems designed to meet the long-term goals may differ sharply from systems focused on the short-term goals. Our report is designed both to clarify the tradeoffs involved with achieving those goals and to evaluate the extent to which the current efforts to build skill standards systems address either the long- or the short-term goals. Our conclusions are presented in the form of a series of suggestions for strengthening the pilot projects and broadening the system of skill standards. These recommendations are grouped into three broad categories: (1) goals, (2) substantive content, and (3) governance.

Goals

1. *Clarify the goals of the skill standards movement.*

Advocates hope that skill standards systems can help achieve a variety of goals. Any assessment of the effectiveness of these systems as well as judgments about the level or resources that should be devoted to these systems will depend on the ultimate objectives of the movement. At this point, there is no strong consensus about the central goals, and indeed, different stakeholders may have conflicting goals. Simplifying greatly, there are two overall goals—one short-term and one long-term.

The short-term goal is to improve the information available to students, prospective job applicants, and employers. A set of skill standards for a relevant occupation will let employers know more about what job applicants can do, and tell students what types of skills they need to acquire to be eligible for particular jobs or occupations. Many employers involved with the skill standards projects appear to be interested primarily in this type of improved information.

According to the long-term goal, the skill standards movement is part of a much broader strategy to reform both work and education. The objectives of this strategy are to develop and deepen the partnership between schools and employers; to increase learning that takes place on the job; to help change education so that it will be more in tune with current needs of the workplace; and, ultimately, to help move workplaces towards high-performance work systems.

The current skill standards projects have made significant progress towards the short-term goal. The process has given many employers a framework in which to articulate their needs in ways that can be understood by schools and students, although there is still a long way to go before the pilot projects develop fully functioning programs with associated assessment and curriculum.

For some, the motivation for the skill standards movement is more ambitious, however. Educators, policymakers, and analysts involved with the projects tend to take this broader view, although some employers also agree. According to this view, the United States already has many job analysis and certification systems that could be used as vehicles for improved communication between employers and educators. The dramatic

increase in the interest in standards arose from a conviction that significant reform is necessary, particularly in the training and education and the management and utilization of so-called front-line workers—nonmanagerial and nonprofessional production and service workers. Advocates hope that the skill standards movement will be a central component of that broad reform strategy. From this long-term perspective, there has been some important progress.

Nevertheless, there are some significant areas in need of improvement as efforts continue to move towards a stronger consensus on the broad objectives of the system. For example, not all employers have altered their workplaces in accordance with the tenets of high-performance work organizations even though few dispute the rationale and benefits of establishing them. If skill standards are being developed to highlight the demands placed upon workers operating in high-performance workplaces, one must not underestimate the difficulty of achieving "buy-in" from employers with less progressive work environments who will see little use for high-performance standards in their current operations. Indeed, these employers and employees will have as much, if not more, impact on the ultimate success of the skill standards movement as those operating in high-performance work organizations.

Substantive Content

2. *If an objective of the skill standards movement is to contribute to a broad movement of school and workplace reform, skill standards systems need to be developed that are more consistent with the broader, more "professionalized" role of workers in innovative workplaces—they need to move away from the skill components model and towards a professional model.*

In this report, we developed a distinction between two broad conceptualizations of skills—the skill components and the professional model. In traditional workplaces, workers are expected to carry out well-defined tasks under the direction of managers and planners. The skills of these workers can be thought of as a collection of tools (tasks) available for the use of managers. In this case, it is reasonable to summarize the capabilities of the workers as a list of tasks that they can accomplish. Underlying academic skills such as literacy are seen as a foundation upon which tasks are accomplished. But in high-performance workplaces, the jobs of workers are less well-defined. Workers

themselves have more autonomy to decide how a particular goal will be reached. They make more decisions about which tasks to use, when they will be used, and how they will be combined. In this case, it is the ability to carry out tasks that are seen as the foundation upon which broader functions within an organization are accomplished. Although the ability to carry out specific tasks continues to be important, the standards should be built around those broader functions rather than being limited to narrowly defined tasks.

In order to analyze the form and content of the skill standards and to compare them to the two models, we developed a two dimensional typology to categorize the form of the projects. This categorization revealed wide variation in the form of the standards.

One dimension was the extent to which the standards integrated vocational and academic material. Within this, we established three categories. In the first, which was most consistent with the skill components model, academic skills were sharply differentiated from vocational/technical skills (and listed separately). In the second, academic skills were applied to a generic workplace setting but remained distinct from vocational skills. In the third, which was most consistent with the professional model, vocational and academic skills were integrated.

The second dimension was the extent to which skills were integrated into workplace functions. There were three categories here as well. In the first, which corresponded most closely to the skill components model, skills were listed generically with no workplace application relevant to the specific industry or occupation. In the second, workplace applications were provided as examples to indicate how skills were used. And in the third, which was closest to the professional model, skills were integrated into critical aspects of the job and the relevant industrial and organizational contexts.

Six out of twenty-one projects that participated were categorized in the lowest level of both dimensions—we referred to these standards as compartmentalized. Four of the twenty-one projects were categorized in the highest level of both dimensions—these we referred to as consolidated standards. And the remaining eleven were categorized in the intermediate level on at least on dimension—these were referred to as contextualized standards.

The most common job analysis techniques reinforce the skill components rather than the professional model. DACUM and V-TECS tend to result in narrowly defined task lists, although some of the projects have been able to modify the process to support a consolidated approach to standards setting. More comprehensive approaches to job or occupational analysis that have been developed over the last few decades require more time, resources, and specially trained analysts. The search for rapid implementation and attempts to involve a wide group of stakeholders, especially employers, have created incentives to use the simplest method. This tendency will only be reinforced when projects turn to assessment. It will be much easier to check off the mastery of a set of tasks than to try to evaluate the effectiveness of workers to carry out broadly defined roles within their organizations. Furthermore, it is revealing that even job analysis methods that collect more comprehensive data end up developing job descriptions based on narrowly defined task lists. In other words, they do not use much of the information that they collect. Ironically, the same development that has spurred the interest in skill standards—the changing nature of work—also makes it more difficult and complex to create those standards.

Although we have argued that the professional model can serve as an important benchmark for the development of industry-based skill standards systems, this does not mean that current practice in professional education should simply be adopted. Professional organizations are struggling with some of the same problems that have confronted those developing systems for front-line workers. The overall objective should be to develop approaches to understanding skills in reasonably broad clusters of jobs or occupations. There is no question that this is an extremely difficult task.

There are important political reasons why project managers want to develop concrete results quickly. Nevertheless, experimentation is one of the goals of pilot projects, and given the current enthusiasm for standards, particular efforts should be made to address these admittedly difficult problems.

Governance

3. *Continue the important progress already achieved on the involvement of employer organizations and associations.*

The future of the skill standards process depends on collaboration among employers in articulating their needs and in developing and perhaps paying for training and appropriate education. Ultimately, employers will also have to be willing to use the standards in their hiring and promotion decisions. Furthermore, the experience of employer associations in the skill standards system may have been useful in the development of related education and human resource programs. For example, organized employer collaboration is also necessary for the development of widespread private sector participation in school-to-work programs, in helping schools design improved programs and curricula, and in bringing about changes in production processes and work organizations. Lessons learned in the skill standards movement may therefore be relevant to other initiatives. To gain the full advantage of this experience, an organized attempt needs to be made to analyze the strengths and weaknesses of the role of employer organizations.

4. *Strengthen the partnership between employer organizations and schools.*

Most of the pilot projects have placed a strong emphasis on the involvement of employers. Perhaps as a result of this, while educators have taken the lead in a small number of projects, in most projects they have played a decidedly secondary role. Although they have been present on the governance and advisory committees, they have tended to be passive participants. To some extent this might be expected since the early stages of the projects were focused on the needs of the workplace, and it is only now that the staff is turning to assessment and curriculum development—areas in which educators are more likely to be needed. Nevertheless, modern thinking about organizational design suggests that projects are most effectively accomplished if they involve cross-functional and cross-departmental teams. According to this view, production, engineering, and marketing personnel should work closely with designers even at the design stage. Similarly, rather than promoting a system in which employers specify what they need and then hand off the standards to educators to develop curriculum, project managers should work towards more integrated involvement of these groups at all stages of the projects.

Thus, educators should be integrated into the standards design process and employers should continue to be involved when curricula are developed.

5. *The involvement of workers and worker representatives in the governance structure needs to be strengthened.*

For the most part, workers have played an advisory role in the pilot projects. Often, as a result of the modifications of the DACUM job analysis technique, workers were only brought into the process after a complete draft of the standards had been developed. Worker participation in the governance is a central component of the professional model. The more autonomy involved with a job, the more important it is for workers themselves to participate actively in the development of standards that describe those jobs. The closer a firm or industry moves towards a high-performance work organization, the more important it will be to integrate workers into the standards-development process.

One possible explanation for the generally weak worker role in the pilot programs is that the move towards high-performance work is exaggerated. Employers are not really interested in broadening the role of workers either in their production or their standards setting processes. If this is the case, it may be particularly important for project managers to emphasize the role of workers in the projects as a means to promote discussion about organizational innovation in the industry.

There are also practical problems that thwart the increased participation of workers in the skill standards process. Attempts to simplify the job analysis process have tended to reduce the role of workers in setting standards. Convening groups of workers and involving them in a significant way is often difficult and time consuming. Employers are reluctant to release workers for the time required for them to participate even in the more passive roles assigned to them in the current projects. In other countries and indeed in some occupations in this country, unions represent worker interests, and union staff, who are often ex-workers, are assigned the responsibility of working more intensively with the standards projects. This avoids the time conflict experienced by workers with full-time jobs at the workplace. But the weak position of unions in this country reduces their potential contribution to the standards process. Although unions have been involved in some of the pilot projects, in other pilot projects, conflicts between the unions and

employers, or explicit efforts to avoid working with unions, have prevented any meaningful collaboration.

Although we have suggested that the projects need to move towards the professional model, the best approach is probably not one in which workers have almost complete control over the process of setting and certifying standards, as is true in some of the professions. Managerial and consumer interests must also have a voice in the process. Nevertheless, project managers must find ways to establish meaningful partnerships between workers, employers, and educators. Many advocates see the skill standards movement as part of a broad reform strategy to promote high-performance work organization. A central component of innovative work organization is the increased autonomy of front-line workers. Thus, if the standards are seen as part of a strategy to promote greater worker autonomy, there is a conflict between a skill standards process based on a passive role for workers.

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INTRODUCTION

Driven by growing concerns about educational quality and perceptions that a more competitive international economy demands a higher skilled workforce, industry-based skill standards and certification have moved to the center of mainstream education reform. It is widely believed that an improved system of skill standards and certification is essential for improving the fit between what is learned in school and what is needed on-the-job, facilitating the movement from school to work, and ultimately strengthening the country's economic position (Commission on the Skills of the American Workforce, 1990).

The skill standards movement has emerged from a conviction that technology and market changes have caused significant modifications in the types of skills and behaviors needed by workers on-the-job. This conviction has motivated a broad education reform movement that involves changes in curriculum and pedagogy and seeks to tie education more closely to the emerging needs of the workplace. Industry-based skill standards are believed to be a crucial component of that movement. Advocates not only argue that skill standards will strengthen the educational system, but that they will also become a critical part of reform efforts in the workplace. Working together, educators and employers will get a chance to reexamine not only their relationships with each other, but also activities within their own institutions. As a result of the growing conviction that skill standards can make a significant contribution to improving both education and work, the Goals 2000: Educate America Act passed in 1994 established a National Skill Standards Board to promote the development of a national system of voluntary industry-based skill standards. Even earlier, starting in 1992, the U.S. Departments of Labor and Education established twenty-two pilot projects to help lay the groundwork for a national system.

The fundamental goal of this report is to contribute to the development of a skill standards system. It does that in several ways. First, it provides some basic information about the skill standards movement and the pilot projects that will be helpful for groups trying to introduce or improve standards systems. Second, it seeks to raise some basic questions about the purpose of such a system. We argue that there are short-term goals which focus on improving the flow of information among schools, students, and employers. There are also long-term goals that place skill standards within the context of broad efforts to reform schools and workplaces. While both sets of goals are important, the nature and governance of skill standards systems designed to meet the long-term goals

may differ sharply from systems focused on the short-term goals. Our report is designed both to clarify the tradeoffs involved with achieving those goals and to evaluate the extent to which the current efforts to build skill standards systems address either the long- or the short-term goals.

In broad terms, our conclusions suggest that the skill standards movement has the potential to serve the long-run goals associated with innovation and reform in schools and workplaces. Nevertheless, many aspects of the current efforts remain rooted in past notions of skills. The conceptualization of skill which serves as a basis for many of the skill standards projects are more closely associated with traditional rather than more innovative approaches to organizing work. To be sure, there remain many traditionally organized workplaces, and systems of standards based on current or past notions about skills may be useful to those workplaces. To a large extent, however, the skill standards movement has arisen as part of an effort to bring the country's education system more in line with emerging, rather than traditional, needs of the workplace. This suggests that at least the objective of designing a system consistent with skills and behaviors needed in innovative workplaces must be considered explicitly.

The more traditional characteristics of the emerging skill standards systems are partly the result of past practice. Project managers have, for the most part, adapted traditional methods for analyzing jobs and developing standards. It is not surprising that those methods, developed in earlier decades when the demands of the workplace were different, are in conflict with emerging needs. Many managers are aware of this limitation and of the practical barriers to skill standards development and implementation. Indeed, the same factors that create a greater need for skill standards systems also make them more difficult to establish.

Outline

This report first briefly describes the skill standards movement and then discusses why it has taken such a prominent place in the current education reform agenda. The subsequent section addresses arguments about the changing nature of work and skills that lie behind the growing interest in skill standards. We then present two broad models of skills. The first model—the skill components model—is rooted in ideas about the role of

nonprofessional or front-line workers in traditionally organized workplaces. The second model—the professional model—is more closely related to understanding the role of workers in innovative workplaces (currently referred to as "high-performance workplaces"). There are two crucial distinctions between the two models. The first is the conceptualization of skills and the second is the governance of the skill standards process. The next sections uses the two models to analyze twenty-two skill standards pilot projects funded by the U.S. Departments of Education and Labor. We find mixed results in terms of the conceptualization of skills—some projects are approaching the professional model while many continue to be firmly rooted in the skill components approach. None of the projects approach the professional model in terms of their governance structures. The dominant techniques for job analysis also tend to be at odds with the professional model. The final section presents conclusions and policy directions.

Skill Standards and Certification in the Past and Present

Proposals to reform the U.S. system of skill certification permeate the current education reform agenda. One central component of that agenda is the Goals 2000: Educate America Act which establishes a National Skill Standards Board to encourage, promote, and assist in the voluntary development and adoption of a national system of voluntary occupational skill standards (United States 103rd Congress: Goals 2000: Educate America Act S. 1150, National Skill Standards Act Title V, 1993). Likewise, the School-to-Work Opportunities Act of 1994 calls for educational programs that lead to a "nationally recognized" skill certificate. Although the Republican Congress has challenged both of these Acts, strong support in the business community for the skill standards initiatives suggests that at least this component of the Clinton education reform agenda may survive.

There are reasonable arguments for improving the system of skill standards and certification. For example, the General Accounting Office (GAO) (1993a) argues that such a system would help employers identify qualified workers, save money on applicant screening, aid in recruiting, and improve the public perception of firms. A better certification system would indicate to students what they must learn and provide a focused motivation for acquiring the particular skills that they will use in the workplace. Graduates would also have better access to a national labor market (if the certification is recognized

nationally), thus promoting their geographic and occupational mobility. And prospective students, employers, and the public would be better able to assess the effectiveness of educational institutions or training programs.

While these arguments make sense, their force does not depend on current economic conditions. Indeed, they would have been equally logical at any time over recent decades. They do not explain why standards have emerged so prominently in the current policy discussion.

Although skill standards and certification are now a fundamental part of the current education reform strategy, ten years ago they were entirely absent from the reform discussion at the national level. *A Nation at Risk* (National Commission on Excellence in Education, 1983) and the cascade of reports that followed its publication did not emphasize skill certification. This dramatic increase in the prominence of the issue gives the impression that skill standards are something that U.S. policymakers have recently discovered in Europe and Japan.[1] As two prominent commentators argue, "The United States has virtually no experience with a large-scale system for certifying the skills of new entrants or experienced workers" (Berryman & Rosenbaum, 1992, p. 51).

