

Work-Based Learning in Occupational Education and Training

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The workplace increasingly is being used as a learning place for youth and adults in occupational training and education programs. However, the design of quality work-based learning activities for students must accommodate the often competing demands of education and production, consider contextual and experiential strategies for learning, and use instructional approaches that differ from familiar classroom-based methods. This article looks at action learning and situated learning theories as appropriate conceptual frameworks for work-based teaching and learning, and examines the contribution of job task analysis models and apprentice training for the design of work-based vocational curriculum materials. Based on these concepts, a listing of characteristics of quality work-based learning is proposed. These characteristics are illustrated through a case study of the development of work-based learning materials for use in small businesses in Germany with limited resources for training on site and with ongoing production needs. The model described in this pilot project has potential for application in industrial work settings where schools and colleges are placing students to learn skills in authentic workplace environments.

Work-based learning is becoming an increasingly essential part of occupational education, whether in the form of internships, apprenticeships, cooperative education, school-supervised work experiences, practicums, or clinicals (Office of Technology Assessment, 1995). One of the three core components of the federal School to Work Opportunities Act of 1994, work-based learning is defined in that legislation as job training and work experiences aimed at developing pre-employment and employment skills, attitudes, and knowledge. Business and industry, national government, and public educators seem to agree that strong partnerships and a larger role for employers need to be part of the reform of education, both vocational-technical and academic (Bailey, 1995). Learning in context at workplace settings is seen as a means of making education relevant to job requirements and enhancing the transition from school to work. Work-based learning initiatives are being used increasingly by schools and community colleges in preparing students for work (Bragg, Hamm, & Trinkle, 1995; Goldberger, Kazis, & O'Flanagan, 1994; U.S. Department of Education, 1991).

However, the development of appropriate and high-quality learning activities and instructional materials that effectively use the resources of a work setting in business or industry has not been adequately addressed (Goldberger et al., 1994). In a review of U.S. youth apprenticeship programs, Bailey and Merritt (1993) found that "almost no attention has been paid to how a learning experience on the job should be designed" (p. 44). They pointed out that using the workplace as a learning place involves more than placing students in jobs to gain work experience. The essence of this issue is captured by Kazis and Goldberger (1995), researchers with Jobs for the Future:

What does it take to make the workplace into a learning place for young people? In school, teachers use curricula, lesson plans, pedagogical methods, homework, tests, and grades as the building blocks of an instructional program with a clear structure and sequence, which can be delivered with relatively consistent quality, and which can assess what students have accomplished. But when the site of learning shifts to the workplace and learning opportunities are embedded in worksite experiences, how can quality and content of learning be assured? Every workplace is different, both across and within industries. They produce different products and services, for different segments of the market, with different technologies, work organizations, and management structures. Moreover, US industry has historically under invested in in-firm training and work force development, particularly for front-line workers. Many firms lack the capacity to be what, in Germany, are called *learning firms*. (p. 181)

Research on contextual learning reinforces the importance of active, experiential learning strategies that are contextually based. These serve to increase student motivation, the relevance of education, and the transfer of learning to work environments (Ellibee, 1997; Office of Technology Assessment, 1995; Resnick, 1987). However, learning within profit-oriented environments designed for ongoing production or service delivery presents unique challenges to educators and their employer partners. The design of instructional activities will need to differ from those used in traditional classroom or even laboratory settings. Accommodating the often competing priorities of business profits and educational outcomes, while making effective use of the opportunity for contextualized learning and the integration of schooling and work, is a major

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challenge in implementing high-quality work-based learning (Office of Technology Assessment, 1995). How can work-based learning on site in production-oriented settings be structured to ensure meaningful, high-quality learning experiences for students?

Conceptual frameworks to guide this effort can be found in situated cognition and action learning theories, and in the task analysis models for curriculum development. Learning strategies developed in apprenticeship training programs also can contribute to an understanding of how learning occurs in the workplace. These conceptual theories, models, and research on contextual, work-site learning can be helpful in addressing the following questions: What do we know about how learning occurs in work settings? What does this tell us about how to design learning activities and materials for work-based learning? What are the characteristics of quality work-based learning? How does education need to be structured in the workplace to provide students with a quality learning experience?

