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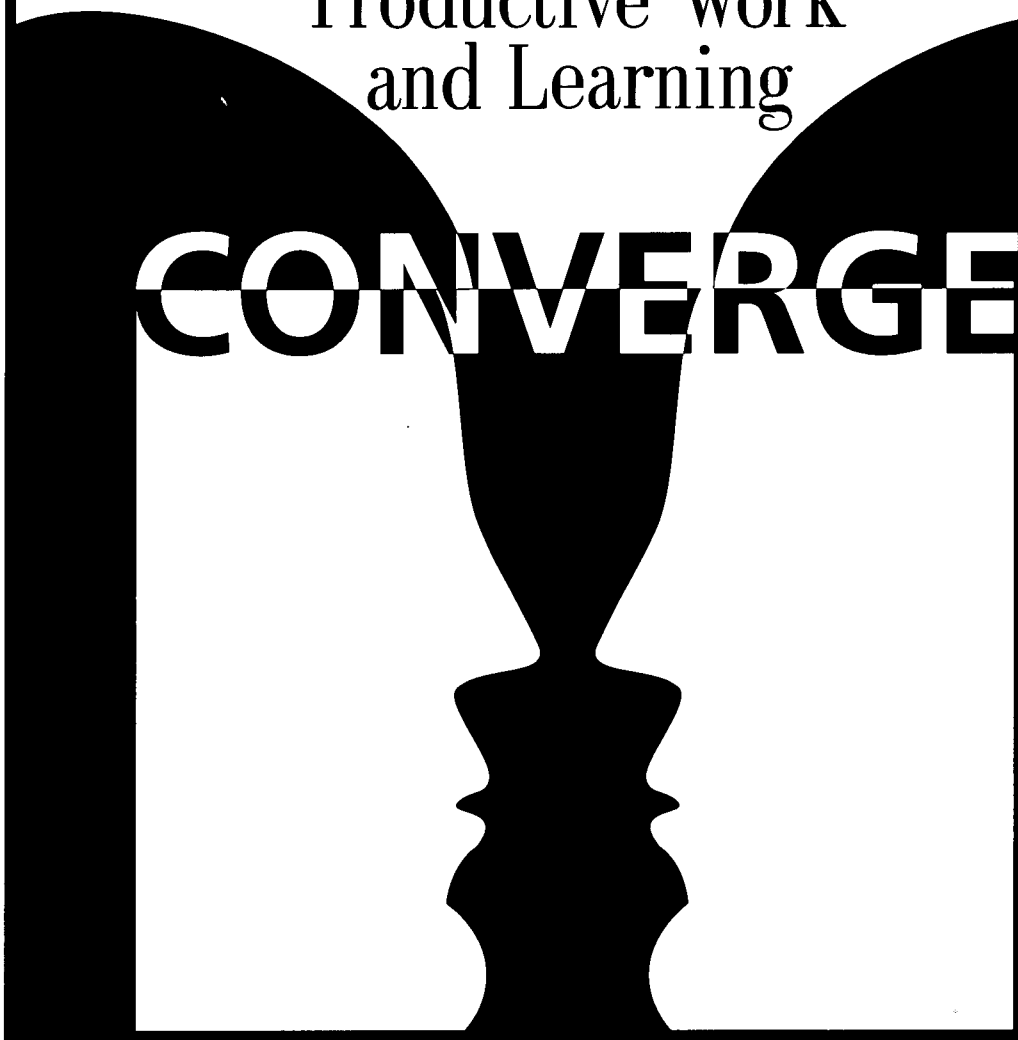
ABSTRACT

The Teaching Firm project examined the process and role of informal learning in seven high-performance work organizations in the manufacturing industry. The working concept of a teaching firm was defined as "an environment in which teaching and learning are institutionally and culturally embedded in the organization and are perceived to be beneficial to both the firm and the individual." The following were among the data collection activities conducted: shadowing and observation followed by interviews; individual in-depth interviews; focus groups of 1-12 participants each; and a survey of 899 individuals. The following were among the key findings: (1) the primary drive for informal workplace learning is the need for employees to meet larger organizational and individual goals; (2) organized work activities were the primary setting for informal workplace learning; (3) contextual factors play an enormous role in the overall frequency and quality of workplace learning; and (4) educators were able to identify gaps between school- and work-based learning, which often motivated them to change their educational approach. (Fifty-five tables/figures are included. The bibliography contains 32 references. An appendix of economic

analyses presents 16 tables. Discussions of the study findings' implications for firms, K-12 education, community and technical colleges, and economic development conclude the document.) (MN)

The Teaching Firm

Where Productive Work and Learning



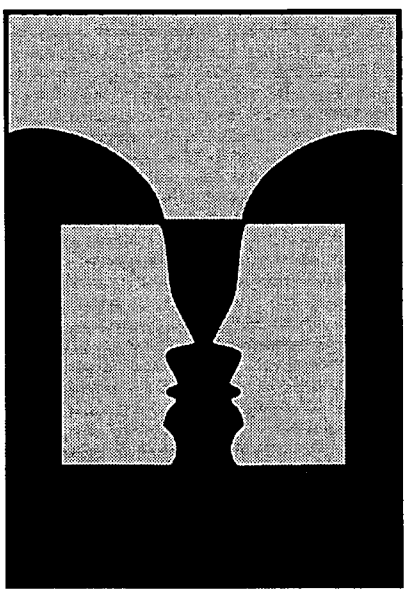
Report on Research Findings and Implications

Center for Workforce Development
Education Development Center, Inc.
Newton, MA
January 1998

The Teaching Firm

Where Productive Work and Learning

CONVERGE



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Introduction

AN INTRODUCTION TO THE TEACHING FIRM PROJECT BY PROJECT CO-DIRECTORS: MONIKA ARING AND BETSY BRAND

The concept of a Teaching Firm was developed by the Education Development Center (EDC) in 1992 when it became clear that America needed to work much harder to prepare and develop individuals for work in order to maintain a high standard of living and compete successfully in the global economy and Information Age.

In terms of preparing students for the workplace, schools still had a massive challenge ahead of them, and, in most cases, businesses were only beginning to make a commitment to developing their own workforce. EDC believed that schools and firms must work as true partners in workforce preparation and development, and that both play key roles in ensuring that American workers have the skills to maintain a high standard of living and to be prepared to learn continuously throughout their lives.