But this impression is misleading. Although one could argue about the meaning of "large-scale," there is in fact a long history of the development of standards systems in the U.S. For example, the competency-based education strategy (CBE), which received widespread support during the 1970s, appears to share many features of the current movement. CBE requires formal exit requirements to be stated in clear and explicit terms. Outcome goals are designed to be easily attached to concrete behaviors and expected performance requirements that were known and agreed upon. CBE advocates call for collaborative decision making by all those interested in students' educational progress. The system is intended to make individuals aware of when, how long, and how often opportunities for both instruction and evaluation will be provided (Spady, 1977). Supporters also indulged in some of the enthusiastic hyperbole that appears to be common

[1] In part of a comprehensive report on skill standards in the U.S. and abroad, Joan Wills and her colleagues identify three fundamental differences between U.S. skill standards systems and those in six other countries (Denmark, Germany, Canada, Japan, Australia, and the UK). These gaps are (1) more advanced support for education and/or work-based skill standards systems; (2) independently developed and administered exit examination given after compulsory education which are supported by the central or territorial governments; and (3) long histories of central government supporting and promoting third party certification of skills and knowledge gained through vocational preparation programs (Wills, 1993d).

today. One CBE proponent declared in 1977 that "Very few educational concepts in recent years have had as great an impact on educators and on society as Competency-Based Education" (Knaak, 1977, p. 1). Furthermore, CBE continues to be used by many educators.

There continues to be a profusion of systems in the U.S. for setting skill standards and for certifying their achievement, as a recent report on skill standards by Joan Wills and her colleagues (1993a, 1993b, 1993c) makes abundantly clear. They report on dozens of programs in a wide variety of occupations. Many organizations, partnerships, and associations in the public and private sectors have been developing certification processes for many years. And professional and craft occupations have extensive and well-developed systems.

The arguments in favor of skill standards and the extensive experience that American educators already have with certification systems raise two questions. First, why has the issue gained such national prominence only recently? After all, as we have pointed out, many of the arguments for a stronger system of skill standards do not depend on the current educational or economic environments. Second, why are the current systems considered inadequate?

The Sudden Emergence of Skill Standards as a National Issue

One cause of the recent preoccupation with standards is the widely held conviction, now more than a decade old, that problems with the U.S. education system account for a variety of economic and employment problems. These problems, articulated perhaps most influentially in *America's Choice: High Skills or Low Wages!* (Commission on the Skills of the American Workforce, 1990), include weakening competitiveness, increasing inequality, and a stagnant standard of living. But the diagnosis focused particularly on the so-called "front-line worker"—those workers in both services and manufacturing who carry out the work as opposed to plan and manage it. Previous educational preoccupation in the 1950s and 1960s (following Sputnik) had focused on engineers, scientists, and high-level technical personnel, and later during the 1960s and 1970s on minorities and the "at-risk." Reformers in the late 1980s thus turned their attention to "The Forgotten Half" or those "noncollege-bound" who did finish high school and perhaps acquired a year or two

of postsecondary education (William T. Grant Foundation on Work, Family, and Citizenship, 1988). Analysts argued that the schools that served these students were inferior, that students were given no incentives by schools and employers to study hard, and that there was no coherent system for moving graduates from schools into the workplace. This nonsystem looked particularly bad in comparison to systems in Germany and Japan, countries that were perceived to be surpassing the U.S., where the education of the noncollege bound was taken much more seriously and where the transition from school to work appeared to be much more effective.

One of the most obvious distinctions between some of these countries and the U.S. involved the systems of skill standards and certification. A system of standards would appear to address directly the most serious perceived problems in the U.S. system. Standards would identify for students what they needed to learn, they would signal the skills and capabilities of students to employers, and if employers took them seriously, they would provide a focused motivation for students. All of this would facilitate the transition from school to work.

The Professionalization of Production Workers

But this could have all been said in earlier decades. Why did the U.S. system, which seemed to have been adequate previously without European-style skill standards, cease to be effective? A widely believed answer to this question involves the changing nature of work—a transformation characterized as the difference between traditional workplaces and "high-performance workplaces." This change is described in many publications and need not be elaborated here.[2] What is important for our purposes is that it involves a fundamental change in the nature of work of many nonprofessional and nonmanagerial workers. In traditional settings, their jobs had been limited, well-defined, and passive. Workers were expected to perform a set of tasks and anything out of the ordinary was referred to managers or specialized support personnel. Little initiative was expected. In contrast, in high-performance systems, workers are engaged in less explicit activities and are expected to be much more actively involved with their jobs, contributing their ideas and initiatives to furthering the goals and objectives of their work group and organization. Rather than simply carrying out specific tasks and following specific

[2] See, for example, Kochan and Osterman, 1994; Appelbaum and Batt, 1994; and Bailey, 1993.

instructions, workers are expected to solve problems, seek ways to improve the methods that they use, and engage actively with their coworkers. Therefore, this is much more than simply increasing the tasks that a worker can perform; rather, it involves a new type of behavior and orientation towards the job (Bailey, 1993). It sounds very much like the behavior that is already expected from professional and technical personnel; therefore, we refer to this as the "professionalization of the production worker."[3]

Thus, the recent preoccupation with skill standards emerges particularly from a concern about the economic performance of nonprofessional and nonmanagerial workers. The traditional system is no longer adequate for the new demands placed on these workers in their new "professionalized" roles. This "mismatch" reduces the overall productivity of the economy and reduces the standard of living of individual workers. The system of skill standards is a crucial part of a broader reform strategy designed to promote innovative approaches to production and human resource management ("high-performance work organization") and to bring the education and school-to-work transition systems more in line with demands of the economy.[4]

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[3] Forty years ago, sociologists argued that industrialization implied a general professionalization (Nelson & Barley, 1994). In an argument that seemed to foreshadow the discussion in the 1990s, Foote (1953) predicted that work would no longer be segmented into discrete tasks, but would become more collaborative, based on shared skills and knowledge (p. 371). Later, though, in a well-known article "The Professionalization of Everyone?" Wilensky (1964) attacked this view, arguing that the division of labor would remain such that professional occupations would continue to be distinct. This perspective seemed to dominate thinking for the next three decades.

Perhaps the current discussion is simply a repeat of optimistic speculations of a half a century ago. But Nelson and Barley (1994) suggest that as a result of the "shift towards horizontalism or the establishment of increasingly collaborative work relations" (p. 23), it may be that Foote (1953) and his colleagues were right after all. To some extent, this hinges on the strength of the shift from traditional to high-performance work (or horizontalism as Nelson and Barley put it). Research suggests that a significant minority of firms have introduced some important workplace innovations (Kochan & Osterman, 1994). Moreover, the current economic conditions do seem to provide a stronger basis for organizational innovation than conditions in previous decades (Bailey, 1993).

[4] On the other hand, there is a more pessimistic view of the underlying social function of skill standards. The well-publicized downsizing of many corporations suggests that more or less long-term employment with one employer is likely to be less common in the future. If workers are expected to change employers more frequently, then it is more important that they have an identifiable and portable credential. The job mobility that this provides is more important in a more fluid and less structured labor market with less job security.

MODELS OF SKILL AND SKILL CERTIFICATION

Both the U.S. education system and conceptions of work have traditionally been based on a series of dualities that distinguish mental activities from physical activities (head and hand), theoretical from practical, academic from vocational, and job conception from job execution. Mainstream education reform is increasingly based on challenging those dualities.[5] For example, the integration of vocational and academic education plays an important role in both the School-to-Work Opportunities Act and the 1990 reauthorization of the Perkins Act. Linking structured work experience to classroom work as a strategy for integrating conceptual and theoretical thinking with practical experience is an increasingly important component of educational reform strategies (Grubb, 1995).

While breaking down the duality between head and hand has received a great deal of attention in discussions about curriculum and pedagogy, the extent to which that duality rules thinking about skills and skill certification has not been discussed. Although skill standards are promoted as part of a strategy to create an education system based on the rejection of the classic dualities, much of the discussion of standards and certification is still couched in traditional dualistic terms.

This distinction between an approach to skill standards based on the traditional dualities and one based on a more integrated perspective can be made clear by developing two broad models of skills and accompanying certification. One will be referred to as the *skill components model* and the other as the *professional model*. These two models differ along two dimensions—the conceptualization of skill and the role of workers in the development and governance of the standards system.

The conceptualization of skills is the first feature that distinguishes the two models. The performance and responsibilities of professional workers cannot be characterized by dividing their jobs into a list of discrete tasks or skills and then adding up tasks that the professional has mastered. The nuances of their roles and responsibilities make narrowly defined listings of their skills difficult to produce. To make sense of the work of professionals, it is necessary to examine their performance as a whole, to study how they combine the many components of their skill and behavior. On the other hand, the

[5] See Berryman and Bailey (1992) for a discussion of these dualities and the role that they play in current education reform

nonprofessional worker in the traditional organization works under the direction of supervisors or professionals whose responsibility is to combine the tasks of subordinates into a coherent whole. In this case, it is possible to characterize the effectiveness of workers by cataloguing the separate tasks that they can perform. Here the focus is on the pieces that make up the whole rather than on the entirety of the activity.

The role of the worker or worker representatives in the development of systems of skill standards and certification is the second aspect that distinguishes the skill components from the professional model. In the skill components model, while nonprofessional workers may be consulted about skill standards, the authority and control rests with managers and educators rather than the workers themselves. In the case of the professional model, the workers or their representatives have a crucial role in the definition of the standards and their certification.

The Skill Components Model

The skill components model is based on the limited roles that workers are expected to carry out in a traditional hierarchical organization. For example, Rosenbaum, Kariya, Settersten, and Maier (1990) argue that ". . . although college graduates are hired based on their ability to be self-directed, noncollege bound youth are hired based on their rule-following behaviors: effort, deportment, attendance, and punctuality" (p. 266). Nonprofessional workers are expected and trained to assume a passive role. Stripped of autonomy by the narrow skills that define them, employees are left to perform a series of rote functions that have been explicitly established for them. Since workers are not expected to make complex independent decisions, the conceptual skills that could be used as a basis for making those decisions are not considered necessary. To some extent, workers are expected to have basic academic skills—literacy and numeracy—but a sharp distinction is maintained between academic and vocational learning. Academic skills are learned prior to specific vocational skills and are useful to the extent that they help workers master the required list of tasks. But the typical approach to teaching and the types of tasks that workers are asked to carry out thwarts the transfer of enabling competencies to their applications (Stasz, McArthur, Lewis, & Ramsey, 1990).

Based on the skill components framework, workers are trained to perform tasks (skilled workers may know how to perform many tasks) that are explicitly defined by their supervisors and managers. They are not expected to know when to do them, how they fit into related tasks, or how they relate to a final product. Nor are nonprofessional workers expected to figure out new and improved ways of carrying out their required functions or how their traditional functions might be applied to different situations (Bailey, 1989).

Professionals or higher-level technical personnel are expected to be able to do these broader, more open-ended activities and the notions of skills associated with them reflect those broader expectations. Because of the lack of an overall organizational perspective in the occupational profile of nonprofessional workers, nonprofessional workers are not provided with the big picture of the organization or their role within it. The skills of the workers can be considered a tool box at the disposal of managers and professionals. Managers can select the individual tools that they need and it is up to the managers, not the workers, to select the appropriate combination of tools.

The skill components model also has a tendency to generate a proliferation of occupational categories. If occupations are thought of as an accumulation of well-defined tasks, then it becomes necessary to establish different occupational or job definitions each time there is a different accumulation of tasks. Wills' (1993a) cataloguing of current systems of skill standards reveals many narrow job definitions. For example, "agricultural power and machinery has three suboccupations—(1) farm equipment mechanic, (2) farm machinery set-up mechanic, and (3) tractor mechanic. Perhaps the best example of the explosion of job titles is the *Dictionary of Occupational Titles*, which includes definitions for over twelve thousand occupations.

This conception of skill has two important implications. First, from this perspective, the effectiveness of a worker can be characterized by a list of the individual tasks that that worker can carry out. This applies both to skilled and unskilled workers. In the skill components model, the difference between the skilled and unskilled worker is the length of the list of tasks that they can perform. Second, in the skill components model, it makes sense that managers have control over the process of developing skill standards and their certification. If managers—functioning outside the occupation itself—have the responsibility of making a coherent whole out of the work of the subordinates, then it is reasonable that they, not the workers, should set and regulate the required skills.

The Professional Model

There are extensive skill certification systems for professional workers. Nurses, doctors, lawyers, accountants, architects, engineers, and many others have systems for identifying and certifying the capabilities needed to carry out the activities of their occupations. We have suggested that descriptions of modern organizational innovations picture a role for production workers that shares many characteristics of professional work. Nevertheless, these professional systems have received very little attention in the current discussion of skill standards.[6]

Much of the long discussion about professionalism has focused on the roots of the power and status of professionals. As Nelsen and Barley (1994) argue, "the analytic emphasis has been overwhelmingly structural and concerned primarily with explicating the role played by certain material conditions in the acquisition, maintenance, and loss of professional power and status" (p. 4). There has been a great deal of discussion on skill content and activities that professionals perform, but, in many cases, authors are interested primarily in the role that the content of professional work plays in establishing the social power and position of the professional worker. As Abbott (1988, p. 3) points out, most of the focus is on how professionals are organized to do what they do rather than what they do. Typologies of professional characteristics often do not include content. Abbott identifies four versions of professionalism—(1) functional, (2) structural, (3) monopolist, and (4) cultural. The content of the work is central to only one—functional. Abbott does emphasize that the abstract nature of the work enables the survival of professional occupations, but other perspectives give even less importance to work content. One perspective holds that professionals derive their status and position from the power that they have over entrance to their professions through their control of appropriate educational institutions and the certification process (Brint, 1993). More broadly, the "social constructionist" perspective emphasizes that professional status derives largely from institutional and social factors rather than any inherent characteristics of the work done by professionals (Attewell, 1990). Much of this discussion is critical of professional power, arguing that professionals use it to raise their incomes and prevent competition. By insulating themselves from the market, professionals serve the interests of their profession

[6] One significant exception is a report on the training of architects by John Wirt (1995). Wirt uses the experience with certification of architects to analyze certification systems being developed as part of the skill standards movement. Hoachlander (1995) also draws lessons for skill standards efforts from the experience with training and certification of pilots.

rather than the best interests of their customers. For example, doctors are often criticized for focusing on specializations, surgical procedures, and drugs and neglecting family practice and prevention.

Our concern here is not directly with problems having to do with defining and attaining professional status. Rather, we focus on two related issues: (1) the implications for skill standards on the content of work, and (2) the role that workers and managers play in defining those standards. Goode (1969) defines two fundamental traits to professionalism: (1) the knowledge base and (2) the ideal of service. How do these relate to the changing role of production workers in a high-performance workplace?

The Knowledge Base and Content of Professional Work

Professionalism assumes that transitions or applications from a general system of knowledge to circumstances of a particular situation are intrinsic to the worker (Wolfson, Trebilcock, & Tuohy, 1980). Professional development stresses a type of autonomous behavior that is different from the behavior expected of lower-level or production workers (those most easily represented under the skill components framework). Proactive, nonroutine behavior is rewarded, indeed required, of professional workers.

Collins (1976) describes the irony involved in the type of duties and responsibilities typically carried out by the professional. Professions involve interventions with uncertain outcomes which implies that an effective, reproducible method—a routine—has not yet been invented to deal with the particular problem. The concept of professional skill is paradoxical—it depends on the absence of an effective technique or technology to produce the desired outcome; a skilled occupation is one that cannot reliably do what it is called on to do (work cannot be carried out effectively every time and this becomes a resource around which those who are employed at the work build their claims to being especially skilled). Similarly, Wolfson et al. (1980) describe professional performance in the following manner: "The uniqueness of a professional's role lies in the 'agency' functions of diagnosis and prescription. Professionals are charged by their clients with making important decisions on their behalf . . ." (p. 191).

To be sure, professionals must also be able to carry out specific tasks. As Hoachlander (1995) points out, it is possible to have a view of the skills of a pilot that is much more complex and nuanced than a list of skills or tasks, but a pilot still must be able

to use instruments to land a plane. No pilot certification system could be considered adequate if it did not require that pilots could accomplish that specific task. Similarly, surgeons would not be worth much if they did not know how to make an incision and close it up, and a quantitative analyst could accomplish little if they could not use the appropriate software. Indeed, professional training often involves mastering lists of specific skills. Nevertheless, two professionals, equally adept at carrying out these types of specific tasks, could differ profoundly in their effectiveness as professionals. Hoachlander argues that a pilot who can hit the landing path every time will nevertheless crash if they use poor judgment in deciding when it is safe to land. One of the greatest criticisms of surgeons is that they do not know when *not* to cut, and there are plenty of analysts who have mastered the most complex software, but have little idea about which variables to include in the analysis.

