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ABSTRACT

This report is designed to help state and local policymakers and practitioners understand the goals behind integrating academic and technical standards and the processes three national partnerships used to develop, test, and implement them in the context of curriculum reform. The first chapter of the report defines and describes integrated standards and how they can serve the needs of both education and industry. Chapters two, three, and four provide detailed descriptions of integrated standards activities in the three Building Linkages consortia (the Health Science Collaborative, the Manufacturing Linkages Consortium, and the Far West Project). The final chapter identifies the challenges and opportunities facing the consortia as they move forward with their work to expand the use of these standards in education and industry. (Contains 10 references.) (KC)

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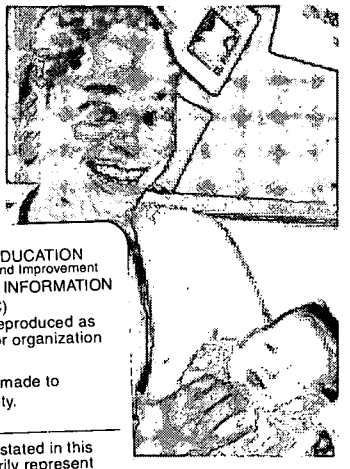

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BUILDING LINKAGES

Making Integrated Standards Work for Education and Industry

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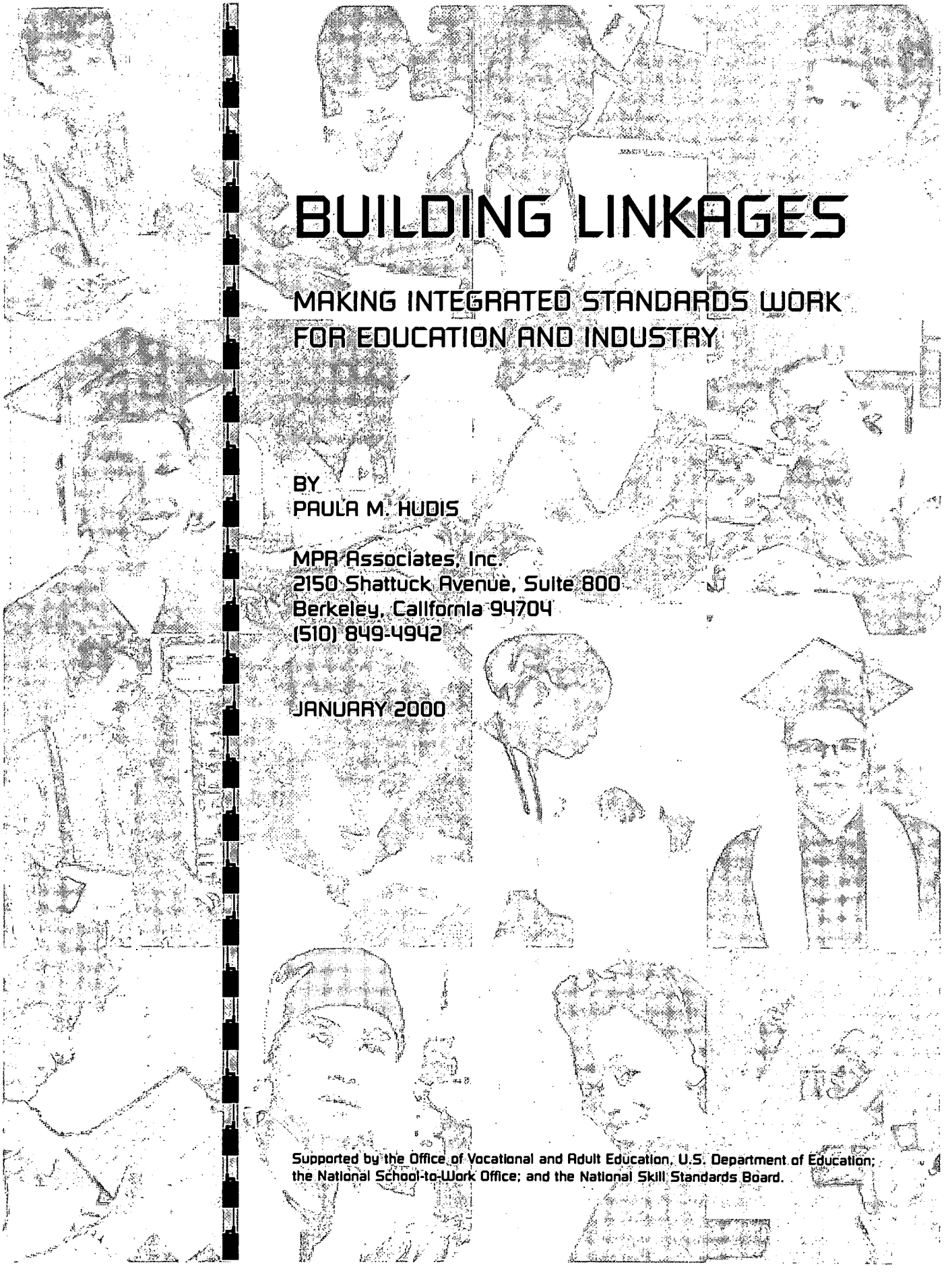

BUILDING LINKAGES

MAKING INTEGRATED STANDARDS WORK FOR EDUCATION AND INDUSTRY

BY
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JANUARY 2000

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PREFACE

With growing national interest in raising student achievement and improving the skills of beginning workers, many supporters of school reform have come together to rethink the foundations of public education. One of these collaborative efforts is the movement—supported by many educators, businesses, and labor organizations—to create new curricula that combine high-level academics and industry-endorsed technical standards. These school reformers argue that integrated academic and technical standards can serve as benchmarks for high student achievement and should become a key element of technical curricula in both high schools and post-secondary institutions. This report describes the first two years of one of the largest of these collaborations, a federally funded initiative known as Building Linkages. The initiative was designed to enhance public understanding of the value of standards-based curricula and increase their use in the classroom through widely endorsed and thoroughly tested curriculum materials and new student assessment methods.

From its beginning in 1996, Building Linkages represented a unique federal, state, and local partnership. It was supported by three federal agencies—the U.S. Department of Education, the National School-to-Work Office, and the National Skill Standards Board. It attracted participants from education, industry, and labor in four diverse industries—health care, manufacturing, retail and wholesale services, and financial services—and it involved intensive field testing at local schools and colleges. The project included three autonomous partnerships or consortia: the Health Science Collaborative, the Manufacturing Linkages Consortium, and the Far West Project, which included retail and wholesale services and financial services. Each consortium recruited representatives from state education departments, local education agencies, colleges, professional and trade associations, and labor organizations. Their mandate was to build on earlier federally funded projects and industry-based efforts to identify skill standards for clusters of occupations and to translate them into products that educators and employers could use to improve and measure skill attainment.

The three Building Linkages consortia had an ambitious agenda. They were asked to establish consortia with broad memberships; identify career majors for high schools and develop and validate career pathways within their industries; create prototype skill cer-

tificates that would be portable across industries and states; and create methods for ensuring, measuring, and certifying student progress in achieving the standards. All three consortia made significant progress toward achieving these goals. Through national and local efforts, including a second phase of federally supported work on health care and manufacturing that began in October 1999, they are working to finish the agenda, especially to broaden validation of curricula and assessment methods and gain endorsement and acceptance of new certifications.

This report is designed to help state and local policymakers and practitioners understand the goals behind integrating academic and technical standards and the processes three national partnerships used to develop, test, and implement them in the context of curriculum reform. The first chapter of the report defines and describes integrated standards and how they can serve the needs of both education and industry. Chapters two, three, and four provide detailed descriptions of integrated standards activities in the three Building Linkages consortia. The final chapter identifies the challenges and opportunities facing the consortia as they move forward with their work to expand the use of these standards in education and industry.

ACKNOWLEDGMENTS

Many people deserve thanks for their contributions to this publication. They include staff at the federal agencies responsible for overseeing the Building Linkages Initiative, leaders of the three consortia whose work is described in the report, project directors and others associated with consortium pilot sites or conducting research on skill standards, and staff at MPR Associates, Inc. in Berkeley, California. Most prominent among these individuals is Cynthia Brown of the U.S. Department of Education's Office of Vocational and Adult Education (OVAE) who served as the project officer and provided ongoing guidance, tireless support, and many rounds of substantive and editorial advice.

Vickie Schray, formerly with the National School-to-Work Office (NSTWO) and now with OVAE, and Lori Pfalzer, formerly with the National Skill Standards Board and now with the NSTWO, also provided important input that helped shape the focus and direction of this work. Beverly Campbell and Nancy Raynor of the Health Science Collaborative carefully read and commented on the report. Along with Carol Stacey, they clarified the many nuances of the health science project and greatly facilitated this research. Important earlier contributions to this effort also came from Terry Fields, Chris Olson, and Ron McCage of the Manufacturing Linkages Consortium and Sharon McFarland of the Far West Project.

Other state representatives to the three consortia and staff at consortium pilot sites were very generous with their time and helpful during our site visits. We especially appreciate the assistance we received from Brenda Gray at LEED-Sacramento; Sharon Callaham at Clover Park Technical College in Tacoma, Washington; Scott Snelson at the Utah State Office of Education (USOE); Scott Hess, formerly at the USOE and now at OVAE; Robert Dierman at Columbus (Nebraska) High School; Darl Naumann at the Nebraska Department of Economic Development; William Reilly at the Pennsylvania Department of Education; and Joseph Trynosky, Beth Ann Hass, and Anthony Gillespie at the Lancaster County (Pennsylvania) Career and Technology Center. Joshua Haimson of Mathematica Policy Research provided many suggestions throughout the project, based on his own research on skill standards, and lent an expert eye to the final report.

At MPR Associates, Cecilia Ottinger participated in many phases of the project, especially in conducting visits to the consortia pilot sites. Barbara Kridl was responsible for overseeing production of this report, Andrea Livingston and Karyn Madden for editing, and Leslie Retallick for designing the graphics and creating the report cover. I am grateful to all of these people, without whose contributions this report could not have been completed.

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CONNECTING THE NEEDS OF INDUSTRY AND EDUCATION THROUGH INTEGRATED STANDARDS

INTRODUCTION

Over the past decade, standards have become a cornerstone of efforts to improve American education. Since the passage of the Carl D. Perkins Vocational and Applied Technology Act in 1990, educators and leaders from industry and labor have viewed standards as key to improving performance by individuals, work organizations, and public institutions (WestEd, 1998).

In 1994, Congress further strengthened the federal commitment to standards in education by enacting two additional pieces of legislation: the School-to-Work Opportunities Act (STWOA) and the Goals 2000: Educate America Act. Through this legislation, they encouraged educators to use industry-endorsed academic and technical standards to create challenging education programs for the nation's youth. Congress also used these Acts to encourage educational institutions, training programs, labor organizations, and employers to adopt these standards voluntarily, with the goal of improving the skills and knowledge of youth and adult workers.

Federal legislation is now being translated into programs that are having a real impact on education systems. This report documents the first two years of an effort on the part of educators and business and labor leaders around the country to produce these tangible results. It demonstrates how their efforts have helped make standards a central part of progressive education programs in four key sectors of the American economy: health sciences, manufacturing, retail and wholesale trades, and financial services.

THE BUILDING LINKAGES INITIATIVE

With federal, state, and industry support available since 1996, representatives from 29 states became partners in a nationally recognized program to implement standards-related provisions of federal education reform legislation. They joined together in three national skill standards consortia. During a period of two years, each consortium

- Identified and assessed previously developed standards in its industry or industries;
- Selected a set of standards that members determined were broadly applicable to all parts of its industry;

THE BUILDING LINKAGES PROJECT

- The Health Science Collaborative
- The Manufacturing Linkages Consortium
- The Far West Project (Retail and Wholesale Services and Financial Services)

Integrated academic and technical standards can enhance curricula in

- Elementary schools
- Secondary schools
- Postsecondary institutions
- Employment training programs
- Employer-sponsored training
- Apprenticeship programs

- Expanded these existing standards to include national and state academic standards; and
- Translated these expanded standards into tools to help state and local education officials and practitioners advance their educational improvement goals.

Federal funding for these three consortia came from an initiative known as Building Linkages that was supported by the U.S. Department of Education, the National School-to-Work Office, and the National Skill Standards Board (NSSB). Its major objective was to begin a collaborative effort nationwide aimed at sharpening public understanding of standards-based curricula and increasing their use to improve education and raise work force productivity.

THE GOALS OF BUILDING LINKAGES

The initial three projects funded under Building Linkages had a set of four common goals, and each consortium charted its own path to achieve them. Their common goals were to accomplish the following:

- Form consortia of states that involve the active partnership of representatives from state School-to-Work (STW) agencies, education, business, and organized labor in establishing policies and planning project outcomes and activities;
- Develop career majors for high schools that identify the academic and technical skill sets required for entry into competitive work environments and further education and training and that lead to industry-defined career pathways, and use innovative strategies to involve all partners in validating and adopting these career pathways;
- Create prototype STW skill certificates that are portable across industries and states, and integrate nationally recognized and state-recognized skill standards; and
- Develop effective methods for ensuring, measuring, and certifying progress toward achieving standards through a variety of flexible educational and assessment strategies.

A single, unifying principle was the foundation for these goals: schools can enhance student preparation for both postsecondary education and productive employment by focusing their curricula around high-level, integrated academic and technical standards.

GOALS OF THE REPORT

The goals of this report are twofold: to give educators and policymakers more information about how standards endorsed by education and industry are being used for educational improvement, and to show that these early Building Linkages outcomes can be transferred to related efforts in a variety of industries. As the report suggests, future applications are quite broad, going beyond developing programs for our public elementary, secondary, and postsecondary institutions. Other applications include improving employment training programs, employer-sponsored training programs, and apprenticeship programs.

DEFINING STANDARDS

As the popularity of using standards for school improvement has grown, so has the number of definitions of standards used by educators, policymakers, and industry representatives. Researchers have recognized these differences in language and interpretation, the confusion they sometimes cause, and the need for common terminology when describing what standards are and how they are used in a particular context (MPR Associates, 1996). For the purposes of this report, the following definitions of standards and integrated standards are relevant to the work of the Building Linkages project.

What Is a Standard?

According to assessment experts at WestEd, one of the research laboratories of the U.S. Department of Education, "a standard is an explicit statement that clearly defines the knowledge and skills and the level of performance expected of an individual in a given context or work area. As a set, standards represent consensus among stakeholders on what is most important for individuals in a field [of study or work] to know and be able to do" (WestEd, 1998, 16).

Clearly defined standards can provide benefits to all of the stakeholders involved in a range of education and employment activities (Far West Laboratory, 1995). For example,

- Workers can rely on standards to know the expectations that relate to job performance and career development;
- Students can use them to understand goals for educational and career preparation;

- Employers can use them as criteria for recruitment, screening, placement, evaluation, and promotion; and
- Educators can use them to design effective programs and curricula.

Integrated standards are based on

- Academic skills
- Employability skills
- Technical skills

What Are Integrated Standards?

Successful careers require students and employees to have much more than just high-level technical skills. Early in the Building Linkages project, participants in the consortia identified three sets of integrated standards that underlie effective preparation for post-secondary education and productive employment. These standards incorporate academic skills, employability skills, and technical skills.

Academic standards are typically met by studying the traditional academic subjects that are taught in grades K–12, such as mathematics, science, language arts, and social studies. (See figure 1 for an example of a broad academic standard from the National Health Care Skill Standards.)

The three Building Linkages consortia identified academic standards that are critical in their industries and connected them to both national and state-level academic standards or curriculum frameworks. These are the standards that national panels of experts and state-level committees, consisting of many community stakeholders,

Each Building Linkages initiative identified the academic standards that are essential for educational and career advancement in its industry.