LEARNING THEORIES THAT PROVIDE GUIDANCE

Action Learning

As an alternative to classroom training, action learning has been adopted by business schools and corporations as a work-based, experiential process for managerial development (Margerison, 1989). Learning occurs through the activity of solving real problems, in the context of actual work assignments, working with a group whose members assist each other to find solutions. Cusins (1995) defined action learning as a set of activities that "create a context for creative decision making in uncertain situations" (p. 1). These activities include (a) experiential learning, including disciplined reflection on the experience that involves reflective observations, making sense of information, and applying learning to other situations; (b) creative problem solving processes, involving problem definition, analysis, generation and analysis of options, and implementation of the chosen solution; (c) acquisition of relevant knowledge from human, print, or electronic resources; and (d) co-learner group support, where individuals assist each other to make decisions and add information from their own experience and resources (Cusins, 1995). A key aspect of action learning is asking questions to develop a better understanding of the functions, skills, knowledge, and processes required to implement an activity or solve a

problem. This requires learning how to find out what one needs to know as well as mastering existing knowledge bases.

Situated Cognition

Cognitive scientists study how learning occurs by examining, perceiving, thinking, remembering, understanding language, solving complex problems, and other activities for making sense of our environment (Stillings et al., 1987). Recent research on how individuals acquire expertise in job tasks has emphasized the importance of the social and physical context in learning. Raizen (1989) noted that experts "call upon a range of clues provided by the environment, the practice and experience of their fellow workers, and their own situated knowledge to address the task at hand" (p. 37). Learners rely on the context in which instruction occurs to determine the usefulness and meaning of knowledge (which is culturally situated and socially constructed), and this is critical to their ability to transfer that knowledge to new situations (Brown, Collins, & Duguid, 1989). Drawing on the processes whereby novices apprentice themselves to an expert or master practitioner who can model skilled behaviors and authentic activities within a realistic work setting, Collins, Brown, and Newman (1989) proposed a cognitive apprenticeship model of teaching. This approach includes four elements: content, methods, structure, and social aspects. The *content* of learning includes conceptual, factual, procedural, and strategic knowledge as well as the "tricks of the trade," cognitive management strategies, and learning strategies used by expert practitioners. *Methods* of instruction include modeling by an expert, coaching, scaffolding and fading support by the teacher, student articulation and reflection on learning, and exploration by students with experiential feedback. The *structure* of learning activities include sequencing tasks to allow increasing levels of complexity and diversity, and building a mental image of the overall process to relate local to global understanding. The social aspects of the learning environment replicate the technology and culture of the work setting, that is, the learning is situated or contextualized, learners participate in a community of expert practice while they perform authentic activities, and learning is cooperative and collaborative. Situated cognition concepts attempt to bridge the separation between knowing and doing by emphasizing the fundamental relationship between what is learning and how it is learned and used.

JOB TASK ANALYSIS AND TRAINING DEVELOPMENT MODELS

Developed to help close the gap between what workers do and what a curriculum teaches, task analysis identifies work requirements of specific jobs using information about tasks performed by workers in that occupation to develop education and training programs based on the realities of the job. Job task analysis identifies what a job includes and how to perform the job (Wolfe, Wentzel, Harris, Mazour, & Riplinger, 1991). The process of job task analysis includes developing and validating a task inventory, prioritizing the tasks, and identifying training applications. Information is gathered from a review of written documentation, one-on-one interviews with expert performers, a review by a panel of expert performers or subject matter experts, or direct observations of workers. Brown (1997) identified three types of task analysis models: worker oriented, job oriented, and cognitive oriented. *Worker-oriented* task analysis gathers information about work behaviors from discussions with job incumbents, observations of job tasks being performed, and worker interviews, as well as from supervisor review of job tasks. Surveys of workers may further define how critical each task is to performing the job (Clifford, 1994). Results focus on the application of work behaviors in performance of job tasks. *Job-oriented* task analysis is a systematic process for collecting information about specific and distinct tasks required for jobs, using employee and supervisor input to identify the specific steps and necessary sequence in completing each job task. The results identify what workers do in a job, how they must do it, how often, in what order, how important it is, and how well they must do it (Wolfe et al., 1991). *Cognitive-oriented* task analysis looks at the thought processes workers use in performing tasks and identifies knowledge and skills needed to perform the task at various levels, using observation and interview methods. It focuses on the interactive, social nature of jobs, the construction of knowledge within a situation, and the problem-solving processes used by workers (Hanser, 1996). The DACUM (Developing a Curriculum) process, used by many secondary and postsecondary educators to develop vocational-occupational curricula, incorporates the above job task analysis procedures in a systematic approach to industry-based curriculum development.