For the professional, the specific tasks are seen as the foundation or enablers for more complex general functions such as problem solving, reasoning, or using judgment. In contrast, for the nonprofessional worker, the broader "academic" skills are the foundation or enablers of the specific tasks. Thus, the tasks are the ultimate activity for nonprofessional workers, while for the professional, the tasks are necessary (but not sufficient) to carry out the core activities of the profession.

As we have argued, in the high-performance workplace, it is the worker, not the manager, who must make sense of the work. In contrast to the traditional workplace, the worker must understand the relationships among the various tasks that they perform. As with the professional worker, the tasks are the building blocks that enable high-performance workers to carry out their broader functions.

Ideal of Service

According to Goode (1969), "the ideal of service, sometimes called a *collectivity orientation*," implies that "the technical solutions which the professional arrives at should be based on the client's needs, not necessarily, the best material interest or needs of the professional himself . . ." (p. 278). On the other hand, Goode goes on to argue that ultimately, the professional who lives by this ideal should be more successful than the practitioner who does not (p. 279).

Although the worker in the high-performance workplace does not serve an individual client in the same way that professionals do, innovative workplaces do require a stronger collective orientation. A fundamental principle of more decentralized organizations is that workers at all levels can be expected to make decisions that reflect the broader interests of the organization, and not necessarily the narrow immediate interests of the worker.[7] On the other hand, proponents of workplace innovation argue that the ultimate interests of the worker will be served through the effect of the innovative practices on the strength of the organization as a whole.[8] Thus, while the workers will not have a professional-type client-practitioner relationship, they will share with professionals a need to relate to a set of interests broader than their own, although ultimately they are expected to benefit from that broader ethic of service.

Testing and Certification

In most professional occupations, aspiring practitioners must pass actual certifying examinations. These exams and certification systems are usually developed by practitioners themselves through the relevant professional organizations and often include practical components. Essay questions or exercises are intended to simulate complex problems encountered in the performance of the occupation. To be sure, professionals must show their mastery of particular tasks, but ultimate acceptance as a professional must be based on a demonstration of the use of those tasks to accomplish the core activities of the profession.

In most cases, the certification cannot be separated from the nature of the training itself. Many of the professions require extensive guided practical experience to achieve various levels of certification. For example, in 1992, the American Institute of Certified Public Accountants issued a new policy report which called for the incorporation of practical experience into the required prelicensure education for CPAs. The Institute of Certified Records Managers requires proof of professional work experience before applicants can sit for the certification exam. The exam itself includes case studies that require essay responses (Wills, 1993c). Students in professional programs know that they have little chance to get better jobs without summer internships or post-training experience

[7] This is a common problem in team-based production in which the interests of the team may at times clash with individual interests of team members.

[8] For a more detailed discussion of the interests of workers in a high-performance work organization, see Bailey, 1993.

which give some indication of how they actually perform in realistic situations. And many graduate students learn that impressive scores on certifying exams are quickly forgotten if they cannot produce a good dissertation—that is, if they cannot effectively perform the core activities of the profession.

Mid-career professionals, when they market themselves, emphasize their concrete accomplishments. Where individual performance is difficult to measure, they emphasize the nature of their experience. In these cases, a long list of skills would count for little if the applicant could not demonstrate an ability to combine those skills in such a way that they were performed effectively.

The Professional Practitioner Role in Setting Standards

Autonomy is a fundamental characteristics of professional certification systems. Professionals themselves set standards since they have the knowledge necessary to do so. In their discussion of the creation of a profession of teaching, Wise and Leibrand (1993) argue that

> The established professions have, over time, developed a body of specialized knowledge, codified and transmitted through professional education and *clinical practice*. As a result of specialized knowledge gained through study and *mentored practice*, professionals are granted autonomy in their practice on the premise that only those who have completed [a] rigorous course of study should be able to apply their knowledge and *to determine the norms of practice*. If teaching is to become a true profession, educators must reverse the traditional practice of allowing state legislators to set standards. (p. 135)

While workers in innovative workplaces may not have full control over standard setting, to the extent that it is workers themselves who are expected to make sense out of their work, they must be integrally involved with the development of standards. As soon as managers focus primarily on the outcomes of work and give more responsibility for specific decisions to workers themselves, those managers have a weaker understanding of exactly what is necessary to do the job effectively. Thus a standard setting process in a high-performance workplace that does not give a central role to workers, will result in incomplete or inaccurate standards.

Skills and Certification in Craft Occupations

In discussing the professional model, we have drawn on experience from professional occupations, most of which require college degrees. But many craft occupations, which employ noncollege graduates, have training and skill certification systems that share the fundamental characteristics of the professional approach.

In the U.S., well-established apprenticeship programs mixing related training, on-the-job training, and skill credentialing are present in many types of industries and occupations, but this road to higher pay and broader skills is most common and established in iron-working and construction industries. Throughout the country, construction accounts for over half of the registered apprentices. At any one point in time, the U.S. Department of Labor's Bureau of Labor Statistics estimates that approximately 350,000 individuals participate in about 43,000 registered apprenticeship programs in the U.S. (U.S. Department of Labor, 1991/1992).

Graduates of apprenticeship programs earn a credential and, through this, future employers have a clear idea about the domains of skill that they have. At the same time, employers have more information than simply the content of a certification test. They know that each apprentice has had experience in a wide variety of tasks and problems associated with the occupation.

Apprenticeships, and related skill certifications, have survived in construction for a variety of reasons. Two important reasons involve the institutional context of the industry and the nature of the work.

The institutional arrangements in the construction industry are crucial. The construction labor market is highly regulated due to the importance of federal funding in many construction markets. Employers working on construction projects with federal funding must pay journeyman's wages (usually the union wage) to all those working in many occupations, but registered apprentices in those occupations can receive lower pay. The majority of apprenticeship programs in construction are administered jointly by unions and employer associations according to collective bargaining agreements. These agreements spread the cost and responsibility for apprenticeship training, curriculum

planning, and testing. Significantly, this involves workers and their representatives directly in defining the necessary skills and overseeing their certification.

Another explanation for the persistence of apprenticeship in construction involves the nature of construction jobs. It is very difficult to standardize construction work. Skilled construction workers are constantly confronted by unexpected and unique situations that require problem-solving skills and teamwork. In other words, construction puts demands on workers that are similar to those thought to be required by high-performance organizations.

New Approaches—SCANS and Generic Skills

One of the most important effects of the discussion of the skill needs of high-performance work organization is that analysts have begun to see traditional conceptions of work as inadequate. This has led to the development of several typologies of skills that include components left out by the traditional approaches. These new types of skills are often referred to as advanced generic skills or SCANS skills (named after the Secretary's [the Secretary of Labor] Commission on Achieving Necessary Skills). They are based on the recognition of the inadequacy of previous perspectives on skills. Thus, they begin to break with the skill components model and in that sense they represent potential to expand the conceptualization of skills. But at the same time, they fail to adopt fundamental characteristics of the professional perspective.

The 1991 Secretary's Commission on Achieving Necessary Skills (SCANS) was an attempt to break out of the task orientation of the traditional approaches and address the issues raised by the new conceptions of work and related skills. SCANS gathered a group of experts with experience in analyzing the skill requirements of the emerging technology and innovative work organization. The group identified five competencies and three foundation skills that they felt were essential to either work preparation or further education. Commissioners agreed on the following basic/foundation skill components:

- Basic Skills—reading, writing, and mathematics, speaking and listening
- Thinking Skills—thinking creatively, making decisions, solving problems, seeing things in the mind's eye, knowing how to learn, and reasoning

- Personal Qualities—individual responsibility, self-esteem, sociability, self-management, and integrity

They also broadened the conception of occupational skills, which they referred to as generic workplace competencies, in the following areas:

- Resources—allocating time, money, materials, space, and staff
- Interpersonal Skills—working in teams, teaching others, serving customers, leading negotiating, and working well with people from culturally diverse backgrounds
- Information—acquiring and evaluating data, organizing and maintaining files, interpreting and communicating, and using computers to process information
- Systems—understanding social, organizational, and technological systems, monitoring and correcting performance, and designing or improving systems
- Technology—selecting equipment and tools, applying technology to specific tasks, and maintaining and troubleshooting technologies (Secretary's Commission on Achieving Necessary Skills, 1991)

Other organizations have developed similar lists. For example, the American Society for Training and Development (ASTD) emphasizes "fundamental educational standards that must be taught from the earliest possible time in school and reinforced throughout an individual's career . . . (which) allow individuals to continuously learn new skills over time and help his/her company be competitive" (Leslie, 1992, p. 7). The list of skills which they emphasized as being the underpinnings for a voluntary system of standards include the following:

- Knowing how to learn
- Competence in reading, writing, and computation
- Listening and oral communication skills
- Adaptability: creative thinking and problem solving

- Personal management: self-esteem, goal setting, career development
- Group effectiveness: interpersonal skills, negotiation, teamwork
- Influence: organizational effectiveness and leadership (Carnevale, Gainer, & Meltzer, 1982)

Similarly, Stasz et al. (1990) describe a set of universal skills needed in the workplace, citing the complex interaction of knowledge, skills, and motivations that determine the degrees of success or failure in all occupations and work efforts. Their framework of generic skills is comprised of two broad categories of skills—(1) basic or enabling skills and (2) complex reasoning skills. Their analysis points out that basic skills such as reading, math, and life skills can often be cognitively complex especially when coupled by the reasoning skills (critical thinking; defining, evaluating, and solving problems) which are key to successful performance in and adaptations to a changing workplace. Motivational style or disposition of the worker (e.g., their motivations for choosing or doing a task, and confidence in one's ability to do a task) becomes a unifying factor and can either strengthen or weaken the workers ability to effectively utilize their skills.

Although the concept of SCANS and similar broad-based skills categorizations add a new, more professionalized and autonomous dimension to workers' roles, they fail to break completely with the traditional classification of the worker. By adhering to strict differentiation between SCANS skills and technical and academic skills, jobs are still being characterized as lists, albeit more extensive lists. In addition to traditional occupational tasks, problem solving, creative thinking, and knowing how to learn skills ("skills" which are presumably needed in new high-performance workplaces) are merely added. In order to meet the needs of the new workplace, while staying in line with traditional conceptualizations of the worker, SCANS is simply a broader listing of parts or component skills—not a movement toward a model that integrates the worker as a whole with the overall organizational context or focuses more directly on the overall performance of the worker.

We suggest that even a list of skills as broad as the SCANS list cannot characterize professional work if it remains a mere list. Our understanding of professional work has evolved over time to include similar skills to those in the SCANS list but, as we will

illustrate below in our discussions of the skill standards pilot projects, these professional skills are packaged, evaluated, and thus perceived in a different manner and are associated with greater status than similar professional-type skills for production and lower-level workers. Thus, SCANS represents a transition—it is based on a recognition of the need for a change—yet is still embedded in a traditional framework and perspective.

Problems with the Professional Model

While we argue that the conceptualization of professional skills is a useful benchmark against which to measure systems of industry-based skill standards, systems of professional standards and certification also have many critics. Some of the criticisms of the skill components model such its narrow conceptualization of skills and the proliferation of job titles and categories are echoed in discussions about professional skills and certification.

For example, Baskett and Marsick (1992) identify a shift in professional education towards what they term "competence models." They point out that "Competencies are identified by subject matter experts and clients, validated, and used as the basis for assessment and for classroom-oriented or alternative self-directed learning activities" (p. 8). But they point out that this model has been severely critiqued, pointing to Phillip Nowlen's argument that

> "The most serious flaw in the competence approach is its underlying assumption that performance is an *individual affair*." Nowlen represents an emerging school of thought that emphasized an understanding of professionals in relationship to the complex environments in which they practice. Professionals do not work solo but are part of an "ensemble" that involves relationships with peers, the organization through which service is delivered, paraprofessionals on whom the professional depends to meet client needs. . . . Competence is much more than an abstract set of knowledge and skills. (p. 8)

Thus, Basket et al. and Nowlen are in effect suggesting that the education of professionals does not always live up to the professional model.

Professional systems of certification have also been attacked for the proliferation of specialties and subspecialties (Miller, 1994). In the professions, this is often justified as a response to the increasing volume of knowledge and the inability of any individual to

master that knowledge over even a moderate range of substantive domains. The search for status and prestige or political struggles about control over occupational entry also provides incentives for the establishment of subcategories. This can be illustrated by the case of skill certification for appraisers. There are eleven different industry and trade associations which provide training and certification. Certifying bodies range from the American Society of Farm Managers and Rural Appraisers to the Institute of Business Appraisers. Educational and work experience requirements vary drastically among industry organizations. The International Society of Appraisers requires only work experience and participation in industry-sponsored courses for membership whereas the American Society of Appraisers requires four years of college for membership in addition to work experience (Wills, 1993c).

On the other hand, current conceptions about work which suggest that there will be an increasingly rapid pace of change and a growing need for group and collaborative activities suggest that there must be some reform of the deep but narrow training that has characterized some professional specialties. In any case, in drawing lessons from professional systems of education and certification, it is important to take account of the problems and tensions that are also facing those systems.

Conclusion

The increased interest in developing a system of skill standards has been caused by a changing understanding of the nature of work. According to views about high-performance work organizations, the activities of front-line, nonsupervisory workers are coming to resemble more the activities previously carried out by professionals and managers. In this section of the report, we have described two models of skills and skill certification—the skill components and the professional models. Standards systems based on the professional model combine two basic elements. First, these systems emphasize broad performance through formal or informal evaluation of work experience or the simulation of complex activities typical of the occupation. Second, the professional systems give significant power to practitioners in the occupation or to their representatives.

Therefore, skill standards developed under the professional framework would promote an "expert decision-making" role for sub-baccalaureate workers which has similar

characteristics to the role that professionals with formal educational credentials enjoy. Acknowledgment of the subtle nature of their duties challenges the idea that their organizational responsibilities can be described by a concise listing of skill standards and activities. The professional framework emphasizes the unique, nonroutine problem-solving abilities that will be required of the job. This has profound implications for the xpansion of worker involvement within organizations.

Nevertheless, in practice, professional training and certification also faces many problems—these system often do not live up to the professional model. Thus, while the conception of professional work is a useful benchmark for the development of skill standards for front-line workers, professional systems cannot be adopted unchanged. The most effective outcome will probably be a synthesis that builds on professional practice, but avoids some of its drawbacks. This issue will be taken up in the last section of this report. We do emphasize, however, that while there are significant pitfalls to the professional path, the current discussion of industry skill standards has not adequately recognized the parallels between the objectives of industry standards and those of professional systems.

THE SKILL STANDARDS PILOT PROJECTS

In mid-1992, the U.S. Departments of Labor (DOL) and Education (DOE) solicited proposals to pilot-test skill-standards systems in various U.S. industries. The funded projects were responsible for developing cooperative relationships between stakeholders and increasing the knowledge and understanding of how skill standards and certification are developed, implemented, recognized, accepted, and used. Projects were expected to meet six specific criteria:

1. Take an industry perspective for voluntary standards as opposed to an occupation-based approach.

2. Focus on an industry of significant size in the national economy.

3. Develop standards that cover all nonbaccalaureate degree workers.

4. Match federal money with industry resources.

5. Involve all relevant parties—labor organizations, workers, trainers, educators, and representatives from human resource and personnel communities.

6. Cooperate in a loose network of other pilot project operators. (U.S. Department of Labor, 1992)

The DOL and DOE served as catalysts to initiate voluntary industry participation and to provide ongoing support through additional technical and research assistance. The ultimate goal is to have skill standards become self-supporting. The DOE funded two rounds of eighteen-month projects—seven beginning in October of 1992 and nine in August of 1993. Six, twelve-month projects were funded by the DOL beginning in December of 1992.

Given the multiple starting dates, the pilot projects are at different stages of development. By early 1995, all projects had completed the development of content standards. Almost two-thirds have completed the validation of the content standards as well as the development of performance standards. Most of these projects have disseminated their standards to industry groups, employers, and educators. During the middle of 1995, most of the projects are focusing on the development of curriculum guides, instructional tools, and assessment instruments, and pilot testing procedures to implement and evaluate the standards.