EDC participated in discussions with numerous groups, such as the National Alliance of Business, the National Center for Research in Vocational Education, Jobs for the Future, the Human Resources Development Institute of the AFL-CIO, Siemens USA, and Motorola on how to increase employer involvement in workforce preparation and development activities and how to make workforce education and training programs more effective for students in school and adults in the labor market.

Additionally, reports such as *America's Choice: High Skills, Low Wages* raised these issues to the national focus and provided a basis for the Teaching Firm project.

Much of the debate in the late 1980's and early 1990's about improving the skills of the American workforce focused on changing the way the public education system operates and prepares students for careers with little attention being paid to identifying strategies that would involve large numbers of employers in the preparation and development of the workforce. While schools and colleges, which we consider to be the suppliers of human resources to business, have increased the number of applied and technical courses in career fields and offered internships for some students, much more needs to be done.

Also, in the past, workforce preparation was seen as a path for only some students, and accorded less attention. But with the press for all students to become lifelong learners and to be prepared for changing and various careers, as well as the urgent calls from business for highly skilled employees, each student today needs to learn the skills to be successful at work.

In the early 1990s, it became clear that schools and businesses would have to work much more closely together in order to ensure a highly skilled workforce. Business needed to be more involved in the process of workforce preparation and development, so that the supply side and the demand side (business being the customers of the education and training system) would be working in tandem, that changes would be made in both supply and demand systems with some rationality, and that there would be a fit between the supply and demand in the labor market. Also, schools and businesses must share information in order for schools to know what skills and knowledge businesses needed and so that businesses can create good learning environments for students and teachers.

While it was easy to exhort business to be involved in workforce preparation programs, many were not involved; nor were they involved in workforce development programs for their own incumbent workforce. Many businesses remain skeptical of the value of these programs or do not have the resources to invest in formal training programs. We also believed that employers would not be involved in workforce preparation programs with schools unless they already had a commitment to the development of their current, incumbent workforce.

We hypothesized that high performance work organizations that had a strong commitment to the development of their current workforce would be good partners for schools and colleges, and that the knowledge that the firm possessed could be useful to the education system in designing workforce preparation programs. We also hypothesized that these firms would provide good learning environments for students involved in school to career programs as well as for their incumbent workforce. And we further hypothesized that a firm that actively promoted the sharing of information and learning both internally and externally would be more productive.

In 1993, Education Development Center initiated Phase I of the Teaching Firm project, with small grants from the U.S. Department of Education, the U.S. Department of Labor, and the German Marshall Fund of the U.S., to explore with employers and high performance work organizations the notion of a teaching firm.

Our working concept of a Teaching Firm, in its ideal, was:

An environment in which teaching and learning are institutionally and culturally embedded in the organization and are perceived to be beneficial to both the firm and the individual.

A Teaching Firm defines the orientation of a company along two dimensions: internal, with its own workforce, and external, with suppliers. In its internal relationships, a teaching firm intentionally creates a workplace environment that maximizes opportunities for informal and formal learning for both individuals and the organization. This learning is in concert with the organization's goals and is seen as mutually beneficial to both the workers and the firm.

In its external relationships, a teaching firm intentionally teaches or trains its suppliers, including the suppliers of human resources, e.g. the schools and colleges, to ensure that suppliers meet standards for quality. This relationship between the teaching firm and its suppliers, including human resources suppliers, is seen as mutually beneficial to both the schools and the firm

We believed in the concept of a "learning organization", as defined by Peter Senge, and agreed that "learning is not something that requires time out from being engaged in a productive activity; learning is the heart of productive activity", Senge, P. (1990) *The Fifth Discipline: The Art and Practice of the Learning Organization*. But we also believed that teaching is a fundamental part of sharing knowledge and of learning, and we wanted to examine companies that actively supported teaching through their practices and in particular to look at how firms "taught" students involved in school to career programs. In the broadest sense, we wanted to study firms that shared their knowledge with their workers, the surrounding community, schools, and colleges as Teaching Firms, much along the lines of a teaching hospital. Lastly, our notion of a Teaching Firm was one that would recognize everyone as a teacher, regardless of position, stature, tenure, or location and create a climate to encourage boundless teaching and learning.

We decided to look particularly deeply at informal teaching and learning embedded in work activities. We were interested in studying informal teaching and learning, because so little research exists in this area. Also, because numerous public education system reform efforts were beginning to explore applied, contextual, and constructivist learning approaches, relying on some forms of informal teaching and learning, we felt our research into informal teaching and learning embedded in work activities might have value and currency for these new pedagogies.

To explore our ideas, EDC carried out four case studies at Motorola, Siemens, the City of Austin, Texas, and the Alliance for Employee Growth and Development to examine formal and informal teaching and learning activities supported or sponsored by employers for both incumbent and future workers. In addition, the National Alliance of Business sponsored two focus groups with employers, and the AFL-CIO organized a focus group with directors of education and training from organized labor.

From these activities, EDC found a significant interest in the concept of a teaching firm and found that some characteristics of a teaching firm might include: having a long-term view of the company's activities and goals (not just on quarterly profits); a focus on systems; strong leadership in promoting education and training and learning; the attitude that employees are assets; and providing learning opportunities in a variety of ways and settings.

Following the completion of this exploratory phase, EDC designed a full-scale research project to study seven high performance work organizations in the manufacturing field to look at how formal and informal teaching and learning occur in the firm and in

relation to the firm's suppliers, including the education system. Funding was obtained by the Pew Charitable Trusts and the U.S. Department of Labor in 1995 to initiate research at Motorola. Following an in-depth period of research at Motorola and initial analysis, the Teaching Firm determined that the project would be strengthened by working with state governments and added six states — North Carolina, Washington, Pennsylvania, Florida, Connecticut, and Massachusetts — as partners and funders of the project. Each state then helped to select a firm to be studied during the research period and to work with after the research was complete. The firms selected were: The Boeing Commercial Airplane Group in Washington; Siemens Power Transmission and Distribution, LLC in North Carolina; Ford Electronics in Pennsylvania; Merry Mechanization, Inc. in Florida; Reflexite North America in Connecticut; and Data Instruments in Massachusetts.