FIGURE 1

NATIONAL HEALTH CARE SKILL STANDARDS

ACADEMIC FOUNDATION

Health care workers will know the academic subject matter required for proficiency within their area. They will use this knowledge as needed in their role. The following skills may be included:

- Read and write, including charts, reports, and manuals;
- Perform mathematical operations, including computations, weights, and measures;
- Use health care terminology;
- Apply knowledge of life sciences, such as biology, chemistry, physics, and human growth and development; and
- Be aware of the history of health care.

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established to help local educators create challenging academic curricula.[1] Through a series of "crosswalks" between the national and state standards, they identified the academic skills that students need to excel in career-based postsecondary academic programs and to satisfy employer requirements. These crosswalks established sets of skills that were common to national and state standards.

Employability standards, which are sometimes referred to as workplace-readiness standards, represent the more generic workplace skills and abilities that employers require in virtually all jobs and work settings. (See figure 2 for an example of the employability skills adopted by the Manufacturing Linkages Consortium.)

Similar employability standards cut across all industries in the three Building Linkages consortia.

FIGURE 2

MANUFACTURING LINKAGES CONSORTIUM

WORKPLACE SKILLS (Employability Skills)

Selected employability skill standards developed by the National Coalition for Advanced Manufacturing (NACFAM) and included among the Manufacturing National Skill Standards:

Communication and Teamwork

- *Skill:* Identify components of group dynamics.

  Skill standard: After having participated in a workplace-specific teamwork training activity, provide a list of at least five important skills and processes that lead to successful and productive teamwork.

- *Skill:* Organize material with a logical flow.

  Skill standard: Demonstrate the ability to organize a series of five steps in a given process into the proper logical order so that the process is logical for a manufacturing assembly process.

- *Skill:* Communicate with customer to establish requirements.

  Skill standard: The individual will communicate with the customer to establish requirements. Given two role plays or actual situations, the individual will identify those needs and fully satisfy the customer with 100 percent accuracy.

[1]Federal support and requirements for state adoption of academic standards come from the Goals 2000: Educate America Act passed in 1994 and the Elementary and Secondary Education Act of 1965 (ESEA). They established a national process for creating education standards that will ensure international competitiveness, reflect the best knowledge of teaching and learning, and reflect a broad-based, inclusive development process.

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The three Building Linkages initiatives identified employability skills for their industries that correlate closely with the standards widely known as SCANS skills and competencies (Secretary's Commission on Achieving Necessary Skills, 1992).

However, all of the consortia expanded upon the SCANS skills to include additional employability standards identified by their own industry and education members. For example, stakeholders in the Manufacturing Linkages Consortium identified two sets of employability standards that are relevant to effective job performance in manufacturing occupations. They derive from the NACFAM National Voluntary Skill Standards for Advanced High Performance Manufacturing and directly from SCANS.

Meeting high-level technical standards sets students apart from other potential employees and "jump-starts" their progress in postsecondary programs.

Technical standards represent what students and workers need to know and be able to do in the specific jobs within individual industry settings, such as manufacturing, health care, retail and wholesale services, or financial services. (See figure 3 for an example of the technical skills established by the Far West Project as important in financial services.)

FIGURE 3

FAR WEST STATES SKILL STANDARDS PROJECT

CORE TECHNICAL SKILLS FOR FINANCIAL SERVICE INDUSTRIES

Selected technical skill standards included in the California Banking Standards and adopted by the Far West States Skill Standards Project for Financial Services:

Maintain accurate account records:

- Input account information into an electronic information management system; use database software; and
- Keep and update current records; establish and maintain document and information storage, backup, and retrieval system.

Process items and proof transactions to ensure accuracy of operations:

- Proof items, using the correct encoding and balancing process and researching, correcting, and resolving out-of-balance situations, differences and errors in accounts, transactions, and processing;
- Understand and use electronic equipment to sort and capture data;
- Prepare proper forms and reports; and
- Understand document preparation procedures and prepare documents for further processing.

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Technical standards may be unique to one industry, or they may be necessary in more than one. However, specific technical skill requirements do not cut across all industries the way that many academic and employability skills do. The consortia identified technical standards for their industries by examining, crosswalking, and consolidating standards for their constituent occupations.

THE VALUE OF INTEGRATED STANDARDS FOR TODAY'S EDUCATION SYSTEM

Enhancing Student Achievement

Integrated standards serve students, educators, employers, and the community.

Why did three federal agencies initiate the Building Linkages project, and why did a nationwide partnership involving many education and business and labor leaders devote more than two years and considerable resources to making it successful? All of these partners share a commitment to improving the productivity of the American work force and enhancing the quality of the education system. Yet, employers and educators have often been at odds over precisely what teachers should be teaching and students should be learning to achieve these goals. Some of their differences can be attributed to a lack of agreement about the specific academic, employability, and technical skills that new workers should bring to the workplace when they leave the classroom for the office or the job site. Creating a common understanding on this issue is a major goal of the standards-based curriculum movement and was a major motivation behind the Building Linkages project.

Establishing agreement about learning goals can be valuable to educators at all levels of the education system. Participants in the Building Linkages project believed that at both secondary and postsecondary levels, widely accepted integrated standards based on academic, employability, and technical skills can be an effective tool for developing rigorous curricula. One initiative of the Building Linkages project—Health Sciences—even demonstrated how integrated standards can be used to teach students in primary and middle schools about their own health and the health care system through high-level academics.

Connecting Education and Students' Career Aspirations

Generating consensus about what teachers should teach and students should know is only the first step in improving student achievement. Another goal of efforts to implement integrated standards is to give students a better awareness of the connection between their classroom studies and the skills that are necessary for success in the workplace and in life (MPR Associates, 1996).

Standards are a foundation for integrating academic and technical learning and highlighting the connection between education and careers.

Today, many students from diverse backgrounds have little opportunity to learn about the world of work, grasp the skills and knowledge it takes to perform various jobs, and even understand the specific jobs that their parents hold (Henke et al., 1999). It is little wonder that these students sometimes fail to see the relevance of school and to engage in the hard work that leads to academic success. It is equally difficult to see how students can be motivated to pursue the challenging, technologically advanced careers that require postsecondary education if they do not understand that advanced academic and technical skills and knowledge are required for rewarding careers. Integrated academic and technical standards can be used to make these connections and, as a result, to enhance student motivation and academic progress (Visher, Emanuel, and Teitelbaum, 1999).

Contextualized Learning Approaches. One solution to the lack of connection between students' perceptions about classroom work and preparation for advanced technical-professional education and employment is introducing contextualized learning approaches. A growing body of research suggests that using work and careers as a substantive context can be effective in achieving academic learning objectives (Resnick, 1987; Nielsen-Andrew and Grubb, 1992). Integrated standards are becoming a key element in contextualized learning approaches that address academic and technical learning objectives and teach students about careers and career pathways. As the projects described in this report demonstrate, integrated standards can be central to new and challenging curricula that incorporate contextualized learning approaches.

Integrated standards can play a key role in both school- and work-based learning.

Connections Between High Schools and Postsecondary Programs. Teachers and school administrators can also benefit from new ways to connect high school curricula and postsecondary programs. In recent years, articulation agreements have gained solid support at both the secondary and postsecondary levels and have proliferated across the country, particularly through the success of Tech-Prep programs. However, linking specific programs, especially deciding whether and how each segment (secondary or postsecondary) will be responsible for specific learning objectives, is still a very time-consuming process. Using a comprehensive set of integrated standards that includes both academic and technical competencies can circumvent some of these laborious discussions and lead to greater postsecondary opportunities for students in technical fields.

Increasing Work Force Productivity

Establishing a clear understanding about what students should be taught is equally important in the other major arenas in which potential employees are prepared for jobs and careers: employment training programs and apprenticeship programs. Agreement about what employers need from new workers is key in programs for

displaced workers and in the high-stakes environment of welfare-to-work programs. Candidates for these programs do not have the time to participate in training that does not lead to immediate employment. Equally important, their future financial success will depend on being able to move out of entry-level jobs by applying the right mix of academic, employability, and technical skills.

On the other side of the equation, for employers, a pool of well-trained potential employees is an essential measure of a successful employment training program. Employer training costs have soared in recent years. Even though most of these expenditures go to skill upgrading and management training, employers frequently emphasize the high cost of training new employees who are not prepared to meet industry needs. Closer connections between employers and educators or trainers through carefully crafted curriculum standards can have a major salutary effect on the financial bottom line for human resource management.

Supporting Career Advancement

Finally, with many employees still entering the world of work at the bottom of the skill and financial ladder, standards can be an essential step toward career advancement. All students and employees can benefit from knowing what skills they need to acquire in order to enter and advance in their chosen careers. As the three segments of the Building Linkages project demonstrate, integrated standards can be an important part of a framework for career advancement that educators, counselors, students, and employees could use to chart future training needs and assess advancement opportunities.

THE CONNECTION BETWEEN INTEGRATED STANDARDS AND SCHOOL REFORM

A central component of systemic education reform is a set of standards-based policies and practices (Clune, Port, and Raizen, 1999). Consequently, states, school districts, and schools that are implementing extensive reforms through school-to-work initiatives will particularly benefit from the models and materials created by the Building Linkages project. Educators in these settings are already strengthening the connection between academics and career development and using work-related material to deliver rigorous academic curricula. Participants in the three Building Linkages initiatives designed the products to be used as tools that would help make this connection through new curriculum and assessment approaches. For example, the Health Science Collaborative gave teachers in grades K–12 detailed instructions on how to use integrated academic and health care standards for lesson planning. The performance-based assessment scenarios and the

methodology for generating additional scenarios developed by the Manufacturing Linkages Consortium were also designed to help teachers of both academic and technical courses use alternative assessment approaches in new, creative learning situations.

Federal support for standards-related projects has helped solidify industry/education/labor partnerships.

MULTILEVEL PARTNERSHIPS: A VEHICLE FOR NATIONAL IMPLEMENTATION OF INTEGRATED STANDARDS

At the federal level, industry-endorsed standards projects began in earnest in 1992 with 22 skill standards projects that were awarded under a partnership between the Departments of Education and Labor. These standards projects—and the more recent National Skill Standards Board (NSSB) partnerships—provided an organizational model for the current national partnerships involving education, industry, and labor created by the three Building Linkages efforts. These partnerships enhanced the credibility of the consortia's work.

- Their large membership—spanning the important stakeholders in each industry—created widespread support for the enterprise. Many different representatives from labor, industry, professional and trade associations, and education had a voice in selecting standards and creating curriculum and career development tools.

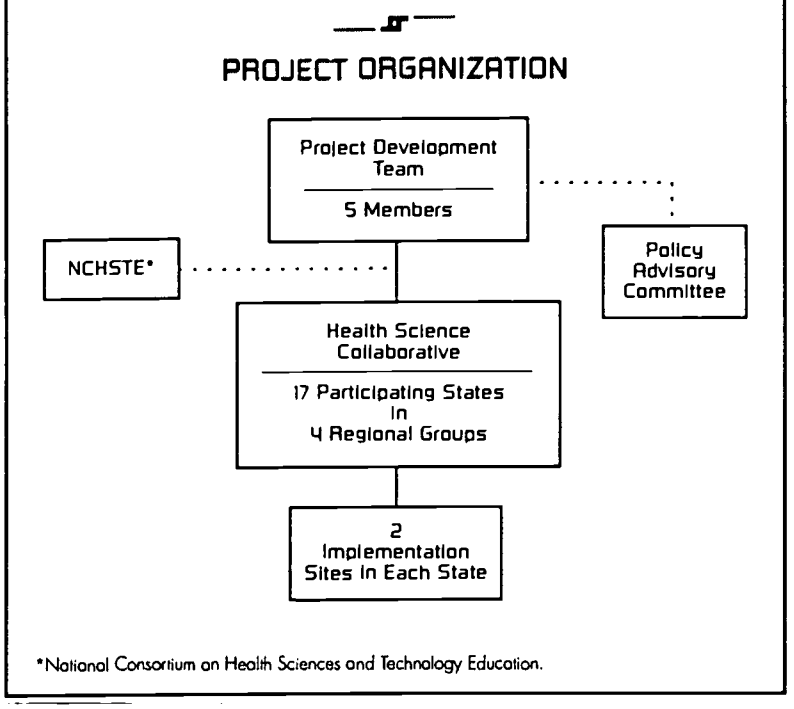
- The national scope of two of the consortia (manufacturing and health sciences) ensured that all regional concerns were addressed.

- The partners drew on their organizational affiliations to create an ever widening circle of participants. Growing support led to continuing work on standards at the national and local levels.

The next three chapters of this report present detailed descriptions of the efforts and successes of the three Building Linkages consortia during their first two years. The descriptions highlight activities to develop integrated standards, products resulting from consortia efforts, and actual implementation at local pilot sites. The final chapter of the report raises issues about the challenges that still face the consortia as they move into the next phase of their work.

HEALTH SCIENCE COLLABORATIVE

FIGURE 4
HEALTH SCIENCE COLLABORATIVE



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PROJECT OVERVIEW

Members of the National Consortium on Health Science and Technology Education (NCHSTE) Building Linkages Collaborative (the Health Science Collaborative) have been working together on standards projects for nearly a decade. Their mission has been to enhance the quality of health care delivery and health science education through collaboration among education agencies, health care providers, policymakers, and organized labor. Infusing standards and standards-based assessment into all parts of the education and training system has been a major avenue for achieving these goals.

For many of the collaborative's members, joining the federally supported Building Linkages project seemed to evolve from their work on earlier standards projects that were started by NCHSTE and WestEd. Beginning in 1992, these two organizations developed integrated standards for health care careers under a grant from the U.S. Department of Education. Seventeen of the states that were

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involved in this initial standards project then became participants in the Health Science Collaborative.[2]

A five-member Project Development Team—consisting of state education leaders and industry representatives—oversaw the project. They were responsible for recommending policies and major activities and for managing project operations. The team received guidance from a large Policy Advisory Committee, consisting of representatives from each participating state and various education and industry organizations and agencies, including national education associations and labor organizations. Through the Policy Advisory Committee, NCHSTE played a major role in the project.

Much of the collaborative's development work was conducted through four regional subunits and at pilot sites. These subunits shared responsibility for creating K–12 instructional activities. In addition, each regional unit developed one of the project's four components: education partnerships, industry partnerships, curriculum integration, and performance assessment. Each unit was also responsible for activities related to one of the four health career clusters that constitute the scope of the health care field. (The scope and clusters are described in detail below.) Pilot site activities were conducted at two locations in each of the 17 participating states.

Through its close affiliation with NCHSTE and by actively involving representatives from many other health care organizations in project meetings and document reviews, the Health Science Collaborative generated input from diverse stakeholders in health care education. For example, representatives from national health maintenance organizations (HMOs), local medical centers, and state and local school-to-work offices frequently participated in the project.

FROM STANDARDS TO CLASSROOM APPLICATIONS

The success of the Health Science Collaborative is an example of the synergy that can result from combining federal, state, and local financial and in-kind support to meet national and state education goals. Over the past eight years, the collaborative's members leveraged funding from two major federal initiatives (the Skill Standards Projects, funded in 1992 by the U.S. Departments of Education and Labor, and Building Linkages), resources from many state education departments, and in-kind support from member states and health

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[2]This group's first effort for the Department of Education was known as the *National Health Care Skill Standards Project*. For the Building Linkages initiative, they used the name *NCHSTE Building Linkages Collaborative*. This report uses the combined term *Health Science Collaborative* when referring to both the original skill standards project and work done under Building Linkages.

care providers. They used these resources to progress from the initial stages of identifying integrated standards for health sciences to producing curriculum products that were pilot-tested in 17 states and are being used in many other locations. These curriculum materials were specifically designed to integrate academic and technical standards into multistate career pathway systems and to help state and local educators advance their school-to-work programs.