In a further development of the skill standards movement, Congress established the National Skill Standards Board as part of the 1994 Goals 2000: Educate America Act. The Board was mandated to work towards strengthening the connection between education and employment in developing and implementing skill standards. Not only was the Board charged with establishing a framework for joint participation between business, industry, labor, educators, and other key groups but it was also given the responsibility for the development and implementation of a standardized national system. Its primary functions include the following:

- Identifying broad clusters of major occupations that involve one or more U.S. industries and share characteristics appropriate for the development of common skill standards

- Encouraging and facilitating the establishment of voluntary partnerships to develop skill standards systems for each of the identified occupational clusters
- Endorsing the skill standards systems developed by the voluntary partnerships that meet objective criteria and contain the following components:
    - Promotion of the portability of credentials and mobility of workers within an occupation or industry
    - A voluntary system of assessment and certification of the attainment of skill standards utilizing a variety of evaluation techniques
- Promoting the use of information within the occupation or industry
- Evaluating the implementation of skill standards
- Periodically revising and updating the skill standards
- Supporting the development of a standards system by conducting research, serving as an information clearinghouse, developing a common nomenclature, and encouraging the development of curricula and training materials (U.S. Department of Labor, 1995)

The twenty-two pilot projects provide a crucial foundation for the work of the Board.

Chart 1 in the Appendices lists the projects and some relevant information about them. This information includes the lead organization and formal partners, the funding department, the year started, and other information that will be discussed later in the report.

In this section, we analyze the pilot projects. One significant issue is that there is not a strong consensus about the goals of the projects. Although advocates hope to achieve a variety of goals, we focus on the two broad objectives outlined in the introduction—a short-term and a long-term objective. From the short-term perspective, the goal of the system is to improve the nature of the communication between schools and employers by specifying a set of required skills and then measuring the extent to which students have achieved them. From the long-term perspective, the goals of the skill standards movement are to help advance a broad reform strategy for both schools and workplaces. Both

perspectives can be found in the pilot projects, and any judgment about the effectiveness of the projects will depend on which goal is being pursued.

We find that project organizers have made great progress, especially if one focuses on the short-term goals. For example, in some projects, the process has led to a reexamination of the needs of the industry. Less progress has been made on the long-term goals. Few of the projects have broken out of the traditional frameworks—the skill components model is still powerful. Both substantive disagreements and practical problems prevent change.

We examine three aspects of the pilot projects. In the first section, we look at the form of the standards themselves. Here we find great diversity with some projects adhering closely to the skill components approach and others making important breaks with the past. We then turn to project governance, focusing on the nature of the partnerships between schools and employers, and the role of workers. In most of the projects, workers play primarily an advisory role. The third section examines the job analysis techniques used by the projects. It is in that area where the tension between the ambitious goals of the skill standards movement and the practicalities of their implementation is most obvious.

The Form of the Standards

The purpose of this section is to classify the standards developed by the twenty-two pilot projects[9] with respect to the professional and skill components models—how closely do these projects adhere to a conceptualization of skills consistent with the professional model? In doing this, three points must be emphasized.

First, this should not be seen as an evaluation of these projects. The DOL and DOE gave the pilot projects considerable latitude which led to wide variation in project outcomes; thus, the criteria that we are using to analyze the projects were not necessarily the criteria that the projects set out to meet. Second, we are focusing on the form of the standards, not their industry- or occupation-specific content. Third, in this section of the report, we do not discuss the governance of the projects. Therefore, while the form of the standards may coincide with the professional model, the governance may include only a secondary role for

[9] Standards were provided to us by only twenty-one projects.

workers. If this is the case, we might expect the occupational or industry specific content to differ from that developed under a project which allowed a more meaningful partnership with workers.

How do we operationalize the professional and skill components models with respect to a skill standards system? What would a set of standards consistent with the professional model look like? One of the crucial distinctions between skill standards as conceived under these two models is the ultimate purpose of the "skill." In the skill components model, skills indicate a set of specified tasks that, given supervision and instruction from someone with more knowledge and organizational control, will allow a worker to perform pre-established, often routine, duties. In the professional model, on the other hand, skills indicate a set of "enablers" that will enhance the worker's ability to effectively carry out broad roles or duties within an organization in an autonomous fashion. This distinction is what allows the skill components model to function based on a set of abstract domain-free skills while the professional model must supply more context for the work performed and the interactions that exist among individuals involved in the work process. In categorizing skill standards systems, we focus on two dimensions—(1) the extent to which academic and vocational skills are integrated and (2) the extent to which the workplace is integrated into the standard.

Academic and Vocational Integration

There is a strong differentiation between academic and vocational skills in the skill components model. Academic skills are those abstract skills that are taught in school settings which are quite distinct from vocational skills that are taught for work—often at work or in work-like settings. There is little, if any, connection or application drawn between academic and vocational skills or tasks. For example, an academic skill for a laboratory technician might be the ability to write in complete, meaningful sentences. A lab technician's vocational skill might involve placing entries into a log book. Whereas these two "skills" are interdependent—one's ability to make entries into a log book depends on how well one can write complete, lucid sentences and one's ability to write coherent sentences can only be demonstrated through writing exercises such as log book entries—in the skill components model they are thought of as separate skills.

The professional model, on the other hand, minimizes the distinction between the types of skills—academic or vocational—that workers possess and concentrates on how

the two types of skills are combined to achieve a workplace-related goal. The fact that a lab technician can write complete sentences in a paper for a science course may be of little use in the workplace—the technician must be able to utilize, transfer, or apply this "academic" ability as written communication in a "real" setting for the skill to have any value.

We categorized the projects into one of three groups with respect to the extent of academic and vocational integration. In the first group, there is no integration between skill "types"—academic and vocational skills are listed separately. Six of the projects fall into this group. In the last group, which includes six projects, academic skills become embedded or integrated in the technical functions (vocational skills) required in the occupation. In the second, or transitional group, academic skills continue to be differentiated from vocational skills but are applied to a generic workplace setting or task which is meant to illustrate their use in the workplace. Nine projects applied academic skills in this manner. Chart 2 in the Appendices displays each type of academic and vocational integration and gives illustrations.

Workplace Integration

Similar to the different treatments of academic and vocational skills in the skill components and professional models, the workplace plays a different role in the two models. In the skill components model, skills (academic and vocational) are packaged as generic skills, having no solid workplace applications. It is assumed that the ability to log lab information goes no deeper than filling in a log book in some predetermined and static fashion that involves no judgment calls or decision making on the part of the worker. The worker is limited to a pre-established set of responses related to the most appropriate technical skills; no application of other perhaps distantly related skills or judgments are necessary. The professional model, however, places great importance on the workplace and the workers' ability to apply the variety of skills he has in an organizational or industry context. Using a log book involves the worker's discretion in making decisions about the importance of relaying information (perhaps a variety of types of "academic" information) to colleagues as well as the worker's ability to adequately communicate in writing the information that the organization needs now and in the future. A physician must be able to decipher important aspects of a patient's condition and fully reflect them in a patient's chart as information for other physicians and for legal purposes. While a surgeon must certainly be able to make incisions, suture, solve problems, and read, a set of skill standards that simply listed these functions would be a profoundly inadequate characterization of a

surgeon's skills. And although a lawyer must perform the tasks of reading law books and knowing legal precedence, the "skill" of practicing law is in being able to apply legal knowledge and use pre-existing law as circumstances require. Similarly, an independently functioning lab technician must be able to assess a situation, decide which information is important enough to include in a log book, and document that information in an understandable fashion.

We categorized the pilot projects into three groups with respect to the extent that skills include aspects of the workplace. In the first group, which included eleven projects, skills are listed with no workplace application relevant to the specific occupation or industry. For four projects at the other extreme, the skills illustrate critical aspects of the occupation by including an organizational and industry context for the job. How workers are expected to operate in their surroundings plays an important role in skill development. In the intermediate group, specific workplace applications are provided as examples to indicate how skills may be used. Six projects fell into this group. Chart 3 in the Appendices displays each type of workplace integration and gives an illustration.

Categorization of Skill Standards in the Pilot Projects

Chart 4 in the Appendices displays the two dimensional categorization of the standards created by the twenty-one projects for which we have data. Six projects fall into the upper left-hand group in which the distinctions between academic and vocational skills are maintained and in which no workplace context is used. We refer to these standards as *compartmentalized*. While compartmentalized standards are most consistent with the skill components model, we use a different term in this context to emphasize that the categorization in Chart 4 only refers to the content of the standards. The governance structure, which is not addressed in this chart, is also a crucial part of the skill components and professional models. Four projects combine academic and vocational skills and integrate the standards into critical workplace functions. These are referred to as *consolidated* standards. The eleven remaining projects are categorized into an intermediate group which we refer to as *contextualized*. For the most part, these projects use workplace tasks, or vocational activities to provide examples of the usefulness of particular skills. These will be explained in more detail below.

Compartmentalized

Compartmentalized projects strictly differentiate academic and vocational skills and include no workplace application. Required skills and knowledge take on either a workplace- or classroom-orientation with little overlap, thus separating worker and learner roles in the organization. Skills represented in this context also tend to be narrowly defined. Six of the twenty-two projects fit into this category.

The compartmentalized perspective creates a fundamental distinction between technical and academic skills. Technical skills define the explicit knowledge and abilities which are necessary to perform industry- or occupational-specific tasks and/or duties (or set of tasks and duties). Academic skills comprise an employee's foundation or basic knowledge component. These skills form the competencies that an employee needs BEFORE gaining technical skills. Employability skills such as SCANS skills, when included, form a third, separate listing of skills which are usually appended to the skills framework.

In the same manner that types of skills are disconnected from each other, they are disconnected from any workplace context or application. The standards are not related to any workplace scenarios or settings in which worker skills and activities can be utilized or integrated. This lack of skill application is especially apparent for academic skills. For example, compartmentalized standards do not provide any background to indicate how a mathematics skill such as the conversion of fractions into decimals or percentages must be used by technicians in the performance of their jobs. Rather, the required skill is simply listed and the task that will utilize this skill is listed separately and generically.

To illustrate how skills can be compartmentalized, we have included excerpts from one project that identified skills in three overall categories—(1) technical, (2) employability, and (3) related academic—and listed them separately. Below are illustrations of the skills included in each category:

- *Technical Skills*

  Safety: Identify first aid supplies and personnel and emergency protection areas; keep work area free from clutter; use appropriate safety procedures and guidelines; monitor, use, store, and dispose of hazardous materials properly; and use protective equipment.

- *Employability Skills*

  Resources: Follow schedules; practice self-starting techniques; forward information; perform inter-related tasks; demonstrate time saving habits; avoid procrastination; perform with cost awareness and consciousness; and demonstrate effective use of resources.

- *Related Academic Skills*

  Algebra: Interpret ratios; solve linear equations; determine equivalent forms of a formula; convert word problems into mathematical expressions; interpret mathematical results to words relative to the research objective; and apply order of operations/rules.

Consolidated

The consolidated conception of skill is more consistent with the professional model. Skills are more deeply based on the worker's established role or purpose within the organization and not on a set of tasks that they are required to perform. Skills often focus on the worker's responsibility to the customer or to the overall mission of the organization rather than primarily on the way in which employers define an employee's tasks/duties in a narrow context. The worker role is not differentiated from the learner role. Skills may be both inherent and acquired but are not necessarily specified to the level of detail of the worker's particular responsibilities. Four of the twenty-one projects that we reviewed were in this category.

The consolidated approach structures skill standards in a framework that depends fundamentally on broad-based workplace scenarios rather than specific worker tasks to produce occupational profiles. This is more in line with the professional view of work which is less structured and more autonomous.

The professional model, by not adhering as strictly to labeling skills, promotes the expansion of worker roles within the organization. Skills identification has less value than understanding the underlying aspects of worker roles and the responsibilities that the skills, workplace scenarios, and problem-solving situations aid in identifying. Categories such as community context, worker activity statements, key purpose, position snapshot, and workplace setting/workplace situation are often a key aspect of the skill standards

statements and are used to ground the skills in the workplace, not as an optional description. As one project staff member commented, standards center around what the work actually looks like and its relation to the organizational or industry mission. The knowledge, skills, attributes, and task competencies required of workers are seen as "enabling" the performance of broad organizational roles.

An example of a project that integrated critical aspects of the job as well as organizational and industry contexts into the skills is illustrated by the following format:

- *Key Purpose of the Occupational Area* (bottom line goals of an occupational area)

  Develop, manufacture, deliver, and improve electronics-related products and processes that meet or exceed customer needs.

- *Critical Function* (what must be done to achieve the key purpose)

  Establish customer needs; initiate and sustain communication processes and procedures; ensure production process meets business requirements; and make products that meet customer specifications.

- *Key Activities* (are needed to perform each critical function)

  Interpret and clarify specifications prepared by others; and communicate with customer to establish requirements.

- *Competent Performance* (performance indicator as to when a key activity is done well)

  All relevant customer specifications are obtained. When necessary, specifications are confirmed with others for clarity, completeness, and viability. Specifications are interpreted completely and in a timely manner.

- *Knowledge, Skills, and Understandings*

  Information that will help guide training and assessment; what enables competent performance.

Contextualized

Contextualized standards lie between the compartmentalized and consolidated groups. While compartmentalized standards produce an abstract list of skills, the

contextualized approach utilizes the context of the workplace as examples to make skills seem more meaningful. Although in most cases, the academic and vocational skills are not integrated and the organizational aspects of the workplace are not included in the skills, there is some application of the skills to a work environment or some object for the actions or skills. This creates a closer link between worker and learner roles than the compartmentalized approach, but skills are still not defined in relation to the broader role of the worker in the organization in which they are employed. Eleven of the pilot projects fell into this category.

As the chart illustrates, there are three ways in which the projects were able to contextualize the occupational skills of employees. At one level of contextualization, projects created applied academic skills that include some generic function or object for the skills. Unlike traditional academic skills that are listed as objectives in and of themselves, academic skills at this level are "applied" in the sense that they are related to some object or activity. This application, however, does not constitute a real-world workplace orientation, for the skills and academic skills continue to be differentiated from technical skills. At another level, applied academic skills are given workplace applications as examples. These examples, however, appear more in the form of "add-ons" than fundamental underpinnings for skill development and utilization. A third level of contextualization attempts to minimize the distinction between academic and vocational skills and attaches both "types" of skills to generic workplace examples of their use (similar to the workplace applications provided by the second form of contextualization).

An example of the first level of contextualization—applied academic skill with no real workplace or organizational orientation or context—is illustrated by the following narratives for the *Related Academic Skill of Language Arts*:

- Request, collect, comprehend, evaluate, and apply oral and written information gathered from customers, associates, and supervisors regarding problem symptoms and potential solutions to problems.

- Adapt a reading strategy for all written materials (e.g., customer's notes, service manuals, shop manuals, technical bulletins, and so on) relevant to problem identification, diagnosis, solution, and repair.

- Attend to verbal and nonverbal cues in discussions with customers, supervisors, and associates to verify, identify, and solve problems.
- Use study habits and techniques (i.e., previewing, scanning, skimming, taking notes, and so on), when reviewing publications (e.g., shop manuals, references, databases, operator's manuals, and text resources) for problem solving, diagnosis, and repair.
- Comprehend and use problem-solving techniques and decision trees that are contained in service manuals to determine cause-and-effect relationships.
- Scan service manuals and databases to locate specific information for problem-solving purposes.

Clearly, these academic skills, although somewhat applied or objectified, can be seen as applicable to almost any occupation, organization, or industry. Although they give more understanding and support to the academic skill that the worker requires than a compartmentalized, generic listing of skill, they do not indicate the extent or conditions in which these skills are utilized in the actual workplace, therefore falling somewhat short of the skill conceptualization required under the professional model.[10]

The second level under the contextualized conceptualization is comprised of those projects that created academic skills which were applied generically with some workplace context offered through examples, applications, or scenarios. An example of this is offered by a project that differentiated a set of core skills and gave a brief context for those skills such as the one below:

> *Basic Mathematics*: Expert press operators are often called on to use mathematical skills in their daily work. They use fractions and percentages, for example, to compute the portion of a page that is print. They use ratios and proportions to compute ink proportions and may need to know Roman numerals to ensure proper page sequencing. Rounding and estimating skills are useful in projecting paper and ink usage.

This type of scenario was also used for other core skills that the project found to be important. One can see a difference in this presentation of skill and the previous example.

[10] Another example of the first level of contextualization is a format where academic skills are matrixed with the appropriate technical skill. Clearly, an attempt is being made to connect the two types of skills (which differentiates this format from the compartmentalized format) although the application is somewhat weak and of little benefit in creating an overall context for skills in the workplace.