Field research was conducted from 1995 through July of 1997 with a goal being not just a final report on the findings, but usable and valuable information and material that can be used by the firms, the schools, and the state government partners in promoting workforce preparation and development. While this phase of the project is now completed, the next phase, the implementation phase, is just beginning.

Executive Summary

INTRODUCTION

The Teaching Firm project is based on the idea that the long-term employability and flexibility of American workers depends on employees' ability to learn on the job.

Building on a 1996 U.S. Department of Labor's Bureau of Labor Statistics report indicating that as much as 70 percent of all workplace learning may be informal, our study investigated the nature of informal workplace learning. This report outlines how informal workplace learning is critical to a company's overall effectiveness and, ultimately, its ability to compete economically in a rapidly changing and increasingly demanding global marketplace.

With rich qualitative and quantitative data from more than 1,000 participants, our study constitutes the first large body of empirical findings describing informal workplace learning. As a whole, the study presents compelling evidence that informal learning is the fundamental way that workers develop competence, and acquire new skills and information.

Our findings have implications for workforce and economic development, and point to ways that firms, schools, and communities can work together toward the betterment of workers and organizations. More specifically, the project co-directors believe that a deeper understanding of informal workplace learning and its contribution to productivity factors will help build a business case for why firms should participate in school-to-career programs.

To frame our research, we formulated functional definitions of a Teaching Firm and informal workplace learning.

For the purpose of the study, we defined a Teaching Firm as:

An environment in which teaching and learning are institutionally and culturally embedded in the organization and are perceived to be beneficial to both the firm and the individual.

We defined informal workplace learning as:

Informal workplace learning is learning in which the learning process is not determined by the organization.

The definition distinguishes between the goals of learning and the process of learning. An organization may (or may not) have a goal for learning to occur yet learning is informal if it does not determine the process of learning. This definition allows for organizations to have explicit goals of increasing informal learning and creating the environment which will facilitate it.

OBJECTIVES

The primary goal of this study was to demonstrate empirically the significant role informal learning plays in the workplace. The study was designed to identify, examine and analyze the various ways that informal learning occurs throughout the workplace.

Our objectives were to:

- Gain insight into the nature of informal learning in the workplace, specifically:
  - Why informal learning occurs;
  - How informal learning occurs; and
  - What is learned informally.
- Enrich the understanding of the value of informal learning to the firm.
- Understand the role of informal learning in school-to-career programs.

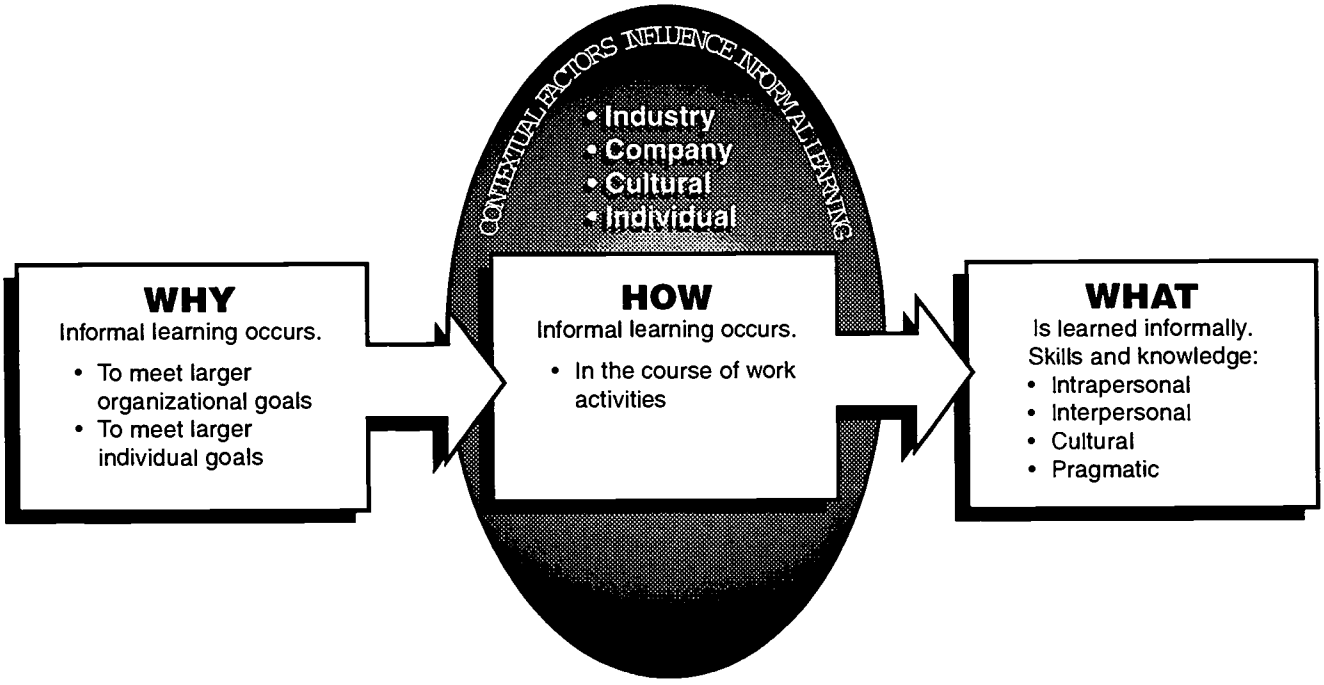
FINDINGS

The following is a summary of the research findings:

- *Why informal learning occurs.* The primary drive for informal workplace learning is the need for employees to meet larger organizational as well as individual goals. Organizational goals include increased employee participation in the decision-making process and expanded job responsibilities; individual goals include survival, security, respect, self esteem and personal growth, among others.
- *How informal learning occurs.* Organized work activities are the primary setting for informal workplace learning. The *majority* of informal workplace learning occurs during teaming, meetings, customer interactions, supervision, mentoring, shift change, peer-to-peer communication (goal- and non-goal directed), cross-training, exploration, on-the-job training, documentation, execution of one's job and site visits. Significantly, the richest informal learning opportunities are not always the most frequent. Also, there are direct factors that affect the quality and amount of informal learning that occurs during these activities.
- *Contextual factors affect the amount and quality of informal workplace learning.* Contextual factors , specific to the industry, company and individual, play an enormous role in the overall frequency and quality of informal workplace learning. Hence, the same activity implemented in two different organizational contexts will result in different types and levels of informal learning. Consequently, organizations seeking to introduce or increase informal learning need to understand the context within which the informal learning activities are embedded.
- *What is learned informally.* The content of informal learning includes information that is task-specific (pragmatic) as well as broad — intrapersonal (e.g. critical thinking and integrating feedback), interpersonal (e.g. providing constructive feedback, working as a member of a team) and cultural (e.g understanding important business goals, understanding the Big Picture). Formal and informal training prepare employees in the pragmatics of the job. However, the majority of broader information is learned informally. Additionally, the developmental context for informal learning is the progression of employees from inexperience to competence in these four areas of learning.
- *The relationship between informal and formal workplace learning.* Employees develop skills and knowledge through a combination of informal and formal learning opportunities. Informal learning is ubiquitous and fulfills many learning needs. However, when both informal and formal learning occur, employees have richer opportunities for development. In general, our research considers formal and informal learning as existing along a continuum rather than as being two dichotomous learning processes.

- *School-to-career programs inform educators, teachers and students of informal learning's value in the workplace.* Educators were able to identify gaps between school- and work-based learning and this often motivated them to change their educational approach. Additionally, teachers were able to identify various informal learning activities and often changed their teaching style and content to reflect more informal learning in the classroom. Students embraced the new approaches and gained a sense of mastery and direction in their lives, and improved their academic performance.

A Graphic Representation of the Findings



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RESEARCH REPORT

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EDC

HOW TO USE THIS REPORT

This report provides the reader with background issues on informal learning and the Teaching Firm, as well as with an in-depth analysis of the empirical findings on informal workplace learning. In general we recommend that readers read through all sections of the report because together they tell a complete story— the story of informal workplace learning. However, since different audiences (such as academics, educators, policy makers, or corporate representatives) may have different needs and reasons for reading this report, the following section will highlight the content of each section of the document and will emphasize points of interest for particular audiences. We will conclude this "preview" of the upcoming sections with a discussion on how not to use this report.

Introduction

The introduction section describes the overall objectives of the study, the methodology and literature review.

The methodology section outlines how the study was conducted, and the firms that were investigated. This section provides the reader with insight into how the results were obtained.

The literature review defines the important terms used in the report (primarily "job" and "learning"). This section is important to academics, educators, and public policy makers, who seek to understand the intellectual context within which this study was conducted and the theoretical and applied contribution of the study. Additionally, this section provides the reader with the definition of informal learning and an understanding of the Teaching Firm concept.

Findings

Each findings section begins with an overview that summarizes the main findings and emphasizes the important conclusions of that section. While most summaries tend to come at the end of a chapter, we have included an up-front summary because of the richness of the detail in each section. Since the document will be read by varied audiences, the up-front summary will enable readers to determine the relevance of each section to their goals.

There are four findings sections, including: Why informal learning occurs; how informal learning occurs; contextual factors influencing informal learning; and what is learned informally. Readers who are interested in increasing informal learning within organizations are urged to read these sections carefully.

The section titled "Why informal learning occurs" provides the underlying reason for the occurrence of informal learning in the organization. This section suggests that informal learning occurs as individuals and organizations pursue goals other than those directly pertaining to informal learning.

The section titled "How informal learning occurs" describes the everyday work activities where informal learning occurs. These activities are described in depth, so the reader understands the structure of the activity and the direct factors that facilitate informal learning within the activity.

The section titled "Contextual factors which influence informal learning" describes how the environment can influence informal learning. A primary finding in the study is the strong connection between the culture of an organization and informal learning. The cultural and contextual variables are described in depth, and the way they can interact with informal learning activities is outlined.

The section titled "What is learned informally" describes the organizational and individual skills that are acquired through informal means. For example, many individuals learned informally about how to solve problems in the workplace.

Taxonomies and Ideal Scenario

The taxonomy section provides a compelling table format representation of the major findings. The taxonomies represent research findings that have already been elaborated upon in the text of this document. This is an opportunity for the reader to see all of the findings in one place, and make a connection between the various dimensions of the report, more specifically what is learned, how it is learned and what impacts the learning process.

The contextual factors that impact informal learning are presented in an idealized depiction of a work environment that would, in the best of all worlds, provide the ultimate environment or context for informal learning. The scenario is an abstraction based on the contextual factors that the research found to be important for informal learning.

School-To-Career

The goal of the Teaching Firm research into school-to-career programs is to understand how educators and students perceive the process of informal workplace learning and how this understanding affects their teaching and learning behavior.

How Not to Use This Report

This research project has answered some fundamental questions about informal learning such as why informal learning occurs, how it occurs and what influences it. As such, the research has identified both the causes and manifestation of informal learning in the workplace. In a sense, this research is "descriptive" as it has provided the first large scale empirically derived depiction of informal learning in the workplace.

This research report represents the first step towards increasing informal learning in the workplace. In order to take the findings towards the next step of applying or implementing the knowledge, a "prescriptive" analysis of each worksite needs to take place. The prescriptive phase will develop tools for assessing the informal learning

environment within organizations, and identify ways to increase or improve informal learning within a particular organization.

The current research has shown that informal learning is extremely context sensitive, and that the same activities in different contexts will yield different informal learning results. Consequently in order to understand how to increase or introduce informal learning activities within an organization, an analysis of that organization needs to take place.

This report does not provide guidelines for implementing informal learning activities within organizations. The ensuing prescriptive phase will be dedicated to achieving this goal.

OBJECTIVES

The objectives of this research study are to:

- Gain insight into the nature of informal learning in the workplace.
- What is informal learning
  - Why does informal learning occur
  - How does informal learning occur
  - What is learned informally
- Enrich the understanding of the value of informal learning to the firm
- Understand the role of informal learning in school-to-career programs.

The above objectives reflect the fundamental questions that need to be asked when exploring a phenomena. The objectives represent the goal of not only understanding the manifestation of the phenomena (i.e., how does it occur and what it does), but also the underlying causal explanation (why does it occur). Taken together these objectives will provide a coherent and encompassing depiction of informal workplace learning.