APPRENTICESHIP TRAINING

Berryman (1995) believed that apprentice training is a “paradigm for learning” and de-

scribed some of the pedagogical characteristics of apprenticeship training. In this training, activities engaged in by learners are determined by work to be accomplished on the job. The learning situation consists of a community of experts and of novices who are inducted into expert practice. Learning has immediate use and relevance, since apprentices are doing necessary tasks in actual work processes, rather than practicing for future applications in a job. Apprentice training usually begins with simple tasks and proceeds to the more difficult. It focuses on performance of skills and embedded knowledge that is not always articulated as general principles. Standards of performance success are obvious to the learner and integral to the work production process itself. Little formal teaching may occur, and apprentices take responsibility for their own learning by observing work sequences and identifying areas where additional skills are needed. Collins, Brown, and Newman (1989) noted that “apprenticeship embeds the learning of skills and knowledge in their social and functional context” (p. 454). In contrast to most formal schooling where skills and knowledge are abstracted and taught separately from their uses in a work setting, apprentices learn skills and knowledge from seeing them used by skilled practitioners to accomplish meaningful tasks.

While work-based apprentice learning offers one model for the design of education in the workplace, its effectiveness can be limited by a number of factors. Job specific skills may not be translated into more generic principles for higher order cognitive skills such as defining problems, identifying processes for solving problems, or knowing how to learn. These skills are especially important in work situations that involve nonroutine tasks and the changing work demands that characterize many workplaces today. Tasks and problems assigned to apprentices often arise from job production concerns, rather than the learning needs for the student. The quality of training depends on who is doing the training and how experienced the master or expert is in the job itself and in effective teaching methods (Office of Technology Assessment, 1995). In work settings, as in classrooms, the way that learning activities are organized can enhance or inhibit learning.

CHARACTERISTICS OF QUALITY WORK-BASED LEARNING

Using the concepts and findings from the theory, research, and application discussed above, a list of characteristics can be proposed as a starting point for the design of learning

activities that occur in work settings and as possible criteria for future research or the evaluation of the quality of work-based learning programs. These characteristics include the following:

1. Knowledge and skills relevant for an occupation are taught using learning tasks that contain essential elements of the work identified by actual workers from all levels of the production process or service area.
2. Learning activities are those typical of a profession, including social and organizational aspects (how work is structured and carried out, interactions, and teamwork) as well as the specialized technical skills.
3. Theoretical knowledge is taught effectively in connection with work tasks so that working and learning are closely integrated and knowledge is more easily transferred to new situations.
4. Teamwork, problem solving, and collaborative work skills are taught through the design of authentic work tasks and exercises used for instruction based on input from expert workers and practitioners from the field.
5. Learning involves the use of equipment, tools, and materials actually used in production and services by workers in the occupation.
6. Tasks can be seen and understood in the context of the total system and process of work, and can be related to the end product.
7. Learning activities result in real products or services of use to clients or customers.
8. Learning tasks are sequential (activities follow a logical order), developmental (student moves from simple to more complex tasks and builds on prior learning), and integrated (relation among activities and to a larger whole is made apparent).
9. Learning involves frequent interaction with workers and expert practitioners of various experience and skill level, but one experienced worker is identified and assigned to the student as mentor, coach, and coordinator of learning activities and progress.
10. Learning involves independent activities requiring student initiative and responsibility, as well as supportive coaching, advice, and demonstration by experienced workers.
11. The location of learning reflects the realistic demands of the workplace and the work contexts in which knowledge and skills have to be used.
12. Learning occurs in a way that encourages

ongoing, self-organized learning and includes a balance of action, reflection, and application.

The case study that follows illustrates and provides an example of the application of these characteristics and the broader theoretical concepts to the development of instructional materials for use with apprentices placed in small- and medium-sized companies with ongoing production processes. Availability of curriculum materials, developed using job task analysis procedures and action-learning principles, structures the learning experience of trainees. Learning is situated in authentic work settings, involves actual work processes, and requires interaction with more experienced workers as well as self-responsibility for learning results. The work settings are in Germany, which has a long tradition in apprentice training and employer involvement in structuring work-based learning experiences.