Clear workplace applications are being used to demonstrate the use of academic skills, although there is still a difference between what the project considers "academic" and what it considers "vocational." Furthermore, there is little in the standards to indicate the extent to which the worker will be called upon to use his skills alone or in a group, with or without supervision. In other words, even though a workplace context has been used to demonstrate the skill application, the workplace context does not indicate important aspects of the organization and the worker's role within that organization.

The third type of contextualized standards moves away from the sharp differentiation of academic and vocational skills. But the workplace application does not involve the integration of the skills into the critical aspects of the worker's role within the organization or the industry. (This is what differentiates these standards from the consolidated standards.) Instead, these standards use the workplace for its examples of how skills could be used.

An example of a case where skill standards were integrated along the academic and vocational lines but where the workplace was used as an example of skill usage is illustrated by a project that presented its standards in the following manner:

- What is the *action* (skill)?
- What are the *conditions* under which the action is performed?
- How good is good enough? (*criteria/measure*)
- How will the action be *measured*? (portfolio/test/observation)
- Why must the action be performed? (*rationale*)

Clearly, the standards provide evidence in their framework for how the skill will be used in the workplace. The "conditions under which the action is performed" and the "rationale" for the standard provide the workplace context for the skill standard.

Conclusion

Although it is too early to determine the precise impact of skill standards on workers and the organizations in which they work, the consolidated approach is more consistent with a professional view of workers. Moreover, the development and

implementation of the consolidated model can be part of a process of organizational change and innovation in the firms and industries that use the model. On the other hand, the compartmentalized approach appears to fit well within a more traditional work organization. But the effects of the skill standards systems are also going to depend on the governance structure of the systems and the relative roles of managers, workers, educators, and other stakeholders. We turn to those issues in the next section.

Project Governance

From the onset, coalition building has been considered a key aspect of skill standards development. It is widely believed that a governance structure emphasizing meaningful and substantial participation of all stakeholders will increase the sense of "ownership" in the skill standards and the process used to develop them. Indeed, federal funding requirements stipulate the involvement of "all relevant parties"—for example, labor organizations, workers, trainers, educators, and representatives from the human resource development/personnel communities (U.S. Department of Labor, 1992)—in the twenty-two pilot projects.

The DOL and DOE had several objectives in designing a broad-based participatory governance structure. At the most basic level, the governance system will organize and implement the standards development process within a framework that can ultimately become self-supporting—not dependent on government funds. In addition, the structure will guarantee that industry-based skill standards have the support and collaboration of employers as well as all relevant stakeholders. This will be especially important when standards move into the implementation phase and later need to be updated.

In this paper, we have argued that the governance structure reflects the relative roles of workers and others within the relevant organizations. For example, skill standards and certification systems for professionals are developed and run by professionals. Imagine a committee established to determine the skills of doctors or lawyers without significant representation from members of those professions. Asking professionals to merely validate (in focus groups or on expert panels) the standards developed by other groups for their occupation would not be considered adequate (or even possible) in the professional model. Similarly, in nonprofessional occupations that have apprenticeships, union

members often serve as worker representatives and participate actively in all aspects of program development. Thus, in both professional and apprenticeship models, the workers whose skills are being considered participate in the actual governance of the standards systems. Their roles (or their representatives roles) are more than advisory.

In contrast, traditional task analysis approaches that are compatible with the skill components model involve systems that are run by educators, managers, or trained analysts. Workers (often acknowledged as "subject matter experts"—SMEs) provide technical input and validation at various stages of the process. As we have pointed out, the crucial distinction concerns who is expected to make sense out of the work. As long as workers are viewed as those who demonstrate a collection of skills that can be applied to a variety of tasks at the discretion of their managers, it is logical that those managers are in the best position to determine the required skills as well as the framework for their development.

None of the pilot projects give workers or worker representatives significant influence in the governance of the projects. Only eight projects had at least one worker on their policy committee and only five of the projects indicated a positive or strong relationship with their industry's union(s). Instead, traditional decisionmakers (not the workers themselves) have kept their established roles. These projects do not challenge the traditional distinction between those who do the work and those who have authority to design the work and to determine the skills required to perform it.

Moreover, advocates and planners of skill standards stress that employers, not employees, must "own" their certification systems. For example, a recent General Accounting Office (GAO) report argued that the most important element of voluntary skills certification systems is industry ownership and control. They conclude that a proprietary connection is necessary for industry to contribute significant financial investments to certification development as well as to contribute the time and commitment it requires to implement and maintain. Industry's governing role, they contend, will ensure their future interests which are vital to maintaining up-to-date systems (GAO, 1993b). While it is easy to understand the need for this type of industry buy-in, it does set up a potential conflict with efforts to integrate workers (and to a certain extent educators) into the governance process.

Research confirms that those who do the work do not have a substantial role in the development or governance of skill standards systems. Indeed, the GAO (1993b), in their review of certification systems, found that workers, actually had "little input into their (skills) development . . . although collaboration with workers is said to be key to many of the systems operating in competitor nations" (p. 5). And Wills found that many of the most competitive sectors in the U.S. economy have done little or no work to involve *either* "employers [or] incumbent employees in the development of nationwide skill standards" (Wills, 1993a, p. 1-3). We now turn to a discussion of the governance structures in the twenty-two pilot projects.

Who is in Charge?

Trade associations or industry membership organizations formally controlled project management and policy issues in ten of the twenty-two pilot projects. Six of the projects were managed by education-based organizations not connected to a specific industry and six by research/education affiliates or foundations connected to trade/industry associations. Project directors and staff were employed by the lead organization (formal partner) and assumed various project roles. Over one quarter of the projects used the technical and methodological expertise of outside consultants at various phases of their projects.

The governance of all the projects was similar. Project directors and their staffs were instrumental in developing an initial governance structure. They initially determined the titles and membership for the various committees and had considerable input into the committees' assigned activities and responsibilities. When they were present, existing board of directors of the industry associations often shared the responsibility with project directors/staff for initial committee appointments.

Committees were formed to fulfill two primary functions within the projects: (1) policy direction and leadership and (2) technical expertise and input. Policy Advisory Committees (also called Executive Committees, Steering Committees, or Grant Management Committees) were responsible for input into and the development of overall project direction and were comprised of coalition members from the various stakeholder groups. Technical Committees were comprised of individuals from industry (and sometimes education) with industry-related knowledge and expertise. These individuals

were drawn upon to supply detailed comments and/or inventories of tasks, duties, skills, and requirements for job performance.

The following sections will discuss in more detail the responsibilities and makeup of these two most prevalent types of committees as well as the role of trade/membership associations and individual employers and the implications for their past, current, and future participation.

Coalition Building and the Policy Players—The "Executive" Committees

Although many directors pointed out that they underestimated the difficulties of bringing and holding together such a diverse group of "stakeholders," Steering Committees, Policy Advisory Committees (PACs), Executive Committees, and/or Grant Management Committees eventually emerged. These committees were formally assigned the responsibility of establishing project direction and making key policy decisions.

Within the policy-setting framework, however, these committees actually assume a variety of roles, working with and sometimes for project directors and staff members. Nearly two-thirds of the project advisory committees were truly advisory in nature, setting policy direction, guiding, validating and evaluating project design, overseeing the projects, and reviewing and approving progress. Five of the projects appeared to have policy committees that became superficial, ceremonial bodies assigned to "oversee" the project, in effect, working within a governance system that begins and ends with the director and his or her central staff. Three of the projects had policy committees that were hands-on governing bodies where the participants and policy setters worked to establish industry definitions and occupational boundaries as well as actually participating in many aspects of the job analysis process.

Although their roles differed somewhat among projects, the actual composition of the PACs was quite similar for most of the projects. Except for the eight projects that included at least one worker on their policy committees, project steering committee members were individuals who held management and/or administrative-type positions within their respective institutions or organizations—labor, industry, and education. For example, when asked what type of educators were represented on Steering Committees, most project directors indicated administrators and not teachers. Overall, front-line workers and low-level supervisors were absent from policy or steering committees.

Instead, workers and supervisors were placed on "technical committees" (if placed on committees at all) where their main duty was providing input in the job analysis phase of the projects.

Although educators were present on eighteen PACs, they rarely played an active role (three of the project directors stressed strong education participation; five of the projects indicated no or insignificant education participation). In most cases, there was a strong emphasis on industry leadership and this was reflected in the prominent role of the industry and employer associations—the "suits" as many project managers referred to them. Certainly there was additional communication between educators and employers as a result of the pilot projects, but it could not be said that the process resulted in a significant development of interactive partnerships between the two sets of institutions, at least not during the development of the standards. Project managers are expecting to increase the involvement of educators when curriculum, training materials, and assessment tools are being developed.

Technical Expertise—Using Workers and Supervisors

All of the project directors interviewed placed a great deal of importance upon the role of workers and/or supervisors in the projects, seeing their role on technical committees and/or in focus groups as pivotal to the success of the projects. Given the varying job analysis processes that developed among the projects, workers and supervisors initially updated, edited, or created (from a blank slate) task and duty lists. These individuals were considered the primary source of contemporary information in the job analysis phase, although the data that they provided were often supplemented or edited by project staff after being obtained, the result to be later validated by a similar sample of workers and supervisors.

Input from workers and/or supervisors was solicited at two phases in the job analysis process—(1) initial duty/task list development and (2) validation. After preliminary decisions were made regarding project scope and policy perspectives (by PACs, Steering Committees and/or project management and staff), workers and/or supervisors were interviewed either by mail surveys/questionnaires or in focus group sessions to determine relevant job tasks, duties, and skills and their frequency and importance in the workplace (see job analysis section for further detail on the exact methods for gaining worker/supervisor feedback). Later, they were asked to validate the list of

content standards and/or tasks/duties that had been synthesized by project directors, staff, and/or policy/steering committees. At few, if any other, times was worker input or feedback required or requested. Indeed, front-line workers and supervisors got involved in the projects only AFTER policy directions had been established.

Worker and supervisor absence on policy-oriented committees had two broad effects. First it reinforces narrowly-defined entry-level worker roles and attitudes—the hallmark of the type of traditional organization that advocates hope will be reformed with the help of skill standards. Ironically, project directors who had given more latitude to workers and supervisors in focus groups stated that, in hindsight, they needed to have exerted more control and structure because this method took too much time and was too costly. Thus, the structure of the projects tended to replicate the top-down environment of the traditional workplace. Not only were workers and supervisors isolated from the industry leaders who participated in many of the PACs, but they were given few opportunities to see the industry as a whole which would have enabled them to better understand their place in the overall organizational framework and skill standards movement.

Second, a governance structure which formally separates management from workers/supervisors (as mirrored in the workplace) perpetuates workers' anxiety and hesitation in freely voicing their ideas about skills and skill standards. For example, few of the projects actually had workers on the PAC, but when a worker was present, project managers reported that they rarely participated in the discussion. This further weakened the value of their influence on the process and the value of their input.

Other Key Players—Employers and Employer Organizations

As we have pointed out, trade and employer associations formally controlled a majority of the pilots. Moreover, personnel from these associations were often the key staff for the projects. Trade association letterhead as well as key companies within trade associations were used to endorse the idea of standards and provide an extra incentive for employer participation. The majority of the education-oriented as well as the major trade association grantees used association membership rosters to obtain listings of possible employer participants in the job analysis phase. From these lists, employers were selected, often randomly, but sometimes by region and size, and asked to "volunteer" employees for

focus group participation or solicit employee responses to previously developed questionnaires.

Ironically, although employer associations played central roles in most of the projects and many reported employer enthusiasm, nearly half of the project directors stated that they had difficulty in getting cooperation from individual employers. Employers were particularly hesitant to allow front-line workers the time off from their jobs in order to participate in the focus group sessions—from one to three days depending on the job analysis process used. This was especially true for small employers.

Conclusion

For the most part, the projects have established policy committees that meet the DOL and DOE specifications of involving all relevant parties. Project leadership has not only been able to organize the development process using employers and educators, but remains cognizant of the need to promote the standards in the employer community once they have been developed. The prominent involvement of industry associations is a positive development. The skill standards process cannot function without collaboration among employers, and the industry associations are in a better position than any other groups or institutions to bring about that cooperation. The role of the associations will become even more important when state and federal governments reduce their involvement in education.

On the other hand, there are two weaknesses in the governance structures of most of the projects. First, they fail to provide a strong role for workers, who were used primarily as subject-matter experts or advisors. Second, little progress was made in developing interactive partnerships between schools and employers. One needs to consider the promotion of standards within the schools as equally important to the promotion of standards among employers.

Occupational/Job Analysis

Occupational or job analysis is a systematic effort to collect information about the work requirements associated with particular jobs. The analysis forms detailed frameworks for describing jobs (Capelli, 1992). Most job analysis techniques have been in

existence for at least thirty years. Throughout these years, they have been used as a crucial element in job design, the basis for establishing wage and salary structures, and as criteria for establishing the validity and legality of organizational decisions such as hiring, promoting, and training selection. More recently, job analysis has gained recognition as the foundation for industry-based skill standards. Indeed, Wills (1993a) contends that job analysis is ". . . fundamental to an investigation of industry standards because it provides the 'reality check,' not only on what workers do as work, but also on the quality of their work performance" (p. 3-1).

Yet, despite its crucial role in these processes, there has been little systematic analysis of the effectiveness and consequences of occupational analysis methods (O'Brien, 1989; Rayner & Hermann, 1988; Wills, 1993a). Moreover, there has been virtually no discussion of how the occupational analysis process and its outcomes affect workers and the roles that they play in the organization.

In this section, we examine the occupational analysis methods used by the skill standards projects. We first describe the process used by the majority (nineteen)[11] of the pilot projects—DACUM (Develop A Curriculum)—and discuss its strengths and weaknesses. We then provide some additional insight into the process as it is used in the pilot projects by taking a look at some of the alternative occupational analyses methodologies. The discussion focuses on whether the method of occupational analysis used is more consistent with the skill components or professional model and whether it promotes the development of workers for high-performance workplaces.

"DACUM" and How the Projects Modified It

The DACUM process, originally developed in Canada, is widely used by community colleges in at least thirty-eight states. Its refined form has been used recently as the primary method for developing the applied curricula for Tech Prep programs.[12] In addition to developing job profiles, the DACUM process produces charts that are subsequently used as the backdrop for worker training programs, tests, and needs-assessment materials. The DACUM process involves seven procedural steps: (1)

[11] Fifteen of the projects indicated using a straight or modified DACUM process. Four of the projects used some combination of DACUM and V-TECS, which we (and the project directors) categorized as a "modified" DACUM process.

[12] Educational programs that coordinate high school and community college curricula and programs.

committee *orientation* to the DACUM process; (2) *occupation/job review* to arrive at a mutually acceptable working title(s) for jobs and specialization areas; (3) *identification of duties or general functional areas* of responsibility under which tasks will fit; (4) *identification of specific tasks* performed in each duty area (each statement including an action verb, object, and one or more qualifying words); (5) *review and refinement* of task and duty statements; (6) *identification of related requirements* such as general knowledge and skills, tools and equipment, supplies and materials used, worker traits and attitudes, and future occupational trends/concern; and (7) *task analysis* to determine specific steps, performance standards and related requirements. Information from the task analysis is incorporated into modules, learning guides, and other instructional materials as a final dimension of the process (Norton, 1993).

DACUM is facilitated primarily by educators and was developed as a way of bringing business and industry into the development of educational programs. Robert Norton (1993), who developed the technique, states that DACUM is a "significant technique for initiating needed cooperation (between business and education) in tech prep . . ." (p. 1). The process, in effect, functions as an "abbreviated version" of the widely known Functional Job Analysis (FJA) process (Wills, 1993a, p. 3-13).

Expert workers and supervisors are brought together for two-day focus group (brainstorming) sessions or "workshops" to interact, describe their jobs, and rate activities according to their frequency and importance. Workshop participants in the original DACUM structure are "not hampered or constrained by a literature base or any instructor-created document" (Norton, 1993, p. 1), but, rather, are given a blank slate in which to define and describe their occupations. From these focus group sessions, a profile chart is created which details and graphically displays the duties and tasks involved in a particular occupation. Output is submitted to a larger group of workers and/or immediate supervisors for verification. Task-specific curricula are then developed based on the component tasks that the process has determined and verified.