METHODOLOGY

As researchers in the workplace environment, we investigated the structure and dynamics of learning by using integrated qualitative and quantitative research. We avoided imposing any assumptions about a company's culture, priorities or language. To accomplish this we worked to ensure that our research instruments were designed only after a "deep structure" understanding of the internal culture, or cultures, of the company. This emphasis on culture-sensitive research, along with an in-depth analysis of the findings, helped us achieve a nuanced understanding of the values, beliefs, and experiences that underlie employee responses.

For this workplace study, seven companies were selected for research: Motorola, Boeing Commercial Airplane Group, Siemens Power Transmission and Distribution, LLC, Merry Mechanization Inc., Ford Electronics, Reflexite North America, and Data Instruments. The study was conducted on company time with the permission of the workers and the full approval of plant management. Participation was voluntary and responses were kept completely confidential.

Research focused on informal workplace learning at all levels of the organization, including senior managers, first and second-level supervisors, design and manufacturing engineers, and front line workers. However, the research focused on the perspective of front-line workers. Front-line workers are the direct producers of the products and services delivered by the organizations studied, and are the focus of much change in terms of job responsibility. Our emphasis is in line with that of high-performance organizations, who are increasingly aware of the need to foster learning in the lowest levels of the organization.

Research design

Research included a variety of methods, from techniques that incorporated little researcher-respondent interaction (i.e., observation of job performance or survey) to those that involved greater levels of researcher-respondent interaction (i.e., in-depth individual interviews and focus group discussions). These approaches reflect our understanding that informal workplace learning occurs both implicitly and explicitly on a continuum. They also reflect our attempt to gain insight into the relationship between implicit and explicit learning on the job and the processes by which each type of informal learning occurs.

In situations where learning occurs implicitly, respondents may be unaware of and unable to articulate the processes through which they learn. In such cases, observing respondents in the work setting can be highly informative. In cases where learning is more explicit, workers are more conscious of (and may have had opportunity to reflect on) the processes through which they learn, and they may be able to identify and describe these processes in an interview. Taken together, this continuum of research methods creates a more complete portrait of the informal learning process.

The research methodology is also ethnographically informed — it was designed to focus on the connections among people, between people and technology, and between people and the social, cultural and physical settings in which they work.

In order to exploit the above methodologies, an integrated portfolio of qualitative and quantitative research was utilized throughout the study, including shadowing, observations followed by interviews, individual in-depth interviews, focus group discussions, survey and analysis of workplace artifacts and documents. This approach compliments the complexity of the research topic and was aimed at providing a detailed data set.

Following is a description of the various research methods and the total number of employees assessed.

Qualitative Research Methods

The following qualitative research methods were used:

Shadowing and observation followed by interview

Shadowing refers to the observation of an individual, group or location. During shadowing, researchers do not disturb workers except to ask brief questions for clarification. This technique allows researchers to observe behavior in its natural setting and gain insight into learning that may take place unconsciously.

Observation followed by interview involved following and observing an individual as he or she performed normal activities and work tasks. Observation differs from shadowing in that it involves more discussion between the researcher and worker about ongoing work activities. Following the observation, an interview was conducted at the work site. The observation period lasted approximately one hour, followed by an interview of one hour.

Individual in-depth interviews

In-depth interviews allowed the research team to have a focused, one-on-one discussion about workers' opinions and attitudes. These interviews were conducted at the employee's worksite and allowed workers to demonstrate and refer to workplace artifacts. Interviews, which lasted between one and two hours, allowed the research team to discuss explicit learning processes and probe the respondents for insights into their attitudes and behaviors about learning and work-related activities.

Focus groups

Focus groups usually included 8-12 participants and lasted approximately one to two hours. Through a process of questioning respondents and follow-up probing of their responses, focus groups produced an understanding of the underlying attitudes, beliefs and values which operate in the workplace. In addition, the flexibility of a loosely structured group interview enabled the pursuit of unanticipated issues and the posing of new questions that emerged as relevant tangents during the discussion.

Quantitative Research Methods

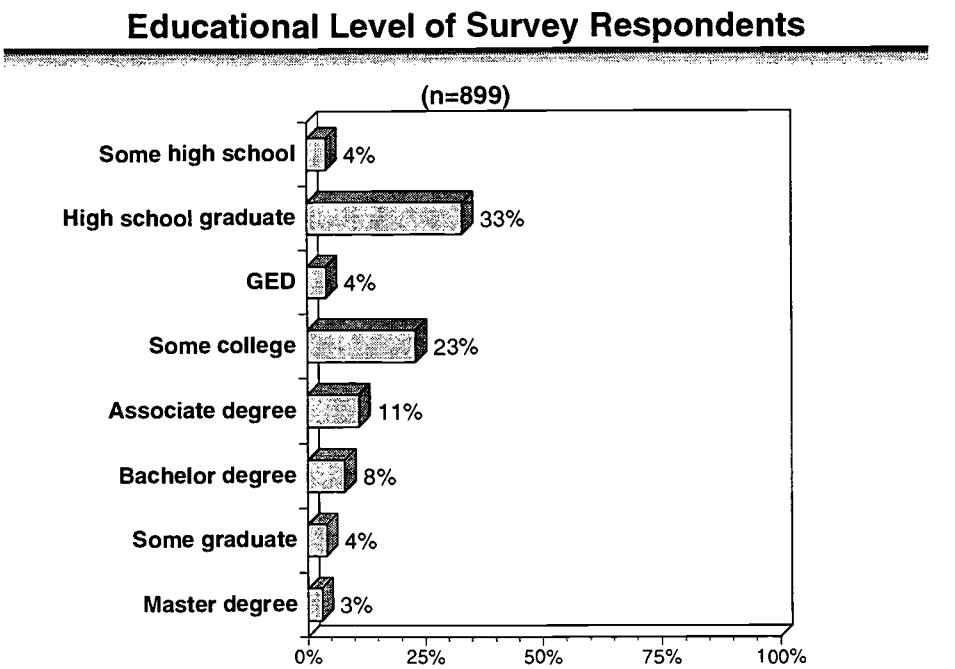
While qualitative research provides an in-depth understanding of the issues, quantitative research, in the form of a survey, gathers data on the diverse attitudes and opinions in the workplace. It is a useful complement to the qualitative data.