CASE STUDY: USING REAL WORK PROCESSES TO DEVELOP SYSTEMATIC ON-SITE TRAINING IN SELECTED GERMAN ENTERPRISES WITH APPRENTICESHIP PROGRAMS

Germany has long been recognized for its leadership in apprenticeship training and the involvement of employers with education for work. This case study describes how work-based learning materials were developed for use on site in smaller businesses that had an interest in apprenticeships but had limited resources for training. Due to ongoing production demands, large German companies have begun operating separate, centralized training facilities where apprentices spend time physically removed from regular production operations of shops, offices, and laboratories (Stern, Bailey, & Merritt, 1996). This trend has created problems for smaller companies that cannot afford centralized training options and that need to rely on decentralized models of training which occurs in their own facility without disrupting production processes.

The Challenge

The development of highly automated production systems, together with changing economic and regulatory demands on industry, has created the need for corresponding changes in the way practical vocational training is designed and provided to enterprises in Germany. Industry trends such as decreasing batch sizes, shorter delivery terms, and mandated quality certifications require new knowledge and different ways of working than in the past. For small- and medium-sized enterprises, training on location is more desirable than the

current trend by large enterprises to remove vocational training from production sites and centralize it in apprentice shops or intercompany training centers so that it will not interfere with production. One result of this separation of training from actual work sites has been that subject matter is taught more abstractly, in isolated courses, and is more difficult to apply in real work situations.

Responding to the Challenge

To counteract this trend towards centralized vocational training programs, the German Federal Institute for Vocational Education launched a series of pilot studies that investigated ways of utilizing real work processes for systematic training in small- and medium-scale enterprises with apprenticeship programs. Trainees were to be instructed in the enterprise using work tasks and work order documents specific to the company, as well as more general learning tasks. Working and learning were closely linked to each other, and theoretical knowledge was imparted in connection with the work tasks. Participants in the four-year pilot process, which began in 1991, included eight enterprises located in the Black Forest, the chamber of industry and commerce of the Schwarzwald-Baar-Heuberg region, the labor exchange authority in Villingen-Schwenningen, the vocational school of Donaueschingen, and several vocational education consultants. The Fraunhofer Institute for Industrial Engineering (IAO) in Stuttgart and the Center of Vocational Education Turmgasse in Villingen-Schwenningen, Germany, developed and implemented the training materials in the project (Wilke-Schnauffer, 1994).

In the Federal Republic of Germany, vocational education takes three and one half years of training and is organized as a "dual system." Theoretical training is taught in state vocational schools (approximately one to two days a week). Vocational education is divided into three phases: basic vocational training (one year), vocational training in specialized field (one year), and an even more specialized vocational training (one and one half years). The pilot study introduced above and described in the following text fits into the second and third phases of vocational education.

Theoretical Framework

The theoretical framework that guided development of the curriculum is based on the action regulation theory (Volpert, 1985) in which learning is understood as a specific form of human activity. The subject matter of learning in vocational training is the activity of

work. The complete work task, which is typical of the profession and includes planning, execution, and verification cycles and hierarchical structures, becomes the point of departure and the objective of training (Skell, 1993). This means that the holistic tasks that are usually carried out by skilled workers in their jobs during a period of several hours or days are the subject matter of learning rather than the individual elements of the work tasks. The company-specific embodiment of work tasks typical of the profession is therefore the only possible concrete subject matter. Owing to its complexity and wholeness, the learning can best be imparted at the workplace itself. This is the only place where they are integrated into a complete system of work and where they are surrounded by other workers of varying age and experience. Trainees also are prepared for future work tasks that may differ from current work requirements. For example, more communication and teamwork is required by training exercises than is found in the existing work tasks.

In addition to encouraging cooperative interactions, trainees also are expected to learn in an independent manner during the training in order to prepare for self-organized, ongoing learning. For example, trainees may read technical literature on a machining process involved in the current work task and/or consult a more experienced coworker. But the decision on the procedure and the extent of the learning activity is up to the trainees so that knowledge can be developed to provide a basis for decision making in the future as well.

In activity-oriented learning, language has a special significance. Learners are asked to describe sequences of activity with language in order to utilize the activity-regulating function of language for creation of appropriate mental images (Galperin, 1979). The underlying intent is to recognize general principles in the actual work activity, represent them consciously with language, and anchor them in a transferable way. This enables transfer of learning to situations where circumstances may not be identical to the learning situation.