Nineteen of the twenty-two pilot projects used a modified DACUM process (one of the nineteen used a "straight" DACUM process and four used a combination of DACUM and V-TECS[13] methods) for job analysis. Although most of the DACUM methodology

[13] Another job analysis technique discussed in this paper.

remained intact, projects modified the job analysis process in one of three ways. Four of the projects reported that workers and/or supervisors (workshop participants) were asked to validate *existing industry standards* instead of using the "blank slate" specified by the original DACUM model. Six projects started with output from an *extended search*[14] of existing industry standards, library databases, curriculum guidelines, instructional material, and current industry/occupational task lists. They then used the DACUM process to validate this output. The remaining eight used a *clean slate* or *free-wheeling* job analysis process similar to the original DACUM methodology. But these were "modified" by either including more experts in the process; developing a set of structured interviews to clarify and discuss the outcomes, their phrasing, and the terminology used; adding a mail survey; or visiting sites and observing workers. Overall, project modifications were almost all based on a perceived need for more "structured coordination" than emphasized in the original DACUM process.

Twelve of the nineteen projects that used a modified DACUM methodology organized focus groups as the primary vehicle to determine and validate the tasks and duties, five of the projects used focus groups and site visits, and the remaining two projects used written surveys or questionnaires to solicit responses. All of the projects "validated" their standards. This was done by asking workers and supervisors to comment on the standards (either by written survey or focus-group participation) and suggest any changes or deletions.

Potential Advantages of DACUM

All of the project directors that used the DACUM process appeared relatively satisfied with the methodology and its results. Advocates argue that DACUM requires less time, expense, and staff training than other methods of job analysis. More traditional approaches often required much more extensive data collected by trained analysts. The language used in the DACUM process is simple and straightforward and avoids excessively academic sounding concepts and categories. Thus, DACUM, at least in theory, can be developed and implemented by employers, employees, and educators, without the need for specialized academics and analysts. This facilitated another strength—the crucial role played by employers.

[14] Extended Search, although often considered a stand-alone job analysis technique, originated as an aspect of the Job-Task Inventory Method or the CODAP (Comprehensive Occupational Data Analysis Program) developed by the U.S. Air Force.

The modified DACUM format, while establishing some methodological "ground rules," gave projects the flexibility to customize the process according to particular industry or occupational needs while inciting a sense of comfort that individual approaches taken were not extensively different. This customization, while being potentially problematic in the future when cross-industry standards and occupational clusters begin to emerge, gives industry an opportunity to "own" their job analysis process and, thus, the ensuing standards. Several of the project managers reported that the industry participation facilitated by the DACUM process was crucial to the development of the project.

DACUM proved to be a job analysis approach that was easily understood by both educational and industrial participants. Overall, DACUM has been widely accepted by the educators and industry leaders involved in the skill standards projects. Despite a few minor process-oriented difficulties, DACUM has generated an overall sense of comfort and accuracy surrounding the process and the results that have been produced.

It should be emphasized that although there appear to be some advantages to DACUM, systematic evaluations have not shown it to be superior. Indeed, no clear conclusions have been drawn in regard to the most effective job analysis methodologies (O'Brien, 1989; Rayner & Hermann, 1988; Wills, 1993a). Researchers have voiced difficulty in the evaluation of any job analysis method "due to the difficulty of finding appropriate criteria against which effectiveness can be measured . . . (as well as) the difficulties in defining the occupational area, and in ensuring that each technique is used with a matched representative sample" (Rayner & Hermann, 1988, p. 48).

Potential Disadvantages to Modified DACUM

The most potentially damaging outcome of casting skill standards within a structure such as DACUM that focuses on dissecting work-based activities into component parts is the reinforcement of a narrow conceptualization of workers' roles within the organization—the skill components model. Wills (1993a) notes that the DACUM process tends to produce training materials that are highly task specific. Hanser (1995) states that "one breakdown in the school-to-work transition process stems from the inability of traditional job and task analysis methods to help us identify, understand, and communicate the skills needed for success in the high-performance workplace" (p. x). DACUM is similar to other traditional job analysis methods in this respect.

Indeed, most job analysis methods, by breaking down jobs into their specific component parts, reduce worker roles to a series of unrelated job functions. There is a strong similarity between this approach and the conceptualization of jobs used in a Tayloristic system of job design (Wills, 1993a). Sydney Fine, after developing Functional Job Analysis in the 1960s, argued that most occupational analysis methodologies failed to provide an adequately integrated description of jobs.

> The worker needs to know what kind and how much freedom of choice he may exercise as he performs his task and by what standards his performance will be judged. . . . [He] needs to know what in his work is prescribed and what is discretionary. (Fine & Wiley, 1971, p. 19)

This statement may have more force today than it did in 1971, given the extent that firms have shifted to high-performance systems where workers have more responsibility and autonomy. To the extent that workers have become "professionalized," job analysis must not only represent the tasks that workers are expected to perform but specify the depth and breadth of their skills by identifying the situations and circumstances that call for them. Work must be placed in a broader organizational context that also relates to the ultimate objective of the work. As the seven steps outlined earlier make clear, DACUM and similar job analysis methods focus attention on the component tasks rather than the broader context and objectives of the work and the worker.

The task focus can also be seen in the V-TECS (Vocational-Technical Consortium of States) process, another job analysis method which was influential in at least four of the skill standards projects and is viewed by many to be similar to DACUM. Indeed, program operators recognize that V-TECS and DACUM are much the same. V-TECS produces task-based output such as *duty and task lists*; *performance objectives* for each task; standards as an observable measure of performance; and *sequential task performance steps.* V-TECS outcomes also include enabling competencies and related academic skills—basic essential skills taxonomy, criterion-referenced test item banks, and performance/ psychomotor items (Wills, 1993a).

Officials who are developing skill standards on the state level have voiced concern as to whether job analysis processes that are commonly being used today (DACUM in most cases) will produce standards that are broad and flexible enough to accommodate changing workplace requirements. At the same time, the standards must be specific enough to be useful to employers and clear enough to be understood by the general public, most of

whom have not developed a professional lens for looking at occupations. While DACUM attempts to include the input of many stakeholders in its process, its focus on narrow, traditional occupational classifications and its use of a task-based approach may prevent standards from reflecting the industry or occupation as a whole (Ganzglass & Simon, 1993). If the industry is not reflected broadly, it is unlikely that the occupations within the industry will be given the latitude to move out of their traditional, skill components framework.

A structured, task-oriented approach such as DACUM forces participants to focus on the details of jobs without dealing with the broad, underlying goals of the industry or the occupations within it. One project director referred to this as a "whiskey bottle" methodology in which every minute aspect of the job is passed around the table for discussion, often in a haphazard manner, in hope that the most important responsibilities and duties will eventually emerge. In abiding by a process where outcome[illegible]e established in a vacuum (without organizational conditions to frame the nature of the work to be performed), dissention can occur among those with different perceptions of what end result is desired. Furthermore, an individual's perceptions regarding job characteristics, if allowed to develop in isolation from workplace characteristics and dynamics, may not necessarily correlate with actual job attributes (Capelli, 1992).[15] These potential problems were noted by several project directors who discussed the tension between educators and industry representatives (employers, supervisors, and front-line workers) and supervisors and front-line workers in task and skill listings. In determining the most desired occupational skills, there is no context in which to support the opinions of either "side." Educators, it was indicated, see an employee as a lifelong student and seek to establish a base of broad-range skills and knowledge for workers to build upon. Employers, on the other hand, are interested in the specific skills that are in more immediate demand. What employers (and many supervisors) want are skills that can be applied effectively by their workers. Although some employers may want broad generic skills, the needs of employers are often communicated, without a context, as narrowly defined specific skills.

Validation of existing standards or an extended search for past information/sources of standards (which took place in half of the projects) poses an additional danger of embedding the job analysis system even further in traditional conceptualizations of work.

[15] Capelli (1992) cites the findings of Myles and Eno that indicate substantial differences in workers' self-reports of skill requirements in their jobs and those provided by expert raters.

Elements of the past and present could become the benchmarks for the future. Hanser (1995) discusses this in terms of official and "emergent" skills. He states that traditional job analysis processes are static and appear to be "more of a snapshot of a job than an organic image of a job" (p. 10), thus focusing more on the current, stated task requirements and not on the dynamic aspects of the job and its contribution to the organization, the worker, or the work performed. While it is easier and perhaps more efficient to edit and alter what is already available instead of starting from scratch, this may not produce the kind of skills or worker profiles that projects indicate they are looking for. Even starting from scratch using a very narrow job analysis framework, as was the case in half of the projects, has a strong conservative bias, especially for those jobs that do not currently assume high-performance characteristics.

DACUM was designed to minimize time and resources in the job analysis phase. Project modifications were carried out to further simplify what can become a difficult, labor intensive, and time consuming process. Nevertheless, one of the most widely cited problems was that the process (particularly the focus groups) took too much time and money. Many directors who used focus groups (both "free wheeling" and more focused) stated that the groups required additional organization and direction to be optimally efficient and productive. Many of the projects found it necessary to modify the focus group structure after their first round. Project directors stated that the original facilitators, most often educators, did not have the technical expertise and knowledge required to answer questions or clarify issues raised by worker/supervisor experts. Project directors then turned to industry representatives to direct the job analysis process.

Managers also reported that they had difficulty finding employers willing to release their workers to participate in focus groups. Others worried that the workers, drawn primarily from among the employees of firms belonging to the relevant employer organization, may not be representative of workers throughout the industry. Indeed, two sets of researchers cite the difficulty of achieving a representative sample of job incumbents for analysis in their review of DACUM (Rayner & Hermann, 1988; Willet & Hermann, 1989). But a search for a more diverse set of workers would have taken more time and resources. Given the prominent role played by employer associations, project directors had much greater access to the employees of member firms.

In general, logistical issues involved in coordinating business and education communities were common. Many of DACUM's coordination problems were addressed by reducing the worker role in the process and, in the interest of time and control, streamlining the job analysis effort by putting more control in the hands of a select group of traditional decisionmakers (i.e., managerial personnel rather than workers).

Alternatives to DACUM and V-TECS

What are the alternatives to task-oriented job analysis techniques? First, as we have emphasized in the section of this report on the professional model, even professionals must master particular tasks, and job analysis techniques must be able to identify critical tasks. But an understanding of professional work must also include information about the broader context in which the professional operates. The following is a description of "job functions analysis" for health occupations:

- The chief functions of a particular professional are observed, clustered in fields or dimensions of activity, given relative priority, and assessed for demands on time. The dimensions of practice include categories such as direct patient services, organization and administration of services, and professional activities. Each dimension contains descriptors of individual acts or sequences of activity.

- The emerging profile of a practice is validated by similar professionals working in similar contexts. Panels of academics, professionals in practice, and patients distinguish competencies significant to successful performance in the dimensions identified. Academic panelists identify requisite diagnostic knowledge. Frequently, patient panelists identify interpersonal skills required to motivate patients to engage in appropriate behavior. Lists of competencies which can be validated begin to emerge.

- A practice audit or job functions analysis of this sort becomes the basis of an assessment center approach to a professional's educational needs. Practice dimensions and their descriptors are simulated in physician-patient interactions, gamed in exercises addressing a cross section of cases, and tested in written questions.

- Role delineations, practice audits, and job functions analysis begin to answer broader questions. Do apparent differences in the settings of practice require

> significantly different kinds of competence? Do the successive plateaus of career paths pose challenges that might be generalizable across the professions? Why do some professionals flounder in one organizational culture and flourish in another, while other professionals thrive across culturally varied practice settings? (Nowlen, 1991, pp. 20-21)

This process clearly does collect information on specific required tasks, but it is also designed to ask very broad questions about the role of the professional. Moreover, it is clear that this process is embedded in a community of professional practice that helps to place the delineated tasks in context. Still, Nowlen argues that even this method is too limited because it continues to see the professional as an individual actor when professional work is increasingly group oriented.

Much broader approaches to job analysis have also been used for nonprofessional jobs. Unlike the narrowly focused, task-specific data that seem to arise from DACUM and V-TECS processes, the Functional Job Analysis (FJA) methodology (used to develop the *Dictionary of Occupational Titles*) investigates jobs based on a broad functional scale of how workers relate in seven categories: (1) *Data Functions*—complexity in the use of information; (2) *People Functions*—level of interpersonal skills demanded; (3) *Functions That Involve Using Objects (Things)*—physical requirements, typically with machines; (4) *Worker Instructions*—level of responsibility; (5) *Reasoning Development*—from common sense to abstract undertakings; (6) *Mathematical Development*—math skills; and (7) *Writing Functions* (Capelli, 1992; Fine, 1988).

The Comprehensive Occupational Data Analysis Program (CODAP), developed and used extensively by the military, requires special computer programs to analyze statistically its extensive task inventory and vast background gathered on job incumbents, including their career aspirations, educational level, tools and equipment used in previous work experiences, work attitudes, and prior training.

The Position Analysis Questionnaire uses 187 worker-oriented job elements to characterize the human behaviors that are involved in jobs, not simply the tasks that are being performed. Among its six broad categories are *Information*—where and how one gets information needed for the job; *Mental Processes*—reasoning, decision-making, and planning activities that employees use; *Work Output*—physical activities, tools, and so

forth; *Relationship with Other People*—measures of complexity; *Job Context*—physical and social parameters of work; *Other Job Characteristics*—irregular work schedules and repetitive activities (Capelli, 1992; McCormick, 1979).

The Critical Incidence Technique identifies hundreds or thousands of critical incidents that illustrate effective or ineffective (successful and unsuccessful) job-related behaviors as a vehicle for determining the aims or purposes of the job. Occupational Analysis Inventory (OAI) consists of 622 work elements grouped into five categories: *information received*, *mental activities*, *work behavior*, *work goals*, and *work context*. The Job Information Matrix System (JIMS) gathers and records job information into categories such as the *responsibilities of the worker* and *the working conditions of the job*. The Threshold Traits Analysis System focuses on workers rather than the work itself. Worker traits are categorized as either *physical*, *mental*, *learned knowledge and skills*, or *social* (Capelli, 1992). Hay Associates developed a measure for skill similar to the DOT measure, The Hay Associates Profile System, which focuses on three areas: *know-how* (capabilities, knowledge, and techniques needed to do a job); *problem solving* (thinking demands of the job, scaling tasks as to whether they would be considered repetitive and routine, or requiring adaptive abilities for abstract concepts and ideas); and *accountability* (amount of autonomy in decision-making, amount of guidance, and amount of impact that individual decisions will have on the organization) (Capelli, 1992). Similarly, the U.S. Department of Labor's O*NET (Occupational Information Network) has developed cross-job descriptors that detail job-specific information using six categories: *worker requirements*, *worker characteristics*, *experience requirements*, *occupational requirements*, *occupation-specific*, and *occupation characteristics*. In this framework, occupational requirements include generalized work activities, organizational contexts, and work conditions; occupational characteristics include labor market information, occupational outlook, and wages.

Cost and practicality are perhaps the most serious drawbacks to these ambitious techniques. These approaches are long and tedious and often require specially trained personnel. The DACUM process is seen as more user-friendly and appeals to the collaborative nature of the current skill standards development movement by including (at least in theory) both educators and industry representatives. On the other hand, these more focused data do not allow for the same breath and depth of analysis that broader data accommodate. The characteristics of the data may have a more direct tie to the current

purpose or aim of the analysis but the immediate gains of more focused data may be difficult to sustain in the future as the focus on the analysis changes and key pieces of data (or aspects of the job) that were considered unnecessary (and therefore uncollected) become important.[16]

Although the more broad-based methods collect data that could be used to move away from the skill components framework, standards actually established using such data look very much like those based on DACUM or V-TECS—a specialized occupational profile that describes workers by identifying a list of their skills. Most of the broader occupational analysis methodologies discussed above include the contextual situation and other relevant aspects of the worker in the data they collect; nevertheless, they fail to incorporate these broader, external, social aspects and definitions of the job into the analysis. This can be seen by examining the *Dictionary of Occupational Titles*, which provides detailed listings of job characteristics for over twelve thousand jobs. This is clearly not consistent with the view of work based on broader conceptualizations of occupational clusters that we have argued is more consistent with the professional model.

Furthermore, although the content produced by these broader approaches may have been at least potentially more consistent with the professional model than the output of DACUM, the broader perspectives failed to provide any significant role for workers (and, therefore, failed to live up to the professional model in terms of the governance structure). Indeed, while DACUM calls for the participation of workers in focus groups, Functional Job Analysis and similar approaches produce occupational profiles by using outside experts to observe and report on workers—workers are not involved in the job analysis process, nor in the validation phase, much less in the actual development of standards.