Members of the collaborative proceeded through a four-step development process. They completed the first two steps under the original Skill Standards grant to NCHSTE and WestEd, and the third and fourth steps with federal funding from the Building Linkages project. This development process included

- Defining the scope of careers in which health science standards apply to education, training, and job performance and defining clusters of occupations within the scope that share their own sets of job responsibilities and skills;
- Developing core standards that apply to all occupations in the health sciences and cluster standards for individual practice areas;
- Linking core and cluster standards to a career progression model that offers guidance to students, teachers, and counselors about education requirements and career opportunities; the model includes classroom and work-based learning activities for students that combine academic and technical standards and can be linked to performance-based assessments and skill certification; and
- Pilot-testing these activities in classrooms from kindergarten to grade 12 at sites in 17 states.

Define the Scope of Health Care Occupations

The first challenge facing members of the collaborative was to identify the occupations within the health care industry that share a set of job performance requirements based on similar skills and knowledge. Members acknowledged that there are many definitions of what constitutes today's health care industry, but only some of these occupations share similar skill and knowledge requirements.

The challenge in defining a cluster was to identify occupations that share similar knowledge and skill requirements.

Broad-ranging discussions with many stakeholders led to a working definition that limited the collaborative's scope to occupations in which employees furnish health care services. Their definition included all relevant professional, paraprofessional, and support personnel who provide health care services in health care delivery settings. It excluded two categories of occupations that are very important to the health care system, but do not meet the requirements of the

definition. First, it excluded many jobs that are performed largely outside health care facilities, such as those that involve planning and designing health care facilities (e.g., hospitals and other facilities), manufacturing (e.g., medical instruments and supplies or drugs), and providing related services (e.g., insurance carriers and personal service attendants). Second, it excluded many jobs that are performed within health care facilities, but in which most of the job responsibilities are not unique to the health care industry. These include health facilities groundskeepers, mailroom clerks in hospitals, and accounting clerks in hospital finance and accounting departments.

Even within these boundaries, the collaborative's definition of health care occupations still included a huge array of highly diverse jobs such as

- Environmental services personnel who provide specialized sanitation and maintenance services within health care facilities;
- Administrative support staff responsible for documenting and managing medical records information;
- Technical personnel with diagnostic or therapeutic responsibilities in laboratory or direct patient care settings; and
- Members of nursing and medical staffs who have both diagnostic and therapeutic care responsibilities.

Develop Core and Cluster Standards

The second step in the collaborative's development process was to specify the related academic, technical, and employability skills required of employees in health care. Dozens of educators and representatives from industry, labor organizations, and professional associations assumed this task. Under the direction of NCHSTE and WestEd, these individuals formed committees responsible for two activities: developing core standards that apply to all occupations in the health sciences and defining cluster standards that apply to each of the field's clusters. As the foundation for this task and with the help of project staff, committees gathered, reviewed, and evaluated existing sets of academic and technical standards used by state education departments, professional associations, and licensing agencies.

The starting point for this evaluation of existing standards was a database developed by WestEd from task descriptions of 60 health care occupations. The competencies established by professional organizations were compared to these standards to ensure that they were compatible. Then staff identified skills common to occupations

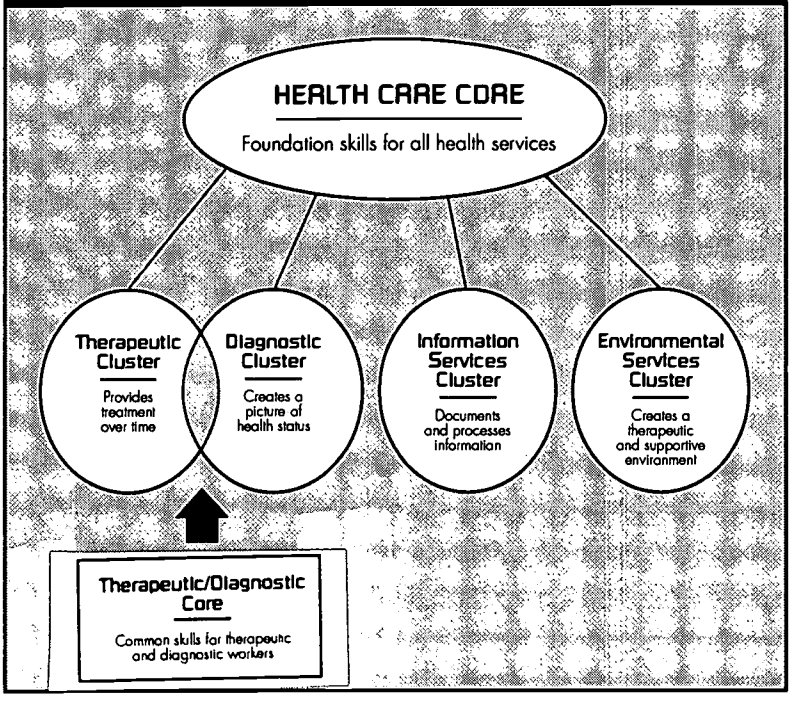
within and across occupational clusters and organized this information into task summaries. Committees of national experts used these summaries and their own experience to produce the National Health Care Skill Standards.

At the end of the evaluation, staff drafted new core and cluster standards for the project and presented them to the NCHSTE Policy Advisory Committee. All committee members completed a standards review booklet that instructed respondents to indicate whether each proposed standard was

- Essential for the success of all health care workers;
- Appropriate for all health care workers (core standards); or
- Appropriate for all health care workers in a particular occupational cluster (cluster standards).

Figure 5 shows the relationship between core and cluster standards in the model that resulted from this process.

FIGURE 5
HEALTH CARE CORE AND OCCUPATIONAL CLUSTERS



With the many sets of standards that already exist in the health care industry, why did the members of the collaborative feel compelled to create new ones? There were two reasons. First, existing

The collaborative identified four occupational clusters in the health sciences:

- Therapeutic
- Diagnostic
- Information Services
- Environmental Services

standards in health care typically apply to specific occupations, such as registered nurses or physical therapy assistants. These standards are part of an extensive system of state and national certifications and licensure that demands testing and licensing for nearly every occupation in health care. NCHSTE members felt a strong need for standards that cross all health science occupations and for broad occupational clusters, especially in emerging entry-level positions that are currently unlicensed. The core standards would be especially valuable to students starting out in health science programs and to adults beginning their health care careers. The cluster standards would be particularly important in today's health care environment, where employers are seeking multiskilled workers and employees are seeking career mobility opportunities.

New standards that cross traditional occupational boundaries are particularly important for today's emerging entry-level jobs.

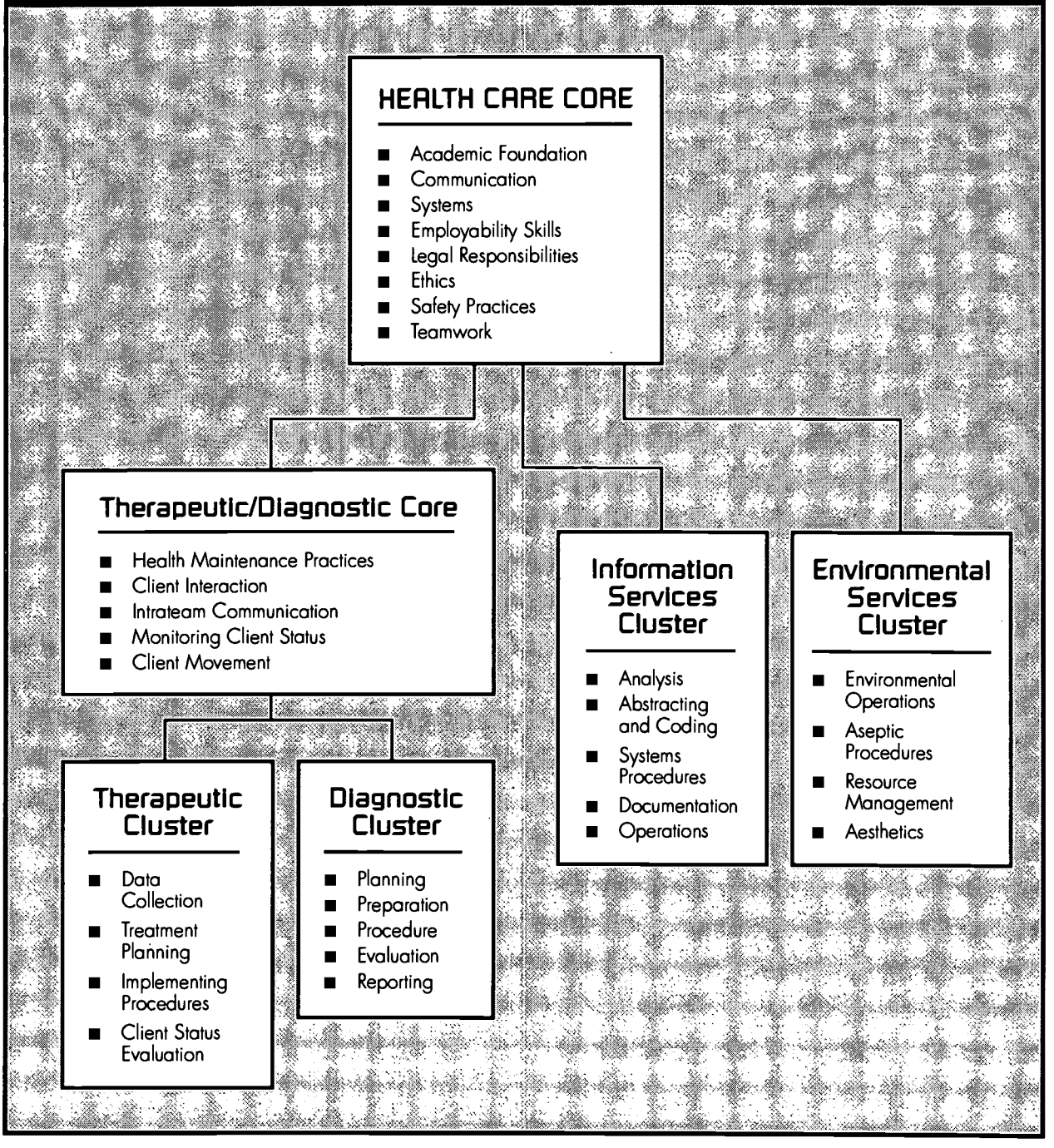
Second, participants in the National Health Care Skill Standards Project were addressing both present and future needs when they drafted the new standards. Existing standards did not reflect the skills that employees would likely need in the future. As a result, members of the collaborative used a unique set of guidelines when evaluating existing standards and making recommendations about new ones. Their guidelines instructed developers of standards to

- Ensure that the new standards would be flexible enough to apply to emerging jobs in health care services, particularly jobs that combine skill sets from more than one existing occupational classification;
- Not unduly emphasize the experimental job configurations that were emerging at individual organizations within the health care industry;
- Guarantee that the standards would be useful to students, individuals in the work force who are changing jobs or careers, educators, trainers, licensing and certification bodies, and supervisors and managers; and
- Ensure that the standards are written so that they can be communicated to and understood by all significant stakeholders.

Figure 6 shows the full set of academic, employability, and technical topics that emerged for the health care core; four occupational clusters (therapeutic, diagnostic, information services, and environmental services); and a final set of standards that combines therapeutic and diagnostic skills. These standards closely fit the definition of the industry skill standards adopted by the NSSB, which includes academic, employability, and occupational (technical) knowledge and skills.

FIGURE 6

NATIONAL HEALTH CARE SKILL STANDARDS



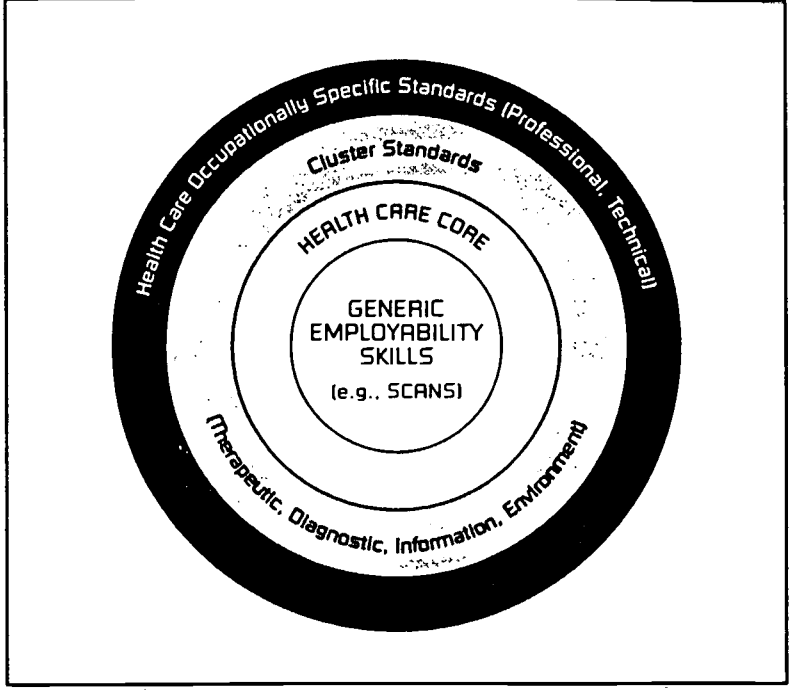
Academic and Technical Standards for the Health Sciences incorporate seven sets of National Education Standards:

- Health Care Skill Standards
- Mathematics Standards
- Science Standards
- Language Arts Standards
- History–Social Science Standards
- Health Education Standards
- Physical Education Standards

Figure 7 presents a different view of the standards, one that reflects a career development perspective. It shows how learning in the health care field begins when students acquire generic employability skills that are relevant in every workplace. At the next level, the health care core, students develop academic, technical, and employability skills that every health care worker must have. Finally, they progress to education and training for clusters and specific occupations, where standards relate to the unique responsibilities in smaller groups of occupations or in individual occupations. At this final, occupation-specific level, performance standards are the basis for the large number of occupational licensing examinations at the state and national levels.

FIGURE 7

NATIONAL HEALTH CARE SKILL STANDARDS in Relation to Generic Employability and Occupationally Specific Standards



Link Standards to an Educational Progression and Learning Activities

Funding from the Building Linkages project was critical as the Health Science Collaborative moved to the next steps in implementing integrated standards: (1) outlining an educational progression for students and adult learners who are planning future employment in the health services arena; (2) creating integrated curricular materials that use the standards to support this educational progres-

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sion as well as aligned assessment approaches; and (3) developing a skill certificate model to support the educational progression. These steps led to the collaborative's major product: The National Health Science Career Path Model. The Model describes the educational progression for health science careers and includes standards-based learning activities for students at all levels through secondary programs. Figure 8 depicts the educational progression in the Health Science Career Path Model.

Creating the model involved intensive effort by many members of the collaborative. Working in small groups, they used the standards to design integrated school- and work-based learning activities for teachers to include in their lesson plans. The educators, practitioners, and health care administrators who participated in writing the activities were instructed to develop them at one of four educational levels: early childhood, elementary, middle, and secondary.

Each activity in the Career Path Model is constructed to support one of the National Health Care Skill Standards. Most of them also help students develop proficiency in one or more of the National Education Standards. Every activity has a primary learning focus (e.g., health, health science, social sciences, English language arts, mathematics) and also can be integrated with other subjects. For example, an activity for high school students requires working in teams to research the history of medicine and explore folklore, herbs, and other alternative medical treatments. Then the students report whether various treatments are believed to be safe or harmful and effective or ineffective. The activity relates to two of the National Health Care Skill Standards—Ethics and Teamwork—and to National Education Standards in the English Language Arts and History–Social Science. Taken together, the 170 activities in the Career Path Model cover every National Health Care Skill Standard as well as many of the National Education Standards.

What is the development process for students in the health sciences?

Figures 9 and 10 present two examples of standards and activities included in the Career Path Model for secondary-level students. The first one is an integrated health, mathematics, and physics activity, and the second integrates health, biology, and English language arts.