A quantitative survey allows for an understanding of the attitudes and opinions of a much larger sample of workers than is feasible through interviews and observations. Based on the qualitative findings that emerged in the initial stage of the field research, a quantitative survey was developed and distributed to workers. The quantitative data was then subjected to statistical analysis. Results of the statistical analyses are integrated into the overall report.

Survey Respondents' Demographics

The following demographics illustrate the range and diversity of survey respondents.

- 46% are between the ages of 17-39 , 30% are between the ages of 40-49, 24% are 50 years or older.
- 73% are White, 11% are Black, 2% are Asian, 1% are Hispanic, 13% defined themselves as "Other."
- 67% are male, 33% are female.
- 64% are married, 12% are single, 6% live with significant other, 10% are divorced.
- Education Level:



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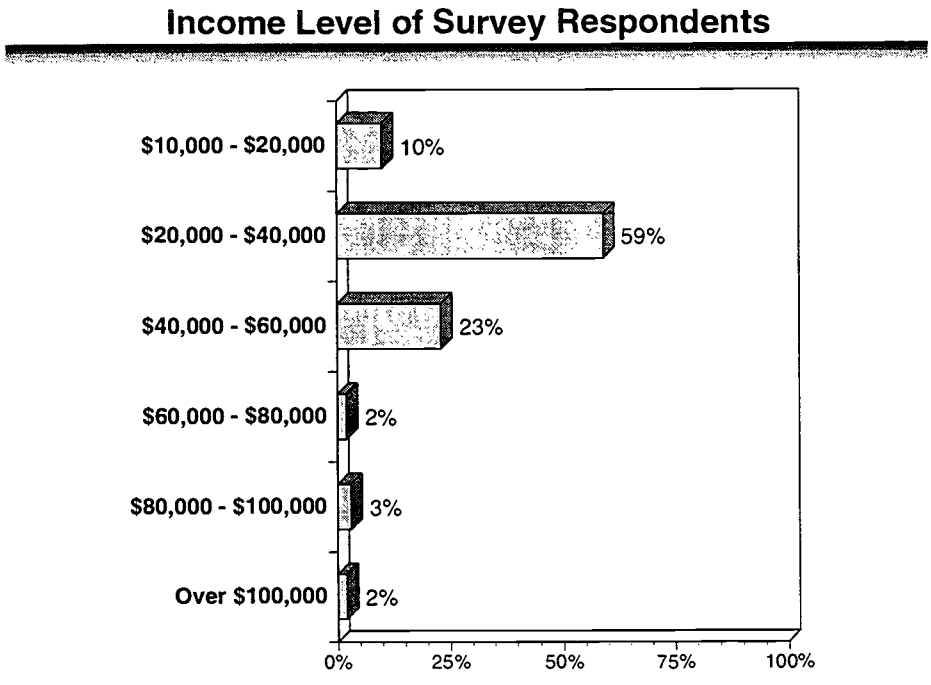
- Income Level:



Survey Respondents' Work Experience

Again, the following data about employee work experience illustrates the range and diversity of survey respondents.

- 32% have worked at the company up to 7 years, 30% have worked 8-10 years, 33% have worked for 11 years or more.
- 34% have worked at the current job for less than 6 months, 34% between 7 months to 7 years, and 28% for 8 or more years.
- 43% worked the 1st shift, 33% worked the 2nd shift, 20% worked the third shift (when shift structure was applicable).
- 13% of respondents have supervisory responsibilities, while 84% reported no supervisory responsibilities.

Secondary research

The field team also gathered documents and artifacts associated with both informal learning and overall business procedures, metrics, and goals. Many of these documents helped to define the structures and constraints operating within the company and impacting informal learning To analyze the impact of informal learning on the firm, the economic analysis team gathered records of economic performance. These included production unit measures of productivity and cost (including average unit labor costs, total cost per unit, and output per worker), product and process quality, flexibility and adaptability (including various measures of cycle time), and other relevant performance measures. In addition, selected demographic data regarding the workers such as educational attainment and amount of formal training received was gathered.

Research Tools Response Rates by Company

Company	Shadowing/ Observing	Individual Interview	Focus Groups	Survey
Motorola	41	17	14	NA
Boeing	12	48	13	298
Siemens	11	41	8	159
Merry Mechanization	5	40	2	38
Ford	25	75	9	322
Reflexite	12	32	7	45
Data Instruments	22	10	4	37
TOTAL	**128**	**263**	**57**	**899**

Study Sites

One research site per state was selected based on eight categories:

- Ownership;
- Size;
- Industry sector;
- Nature and extent of the company's involvement with its product after consumer purchase;
- The firm's explicit description of itself as a Teaching Firm;
- Existence of a formal relationship with educational institutions;
- Unionization of workforce; and
- Scope of operations.

Below is a brief description of each site denoted by the company's manufacturing plant size.

1) Large (over 1000 employees)

Motorola
Motorola is one of the world's leading providers of wireless communications, semiconductors and advanced electronic systems and services. The company was founded in 1928 as the Galvin Manufacturing Corporation in Chicago, Illinois. Its name was changed to Motorola, Inc. in 1947 and its headquarters are now in Schaumburg, Illinois. The company has been experiencing tremendous growth over the past three years and has been emphasizing its corporate effort to incorporate cultural learning in the workplace.

Boeing Commercial Airplane Group
Boeing is the world's largest designer and manufacturer of commercial aircraft, capturing 65% of the aircraft production globally. As of mid-1996, Boeing had 114,000 employees (including employees in its wholly owned subsidiaries) and 102,828 employees in Boeing proper, with 75,545 employed in Washington State. The company is headquartered in Seattle, Washington, where we studied workers at three sites — Aubern, Renton, and Frederickson (with approximately 7500 employees all together) — which are all part of the Wing Responsibility Center. The production facility at Auburn is the second-largest single-site production facility in the world, followed by the company's nearby final assembly facility at Everett.

We focused our study on the wing assembly production line and design engineers work processes. Floor-level employees at the three wing-responsibility facilities are unionized and work together in enormous production and assembly facilities which operate around the year according to full-day, three-shift schedules.