In this tension between complex content and practical imperatives, at least on a formal level, the practical appears to have won. The job analysis processes that dominate the skill standards projects are much more consistent with the skill components than the professional model, both in terms of the content of the standards (the conceptualization of skill) and the governance structure. The DACUM and V-TECS approaches tend to result in

[16] We are not endorsing the use of one specific occupational analysis method. Indeed, various authors have listed countless difficulties and pitfalls in using many of the traditional job analysis methods that currently exist (e.g., see Hanser, 1995, and Rayner & Hermann, 1988). Nor do we argue that the DACUM process cannot be used effectively, especially if it is used in conjunction with other approaches. We present some suggestions for approaches to job analysis in the conclusions to this report.

a task-focused list of skills and to marginalize workers in the standards process. The basic DACUM model does not establish a strong leadership role for workers and the "modifications" give them only an advisory role in validating standards developed by project staff or "experts."

In the end, the output of any job analysis technique is only part of the standards development process. As we have seen, it is possible to collect extensive information through job analysis but ignore when standards are created. When workers or professionals who are embedded into a community or practice associated with the occupations being analyzed are integrally involved with the standards development process, the job analysis technique may appear to be more simple and superficial than the standards the job analysis is presumably being used to create. These practitioners bring their own understanding to the process that may not be contained in the formal approach to analysis. But we do suggest that it will be difficult to develop standards consistent with the professional model by using task-oriented job analysis techniques that are set without extensive participation of incumbent workers.

This is not to say that project managers have not struggled with the limitations of the job analysis methodologies. Earlier in the paper we described three broad approaches to defining standards—compartmentalized, contextualized, and consolidated. Certainly those who used the consolidated perspective have gone beyond the confines of the narrow occupational analysis methodologies such as DACUM. But these achievements come despite, rather than as a result of, the occupational analysis techniques that they have used.

CONCLUSIONS AND RECOMMENDATIONS

The skill standards movement was launched as part of a broad strategy designed to strengthen the education system and ultimately the economy. Policymakers, educators, and employers have perceived an important change in the nature of work and the types of skills required on the job and have come to believe that a system of skill standards would strengthen the skills of the country's workforce. As part of that broad effort, Congress established the National Skill Standards Board to promote the development of a national system of voluntary industry-based skill standards. The work of the Board can build on the experience developed in the twenty-two pilot projects established by the Departments of

Labor and Education and utilize them as laboratories for the development of skill standards systems.

These twenty-two pilot projects have made some important advances and have now provided a foundation for the development of a broader system of skill standards. The pilots have created an opportunity for policymakers, educators, and employers to experiment and try different approaches. One of the purposes of our analysis was to review the progress of these pilots. Our conclusions are presented in the form a series of suggestions for strengthening the pilot projects and broadening the system of skill standards. These recommendations are grouped into three broad categories: (1) goals, (2) substantive content, (3) governance.

Goals and Evaluation

1. *Clarify the goals of the skill standards movement.*

Advocates hope that skill standards systems can help achieve a variety of goals. Any assessment of the effectiveness of these systems as well as judgments about the level or resources that should be devoted to these systems will depend on the ultimate objectives of the movement. At this point, there is no strong consensus about the central goals, and indeed, different stakeholders may have conflicting goals. Simplifying greatly, there are two overall goals—one short-term and one long-term.

The short-term goal is to improve the information available to students, prospective job applicants, and employers. A set of skill standards for a relevant occupation will let employers know more about what job applicants can do, and tell students what types of skills they need to acquire to be eligible for particular jobs or occupations. Many employers involved with the skill standards projects appear to be interested primarily in this type of improved information.

According to the long-term goal, the skill standards movement is part of a much broader strategy to reform both work and education. The objectives of this strategy are to develop and deepen the partnership between schools and employers; to increase learning that takes place on the job; to help change education so that it will be more in tune with

current needs of the workplace; and, ultimately, to help move workplaces towards high-performance work systems.

The current skill standards projects have made significant progress towards the short-term goal. The process has given many employers a framework in which to articulate their needs in ways that can be understood by schools and students, although there is still a long way to go before the pilot projects develop fully functioning programs with associated assessment and curriculum.

For some, the motivation for the skill standards movement is more ambitious, however. Educators, policymakers, and analysts involved with the projects tend to take this broader view, although some employers also agree. According to this view, the United States already has many job analysis and certification systems that could be used as vehicles for improved communication between employers and educators. The dramatic increase in the interest in standards arose from a conviction that significant reform is necessary, particularly in the training and education and the management and utilization of so-called front-line workers—nonmanagerial and nonprofessional production and service workers. Advocates hope that the skill standards movement will be a central component of that broad reform strategy. From this long-term perspective, there has been some important progress.

Nevertheless, there are some significant areas in need of improvement as efforts continue to move towards a stronger consensus on the broad objectives of the system. For example, not all employers have altered their workplaces in accordance with the tenets of high-performance work organizations even though few dispute the rationale and benefits of establishing them. If skill standards are being developed to highlight the demands placed upon workers operating in high-performance workplaces, one must not underestimate the difficulty of achieving "buy-in" from employers with less progressive work environments who will see little use for high-performance standards in their current operations. Indeed, these employers and employees will have as much, if not more, impact on the ultimate success of the skill standards movement as those operating in high-performance work organizations.

Substantive Content

2. *If an objective of the skill standards movement is to contribute to a broad movement of school and workplace reform, skill standards systems need to be developed that are more consistent with the broader, more "professionalized" role of workers in innovative workplaces—they need to move away from the skill components model and towards a professional model.*

In this report, we developed a distinction between two broad conceptualizations of skills—the skill components and the professional model. In traditional workplaces, workers are expected to carry out well-defined tasks under the direction of managers and planners. The skills of these workers can be thought of as a collection of tools (tasks) available for the use of managers. In this case, it is reasonable to summarize the capabilities of the workers as a list of tasks that they can accomplish. Underlying academic skills such as literacy are seen as a foundation upon which tasks are accomplished. But in high-performance workplaces, the jobs of workers are less well-defined. Workers themselves have more autonomy to decide how a particular goal will be reached. They make more decisions about which tasks to use, when they will be used, and how they will be combined. In this case, it is the ability to carry out tasks that are seen as the foundation upon which broader functions within an organization are accomplished. Although the ability to carry out specific tasks continues to be important, the standards should be built around those broader functions rather than being limited to narrowly defined tasks.

The most common job analysis techniques reinforce the skill components rather than the professional model. DACUM and V-TECS tend to result in narrowly defined task lists, although some of the projects have been able to modify the process to support a consolidated approach to standards setting. More comprehensive approaches to job or occupational analysis that have been developed over the last few decades require more time, resources, and specially trained analysts. The search for rapid implementation and attempts to involve a wide group of stakeholders, especially employers, have created incentives to use the simplest method. This tendency will only be reinforced when projects turn to assessment. It will be much easier to check off the mastery of a set of tasks than to try to evaluate the effectiveness of workers to carry out broadly defined roles within their organizations. Furthermore, it is revealing that even job analysis methods that collect more comprehensive data end up developing job descriptions based on narrowly defined task lists. In other words, they do not use much of the information that they collect. Ironically,

the same development that has spurred the interest in skill standards—the changing nature of work—also makes it more difficult and complex to create those standards.

Although we have argued that the professional model can serve as an important benchmark for the development of industry-based skill standards systems, this does not mean that current practice in professional education should simply be adopted. Professional organizations are struggling with some of the same problems that have confronted those developing systems for front-line workers. The overall objective should be to develop approaches to understanding skills in reasonably broad clusters of jobs or occupations. There is no question that this is an extremely difficult task.

There are important political reasons why project managers want to develop concrete results quickly. Nevertheless, experimentation is one of the goals of pilot projects, and given the current enthusiasm for standards, particular efforts should be made to address these admittedly difficult problems.

Governance

3. *Continue the important progress already achieved on the involvement of employer organizations and associations.*

The future of the skill standards process depends on collaboration among employers in articulating their needs and in developing and perhaps paying for training and appropriate education. Ultimately, employers will also have to be willing to use the standards in their hiring and promotion decisions. Furthermore, the experience of employer associations in the skill standards system may have been useful in the development of related education and human resource programs. For example, organized employer collaboration is also necessary for the development of widespread private sector participation in school-to-work programs, in helping schools design improved programs and curricula, and in bringing about changes in production processes and work organizations. Lessons learned in the skill standards movement may therefore be relevant to other initiatives. To gain the full advantage of this experience, an organized attempt needs to be made to analyze the strengths and weaknesses of the role of employer organizations.

4. *Strengthen the partnership between employer organizations and schools.*

Most of the pilot projects have placed a strong emphasis on the involvement of employers. Perhaps as a result of this, educators have played a decidedly secondary role. Although they have been present on the governance and advisory committees, they have tended to be passive participants. To some extent this might be expected since the early stages of the projects were focused on the needs of the workplace, and it is only now that the staff is turning to assessment and curriculum development-areas in which educators are more likely to be needed. Nevertheless, modern thinking about organizational design suggests that projects are most effectively accomplished if they involve cross-functional and cross-departmental teams. According to this view, production, engineering, and marketing personnel should work closely with designers even at the design stage. Similarly, rather than promoting a system in which employers specify what they need and then hand off the standards to educators to develop curriculum, project managers should work towards more integrated involvement of these groups at all stages of the projects. Thus, educators should be integrated into the standards design process and employers should continue to be involved when curricula are developed.

5. *The involvement of workers and worker representatives in the governance structure needs to be strengthened.*

For the most part, workers have played an advisory role in the pilot projects. Often, as a result of the modifications of the DACUM job analysis technique, workers were only brought into the process after a complete draft of the standards had been developed. Worker participation in the governance is a central component of the professional model. The more autonomy involved with a job, the more important it is for workers themselves to participate actively in the development of standards that describe those jobs. The closer a firm or industry moves towards a high-performance work organization, the more important it will be to integrate workers into the standards-development process.

One possible explanation for the generally weak worker role in the pilot programs is that the move towards high-performance work is exaggerated. Employers are not really interested in broadening the role of workers either in their production or their standards setting processes. If this is the case, it may be particularly important for project managers to emphasize the role of workers in the projects as a means to promote discussion about organizational innovation in the industry.

There are also practical problems that thwart the increased participation of workers in the skill standards process. Attempts to simplify the job analysis process have tended to reduce the role of workers in setting standards. Convening groups of workers and involving them in a significant way is often difficult and time consuming. Employers are reluctant to release workers for the time required for them to participate even in the more passive roles assigned to them in the current projects. In other countries and indeed in some occupations in this country, unions represent worker interests, and union staff, who are often ex-workers, are assigned the responsibility of working more intensively with the standards projects. This avoids the time conflict experienced by workers with full-time jobs at the workplace. But the weak position of unions in this country reduces their potential contribution to the standards process. Although unions have been involved in some of the pilot projects, in other pilot projects, conflicts between the unions and employers, or explicit efforts to avoid working with unions, have prevented any meaningful collaboration.

Although we have suggested that the projects need to move towards the professional model, the best approach is probably not one in which workers have almost complete control over the process of setting and certifying standards, as is true in some of the professions. Nevertheless, project managers must find ways to establish meaningful partnerships between workers, employers, and educators. Many advocates see the skill standards movement as part of a broad reform strategy to promote high-performance work organization. A central component of innovative work organization is the increased autonomy of "front-line" workers. Thus, if the standards are seen as part of a strategy to promote greater worker autonomy, there is a conflict between a skill standards process based on a passive role for workers.

REFERENCES

Abbott, A. (1988). *The system of professions: An essay on the division of expert labor.* Chicago, IL: University of Chicago Press.

Appelbaum, E., & Batt, R. (1994). *The new American workplace: Transforming work systems in the United States.* Ithaca, NY: ILR Press.

Attewell, P. (1990). What is skill? *Work and Occupations, 17*(4), 422-448.

Bailey, T. (1989, November). *Changes in the nature and structure of work: Implications for skill requirements and skill formation* (Technical Paper Number 9). New York: National Center on Education and Employment.

Bailey, T. (1993). *Discretionary effort and the organization of work: Employee participation and work reform since Hawthorne.* Unpublished paper prepared for the Sloan Foundation.

Baskett, H. K. M., & Marsick, V. (1992). *Professionals' ways of knowing: New findings on how to improve professional education.* San Francisco: Jossey-Bass.

Berryman, S. E., & Bailey, T. (1992). *The double helix of education and the economy.* New York: The Institute on Education and the Economy, Teachers College, Columbia University.

Berryman, S. E., & Rosenbaum, J. E. (1992). Certification of work competencies. In *Youth apprenticeship in America: Guidelines for building an effective system* (pp. 51-59). New York: William T. Grant Foundation Commission on Work, Family, and Citizenship.

Brint, S. (1993). Eliot Freidson's contribution to the sociology of professions. *Work and Occupations, 20*(3), 259-278.

Capelli, P. (1992). *College and the workplace: How should we assess student performance?* (EQW Working Paper, WP09). Philadelphia: The Trustees of the University of Pennsylvania.

Capelli, P. (1993). Are skill requirements rising: Evidence from production and clerical jobs. *Industrial and Labor Relations Review*, *46*(3), 515-530.

Carnevale, A., Gainer, L. J., & Meltzer, A. S. (1982). *Workplace basics: The skills employers want.* Washington, DC: American Society for Training and Development and U.S. Department of Labor, Employment and Training Administration.

Collins, R. (1976). *Conflict sociology.* New York: Academic Press.

Commission on the Skills of the American Workforce. (1990). *America's choice: High skills or low wages!* Rochester, NY: National Center on Education and the Economy.

Fine, S. (1988). Functional job analysis. In S. Gael (Ed.), *The job analysis handbook for business, industry and government* (pp. 1019-1035). New York: John Wiley and Sons.

Fine, S., & Wiley, W. W. (1971). *An introduction to functional job analysis.* Kalamazoo, MI: W. E. Upjohn Institute for Employment Research.

Foote, N. (1953). The professionalization of labor in Detroit. *American Journal of Sociology*, *58*, 371-380.

Ganzglass, E., & Simon, M. (1993). *State initiatives on industry-based skill standards and credentials.* Washington, DC: National Governors' Association.

General Accounting Office (GAO). (1993a). *Occupational skill standards—Experience shows industry involvement to be key* (T-HRD-93-23). Testimony of Linda G. Morra, Director, Education and Employment Issues, Human Resources Division. Washington, DC: Author.

GAO. (1993b). *Occupational skill standards—Experience in certification systems shows industry involvement to be key* (HRD-93-90). Washington, DC: Author.

Goode, W. J. (1969). The theoretical limits of professionalization. In A. Etzioni (Ed.), *The semi-professions and their organization* (pp. 266-313). New York: The Free Press.

Grubb, W. N. (1995). Conclusion: The promises of curriculum integration. In W. N. Grubb (Ed.), *Education through occupations in American high schools: Approaches to integrating academic and vocational education* (Vol. 1) (pp. 215-230). New York: Teachers College Press.

Hagerty, B. M. K., & Stark, J. S. (1989, February). Comparing educational accreditation standards in selected professional fields. *Journal of Higher Education*, *60*(1), 1-20.

Hanser, L. M. (1995, May). *Traditional and cognitive job analysis as tools for understanding the skills gap.* RAND unrestricted draft series.

Hoachlander, E. G. (1995). *Making pilots: An inquiry into standards.* Paper presented at the 1995 meeting of the American Educational Research Association, San Francisco, CA.

Knaak, W. C. (1977). *Competency-based vocational education: A review.* Columbus: National Center for Research in Vocational Education, Ohio State University.

Kochan, T. A., & Osterman, P. (1994). *The mutual gains enterprise.* Boston: Harvard Business School Press.

Leslie. B. (1992, April 30). *Skill standards and certification issues.* Testimony delivered to the U.S. Department of Labor, the U.S. Department of Education, and the National Advisory Commission of Work-Based Learning on behalf of the American Association of Community and Junior Colleges, Washington, DC. (ERIC Document Reproduction Service No. ED 343 640)

McCormick, E. J. (1979). *Job analysis: Methods and applications.* New York: American Management Association.

Miller, J. W. (1994). *Accreditation and other services: Appropriate roles for certifying agencies.* Paper commissioned by the Institute on Educational Leadership, Washington, DC.

National Commission on Excellence in Education. (1983). *A nation at risk.* Washington, DC: U.S. Department of Education.