Developing the Learning Materials

Before real work tasks could be used for training, information had to be gathered from the enterprises. This was accomplished in several steps. First, managers were interviewed to obtain an overview of the range of products, production plants, and sales channels of the eight enterprises and the company-specific tasks of the skilled worker professions for which training takes place. Second, the training situation in each enterprise was analyzed

to identify conditions for learning within production processes and the availability of machines and equipment for training purposes. Third, work tasks at skilled workers' workplaces were selected where the trainees could work and learn in cooperation with the employees responsible for training. Each of these tasks was then analyzed through a question-

naire and the various components represented in chart form (see Figure 1).

Structure of Learning Materials

The learning aids developed from this information are called *work tasks and exercises*, indicating that they address both real work and learning activities. The term designates a

Technical/Special Requirements	Organizational Requirements	Supervisory Ability/Social Requirements	General Requirements
<ul style="list-style-type: none"> -Preventive Maintenance -Systematic location of errors: -Systematic location/analysis of malfunctions -Perform minor repair work -Bringing the system "back to operation" preferably without exchanging parts -Major malfunctions: leading the person performing the repair work with the greatest possible degree of exactness to the source of the error -Operation of diagnosis devices -Basic electronical knowledge (especially for error diagnosis) -Resetting of Machines: -Preparation of work plans -Removal/fitting back of parts -adjustment -test/correction -Programmable Operation Material: -CNC-machines: -operation of many different controls -Programs: load, change slightly (as requested) -Handling devices -Quality Control: -Familiarity with many different measuring instruments/ability to operate them -Familiarity with/ability to perform -Statistical process control (SPC) -Mastering of Control Technique: -Ability to read/understand process diagrams -Mastering of pneumatics -Mastering of hydraulics -Familiarity with SPC -Special Requirements: -Precision processing procedure -Screen work -Driving technique (controlled drives) 	<ul style="list-style-type: none"> -Preparation of shift plans (types, number of pieces, manpower) -Keeping of a shift record/documentation -Disposition (via screen: material, tools, spare and wear parts, operating material, environmental protection) -Calculation of payment -Planning of repair work 	<ul style="list-style-type: none"> -Tenacity of purpose -Being respected -Handling of rivalries -between groups -between individuals -Setting an example (in general) -Self-confidence -Honesty -Mastering of machines (technical expertise) -Further qualification of subordinates -Give fellow workers meaningful tasks, even in the case of an assembly line standstill -Calculation of payment structure, including defense and reasoning in front of fellow workers 	<ul style="list-style-type: none"> -Product responsibility -Machine responsibility ("my machine") -Logical thinking/engineer-type thinking -Mental flexibility

Figure 1. Requirements of the firms for industrial mechanic engineers and industrial electronic engineers in the field of production techniques.

series of tasks with graduated levels of difficulty, having the following characteristics:

1. Each work task and exercise is structured as a complete work order.
2. Work orders are processed that are typical for the field of activity.
3. Work tasks and exercises presented at an early stage cover characteristic requirements occurring in almost all work orders.
4. Tasks presented at a later stage include skills required at a previous stage plus additional and new ones.
5. The degree of difficulty rises reasonably from one work task and exercise to the next.
6. For each work task and exercise, several work orders should be derived from the everyday spectrum of orders.
7. Theoretical knowledge of facts is covered when required in the practical part of the task.

Each work task and exercise to be completed by trainees consists of texts and figures that are not specific to a company but are typical for the profession, and an integrated complete set of order documents for a currently existing order used in the company. The essential characteristics of learning activities are those of a real work task integrated into the work system. Each task folder starts with orientation on the components of the typical work task and the structure of the learning phrases. Processing of partial tasks is illustrated in Figure 2 using an example from an enterprise involved in the project.

The example includes documentation on work orders that have been processed by the company. The difference between actual work and the work task and exercises is that time is provided to the trainees for reading, consultation, and practice, and informational material is available at the worksite. The deadlines for

Figure 2. Sample learning materials (work task and exercises) derived from industry-identified tasks and work order documents.

processing the work task are less tight than in the usual production process, but the trainees know about them from the order documentation.

In the associated nonspecific text, questions and tasks concerning the order documentation are presented. Structural task diagrams are used to help trainees visualize the subdivision of work tasks and how each is related to the whole process. Approximately 25 pages of nonspecific text outline the essentially nonvariable steps of a typical vocational work activity. The trainee responds throughout with concrete and general knowledge, using questions included in the text or arising from the work activities. Each work task and exercise covers a complete work order, but also touches all operational areas of an enterprise and includes future tasks needed by skilled workers. It is made up of nonspecific instruction documentation and the specific order documentation of an actual work order in the company. The instruction documentation is phrased so that it can be used with different work orders. This offers the possibility of forming a series of work tasks and exercises with increasing levels of complexity and comprehensiveness. In this way the structure of the complete work task is already mentally available to the learner after completing the first task. Each subsequent task is merely an extension using the same basic structure, allowing new company-specific work tasks and exercises to be constantly developed in the enterprise.