In addition to creating a unique curriculum development tool, designing the Career Path Model was also a vehicle for the collaborative to connect its vision of major national education goals to goals at the state level. By the start of the collaborative's work, the Utah Department of Education had already committed to using standards for health science and health technology education. They joined the Health Science Collaborative's efforts and planned to use the health science standards, Career Path Model, and its new curriculum materials as part of an existing system of certificates that students earn in Advanced Technology Education programs. At the time, certifi-

FIGURE 8

HEALTH SCIENCE CAREER PATH MODEL

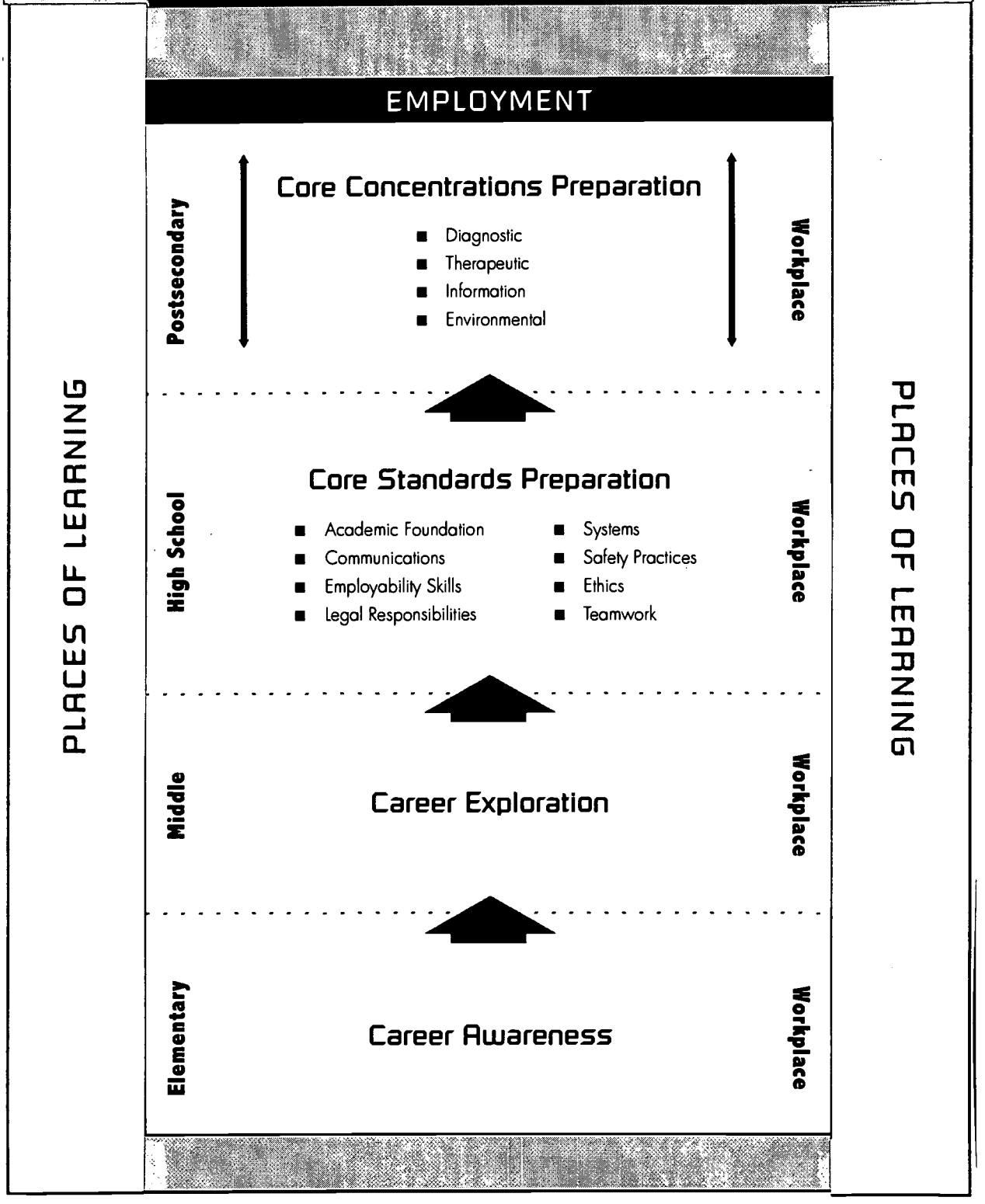

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FIGURE 9
SPLINTS, TRACTION, AND LEVERS

ACTIVITY TITLE: SPLINTS, TRACTION, AND LEVERS

PURPOSE: This activity will

- Generate an awareness of health care careers.
- Provide learners with introductory experiences that relate to all aspects of the health care industry and may assist with the selection of a health care career plan.

PRIMARY AREA OF INTEGRATION: Mathematics (Physics)

SECONDARY AREA OF INTEGRATION: Science

ACTIVITY: Learners demonstrate their knowledge of the components of levers by constructing models and applying knowledge to the world they live in and their body.

Getting Ready: Review or teach concepts of levers and leverage including the components, purpose, and process. Invite a physical therapist as a guest speaker. Have the speaker apply the function of levers to the body and how it accomplishes movement. Have him or her speak about this career. Invite a paramedic or member of a search-and-rescue team to discuss how these concepts are used.

- In teams of two to three, learners build (with tinker toys, erector set, Lego™ toys, etc.) a traction set to splint a broken knee at a 45-degree angle.
- Teams build first-, second-, and third-class levers, sketch their example, and identify the components.
- Teams provide an example of a traction system to apply traction to a broken bone, sketch it, identify the components, and show the pressure (leverage) points.

TEACHER ROLE:

- Provide resources and materials for the activity.
- Provide background on levers.
- Invite a guest speaker.

EDUCATION PARTNER ROLE:

- A health science teacher can provide anatomical models.
- A mathematics teacher can assist and provide resources.

INDUSTRY PARTNER ROLE:

- A physical therapist, paramedic, or member of a rescue team could connect the activity to the career and provide anatomical models or charts.

RECOMMENDED RESOURCES:

- Building materials
- Guest speaker
- Information about levers

SUGGESTED ASSESSMENT:

- Teams accurately build first-, second-, and third-class levers as traction devices.
- Refer to Appendix II.

  A. Performance-Based Assessment
  B. Experiments/Exhibitions/Performances
  C. Rubrics

CAREER PATH ALIGNMENT:

- National Health Science Career Path Model: Goal-2, Strategy-1 & 2
- National Education Standards: Mathematics (Physics) (S-6)
- National Health Care Skills Standards: Academic Foundation (.01), Teamwork (.08)

National Health Science Career Path Model—*Second Edition, May 1999*—Secondary Level (Introduction), SCIENCE.

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FIGURE 10
IT'S ALL IN THE GENES

ACTIVITY TITLE:	IT'S ALL IN THE GENES
PURPOSE:	This activity will ■ Provide learners with an increased awareness of their own health. ■ Generate an awareness of health care careers.
PRIMARY AREA OF INTEGRATION:	Science (Biology)
SECONDARY AREA OF INTEGRATION:	Health, English Language Arts
ACTIVITY:	Learners collect, analyze, and interpret data on genetic traits in the human population. Getting Ready: Review or teach the following concepts: Mendelian genetics, pedigree chart construction, dominant and recessive traits. ■ Learners, working in teams of two or three, choose a human genetic disorder to investigate; i.e., Down's syndrome, Tay-Sachs disease, or hemophilia. ■ Teams research the information on the disorder selected. ■ Teams prepare a three-generation pedigree chart for the disorder. ■ Teams present the information to the entire class though oral presentation.
TEACHER ROLE:	■ Facilitate learners on locating information. ■ Provide questioning to stimulate critical thinking.
EDUCATION PARTNER ROLE:	■ A health science teacher can provide resource materials.
INDUSTRY PARTNER ROLE:	■ The March of Dimes could provide resources on genetic birth disorders.
RECOMMENDED RESOURCES:	■ Woodrow Wilson Collection ■ List of genetic disorders ■ Access to library and Internet ■ http://outcast.gene.com/ae/AE/AEPC/WWC/1994/
SUGGESTED ASSESSMENT:	■ Teams of learners research genetic disorders and relate them to generations of a family tree. ■ Refer to Appendix II. A. Performance-Based Assessment B. Oral and Written Expression C. Pictograms and Graphic Organizers D. Rubrics
CAREER PATH ALIGNMENT:	■ National Health Science Career Path Model: Goal-1, Strategy-1 & 2 ■ National Education Standards: Science (Biology) (C) ■ National Health Care Skills Standards: Academic Foundation (.01), Communications (.02)

National Health Science Career Path Model—*Second Edition, May 1999*—Secondary Level (Introduction), SCIENCE.

cates were offered in programs for home health aides, information and emergency medical services, medical office administrative assistants, advanced health science, and medical anatomy and physiology. In the Utah system, these certificates also played a key role in students' early career advancement. Articulated programs at state postsecondary institutions recognized certificates based on the National Health Care Skill Standards.

The Career Path Model, with its standards and related activities, has become an important resource for educators and counselors who are working with students on career development. It offers learners career information and school-to-work opportunities in conjunction with related academic preparation.

The activities focus on four career development themes: healthy lifestyles, career relationships, technology, and national standards. For example, at the secondary level, the health science standards and activities help students

- Understand the importance of implementing a healthy lifestyle as they demonstrate healthy living concepts at school, home, and work (healthy lifestyles);
- Understand how to implement the career planning process to create, refine, and pursue their career goals (career relationships);
- Become proficient in accessing information and health care procedures through electronic communication (technology); and
- Complete a coherent sequence of rigorous courses aligned with their career choice (national academic and health science standards).

Pilot-Test the Career Path Model

Field coaches at each pilot site were key to successful implementation.

Pilot-testing was the last step in the collaborative's work on the Career Path Model. These tests were conducted at two school locations in each of the 17 member states. In some cases, more than one school in a district conducted a pilot test in order to guarantee that activities were used and evaluated at the appropriate educational level. To ensure that each of the 170 activities was tested in a variety of educational settings—such as large and small schools and rural and urban locations—every activity was assigned to three different test sites. Figure 11 describes how activities were tested in a Utah school district.

One of the most important early activities designed to assure valid pilot-testing was creating a system to support pilot-site activities. The system included (1) local staff who were responsible for activi-

ties in individual schools (field coaches); (2) state-level personnel (field-test state leaders) who had oversight responsibility for the two districts in their states; and (3) centralized professional development for all of these individuals, which included practically oriented training for 50 school-level field coaches. These training sessions covered all aspects of the collaborative's history and goals and provided thorough instruction on how to test each activity and evaluate its success. In a multilevel evaluation process, teachers, field coaches, and state leads were asked to suggest how instructions and materials could be improved, and this information was used to revise activities where necessary.

Pilot sites were also connected to the NCHSTE Web page via a listserve. Coaches at individual sites entered status reports and shared ideas through the listserve. An unexpected outcome of this process was that the technology skills of some field coaches improved.

FIGURE 11
MURRAY COUNTY SCHOOL DISTRICT
Salt Lake City, Utah

The school district in Murray County, Utah, was one of the lead pilot sites for testing activities included in the National Health Sciences Career Path Model. Three schools participated—at the elementary, middle, and high school levels—giving district teachers an opportunity to implement and assess integrated, standards-based health science activities with students at all age levels.

Murray is an ideal location for any pilot effort involving health science standards: the school has solid relationships with local health care institutions; district leaders strongly support the school-to-career (STC) approach; and the high school is a funded STC site in a state that is committed to using standards as a key element in STC implementation.

The pilot effort at Murray had several ambitious goals. They were to

- Enhance links between health sciences and academic disciplines in the classroom;
- Introduce students to health science careers;
- Connect state and national academic and technical education standards;
- Enhance partnerships with industry; and
- Make learning more relevant for students.

At all three education levels, teachers worked directly with industry representatives before and during testing activities that occurred in the classroom.

At Murray High School, an athletic trainer from The Orthopedic Specialty Hospital worked with the teacher on an activity that integrated science standards—anatomy—with the health science core standard that focuses on maintaining and promoting optimum health and treating illness. The activity taught students about the mechanics of the skeletal structure and about preventative care. Participation reinforced students' understanding of basic anatomy.

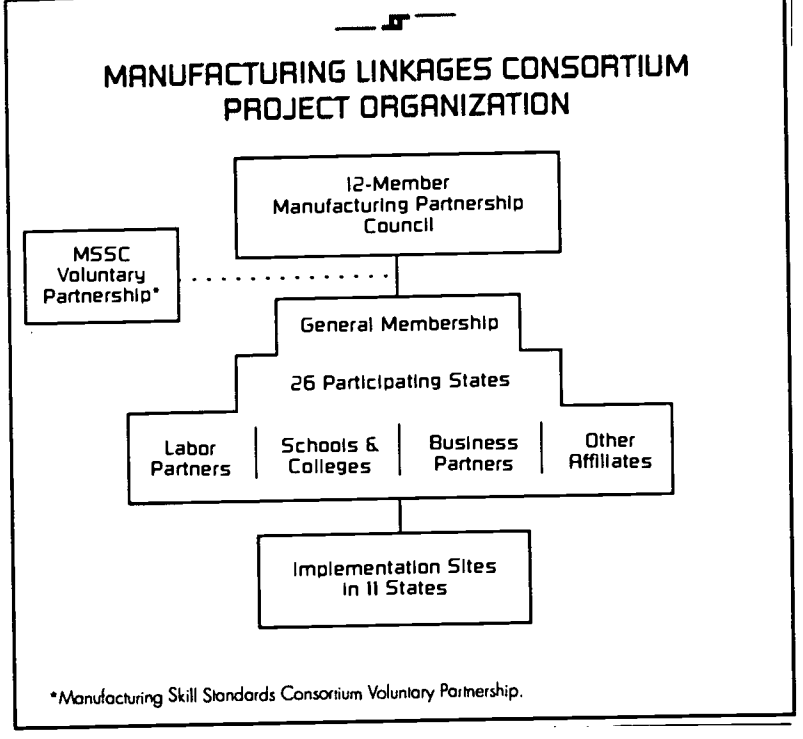
The activity tested at Hillcrest Junior High School was designed to teach students about good nutrition and the science that underlies nutrition and health. A registered dietitian joined the teacher in conducting this class, in which they helped students analyze and compare the nutritional content of "junk food" versus a nutritious fruit smoothie.

At Liberty Elementary School, the teacher was joined by a registered nurse in an activity that combined health science, mathematics, and science standards. The nurse demonstrated how she uses mathematics and knowledge of anatomy when she performs her job, and students performed hands-on measurement activities.

All three of these activities integrate academic and health science standards. They also contribute to the district's broader career development program by showing students the work of health care professionals.

THE MANUFACTURING LINKAGES CONSORTIUM

FIGURE 12
MANUFACTURING



PROJECT OVERVIEW

The Manufacturing Linkages Consortium built its partnership on a strong foundation. Many of the key participants shared a history of effective working relationships and goals before starting this new collaboration. The consortium began in 1996 with 13 states that were members of V-TECS, an association of state vocational agencies and business groups. By participating in that organization, these states were already developing curriculum models and tools to help education and industry prepare a more productive work force.

By 1998, the Manufacturing Linkages Consortium had grown to 26 active state members and a long list of industry, labor, and education contributors. Twelve members were drawn from state agencies, private organizations, and associations to serve on the Manufacturing Partnership Council, which was responsible for recommending consortium policy and initiatives to the general membership and overseeing general operations.

MEMBER STATES

Alabama
Arizona
California
Hawaii
Idaho
Illinois
Indiana
Iowa
Kentucky
Maine
Maryland
Michigan
Nebraska
New Jersey
New York
North Carolina
Ohio
Oklahoma
Oregon
Pennsylvania
South Carolina
South Dakota
Vermont
Virginia
West Virginia
Wisconsin

By generating widespread support from all sectors of the manufacturing industry and from labor and education groups and institutions, the consortium made significant progress toward fully implementing manufacturing standards. In particular, the organizational strengths and expertise of V-TECS in promoting technical education helped to enhance the visibility of the manufacturing standards effort and broaden the impact of the consortium's work. The consortium also collaborated closely with the Manufacturing Skill Standards Consortium (MSSC) Voluntary Partnership, established in 1998 by the National Skill Standards Board. Through their work together, these two organizations supported each other's efforts to improve education and enhance work force development.