Nelson, B. J., & Barley, S. R. (1994). *Toward an emic understanding of professionalism among technical workers* (EQW Working Paper Number WP29). Philadelphia: The Trustees of the University of Pennsylvania.

Norton, R. E. (1993, June 9-11). *DACUM and Tech Prep: Dynamic duo.* Paper presented at the Mid-America Competency-Based Education Conference, Bloomington, MN. (ERIC Document Reproduction Service No. ED 359 339)

Nowlen, P. M. (1990). New expectations, new roles: A holistic approach to continuing education for the professions. In R. M. Cervero, J. R. Azzarett, & Associates (Eds.), *Visions for the future of continuing professional education* (pp. 15-23). Athens: Georgia Center for Continuing Education, University of Georgia.

O'Brien, T. P. (1989, Summer). Reliability and construct validity of a DACUM occupational profile. *Journal of Vocational Education Research, 14*(3), 21-39.

Rayner, P., & Hermann, G. (1988, August). The relative effectiveness of three occupational analysis methods. *The Vocational Aspect of Education, XL*(106), 47-55.

Rosenbaum, J. E., Kariya, T., Settersten, R., & Maier, T. (1990). Market and network theories of the transition from high school to work: Their application to industrialized societies. *Annual Review of Sociology, 16*, 263-299.

Secretary's Commission on Achieving Necessary Skills. (1991). *What work requires of schools: A SCANS report for America 2000.* Washington, DC: U.S. Department of Labor.

Spady, W. G. (1977, January). Competency based education: A bandwagon in search of a definition. *Educational Researcher*, *6*(1), 9-14.

Stasz, C., McArthur, D., Lewis, M., & Ramsey, K. (1990). *Teaching and learning generic skills for the workplace* (MDS-066). Berkeley: National Center for Research in Vocational Education, University of California at Berkeley.

U.S. Department of Labor, Bureau of Labor Statistics. (1991/1992, Winter). Apprenticeship. *Occupational Outlook Quarterly*, *35*(4), 27-37.

U.S. Department of Labor, ETA Division of Acquisition and Assistance. (1992, July 6). *Commerce business daily* (Government Procurement Notice). Washington, DC: U.S. Government Printing Office.

U.S. Department of Labor, Training Technology Resource Center, Employment and Training Administration. (1995). *National Skill Standards Board fact sheet.* Washington, DC: Author.

Wilensky, H. (1964). The professionalization of everyone. *American Journal of Sociology*, *70*, 130-158.

Willet, J., & Hermann, G. (1989, December). Which occupational analysis technique: Critical Incident, DACUM, and/or Information Search? *The Vocational Aspect of Education*, *XLI*(110), 79-88.

William T. Grant Foundation on Work, Family, and Citizenship. (1988, November). *The forgotten half: Pathways to success for America's youth and young families.* Washington, DC: Author.

Wills, J. L. (1993a, March). *Overview of education and industry skill standards systems in the United States—Volume I.* Draft report for the Institute for Educational Leadership, U.S. Department of Education.

Wills, J. L. (1993b, March). *Education driven skill standards systems in the United States—Volume II.* Draft report for the Institute for Educational Leadership, U.S. Department of Education.

Wills, J. L. (1993c, March). *Industry driven skill standards systems in the United States—Volume III.* Draft report for the Institute for Educational Leadership, U.S. Department of Education.

Wills, J. L. (1993d). *Skills standards systems in selected countries—Volume III.* Draft report for the Institute for Educational Leadership, U.S. Department of Education.

Wirt, J. G. (1995). *Performance assessment systems: Implications for a national system of skill standards, Volume II.* Washington, DC: National Governors' Association.

Wise, A. E., & Leibrand, J. (1993). Accreditation and the creation of a profession of teaching. *Phi Delta KAPPAN, 75*(2), 133-136, 154-159.

Wolfson, A. D., Trebilcock, M. J., & Tuohy, C. J. (1980). Regulating the professions: A theoretical framework. In S. Rottenberg (Ed.), *Occupational licensure and regulation* (pp. 180-214). Washington, DC: American Enterprise Institute for Public Policy Research.

APPENDICES

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Chart 1

INDUSTRY	LEAD ORGANIZATION (Formal Partner)	DOL or DOE	START DATE	JOB ANALYSIS METHOD	SKILLS CATEGORIES	OCCUPATIONAL AREAS	PROJECT STATUS AS OF APRIL '95
Metalworking	National Tooling & Machining Association (Council of Great Lakes Governors)	DOL	12/92	Modified DACUM	○ Occupational duties ○ Performance standard	Machining, Industrial Equipment, Tooling and Metalforming Technicians	Published standards for machining skills cluster; assessment tools in development (validation scheduled for 4/95); pilot implementation in progress—standards used as guides to train new workers and upgrade skills of incumbent workers
Electronics	American Electronics Association	DOL	12/92	Modified DACUM	○ Key purpose of occupation ○ Critical functions ○ Key activities ○ Descriptions of competent performance ○ Knowledge, skills, and attributes	Manufacturing Specialist, Administrative/ Information Services Support, and Pre/Post Sales	Standards developed and validated 2/94; implementation underway at industry and school test sites; currently developing assessment system in the workplace; standards being developed for a new occupation—Manufacturing Specialist Team Leader
Retail	National Retail Federation	DOL	12/92	Modified DACUM	○ Purpose and uses of standard ○ Description of standard ○ Statement of criteria to be met by the standard ○ Measurement system	Professional Sales Associate	Standards framework released 11/94; work underway to integrate standards with state STW initiatives; research underway to establish methods for dissemination, promotion, and use as training and certification tool
Hospitality and Tourism	Council on Hotel, Restaurant, and Institutional Education (Convocation of National Hospitality and Tourism Industry Association)	DOL	12/92	Modified DACUM	○ Content standard (critical tasks and duties) ○ Position snapshot (types of work and work environment) ○ Skill standard ○ Training standard (task definition and performance level)	Front-Line Positions in Lodging (Front Desk Associate, Reservationist, Bellstand, and Concierge) and in Food (Server, Host, Cashier, and Busser)	Standards issued 4/95; current focus on establishing framework for governance and developing credentialing and assessment tools

Chart 1 (continued)

INDUSTRY	LEAD ORGANIZATION (Formal Partner)	DOL or DOE	START DATE	JOB ANALYSIS METHOD	SKILLS CATEGORIES	OCCUPATIONAL AREAS	PROJECT STATUS AS OF APRIL '95
Electrical Construction	National Electrical Contractors Association	DOL	12/92	Modified DACUM	○ Job description ○ Use of tools ○ Knowledges ○ Skills ○ Abilities	Electrical Construction Worker, Electrical Line Construction Worker, and Electrical Residential Construction Worker	Final standards available summer '95 pending compilation of results from national job analysis
Laundry, Cleaning, & Garment Services	Uniform & Textile Services Association	DOL	12/92	Modified DACUM	○ Task/Activity statement ○ Standards statement ○ Required skills/knowledge ○ Evidence of successful performance ○ Assessment strategies ○ Skills/Knowledge matrix	Production Worker and Maintenance Technician	Standards published 2/95; completed written assessments, performance-based demonstrations, and promotional and pre-employment selection guides; currently pilot testing certification processes
Bioscience	Education Development Center	DOE	10/92	Modified DACUM	○ Workplace situations ○ Workplace settings ○ Key competency areas demonstrated by situations ○ Task mastery needed to perform routine procedures ○ Task mastery needed to solve problems ○ Skills, knowledge, and attributes	Beginning-Level Bioscience Technical Specialists (covers 20 related occupations)	Standards publication set for 5/95; education and training directory scheduled for publication 5/95; resource book of recommendations for program and system development available 9/95
Electronics	Electronics Industries Foundation	DOE	10/92	Modified DACUM	○ Desirable behaviors and work habits ○ Technical skills ○ Test equipment and tools ○ Basic and practical skills ○ Additional skills	Entry-Level Electronics Technician employed in basic and applied research; product development; manufacturing; marketing; maintenance; and repair of electronic components, devices, and systems	Standards published 6/94; detailed measurement criteria expected summer '95; currently developing certification process

Chart 1 (continued)

INDUSTRY	LEAD ORGANIZATION (Formal Partner)	DOL or DOE	START DATE	JOB ANALYSIS METHOD	SKILLS CATEGORIES	OCCUPATIONAL AREAS	PROJECT STATUS AS OF APRIL '95
Health Services	Far West Laboratory for Education Research & Development	DOE	10/92	Modified DACUM	○ Description of skill area or topic covered by the standards ○ General description of knowledge and skills ○ Specific applications for clarification or illustration of the standards statement	Health Care Core (all workers in health services) and 4 occupational clusters: therapeutic, diagnostic, information services, and environmental services	Standards have been issued; currently working on implementation at 12 sites including curriculum development (secondary and postsecondary), employee in-service training and professional development, and creation of job competencies
Computer-Aided Drafting	Foundation for Industrial Modernization (FIM)	DOE	10/92	Other—not labeled	○ Technical skills cross referenced with related academic skills and employability skills ○ Tools and equipment ○ Hours of instruction ○ Qualification of CADD instructor	Computer-Aided Drafting and Design (CADD) users across all industries	Standards published in spring '94; currently developing knowledge and skills assessment due late 4/95; pilot tests of exam scheduled for 8/95 in school and industry
Printing	Graphic Arts Technical Foundation (Council of Great Lakes Governors)	DOE	10/92	Modified DACUM	○ Core skills (including discussion of possible uses) ○ Technical skills	Pre-Press/Imaging, Press and Binding, Finishing, and Distributing	Validation of press skills completed 3/95; currently identifying pilot sites; working on finishing cluster; next step: develop assessment measures and establish dissemination and maintenance structure for certification and accreditation
Automotive, Autobody, and Truck Repair	National Automotive Technicians Education Foundation	DOE	10/92	Modified DACUM	○ Workplace skills (employability skills) ○ Narrative statements for related academics ○ Related academic skills ○ Tasks lists	Entry-Level Automobile, Autobody, and Medium/Heavy Truck Technicians	Standards for all occupational areas have been completed; applied academic and workplace skills for automobile techs have been completed; research on remaining occupational areas is being synthesized

Chart 1 (continued)

INDUSTRY	LEAD ORGANIZATION (Formal Partner)	DOL or DOE	START DATE	JOB ANALYSIS METHOD	SKILLS CATEGORIES	OCCUPATIONAL AREAS	PROJECT STATUS AS OF APRIL '95
Agricultural Biotechnology	National FFA Foundation	DOE	10/92	Modified DACUM	○ Technical skills ○ Employability skills ○ Related academic skills ○ Hours of student instruction ○ Instructor qualifications ○ Tools and equipment	Agricultural Biotechnology Technician	Standards validated 8/94 and are being disseminated; currently focusing on production of instructional and informational materials for education (for completion 6/96)
Heating, Air Conditioning, and Refrigeration	Vocational-Technical Consortium of States	DOE	10/92	V-TECS	○ Technical skills ○ Tools and equipment required for performance ○ Industry-derived standard for performance ○ Procedure for performing skill ○ Foundation skill ○ Workplace behaviors and their respective criteria required for successful job performance	Air-Conditioning, Heating, and Refrigeration Technicians in residential and commercial environments	Performance standards and academic and workplace skills have been identified; current effort to develop assessment items for each task; plans to develop and field test certification process
Chemical Processing	American Chemical Society	DOE	8/93	Modified DACUM	○ Employability/general application skills (performance-based) ○ Critical job functions (technical performance standards)	Entry-Level Chemical Laboratory Technicians and Process Technical Operators	Standards published 1/95; currently expanding standards to benefit educators and determine teacher qualifications and continuing education requirements
Photonics	Center for Occupational Research & Development (CORD)	DOE	8/93	Other—not labeled	○ Task list ○ Curriculum (basic core and photonics core)	Photonics Technicians including specialty areas such as defense/ public safety, medicine, and communications	Standards translated into knowledge requirements and released 3/95; currently developing curriculum to support standards, identifying certification issues and options, and building maintenance structure
Hazardous Material Management	CORD	DOE	8/93	Other—not labeled	○ Job function ○ Related academic skills ○ Employability skills ○ Quality process skills	Entry-Level Hazardous Materials Management Technician (includes several job titles)	Standards published 1/95; currently working on curriculum, assessment, and certification development

Chart 1 (continued)

INDUSTRY	LEAD ORGANIZATION (Formal Partner)	DOL or DOE	START DATE	JOB ANALYSIS METHOD	SKILLS CATEGORIES	OCCUPATIONAL AREAS	PROJECT STATUS AS OF APRIL '95
Welding	American Welding Society	DOE	8/93	Modified DACUM	Not available	Entry-Level Welder (semiskilled production worker requiring significant supervision)	Standards, training guide, and video for entry-level welders available 4/95 (completion of project)
Advanced High Performance Manufacturing	Foundation for Industrial Modernization (FIM)	DOE	8/93	Modified DACUM	○ Action (skill) ○ Conditions under which action is performed ○ Criteria/measure (performance standard) ○ Portfolio/test/observation (method for measurement) ○ Rationale for action performance	Technical Workers	Currently validating skills topics (due 5/95); identification of conditions and criteria for skills and development of assessment and documentation system will begin afterwards
Human Services	Human Services Research Institute	DOE	8/93	Modified DACUM	○ Competency/duty area ○ Skill standard statement ○ Work activity statement ○ Performance indicators ○ Recommended assessments ○ Community context ○ Scenario	Entry-Level Human Service Occupations, including case managers, job coaches, and residential support staff	Currently validating draft standards; have identified 4 demonstration sites (work-based and education)
General Construction—Heavy Highway/ Construction and Environmental Remediation	Laborers Association of General Contractors Education and Training Fund	DOE	8/93	Modified DACUM	○ Aptitudes and abilities ○ Workplace basic skills ○ Cross-functional skills ○ Occupational specific skills ○ Occupational specific knowledge ○ General occupational skills and tool use	Pipe Laying Work, Concrete Work, Lead Remediation, and Petro-Chemical Remediation	Validation of task list in spring '95; plans to identify cross-functional skills and to improve communication between education and work worlds
Grocery	National Grocers Association	DOE	8/93	Modified DACUM	○ Employability skills ○ Duties and tasks (performance steps; conditions for performance; standards; enabling competencies—academic and job-specific)	Customer Service/Stock Associate and Front-End Associate (all entry-level positions)	Validation survey now being distributed

Chart 2

Extent of Academic and Vocational Integration	Most Applicable Model	Projects Using Type of Integration	Illustration
Academic skills are differentiated from vocational/technical skills (and listed separately)	Skill Components Model	6 projects	Academic skill: Perform basic math computations using addition, subtraction, multiplication, and division Technical skill: Analyze field samples
Academic skills are applied to a generic workplace setting but remain distinct from vocational skills		9 projects	Academic skills: Divide decimals to determine measurement in conformance with manufacturer specifications Technical skills: Replace fuel filters
Academic and vocational skills are integrated	Professional Model	6 projects	Maintain accurate records, collecting, compiling, and evaluating data, and submitting records to appropriate sources in a timely fashion

Chart 3

Extent of Workplace Integration	Most Applicable Model	Projects Using Type of Integration	Illustration
Skills are listed generically with no workplace application relevant to the specific occupation and/or industry	Skill Components Model	11 projects	Demonstrate an understanding of basic assembly skills using hand and power tools.
Workplace applications are provided as examples to indicate how skills are used		6 projects	Expert operators are often called on to use mathematical skills in their daily work. They use fractions and percentages, for example, to compute ink proportions and may need to know Roman numerals to ensure proper page sequencing.
Critical aspects of the job and organizational and industry contexts are integrated	Professional Model	4 projects	Perform routine quality control procedures to evaluate the quality of culture media used in the microbiology lab. Demonstrate the steps involved. You find that the negative control culture yields a positive result on one type of selective media. How should you deal with this?

Chart 4

CATEGORIZATION OF SKILL STANDARDS
Workplace Integration

Academic and Vocational Integration		Skills are listed generically with no workplace application relevant to the specific occupation and/or industry	Workplace applications are provided as examples to indicate how skills are used	Critical aspects of the job and organizational and industry contexts are integrated
	Academic skills are differentiated from vocational/technical skills	Compartmentalized 6 projects		
	Academic skills are applied to a generic workplace setting but remain distinct from vocational skills	Contextualized 5 projects	Contextualized 4 projects	
	Academic and vocational skills are integrated		Contextualized 2 projects	Consolidated 4 projects