Working with the Learning Materials

Once the materials have been developed, the company employee responsible for training in the enterprise selects a work order from the current customer orders. The trainee, who should be at least in his or her second year of training, receives a copy of the text of the work task and exercise and the company-specific order documentation. This becomes the training workbook for the trainee to write in and add additional information. The employee responsible for training and the trainee mutually decide the extent to which partial tasks should be processed by the trainee, depending on the trainee's actual level of skills.

The trainee processes the entire work task and exercise, guided by the text and by supporters whom he or she consults whenever necessary. In this way, task-related conversations with other employees are initiated and continuous attention to the trainee by a trainer is not required. Even the quality inspections of the product are carried out independently by the trainee during the working process. Since trainees use structured realistic job orders,

actual products are produced and sold, so that trainees learn responsibility for the usability of their products. After processing all partial tasks of a job, the trainee discusses the work and learning steps with the trainer. This is useful for reflection on the subject matter by the trainee and provides feedback to the trainer who uses it for selecting the next work task for this particular trainee. Subsequent work orders are at a higher level of difficulty. By exchanging job orders it is possible to establish a series of tasks with an increasing degree of difficulty, and by completing more complex jobs, the trainee develops higher levels of professional competency (see Figure 3). It continues to be the trainer's responsibility to intervene in the process whenever problems arise that the trainees are not able to solve on their own.

Results

The primary sources of information about the effectiveness of these materials for training are interviews with the trainees and the instructors after completion of the work tasks and exercises in an enterprise. Preliminary feedback is qualitative and descriptive because of wide variation in processing time for the exercises, experience levels of apprentice trainees, complexity of work situations, and interruptions in the completion of work tasks and exercises by trainees for various reasons. So far, three work tasks and exercises have been evaluated. In all three cases, both the trainees and trainers were able to work successfully with the materials and saw positive results in learning. For example, one set of materials was used by a group of five trainees in their second year of apprenticeship. Using the training materials, they were able to assemble the production part independently. They gave each other mutual support at various points of the work task, found the exercises interesting and able to be solved, and worked with a high motivation level. The size of the materials (25 pages) was not felt to be too large, and the integration of the work task into the operational context through structural diagrams was appreciated. The instructor found it easy to select tasks that were suitable to the skill level of the trainees and to vary the degree of difficulty as needed.

It has become evident that the application of work tasks and exercise methods also offers opportunities for implementing teamwork concepts in organizational development. These findings will be integrated into other projects on continuation training for employees. The next steps in the project involve organizing intercompany training sequences in which trainees will process coordinated work tasks

Figure 3. System of work tasks and exercises encompassing basic to complex job competencies.

and exercises in several enterprises. After further tests, the materials will be revised and made available to the public for practical application in training. A guide for training instructors in enterprises to use these materials is also currently under preparation to facilitate broader use of the training materials developed in this project.

An overview of issues related to the development of quality work-based learning experiences and materials has been presented. It includes identification of relevant learning theories, curriculum development approaches, and information on contextual learning applications such as apprenticeships. Using characteristics of quality work-based learning drawn from this literature, a practical example of the application of this knowledge to development of apprentice training materials within German industries has been provided as an illustration and model.

As high schools and community and technical colleges increasingly incorporate various forms of work-based learning into their curricula to prepare students for work, questions about how to structure and implement

this learning will become more important. Extending the learning environment from the classroom into the workplace will require greater understanding of how learning occurs in ongoing work settings and how this differs from the traditional school-based curriculum. The experience of countries such as Germany that have been designing situated learning for apprentices for many years can serve as a resource and collaborative source for work-based learning curriculum efforts in the United States and elsewhere. Much more information is needed to fully answer the questions posed at the beginning of this article. Research and evaluation that builds on situated learning principles seem to hold promise for producing deeper understanding of the process of learning in the context of work. Work-based learning, an integral part of school-to-work transition, has been identified as a critical direction for occupational education reform. Whether or not it fulfills its promise may depend on the quality of the design and content of that experience and how well schools and employers work together to educate tomorrow's workforce.

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