A STRATEGY FOR USING MANUFACTURING STANDARDS

During its first two years, the Manufacturing Linkages Consortium designed and implemented a multistage process to make manufacturing standards integral to education and work force development. The process relied heavily on standards that several industry associations had already identified for various manufacturing occupations. The process included

- Defining an occupational scope or career cluster area in which manufacturing standards apply to education, training, and job performance;
- Identifying the key activities (core standards) that are common to workers in all occupations within this occupational scope;
- Linking the core standards to higher level skills and certification for occupational concentrations and specialties;
- Creating performance-based student assessments to evaluate students' academic, technical, and employability skills;
- Pilot-testing standards and assessments in local education programs; and
- Establishing a vehicle for documenting and communicating learner achievement and proficiency in key activities.

Throughout this process, the members took advantage of advanced communications technology, such as a regularly updated Web site that included e-mail, links to other sites, reports and archives, and a chat room. This communications approach was very effective in actively involving the many far-flung members of the consortium, and it serves as a model for other industry clusters that plan to implement skill standards in the future.

Define the Scope of Manufacturing Occupations

For members of the Manufacturing Linkages Consortium, an early step in the project was to identify the cluster of related occupations in which manufacturing skill standards were relevant for job performance. Consortium members asked an essential question: which occupations within the huge manufacturing sector of the economy share a broad set of tasks and related skills and could benefit from the same standards-based curriculum? This occupational-sorting process was crucial to the success of later consortium efforts that depended on knowing which occupations share a core set of performance standards.

Through input from all of the stakeholders, consortium members determined that manufacturing jobs sharing a set of tasks and skills were found in a broad, diverse group of companies. These jobs were found in all businesses that supply commodities to consumers, ranging from food and chemical products to discrete parts and assembled products. Certain sectors of the printing industry were in the cluster as well: these were press and post-press operations, but not publishing.

However, among employees in these commodities companies, not all occupations fell within the scope of manufacturing. There were two separate, but related, systems within manufacturing businesses—manufacturing operations and business operations—and only the former were in the manufacturing scope. Occupations within business operations (e.g., research and development, design/product engineering, and business and administrative/information services) were not included.

The Manufacturing Framework. Once the consortium identified the occupational scope, they considered the connections among standards, existing certification systems, and states' career education programs. The resulting manufacturing framework was formalized to include four elements:

- A definition of the manufacturing career cluster (occupational scope) establishing which occupational specialties should be included and which should not;
- Two occupational subclusters that constitute the larger manufacturing career cluster (production support and production processes discrete parts/assembly), and the specific occupational specialties that are in each subcluster;
- A Career Pathways and Certification Model that identified potential new skill certificates growing out of the consortium's work and links to existing industry certifications; and

The Manufacturing Framework includes

- An occupational scope (career cluster)
- Two occupational subclusters
- A Career Pathways and Certification Model
- A Career Preparation and Development Model

- A Career Preparation and Development Model that included applications of the consortium's work to school-to-work transition efforts.

By defining this manufacturing framework, consortium members were able to identify a substantial set of occupational specialties that shared a core set of activities and required skills. These are shown in Table 1.

Today's manufacturing employees combine production and production support responsibilities.

TABLE 1
OCCUPATIONAL SPECIALTIES IN MANUFACTURING

OCCUPATIONAL SPECIALTY		EXISTING CERTIFICATIONS[3]
1. Production Support		
■ 1.1	Production Planning and Control	APICS
■ 1.2	Quality Assurance	ASQC
■ 1.3	Industrial Maintenance	None
■ 1.4	Manufacturing Engineering	SME
2. Production Processes Discrete Parts/Assembly		
■ 2.1	Metalworking—machining, forming, machine building, tool/die	NIMS
■ 2.2	Plastic Molding—injection molding, blow molding, extrusion, and other molding processes	SPI
■ 2.3	Welding	AWS
■ 2.4	Electronics—IC processing, electronic assembly/packaging	AEA/EIA
■ 2.5	Textile and Apparel—textile cutting, sewing, weaving	None
■ 2.6	Woodworking	None
■ 2.7	Other Component Parts/ Assembly Processes	None
■ 2.8	Printing	NCSSGS
■ 2.9	Food Processing	None
■ 2.10	Biotechnology Processes—pharmaceutical and other biotechnology processes	None
■ 2.11	Other Chemical Processes (e.g., chemical plant and system operators, chemical equipment operators, etc.)	ACS
■ 2.12	Other Process Industries (e.g., stone, glass, etc.)	None

[3]Existing certifications that were ultimately incorporated into the Manufacturing Skill Standards Certification Model include those from the National Institute for Metalworking Skills (NIMS), the Society of the Plastics Industry (SPI), the American Welding Society (AWS), the American Electronics Association (AEA), the Electronics Industry Association (EIA), the National Council for Skill Standards in Graphic Communications (NCSSGC), the American Chemical Society (ACS), the American Production and Inventory Control Society (APICS), the American Society for Quality Control (ASQC), and the Society of Manufacturing Engineers (SME).

Identify Key Activities and Develop Core Standards

Establishing the core standards for all jobs in the occupational scope became the consortium's next task. These standards would describe what all manufacturing workers need to know and be able to do.

As in the health care field, the manufacturing sector also has many professional associations with a long history of certifying workers who have specific and often highly technical skills. Consortium members were able to build successfully on the strengths and content of these existing certification systems by incorporating them into a more general career preparation and certification process for the manufacturing industry.

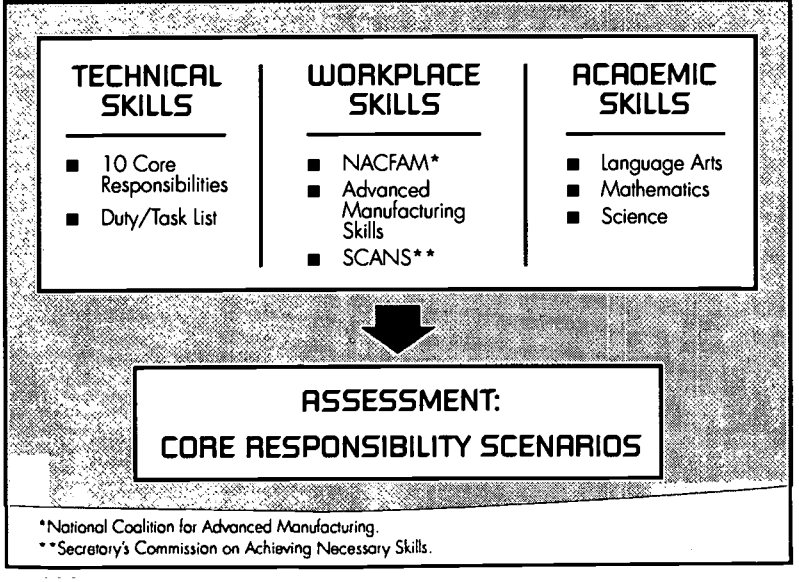
The manufacturing core included technical, workplace, and academic skills.

The Manufacturing Core. One important product arising from the work of the Manufacturing Linkages Consortium was three sets of standards related to manufacturing employment. Known as the manufacturing core, these were the broad skills and knowledge that employees needed in order to work successfully in manufacturing production and production occupations. (See figure 13.) These broad standards spanned the categories required by the National Skill Standards Board (NSSB) for national voluntary standards:

- Occupational Knowledge and Skills
- Cross-Functional Work Activities
- Academic and Employability Skills

FIGURE 13

MANUFACTURING CORE



*National Coalition for Advanced Manufacturing.
**Secretary's Commission on Achieving Necessary Skills.

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The manufacturing core included a set of technical, workplace, and academic skills common to all areas of manufacturing within the occupational scope. The **technical skills** included in the core, along with workplace and academic skills, were established by members of the consortium who represented business and industry. These skills were necessary for 10 key work responsibilities in manufacturing occupations that were essential for manufacturing workers to meet the needs of customers.

The consortium identified 10 key responsibilities of manufacturing employees that require students and workers to master academic, workplace, and technical skills:

- Establishing customer needs;
- Designing for manufacturing;
- Designing production systems;
- Designing support systems;
- Developing prototypes;
- Performing production planning;
- Maintaining and optimizing equipment and machines;
- Managing quality systems;
- Improving manufacturing processes; and
- Providing for health, safety, and environmental considerations.

The Manufacturing Linkages Consortium relied on previous work conducted by industry associations when selecting **workplace skills** that were crucial for workers to perform successfully in manufacturing occupations. For example, they included standards identified by NACFAM for Advanced High Performance Manufacturing, such as communication and teamwork, workplace safety and health, problem solving, and learning skills. They also included the key workplace skills identified by SCANS, such as acquiring and using information, working with a variety of technologies, and displaying responsibility, self-esteem, sociability, self-management, and integrity and honesty.

Academic standards in the manufacturing core were designed for contextual learning applications and integrated curricula.

Academic skills, or standards, included in the manufacturing core reflect three major content areas: language arts, mathematics, and science. The consortium adapted them from academic content statements developed by the Mid-continent Regional Educational Laboratory (McREL), another of the regional education laboratories sponsored by the U.S. Department of Education. These statements were then placed in a matrix with the Snyder/V-TECS Academic Skill Taxonomy and state-level academic standards. This process allowed the consortium to identify the academic skills and proficiencies required of beginning manufacturing workers and to connect them to states' academic standards for students.

The adapted academic standards that the consortium developed were designed explicitly to support applied learning approaches. Figure 14 provides an example of these specially tailored academic content standards for language arts. It shows how the manufacturing core frames each academic standard within the context of specific manufacturing applications.

FIGURE 14
LANGUAGE ARTS
STANDARD #2

- *Demonstrates competence in using different information sources, including informational texts or those of a technical nature, to accomplish specific tasks.*

  LA# 136: Comprehends written information: charts/tables/graphs

  A manufacturing employee interprets charts/ tables/graphs to facilitate production control, process design/improvement, preventative maintenance, quality control, and problem solving.

Link Core Standards to Skills and Certification for Concentrations and Specialties

For students and teachers, one of the key extensions of the manufacturing core is the consortium's Model for Career Preparation and Certification. It shows the progression from a common foundation of skills in manufacturing operations (the manufacturing core) to the more advanced competencies needed in four occupational concentrations (production, production planning and control, manufacturing engineering, and industrial maintenance) and, ultimately, to the skills needed for many specialties. The model developed by the consortium, as shown in figure 15, demonstrates the linkages among core, concentration, and specialty standards and certifications in manufacturing.

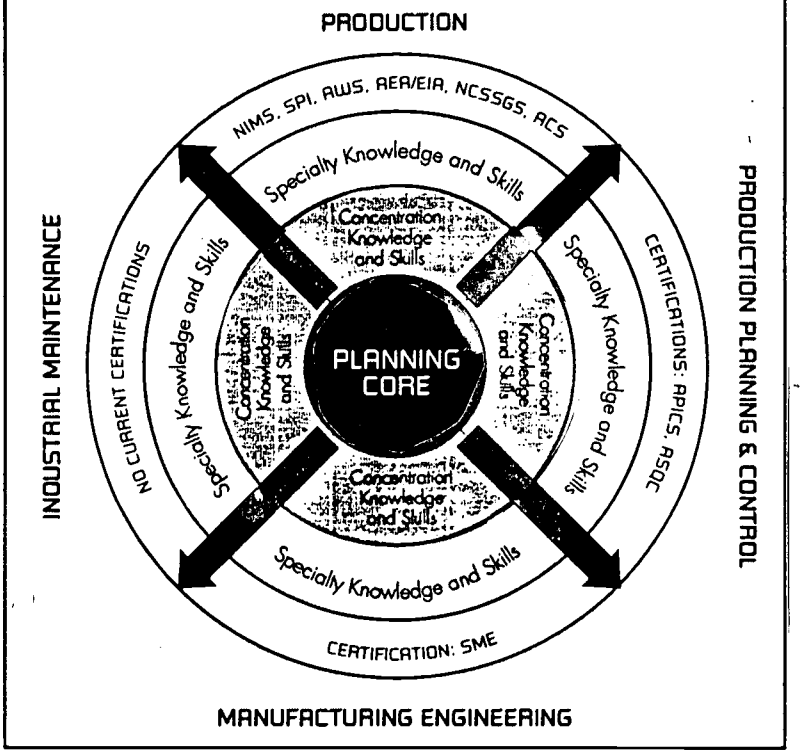
How does the career model work to connect standards and careers?

- According to the model, students in secondary and postsecondary institutions who are interested in manufacturing careers begin by meeting the standards in the manufacturing core. Career development projects linked to the core standards introduce them to all aspects of manufacturing and lead up to certification in Basic Manufacturing Operations. Achieving proficiency in the core standards prepares students for entry-level positions across the entire manufacturing scope.

How can students use a progression of certificates for career advancement?

FIGURE 15

MANUFACTURING LINKAGES CONSORTIUM CAREER PREPARATION AND CERTIFICATION MODEL



- New certifications—still to be developed by the manufacturing consortium—will recognize proficiency at the next (cluster) level. Cluster-level standards include technical, workplace, and academic skills that are common within, but not across, each of the four occupational concentrations. Students will prepare for these new certifications by selecting a career specialty area and participating in capstone projects, internships, and apprenticeships.

- In the final step, students progress up the career ladder by obtaining additional education and training and achieving industry-recognized certifications in specialty occupations. Existing industry certifications (e.g., NIMS, SPI, AWS, AER/EIA, NCSSGS, and ACS) provide national recognition for proficiency in these occupational specialties. A wide range of education and training providers, including high schools, skill centers, community colleges, universities, company training programs, and apprenticeship programs, will give students opportunities to earn these specialty certifications.

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Create Performance-Based Assessments

Following the lead of many manufacturing specialty certification processes, consortium members used performance-based assessments as a cornerstone of their new standards system. Taking this direction was also a natural outgrowth of the consortium's commitment to using standards in integrated academic and technical instruction. They developed and tested a performance-based assessment approach that relies on workplace scenarios designed in local collaborations between educators and industry representatives. These scenarios were created to test students' proficiency in the 10 key manufacturing responsibilities described earlier.

The manufacturing scenarios required students to demonstrate what they could do through complex tasks that lead to products or solutions to problems.

Local development of scenarios serves many stakeholders. It ensures the active participation of educators and business leaders who are familiar with local business conditions and requirements. It also lets students who perform well on the assessments know that they have been tested on the skills that are important to local employers.

Consortium members made prototype scenarios available to certified and registered users on the consortium's Web site. Through this system, educators and trainers could access the scenarios by using specially designed PROFLINK software, adapted by the consortium from Indiana's own PROF software. Consortium members also planned to enhance the PROFLINK software so that state or local academic standards could be incorporated directly into the scenarios.

Pilot-Test the New Standards and Student Assessments

A major Manufacturing Linkages Consortium activity during 1998 and 1999 was supporting state education departments and local sites that wanted to use the scenario-based manufacturing assessments. To enhance the success of these efforts, several consortium leaders provided training in using the PROFLINK system, including how to write scenarios and document proficiency.

Nine of the state members established implementation pilot projects either at the state or local level. All pilot efforts included extensive training in the manufacturing framework and the PROFLINK system. Table 2 briefly describes these pilot implementation efforts.

Successful pilot programs demonstrated the broad range of local applications.