Ford Electronics
The Ford Electronics plant, located in Lansdale, Pennsylvania, is a modern manufacturing plant that is considered technologically state-of-the-art. The plant was built in 1990, replacing an old Philco Ford plant built in the 1940s. The new plant has the latest in robotics and automation for producing powertrain electronic devices for Ford and non-Ford automotive plants. This wholly owned subsidiary of Ford employs approximately 1700 workers, of whom 1000 are production specialists, 350 are skilled tradespeople and 350 are engineers, management and other support staff. The assembly line and skilled workers belong to the United Auto Workers Union and have worked in a team-based environment for the last ten years.

2) Mid-size (200-999 employees)

Siemens Power Transmission and Distribution, LLC

German-based Siemens AG, celebrating its 150th anniversary, employs 348,000 people worldwide, with a reputation for providing highly innovative technical products to clients in such key markets as automotive, components, power and energy, healthcare, information systems, lighting, transportation and telecommunications. With approximately 700 employees, the Siemens' plant in Wendell, North Carolina, makes electrical switchgear and controls for nearly 40% of the worldwide market.

Data Instruments

Data Instruments, headquartered in Acton, Massachusetts, consists of two distinct operations. One makes pressure and displacement transducers; the other makes automation and safety controls for the metal stamping and forming industries. Our study focused on the latter operations, Wintriss Controls Group, which is considered the premiere maker of safety and injury prevention devices. The company employs 500 people worldwide, with 400 employees at the Acton plants. Forty percent of the company is employee-owned through an Employee Stock Ownership Plan (ESOP). Currently, Data Instruments is growing at an annual rate of 15 percent compared to the industry average of 10 percent, and has a low turnover among workers with 3 or more years employment with the company. The plant operates two work shifts on a limited number of production lines.

3) Small (25-199 employees)

Reflexite North America

Reflexite North America is a leading producer of retroreflective materials, the highly light-reflective strips used to enhance the visibility of vehicles, boats, traffic control devices and people working outside daylight hours. Reflexite North America is located in New Britain, Connecticut. The company has an Employee Stock Ownership Plan (ESOP), where all workers are part owners of the company, receive monthly bonus checks based upon the company's performance, and participate in decision-making and review of company financial information. There are approximately 350 employees at Reflexite Corporation's Member Companies worldwide, with some 85 employees at the New Britain converting facility. The company has a slight but steady growth rate with workers employed on average for ten years. The manufacturing operation runs on two work shifts.

Merry Mechanization, Inc.

Merry Mechanization Inc. is a small, privately owned corporation that designs, markets and supports software for precision sheet metal manufacturing. Merry Mechanization Inc.'s software is recognized as the industry standard, driving a variety of machines in a CAD/CAM system. Located in Englewood, Florida, Merry Mechanization Inc. employs approximately 50 people. The production work at Merry Mechanization Inc. entails software development of generic functionality and translators.

DEFINITION OF TERMS AND LITERATURE REVIEW

INTRODUCTION

Overview

In the following section, we present a definition and brief history of important concepts that describe the framework for the objectives and findings of the Teaching Firm project.

Critical to understanding why informal learning occurs is an awareness of the ways in which jobs have evolved in high-performance organizations. For many workers, the job has expanded to include many new responsibilities including understanding production needs, working as a team member, and communicating with customers. Our research shows that it is in this stretch toward increased job responsibilities that much informal learning occurs.

Our research was stimulated by an interest in understanding how this learning is actually manifest in the high-performance environment. To inform our research, we looked to the literature on learning theory and informal workplace learning. We found the interactive learning approach to best describe the nuances of workplace learning. In this approach, learning is described as the "construction" of knowledge through active participation in work communities and interaction with the environment. This understanding helped guide our research methods and attend to the clear and subtle ways that individuals learn in the workplace.

In order to define the scope of our research, we formulated a definition of informal workplace learning. According to our definition, informal workplace learning is learning in which the process is neither determined nor designed by the organization, regardless of the formality or informality of the goals toward which the learning is directed. Thus, informal learning may or may not be directed toward organizational goals, and may emerge naturally in the course of meeting organizational or other goals.

Definitions of a Job

The Traditional Job

In the first two-thirds of the century, jobs were defined in the context of Frederick Winslow Taylor's scientific management system, which emerged out of the industrial revolution (Scientific Management, 1911). In this system, jobs consisted of the "one best" method of performing a task. Rigid time-and-motion studies and job analyses were undertaken by management to identify the optimal way to perform each clearly delineated task. Front-line workers were required to perform these specific tasks "in the best way," with no input into the process and as little thought as possible. Management and skilled employees were responsible for all critical thinking and process design. Scientific management is thus characterized by a sharp distinction between "execution" of work reserved for workers, and "conception" of work reserved for management. This job characteristic was effective in mass production systems where economies of scale could be realized, and when companies could control pricing and had a large internal market for standardized products (Marshall, 1994).

The High-Performance Job

In recent decades, however, many firms have adopted a high-performance profile. This movement toward high-performance is widely understood to be critical to survival and competitiveness in a business environment in which the benefits of the mass production system are eroding due to rising consumer expectation, increased global competition and knowledge-based technology. Organizations are starting to realize that they can no longer be successful when they tolerate inefficiency by separating the thinkers and doers; relying solely on top-down planning; control, and supervision; and accepting the inherent lag and inflexibility of bureaucracy.

High-performance firms are characterized by jobs that require critical thinking and a different style of supervision. These high-performance jobs involve extensive employee participation in what were, in Taylor's time, considered "management functions." High-performance jobs involve less direct (hands on) experience and more indirect (thoughtful) work such as improving quality, productivity, and flexibility. This changing worker role demands technical knowledge as well as skills in interpersonal communication and teamwork. Importantly, high-performance jobs require on-going learning about changing technology, business relationships, and the perspectives of all members of the work community, including management, customers, and suppliers. (Walton, 1985; Marshall, 1994).