TABLE 2
PILOT PROJECTS USING
MANUFACTURING SKILL STANDARDS

STATE	PROJECT DESCRIPTION
Hawaii	Developed scenarios for instruction in the production of mushrooms and recycled bicycles; worked on secondary/postsecondary integration based on the manufacturing core and printing industry standards.
Indiana	Two sites incorporated Indiana Proficiencies and NIMS Proficiencies into the Building Linkages project for the Manufacturing process.
Kentucky	Integrated academic skills and NACFAM Advanced Manufacturing Skill Standards into local high school curriculum.
Maryland	State Department of Education supported implementation, including PROFLINK training and secondary/postsecondary articulation activities.
Michigan	Created local implementation partnerships that included representatives from the United Auto Workers (UAW) and the Michigan Bureau of Apprenticeship and Training.
Nebraska	Developed assessment metrics for appropriate NACFAM Advanced Manufacturing Skill Standards and included them in assessment scenarios.
Pennsylvania	Working group—including representatives from industry and labor, academic and occupational teachers, and a guidance counselor—developed and implemented scenarios for pilot-testing.
Vermont	Governor budgeted funds for vocational improvement and included Manufacturing Linkages in the process.
West Virginia	State Department of Education supported a Manufacturing Linkages workshop.

Consortium members designed the manufacturing standards as a tool for educators and employers to use in a wide variety of instructional and career development activities. Consistent with this objective, implementation projects in pilot sites addressed many different local needs. Figures 16 and 17 provide descriptions of two successful manufacturing standards projects—in Columbus, Nebraska, and Lancaster, Pennsylvania—that demonstrate how educators have used the standards to meet local needs.

FIGURE 16

COLUMBUS HIGH SCHOOL

Columbus, Nebraska

Introducing manufacturing standards to the curriculum in Columbus, Nebraska, served both industry and education in this regional manufacturing center. Located 85 miles west of Omaha, Columbus is the most highly industrialized city per capita in the state, and projections indicate that manufacturing will continue to grow in the future. As a result, local manufacturers recognized the need for high-quality technical education and played a central role in the Manufacturing Standards Pilot Project at Columbus High School. Serving as a Manufacturing Linkages Consortium pilot site was a catalyst for the school to become actively involved in broader school-to-careers-based education reform. Through its success, this local project became an exemplar for state efforts to bring industry-based standards into the statewide school-to-careers movement.

Along with the business community, the principal at Columbus High School was another driving force behind the manufacturing standards effort. He used this new approach to achieve two goals: improve the achievement of students who have not been served by the traditional college-prep curriculum, and meet the employment demands of one of the state's fastest growing manufacturing areas.

At Columbus High School, a Certificate of Manufacturing will be the ultimate achievement for students who demonstrate proficiency on the performance-based assessments. To test the standards and create local assessments, the first year's activities focused on designing scenarios and grading rubrics that are based on the NACFAM Advanced Manufacturing Skill Standards. School staff used the following development process:

1. Establish a steering committee of representatives from local manufacturers, public and private employment agencies, the local community college, academic and vocational teachers, and the local school-to-careers partnership.

2. Review and evaluate the core standards developed by the Manufacturing Linkages Consortium.

3. Establish subcommittees of the steering committee to develop rubrics for each of the core standards; committees consisted of vocational teachers and business representatives, and academic teachers were encouraged to participate as well.

4. Submit standards and rubrics to appropriate academic teachers for review; ask them to identify standards that should be taught in academic classes; review and provide input on the draft rubric tasks; place individual rubric tasks into relevant academic courses; and align the industry-based standards with academic standards.

5. Provide support for summer work by subcommittees to develop assessment scenarios using prototypes developed by the Manufacturing Linkages Consortium.

6. Review rubrics and scenarios in meetings of the full steering committee.

FIGURE 17

LANCASTER COUNTY CAREER & TECHNOLOGY CENTER

Lancaster, Pennsylvania

Manufacturing is a growing economic sector in the area around Lancaster, Pennsylvania, about 50 miles west of Philadelphia. Nearly 30 percent of the county's work force is employed in manufacturing, making it an ideal place to pilot-test and implement the industry-based standards and assessments of the Manufacturing Linkages Consortium. The Lancaster County Career & Technology Center (LCCTC) was selected by the Pennsylvania Bureau of Vocational Education and the Manufacturing Linkages Consortium as the pilot site, based on their enthusiasm for the project and the advanced manufacturing program offered at one of their three campuses.

LCCTC is a countywide technical high school that serves students in their senior year of high school through a full-day/full-year program. These students have completed all academic courses required for graduation before entering LCCTC. However, additional academic competencies are integrated into the technical curriculum at LCCTC. For the final three months of the school year, students can participate in cooperative education (co-op) assignments with local manufacturing employers.

The school established two specific goals for piloting manufacturing standards: (1) to develop scenario assessments that reflect the needs of local manufacturers, and (2) to pilot-test the scenarios with students during fall 1998. These goals were established by the Bureau of Vocational Education of the Pennsylvania Department of Education, one of the early and active supporters of the Manufacturing Linkages Consortium.

To develop and pilot the scenarios, staff at LCCTC used the following multistage process:

1. Write a facilitator's manual to use throughout the process; design the manual to lead the facilitator and subject matter experts through the scenario-building process; and provide necessary background information about the job titles included in the manufacturing scope and descriptions of the academic, workplace, and technical skills that constitute the manufacturing core.

2. Conduct a two-day workshop in which vocational teachers, academic teachers, and industry representatives write the assessment scenarios, ensuring that they include relevant academic, employability, and technical skills.

3. Test the scenarios by asking 20 students to complete a scenario assessment, such as the one developed for the manufacturing standard on Establishing Customer Needs, one of the 10 key responsibilities of manufacturing employees.

4. Review and evaluate the pilot-testing process through input from educators and industry representatives.

Establish a Vehicle for Documenting Learner Achievement and Proficiency

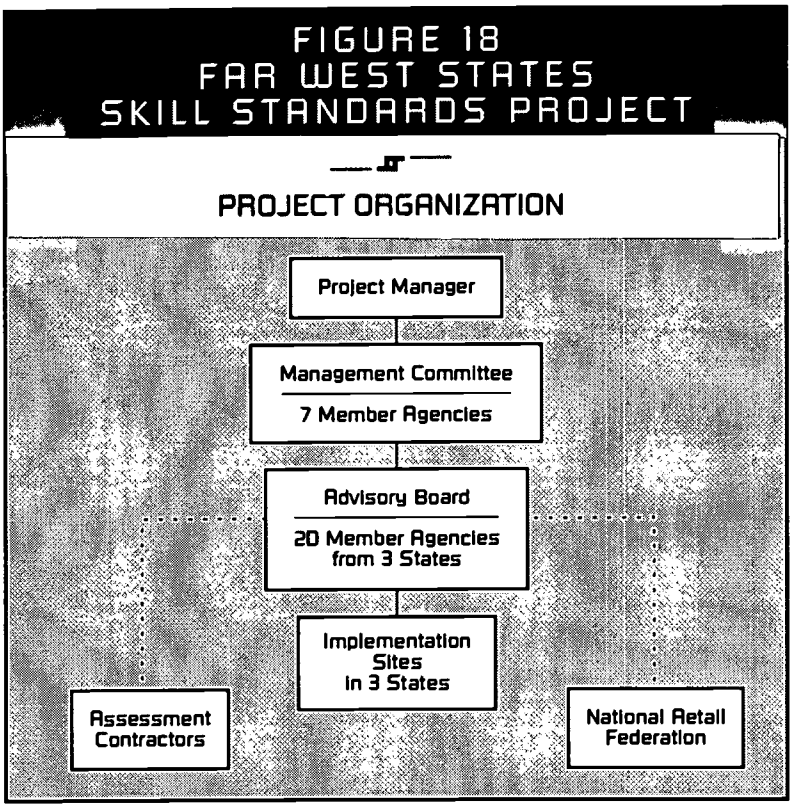
The last stage of the initial three-year strategy for the Manufacturing Linkages Consortium was to develop a certification document. This certificate will communicate students' achievement in the manufacturing field to potential employers and postsecondary education and training institutions.

The consortium was fortunate in having a prototype for this certification process that was administered by the Workforce Proficiency Panel in the state of Indiana. There, the governor signs skill certificates in seven occupational areas that are issued to secondary and postsecondary students and adults. Consortium members have been strong supporters of having the governor or another high-level state official sign certificates because they then can be recognized throughout the state and probably across states as well. Following this model, the consortium and its individual members worked within individual states to expand the use of portable certificates.

In developing the certificate, the Manufacturing Linkages Consortium established some general criteria for portable certificates that can be useful to others who plan to create certificates:

- The portable certificate must be complementary to current industry certifications;
- The process must support career pathways and lead to current industry certifications;
- The certificate must enable the recipient to qualify for high-wage jobs;
- The certificate must be transferable across industries, states, and occupations with minimal obstructions; and
- Each state must demonstrate that the certificate documents the integration of academic, technical, and workplace skills and is portable from state to state.

THE FAR WEST PROJECT



MEMBER STATES

California
Oregon
Washington

PROJECT OVERVIEW

The Far West States Skill Standards Project (Far West project) began in 1996 with the broadest industry focus of the three Building Linkages efforts. Their mandate was to use integrated academic and technical standards to create a certification system for careers in the huge area of business and management. Project leaders quickly recognized that because many different sets of standards are relevant to careers in this broad economic sector, many different certificates would be needed. Consequently, they limited their scope to two business-related industries that already had industry-endorsed standards: banking and retail services.[4]

Project leaders applied two fundamental principles to their work: the project's direction and activities would be employer driven, and they would build on existing standards-based materials, rather than start from "scratch" and duplicate work already done or being developed elsewhere.

[4]These industries were later broadened to include all of the financial services and retail and wholesale trades.

Three states joined together to form the project: Oregon, Washington, and California. Representatives from Oregon and Washington shared leadership roles. Membership in the project included representatives from state education agencies, state employment agencies, individual employers, and employer associations. During its two years of operation, the project was successful in broadening support and increased its membership from 14 to 20 agencies and organizations.

The project developed a four-tiered structure for management and operations. As was shown in Figure 18, it included the project manager, management committee, an advisory board, and three implementation sites. The 20-member advisory board represented public- and private-sector stakeholders from all three participating states. This board developed the vision and purpose of the project, oversaw the project, reviewed and evaluated products and outcomes, informed the various stakeholders about project activities, and identified issues and concerns affecting the project. They also advocated the use of integrated skill certificates to their respective stakeholder groups.

The management committee reviewed reports and other project documents and acted as a sounding board for the project manager. Between advisory committee meetings, they made policy decisions and collaborated with the project manager on policies and budget recommendations that were submitted to the advisory board. The implementation sites were responsible for helping to develop and test project materials, especially for working with project contractors on integrated standards-based assessments in financial services and wholesale and retail trades.

Over time, the project added ad hoc members to the advisory board, including individuals from the pilot sites and a representative from the National Retail Federation (NRF), who served as an advisor for developing and validating retail services assessments. The project also worked with two assessment contractors: WestEd developed assessments, including scenarios and projects, that were aligned with integrated academic and industry-based standards for wholesale and retail trades, and Strumpf Associates: Center for Strategic Change in Washington, D.C., worked with the project to develop assessments for financial services.

A PROCESS FOR APPLYING INDUSTRY-ENDORSED STANDARDS TO EDUCATION PROGRAMS[5]

The goal of certification was to improve individuals' employment prospects.

The primary goal of the Far West project was to develop a certification process for workers in retail and financial services jobs. According to their plan, they would develop a new student assessment approach—based on multiple assessment methods—that would become the foundation for certification. Once completed, employers could use this standards-based certification system to identify individuals who have essential skills needed by industry. Having these skills would put some job applicants "at the head of the interview line." Given the labor market's high demand for employees, project members from both education and industry enthusiastically supported this new certification system.

To create the new system, project members established the following objectives:

1. Develop an assessment system that measures learners' skills against integrated standards;
2. Create prototype skill certificates for the financial services and wholesale and retail industries that are portable and reflect core-level standards;
3. Make recommendations for a state certification process;
4. Document lessons learned; and
5. Provide technical assistance to teachers in pilot sites on using integrated curricula and applied learning methods.

Employers conducted focus groups and mock interviews to help the consortium shape a final set of standards.

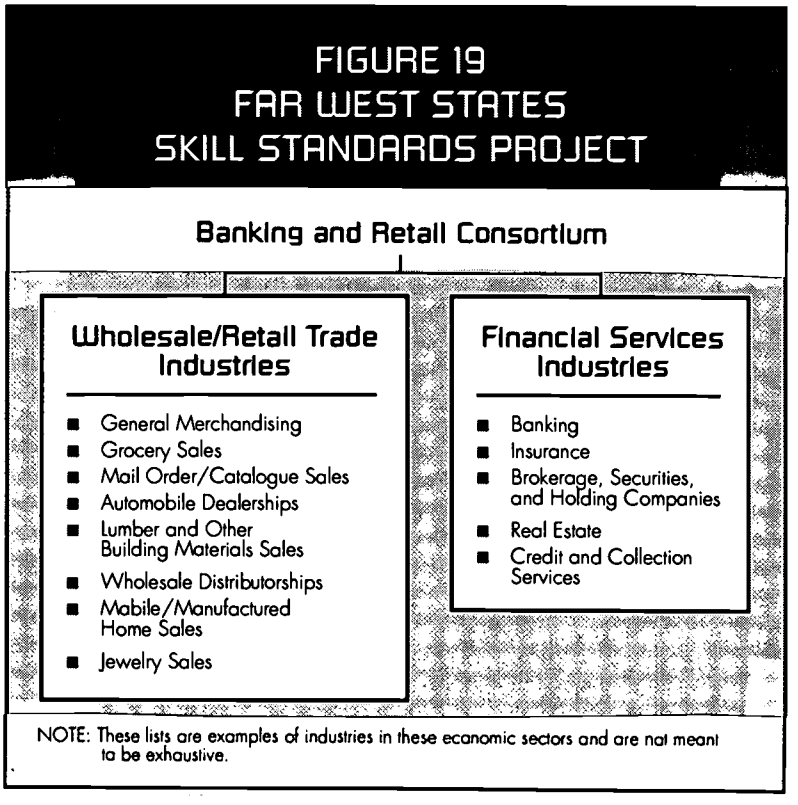
As an employer-driven effort, project members needed to know precisely what employers wanted and needed from a certification system. To answer these questions, the project conducted focus groups with employers in the three member states and in both industries. Before these focus groups met, project members asked employers to conduct mock employment interviews with students. Results of these interviews were used to articulate the skills that new employees needed and how a certification process might help identify them. Data gathered from the focus groups was an important adjunct to using existing standards in the assessment development process that soon followed.

Members of the project determined that new student assessment instruments, a certification process, and a teacher toolkit *Developing*

[5]For additional details about the work of the Far West project, see the *Far West Skills Standards Final Report*, prepared under contract by Strumpf Associates in Washington, D.C.

Integrated Problem- and Project-Based Instruction would be the major products of their work. Like the other Building Linkages initiatives, the Far West project followed a multistep process to proceed from developing a broad set of initial goals to completing these products. The Far West process included

- Identifying the occupational clusters within the retail and wholesale trade and financial services industries that would be the target of project activities;
- Establishing the career majors and approved education programs that prepare students for jobs in these industries;
- Identifying core and occupational-cluster standards that apply across the three member states;
- Developing and pilot-testing assessment tools appropriate for students at the secondary and community college levels and for adult workers; and
- Creating a toolkit to help teachers integrate technical and academic standards into the curriculum.[6]



[6]Although the value of this product was not anticipated early on, by the end of the first year, project members determined that many teachers, even in pilot site schools, could benefit from having the toolkit.

DEFINE TARGET OCCUPATIONAL CLUSTERS FOR FINANCIAL SERVICES AND RETAIL SERVICES

At the outset, project leaders determined that they could not develop certificates for the large array of occupational clusters that make up these two broad industries. (See Figure 19 for examples of these industry components.) Consequently, in one of the first major project activities, members gathered input from their employer representatives about priorities: that is, which clusters of occupations did they think should be the targets of efforts to apply integrated standards. Two factors figured prominently in their decision: employer recommendations based on labor market demand and the availability of existing skill standards.

Among employers in the wholesale and retail trades industry, project members indicated that effective, standards-based education and assessment programs were badly needed in the rapidly growing retail services sector. Entry-level professional sales associates, in particular, were difficult to recruit; they often did not have critical skills; and they tended to have high turnover rates. The employers argued that better academic and industry-related preparation and an understanding of career opportunities in the industry could improve both recruitment and retention. In addition, the National Retail Federation (NRF) had previously developed standards for their industry. Based on these recommendations, the project selected professional sales associates in retail services as the occupational cluster on which they would concentrate their efforts.

In the financial services industry, employer representatives recommended that the project focus on three occupational clusters in which standards-based education and training could help employers meet their labor market needs. They selected sales and service, loan processing, and data and item processing. These three occupational clusters also met the project's second selection criterion: the California Banking Standards already included separate sets of job requirements for the three individual career clusters.

IDENTIFY CAREER MAJORS AND APPROVED PROGRAMS

After agreeing on these four occupational clusters—one in retail services and three in financial services—project members conducted a survey of education officials responsible for secondary and community college programs in the three member states. They administered the survey to determine which career majors and approved programs were educating students for careers in these two industries. Figure 20 displays the many career majors and programs that were preparing students for employment in careers related to the financial and retail services industries. It also suggests the wide range of edu-

cation and training programs that will benefit from the standards-based curricula and validated assessment instruments that the Far West project developed.

FIGURE 20
CAREER MAJORS AND APPROVED EDUCATION PROGRAMS IN FINANCIAL SERVICES AND RETAIL SERVICES IN WASHINGTON, OREGON, AND CALIFORNIA*

Career Major/Program: Retail Services

- Business and Management: Marketing and Marketing Management
- Business and Management
- Hospitality, Taurism, Recreation Management
- Business: Merchandising and Retail Sales
- Business: Hotel, Motel, and Restaurant Management
- Business: Travel and Taurism Management
- Business Administration: Purchasing and Procurement
- Sales and Marketing
- Business Leadership and Management: Retail
- Customer Service Technology: Sales Services
- Industrial Marketing
- Hardware/Building Materials Marketing
- Floral Marketing
- Apparel and Accessories Marketing
- Automotive and Parts Marketing
- Home Furnishings Marketing
- Entrepreneurship and Small Business Ownership and Management
- Marketing, Customer Service, and Business Management
- Business Marketing Enterprise Operations
- Business and Management: Customer Service

Career Major/Program: Financial Services

- Business and Management
- Accounting/Financial Occupations
- Accounting
- Accounting Technician
- Banking and Finance/Banking and Financial Services
- Escrow Services
- Savings and Loan Administration
- Customer Service Technology
- Credit Services
- Business Technology: Entry Management
- Office Technology: Information Processing/ Data Entry Technician
- Banking and Credit Career Training
- Financial Technician/Teller Training
- Credit and Finance Management
- Loan Officer
- Loan Procecessor
- Real Estate: Escrow and Title Insurance

*Programs offered vary by state and by education level within states.

IDENTIFY CLUSTER AND CORE STANDARDS

Cluster Standards: A Starting Point

Unlike the other two Building Linkages efforts, members of the Far West project—especially those representing employers—were more interested in creating a certification system linked to cluster standards than to core standards. Industry conditions and projections appear to have motivated their preferences. The changing nature of entry-level jobs in both the retail and financial services industries, coupled with rising demand and high turnover, had created a substantial need for new workers with cluster-related skills. Consequently, at the urging of many employer representatives, the project initially designed its approach to meet a specific industry need—providing better information about potential employees' cluster-related skills. However, during the initiative's second year, at the urging of the federal funding agencies, core standards were also added to the Far West agenda to enhance the value of their work for broad career-focused high school curricula. This led to a process that began with cluster standards and later involved developing standards for an industry core.

Because the project initially focused on occupational clusters, the early certification model both resembles and differs from the models created by the Manufacturing and Health Science initiatives. To illustrate this point, Figure 21 shows the model the project developed for wholesale and retail trades. It includes academic standards in English, communications, mathematics, physical science, and social science that were similar to those in health and manufacturing.[7] All three Building Linkages certification models—health, manufacturing, and wholesale and retail trades—also emphasize the importance of workplace-readiness skills related to the Secretary's Commission on Achieving Necessary Skills (SCANS) competencies. However, unlike the other two, the early Far West model did not include core industry-based standards that stakeholders consider important for all occupational clusters in an industry.

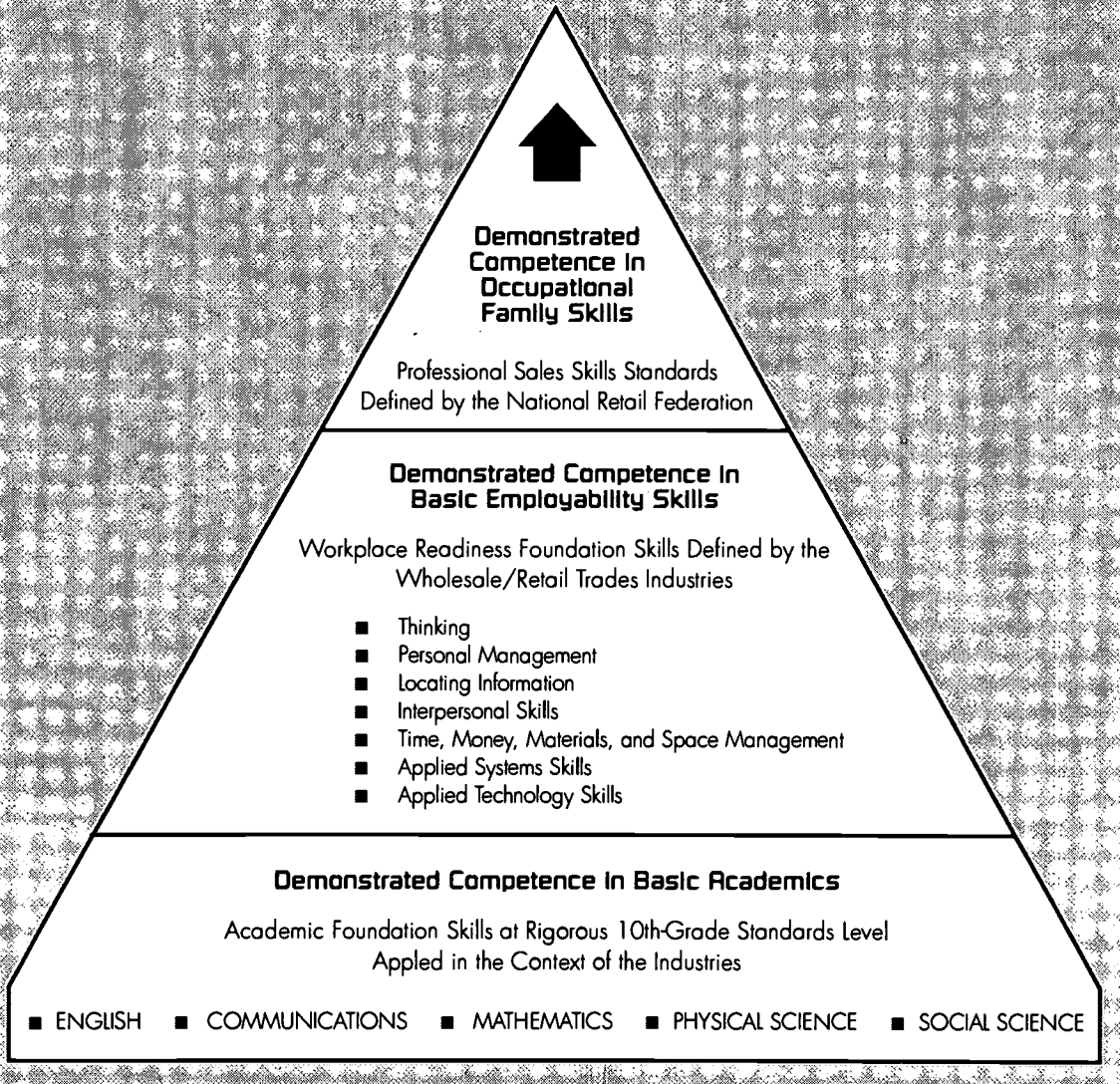
During the initiative's second year, the project was able to combine ongoing work on assessments with the new task of developing core standards for wholesale and retail services and financial services. This task was assigned to the two contractors responsible for developing assessments. In both cases, they used a "crosswalking" process, in which they identified skills and skill levels that were common across state standards, that was subsequently followed up with employer surveys.

"Crosswalking," or comparing three sets of state and national standards to each other and to employer surveys, led to the new core industry standards.

[7]Staff at WestEd identified academic standards for both wholesale/retail trade and financial services. They compared standards from the National Retail Skill Standards and the California Banking Standards to academic standards in the states of Washington, Oregon, and California.

FIGURE 21
THE CORE WHOLESALE/RETAIL TRADES SKILLS CERTIFICATE

Career Employment	Postsecondary Education
■ Business Owner/Entrepreneur	BA/BS Marketing
■ General Manager	BA/BS Business Administration
■ Operations Manager	Industry Certification
■ Sales/Marketing Manager	AA Entrepreneurship and Small Business Management
■ Sales/Marketing Supervisor	AA Business/Purchasing and Procurement
■ Buyer/Marketer/Purchasing Agent	AA Business and Management/Marketing
■ Professional Sales Associate	AA Business/Merchandising and Retail Sales



To develop core standards that applied across the entire financial services industry, the project members compared the California Banking Standards to two other sets of skill standards for career-entry banking occupations: the Connecticut Business & Industry Association (CBIA) skills and tasks for business and finance/administrative support occupations, and the Indiana Department of Workforce Development tasks and proficiencies for business support occupations.

For wholesale and retail trades, project members compared the NRF skill standards for professional sales associates to both the CBIA skills and tasks for a cluster of retail, tourism, recreational, and entrepreneurial occupations and the National Grocers Association (NGA) skill standards for front-end associate occupations. They identified items that correlated across the standards documents as core standards. Figure 22 illustrates the results of this process. It shows the core, or common foundation, skills for financial services that were listed in all three sets of standards, NRF, CBIA, and NGA.

FIGURE 22
COMMON FOUNDATIONS SKILLS LIST FOR THE FINANCIAL SERVICES INDUSTRY

I. BASIC ACADEMIC SKILLS

- I.A. Reading
- I.B. Writing
- I.C. Speaking
- I.D. Listening
- I.E. Mathematics
- I.F. Follow Basic Accounting Principles

II. EMPLOYABILITY SKILLS

- II.A. Personal Qualities
- II.B. Interpersonal Skills
- II.C. Thinking Skills
- II.D. Basic Technological Skills

III. CORE TECHNICAL SKILLS

- III.A. Maintain Accurate Account Records
- III.B. Process Items and Proof Transactions to Ensure Accuracy of Operations
- III.C. Process Applications by Assembling a Completed Package and Monitoring Status
- III.D. Handle Cash and Non-Cash Transactions
- III.E. Provide Customer Service
- III.F. Market and Sell Financial Products and Services

To obtain the final list of core standards, project members included the results from the crosswalking exercise on surveys that they sent to employers and representatives of organized labor in Washington, Oregon, and California. If 70 percent or more of the respondents called a skill "essential as a foundation for career employment," it was included in the core standards for the industry.

DEVELOP ASSESSMENT TOOLS FOR SECONDARY-LEVEL AND COMMUNITY COLLEGE STUDENTS

When members of the Far West project began to develop new assessment processes, they concluded that multiple assessment strategies would be the foundation for student certification. Stakeholders from both industries agreed that a multiple assessment approach is valuable for both employers and educators because it

- Certifies that an individual is competent at a specified level of skill;
- Certifies that the skill is transferable—i.e., it can be demonstrated in similar situations;
- Certifies that the skill is durable—i.e., it can be demonstrated over time; and
- Ensures that different cognitive processes, both cognition and metacognition, are assessed.

A multiple-mode assessment strategy met the needs of both educators and employers.

For employers, a multiple-mode assessment strategy is particularly appropriate because its elements are directly linked to actual performance tasks. For educators, it fits directly into curricula that integrate academic and technical content and standards. Based on these assumptions, project members asked each assessment contractor to develop instruments that use multiple modes: multiple-choice questions, short-item responses, scenarios, and performances.

Assessments for Financial Services. The Far West project located a contractor team with experience in developing standards-based assessment tools for the financial services industry. Strumpf Associates and the Comprehensive Adult Student Assessment System (CASAS) had previously created reading, mathematics, and critical-thinking assessments for the industry. These were used in the first phase of the assessment validation process along with results of the standards crosswalks and employer surveys described earlier.

Two schools, Hiram Johnson West Campus High School near Sacramento, California, and Bend Senior High School in Bend, Oregon, were chosen to pilot-test the financial services assess-

ments. Hiram Johnson was one of the schools associated with LEED-Sacramento, a business-education partnership that had been heavily involved in school reform and school-to-work innovations. Selected students in grades 9 through 12 at Hiram Johnson were tested on reading, mathematics (multiple-choice), and three critical-thinking tests that used open-response and multiple-choice modes. Pilot-testing allowed the contractor to gauge the effectiveness of the test, identify any problems related to administration, and generate feedback from teachers about scoring guidelines and student performance results.

The work that Strumpf Associates had done related to financial services represented a major step forward in creating assessment tools that can be used industrywide in three occupational clusters. However, these tools were validated only at the two high school sites just described, and the number of students tested was small. Rigorous validation of the instruments will require considerable additional testing. Consequently, project members and Strumpf Associates planned to continue validation work in the future. Both of the original pilot sites planned to continue working with the assessments, and Strumpf Associates was recruiting additional sites for more validation work.

Assessments for Wholesale and Retail Trades. The second assessment contractor working with the Far West project also brought relevant experience to its task of developing an assessment for wholesale and retail trades. WestEd has played the lead role in California's Career-Technical Assessment Program (C-TAP) and is very familiar with the DECA/Future Business Leaders of America standards. They were able to apply this experience to creating a multiple-mode assessment for the wholesale and retail trades, especially in developing portfolio and project templates. In addition, during their first year of working with the Far West Project, WestEd and the CASAS performed the task of crosswalking academic standards in the three member states to the NRF National Retail Skill Standards.

To develop these new assessments for wholesale and retail trades, WestEd started with the NRF national retail standards; expanded and aligned assessment items to include wholesale trades; generated input and feedback from educators and industry representatives at demonstration sites; and developed a new set of items that were more relevant to the broad wholesale and retail trades sector. One additional goal of this process, achieved with the help of demonstration site teams, was to enhance the academic rigor of the item set, especially in mathematics.

The multiple-mode assessment that was pilot-tested for wholesale and retail trades consisted of two short-answer items, one long-written response item, and a multiple-choice section developed

and administered by McGraw-Hill. Pilot-testing involved both high school and community college students in Clover Park, Washington, and at Mira Loma High School in Sacramento, California. The Clover Park test involved students from Clover Park Technical College as well as four area high schools. Mira Loma High is part of the LEED-Sacramento school-to-career partnership.

ENCOURAGING SUCCESS: A TOOLKIT FOR TEACHERS

Professional development and field-testing at pilot sites resulted in a teacher toolkit for contextualized, or applied, learning.

Providing technical assistance to teachers in pilot sites on integrating and contextualizing curriculum and instruction was the final objective for the Far West project. At the outset of their work, members recognized that for schools and teachers to be successful in using new assessment tools and, ultimately, implementing a new certification system, they would need appropriate professional development and support. As a result, early on they planned to provide technical assistance on developing and using contextualized curriculum material.

However, by the end of the first year, project members concluded that even at the pilot sites, which had been chosen for their involvement with integrated instruction and other aspects of curriculum reform, many teachers were still unfamiliar with these newer learning approaches. Consequently, the project asked Strumpf Associates to create a teacher toolkit that would help fill the gap and increase the potential for success.

Lori Strumpf spent 10 days during 1998 working with teams of teachers at the following three pilot assessment sites:[8]

- Bend School to Work Alliance/Bend Senior High School
- Clover Park Technical College/Clover Park High School
- LEED-Sacramento (where 10 high schools participated)

The teacher toolkit developed from this work gives teachers and administrators all of the materials they need to develop authentic projects. It includes project samples and provides illustrations of how to put the projects together. Teams at the three schools created a compilation of authentic learning projects that they could use with students during the 1998–99 school year. Producing these projects required the teams to

[8]This description of the development process and its contents is taken from the teacher toolkit, which is included in the Far West Project Final Report.

- Develop quality standards for integrated instruction;
- Develop an instructional vision for the team;
- Learn the differences between problem- and project-based instruction;
- Learn how to develop authentic projects;
- Learn how to analyze the projects for learning opportunities;
- Learn how to use industry skill standards as one set of skills and knowledge to be learned;
- Learn how to use SCANS as another set of skills and knowledge to be learned;
- Learn how to design curriculum using projects as the base;
- Learn how to integrate academic skills and knowledge;
- Learn how to use performance-based assessment as part of project-based learning; and
- Develop an integrated project and framework to be replicated.

Figure 23 is an example of an integrated, standards-based curriculum project. It was developed at Clover Park Technical High School in consultation with WestEd. Figure 24 is the set of quality standards developed by Strumpf Associates to be included in the Far West States Skill Standards Teacher Toolkit.

High-quality integrated projects help students develop academic, employability, and technical skills through complex and relevant activities.

FIGURE 23

CLOVER PARK TECHNICAL HIGH SCHOOL INTEGRATED CURRICULUM PROJECT*

Clover Park, Washington

Endangered Species Awareness Campaign

This project ideally sets itself up for a combined science/marketing team.

Skills Standards:
Academic: Science
Retail/Wholesale Trades: Promotional Mix & Research Analysis

Purpose: Ability to research and successfully develop an awareness campaign to include

- Advertising in broadcast media (radio, TV), print media (newspaper, magazine, brochure), signage media (billboard, transit), and specialty;
- Public relations articles and displays; and
- Potential fundraising and/or promotional activities.

Activity: Student teams will contact and collaborate with a community environmental group or organization. After identifying an endangered species (preferably from the surrounding area) and its presumed reason for becoming endangered, they will conduct research to determine the following: (1) the species' natural environment; (2) possible requirements for the species to adapt, coexist, and possibly thrive in current environments; and (3) a list of potential needs (sanitary, breeding specialists) in order to facilitate species adaptation.

Products: Presentation of entire findings and promotional mix to the environmental group. The presentation would include the promotional campaign, possible costing options (time slots, layout), activities and events that bring about an awareness of the endangered species, and possible effects on the ecosystem.

Assessment Tools:

- Their campaign components: Completeness, accuracy, creativity, and budget
- Their research findings
- The presentation: Communication, visuals, and organization

* Courtesy of Terry Ackley, Clover Park Technical High School.

FIGURE 24
QUALITY STANDARDS FOR AUTHENTIC INTEGRATED INSTRUCTION*

1. Requires that the participants demand excellence of self, each other, and the product
   a. Requires that participants periodically meet to discuss and reflect on progress and achievement (project, individual, group)
   b. Requires participants to take ownership of project
   c. Requires that participants seek knowledge from appropriate experts
   d. Requires that participants have total and equal opportunity for participation

2. Is authentic and has a genuine purpose and true need
   a. Fulfills a real need
   b. Provides connections between school, home, and community
   c. The project outcome is delivered to an authentic client, thereby creating an external value
   d. Includes a completed project

3. Is skill-based
   a. Incorporates academic, employability, and technical skills
   b. Incorporates SCANS skills (competencies and foundations skills)
   c. Develops a common core of measurable learning skills

4. Includes a clear goal involving multiple disciplines
   a. Clearly states project objectives that can be articulated by all participants
   b. The process of the project requires flexibility to achieve the goal
   c. Includes a planning process that connects the skills and knowledge to be taught through the project

5. Includes multiple forms of knowledge
   a. Incorporates domain knowledge
   b. Integrates strategic action knowledge (i.e., heuristics, cognitive management, and self-knowledge of learning style)

6. Is relevant
   a. Links previous and new knowledge to current and future applications
   b. Focuses on a process-oriented approach

7. Has a clearly defined method of assessment
   a. Includes assessment by self, peers, teachers, and clients
   b. Develops the process of learning through inter- and intradisciplinary learning (e.g. portfolios, self-evaluation, and conferencing)
   c. Evaluates participants using a skill-based rating rubric that utilizes performance-level descriptors to indicate growth
   d. Evaluates the product and the process based on completion of the task, validity of the project, and other indicators included in the rating rubric
   e. External audiences participate in the evaluation process
   f. Includes a process for continuous improvement to the process and the product
   g. The project results meet client specifications

*Developed by Strumpf Associates: Center for Strategic Change.

CHALLENGES AND OPPORTUNITIES FOR THE FUTURE OF BUILDING LINKAGES

As this report nears completion in fall 1999, two of the original Building Linkages consortia (Health Science and Manufacturing) are beginning follow-up work with additional support from the Office of Vocational and Adult Education and the National School-to-Work Office. Participants in the Far West Consortium also plan to continue their efforts through state and local curriculum development activities and technical assistance to local sites from Strumpf Associates: Center for Strategic Change and WestEd.[9]

Upon completing the first phase of Building Linkages, the consortia achieved several important goals. They established solid partnerships between educators and employers that were continuing and supporting additional development and pilot-test work. These collaborations produced career pathway models designed to help students succeed in further education and employment. In addition, the consortia laid the foundation for transferable skill certificates based on integrated national and state-recognized standards by continuing efforts to establish wide support for these certificates. Finally, with significant input from a broad base of stakeholders, they designed curriculum products and assessment tools and began piloting them in secondary and postsecondary institutions. Further testing of the assessment tools will help validate the standards and career pathway models through input from both educators and employers.

As they continue their work in the future, these consortia will face a variety of challenges and opportunities. Responses to them will influence the extent to which the consortia's standards and certificates are accepted by educators and employers and integrated into curricula and employment processes. In particular, the consortia will need to

- Complete rigorous validation of curricula and assessments at local implementation sites;
- Ensure that standards, curricula, and assessment tools remain current;
- Achieve widespread understanding and acceptance of portable certificates; and

Next steps for the consortia will involve further validation of curricula and assessments and institutionalizing their use.

[9]In addition, three new consortia have started work on using integrated standards for three high-technology career clusters: audiovisual communications technology; information technology; and transportation, distribution, and logistics.

- Help local sites respond to the array of implementation issues that emerge when new curricula and assessments are introduced into individual districts and schools.

Similar challenges and opportunities are likely to confront other consortia that plan to develop products based on integrated standards. This final chapter outlines some of these challenges and describes how the three Building Linkages projects have started to address them.

CURRICULA AND ASSESSMENT TOOLS WILL REQUIRE FURTHER DEVELOPMENT AND VALIDATION

Educators and employers share responsibility for evaluating and demonstrating the value of any curriculum or assessment tool that aims to prepare students for further education and good jobs. The success of the consortia's assessments will rest on evidence that educators use them and employers recognize them as useful for preparing and identifying qualified employees. Without these assessments, educators will be hard pressed to integrate the new standards into curricula, and employers will lack a systematic way of using the standards for recruiting and screening new employees and for developing employees' skills.

Consequently, the availability of student assessment instruments and the rigorous and broad-based validation of these tools will be essential for acceptance of the Building Linkages efforts. As summarized below, the three Building Linkages consortia made significant progress in this direction during the first phase of their work, and they are planning to broaden these efforts in the future.

- The Manufacturing Linkages Consortium created a performance-based assessment based on locally developed scenarios within a nationally defined framework of integrated standards. More extensive validation of the assessment instruments through a growing network of user sites will support refinements of the scenarios and the scenario process and will increase the value of existing products.

- The Far West Project created student assessments for retail and financial services through their work with WestEd and Strumpf Associates/the Comprehensive Adult Student Assessment System (CASAS). During the federally funded phase of the consortium, these assessments were validated in a small, but diverse, group of educational settings that included high schools and postsecondary institutions. Further validation efforts, led by Strumpf Associates, were planned as the consortium ended its cross-state collaboration. A recent study

by Mathematica Policy Research on implementing national skill standards indicated that many employers remain unaware of them or uncertain of their value (Haimson and Hulsey, 1999). Consequently, conducting validation activities beyond the consortium's three western states will be important for increasing industry's knowledge and appreciation of integrated standards for use in the workplace.

- The Health Science Collaborative has established student assessment criteria for each of the core National Health Care Skill Standards. Participants in the collaborative are working to create an electronic national assessment for graduates of secondary school health science programs and employee candidates. The assessment, which will accompany a portfolio for secondary program completers, is based on evidence of work-based learning, work samples, and a career development plan. An electronic registry, which will be available in all states, will contain the names of successful completers. The collaborative is planning to include in the registry other assessments for postsecondary graduates and individuals currently in health care positions that do not have assessment instruments.

PROCEDURES MUST BE IN PLACE TO ENSURE THAT PROJECT MATERIALS REMAIN CURRENT

All three consortia established relationships with organizations that are committed to maintaining and promoting the standards.

Curriculum and assessment tools must be kept up to date. They offer lasting benefits to stakeholders in education and industry only when they reflect current skill requirements, labor market needs, and educational approaches. When creating their organizational structures and partnerships, the Building Linkages consortia took this mandate seriously. They developed relationships with established organizations that serve the needs of their industries through educational improvement. These organizations, in turn, have made a commitment to help keep standards-based material current.

- The Manufacturing Linkages Consortium established a close affiliation with V-TECS, which has solid experience supporting vocational-technical education. They also developed close ties with the National Skill Standards Board's (NSSB) Manufacturing Partnership, which is working on ways to use industry-endorsed standards for educational improvement. These organizational ties should be effective in helping the consortium continuously improve and update its project materials.

- WestEd and Strumpf Associates, the assessment contractors that worked with the Far West Project, both have broad organizational mandates related to using standards for curriculum

design and assessment. Future work by these organizations to apply standards for financial services and wholesale and retail trades should be essential for keeping project materials up to date.

- The Health Science Collaborative is closely affiliated with the National Consortium on Health Science and Technology Education (NCHSTE). The growing membership of this national organization and its decade-long commitment to integrated standards should be an asset to maintaining and improving the National Health Science Career Path Model in the future.

FURTHER EFFORTS ARE NEEDED TO GAIN WIDESPREAD ACCEPTANCE OF INTEGRATED STANDARDS AND STANDARDS-BASED CERTIFICATES

Endorsement by state leaders or professional and trade organizations will be critical for widespread adoption of portable certificates.

A key goal of all three Building Linkages projects was to develop prototypes of portable certificates for their industries. All of the consortia identified a process for establishing these certificates and started working to put it in place. At the same time, each consortium faces further challenges to doing so in the future.

- With input from all participating members, the Manufacturing Linkages Consortium determined that a high-level official in each state should sponsor and sign certificates. The consortium used the current system in Indiana in which the governor signs these certificates as a model for this approach. Achieving this high level of support in every state will be a challenge, however. To achieve this goal in the next phase of their work, consortium members plan to continue validating products in every member state and working with state-level officials.

- The Far West Project developed a different approach for implementing portable standards-based certificates. They concluded that certificates should be sponsored by industry associations or partnerships between industry associations and education institutions. Similar to the situation in manufacturing, achieving this type of sponsorship—especially through industry and education partnerships—will also require labor-intensive work with individual institutions in many states if certificates are to become widely available and accepted.

- There are particularly difficult challenges ahead to creating a new, portable certificate for health sciences. Certification in the industry has long been organized around an established system of tests for individual health care occupations, which

are widely accepted and even required for employment in many occupations. However, employers have been working with educators to focus on the broader, transferable content of the core National Health Care Skill Standards. Many secondary health science programs have already adopted these integrated standards. Now, postsecondary programs are expressing interest in doing so. The next challenge facing the Health Science Collaborative will be to ensure that assessment items that reflect the core standards are included on national credentialing examinations.

MANY ISSUES MUST BE ADDRESSED BEFORE INTEGRATED STANDARDS AND ASSESSMENTS ARE EMBRACED AT THE SCHOOL LEVEL

Questions about resources, student participation, stakeholder support, and curriculum design must be resolved as part of local implementation of integrated standards.

For many educators, basing curricula on integrated standards represents a significant departure from traditional approaches. Consequently, a wide variety of issues must be addressed before teachers and administrators at the local level embrace these standards and associated assessment methods. Some of these issues center on which students should be encouraged to participate in curricula that are based on integrated standards and how should they participate—through school- and work-based activities, through academic as well as technical courses? Others address critical operational questions that affect administrators, academic and technical teachers, and students.

Findings from the recent Mathematica study of national skill standards underscore the importance of these kinds of issues for the future of the consortia's work. In particular, their study of standards in retail, printing, and metalworking identified several challenges facing implementation efforts at six sites across the country. These included

- Generating resources to design or modify curricula;
- Creating incentives aimed at raising student interest;
- Showing instructors the value of new standards-based credentials; and
- Tracking students' employment outcomes after graduation.

Educators at Columbus High School in Columbus, Nebraska, raised—and addressed—a number of the same issues. Figure 25 shows some of the key questions that came up in deciding how to use manufacturing standards in their comprehensive high school.

FIGURE 25

KEY ISSUES FOR SKILL STANDARDS IMPLEMENTATION IN A COMPREHENSIVE HIGH SCHOOL*

■ Project Goals

1. Which groups of students should be encouraged to participate in the program? All students? Only vocational students? At-risk students?

■ Organization and Structure of Project Management: Who Should Participate and How?

1. What is the most effective management structure for designing and implementing the project?
2. What are the functional areas that must be covered, and what staffing will be necessary to address them?
3. Who should participate in project management and in what capacities?
4. Where does responsibility lie for sustaining the program?

■ Overall Project Implementation

1. How can the goals of the skill standards effort be communicated effectively to all stakeholders?
2. What is the process that will be used to engage academic teachers, to involve vocational teachers?
3. What kind of public relations campaign is desirable to raise parental and student awareness of the program?

■ Student Participation

1. Should participation incentives be offered to students?
2. What role, if any, should business play in developing incentives for students?
3. What type of incentives would industry representatives like to provide (e.g., paid versus unpaid internships)?
4. How will the system accommodate delayed-entry students?
5. What provisions will be made for alternative education students, for special needs students?

■ Curriculum Design and Implementation

1. Where should skill standards fit into the existing technical curriculum?
2. How will skill standards fit into the academic curriculum?
3. What will be the course sequence over a four-year period for students who are pursuing a standards-related certificate?
4. In a vocationally oriented program, how—or will—the system address the needs of academic students who want to pursue a career path in a four-year postsecondary institution?
5. How will the school-level standards project interface with state academic standards?

FIGURE 25

KEY ISSUES FOR SKILL STANDARDS IMPLEMENTATION IN A COMPREHENSIVE HIGH SCHOOL*—continued

■ Connections Between Curriculum Redesign and Student Support Services

1. How will the guidance system incorporate career exploration and assessments that reflect new standards-based curriculum directions?
2. What kind of a career guidance program will assist student progress through the standards sequence?

■ Assessment and Certification

1. How will students' progress toward completing the standards be measured?
2. What type of credential will students receive at the end of the program?
3. Will students receive recognition for partial progress toward completing a certificate? If so, how?
4. Should the credential resulting from the program be differentiated from an academic diploma? If so, how?
5. What mechanisms will be developed to assist students who fail?
6. Will there be methods for students to "test out" of parts of the program?
7. What kind of record-keeping system will facilitate the standards-based program?

■ Program Monitoring, Evaluation, and Updating

1. What aspects of program operations and student participation should be tracked and evaluated?
2. How will data be collected, stored, and accessed, and by whom?
3. Who will be responsible for developing record-keeping procedures and manuals, maintaining the database, and producing monitoring reports?

*Developed at Columbus High School, Columbus, Nebraska.

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