At the most general level, high performance work systems achieve continuous improvements in quality, productivity and flexibility by fully utilizing the knowledge and skills of every employee. High performance work organizations are best defined as "Learning Organizations." W. Edwards Deming, the founder of the quality movement, appreciated what is the fundamental assumption of learning organizations: "People are born with intrinsic motivation, self-esteem, dignity, curiosity to learn, joy in learning" (Senge 1990). In keeping with Deming's philosophy, learning organizations are skilled in five main activities, according to David Garvin, a management analyst:

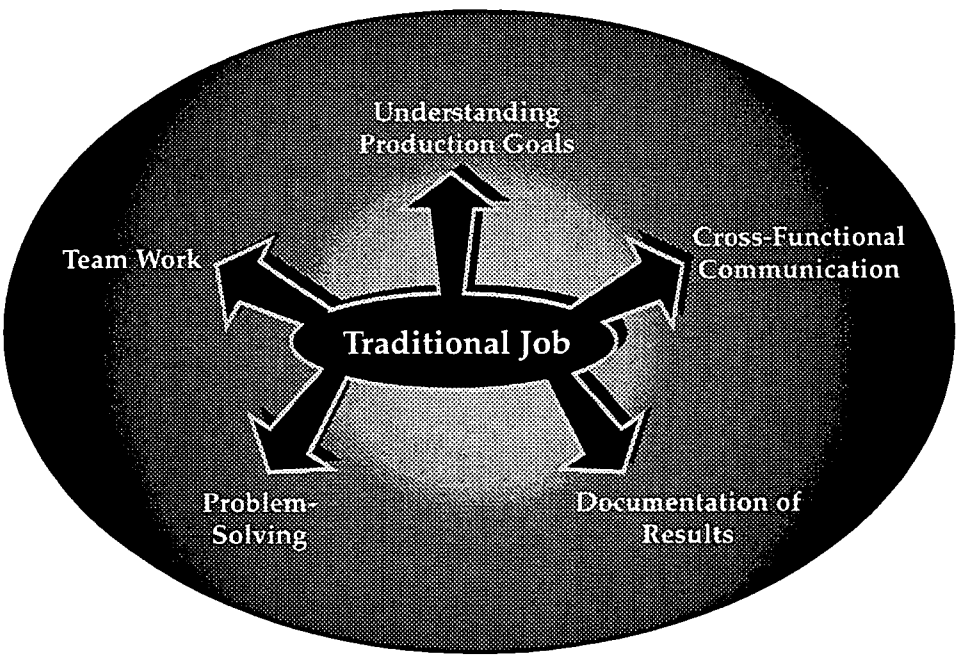
1. Systematic problem solving;
2. Experimentation with new approaches;
3. Learning from their own experience and past history;
4. Learning from the experiences and best practices of others; and
5. Transferring knowledge quickly and efficiently throughout the organization (Garvin 1993, p. 81). Managers and employees share a commitment to continuous learning and teaching which is a driving force in high performance work organizations.

The Job in Transition

The firms investigated in this study were at various stages of moving employees from traditional to high-performance jobs. This stretch toward a high-performance job was experienced by employees, especially front-line workers, as an expansion of their job scope to include more skills and responsibilities than they had previously performed and/or mastered.

It was in this stretch that much informal learning occurs. Our research showed that this change in job scope is critical in stimulating learning in the firms studied. For many, the movement toward high performance jobs moved workers outside of their comfort zone and skill base, creating new learning opportunities and experiences through which workers from all levels of the organization acquire new skills and knowledge.

The Shift From Traditional to High Performance Jobs



Definitions of Learning

The academic literature does not provide a unified theory or definition of learning. Philosophers, psychologists, and educators all have varied interpretations of learning. Here we provide an abbreviated review of the learning literature relevant to this project.

The Classical Definition

In classical psychology, learning was defined in behavioral terms, such as Pavlov's association between unconditioned (e.g., food) and conditioned stimuli (e.g., the sound of a bell) through repeated pairing. This definition could not, however, account for non-associative learning such as observational and insight learning. The definition was broadened, most significantly by the cognitive psychologists working in the 1960s, to refer to cognition or "all processes by which sensory input is transformed, reduced, elaborated, stored, recovered, and used." (Neisser, 1967) Psychologists in this human-information-processing approach sought to understand exactly how learning occurs, i.e., how people transform information between the stimulus and the response. The unit of analysis in this approach to learning is the individual. It is this perspective that has lead to the standard definition of learning as "the act, process, or experience of gaining knowledge or skill." (The American Heritage Dictionary of the English Language, 1992.)

The Interactive Approach

Others have conceptualized learning as individuals and entities interacting within their environment, understanding that the social and cultural context provide tools for learning and the creation of meaning (Vygotsky, 1934; Cole, Gay, Glick and Sharp, 1971; Engestrom, 1994). In this approach, the unit of analysis moved from the individual to the individual in relationship to the environment.

Learning is a meaningful construction and creative use of intelligent cognitive tools, both internal mental models and external instruments. Learning is also participation, collaboration, and dialogue in communities of practice. Finally, learning is also criticism of the given, as well as innovation and creation of new ideas, artifacts, and forms of practice (Yrjo Engestrom,1994). Engestrom describes learning in which the learner is an active participant, i.e. both processes information and forms his or her own opinions and solutions, as "constructivist" learning. In this process, the learner actively constructs information via problem solving or creative thinking.

Lave and Wenger (1990) have enriched this understanding of situated learning: "The notion of participation dissolves dichotomies between cerebral and bodily involvement, between abstraction and experience. Rather, learning concerns the whole person acting the world, a world in which understanding and experience are in constant interaction - indeed are mutually constitutive." They describe the learning process as one in which the newcomers become part of a community-of-practice through a process of legitimate peripheral participation. That is, the newcomer legitimately participates in situated learning from a peripheral standpoint, and moves toward full participation in the sociocultural practices of a community through increasing interactions with the social and physical world.

Within this framework, other psychologists have described the concept of incidental learning, learning that occurs as a byproduct of another activity, such as a task or social interaction (Marsick and Watkins, 1990). Incidental learning may produce tacit knowledge - the knowledge that exists in the relationship between an individual and her environment outside of her main focus. Much practical information acquired on the job is tacit in nature. This knowledge may not be consciously recognized by the individual, and may be created or recognized later, as in comparing past and present information (Sternberg, Wagner, Okagaki,1993).

Another major contribution to this framework is the activity approach to learning (Scribner and Cole, 1973; Rogoff and Lave, 1984). In this approach, learning is described as cognitive change located in cultural practices or activity. This approach has been directly applied to the labor process (Scribner, 1985) to understand learning as a process that meets specific human needs and purposes valued in those cultures. The activity approach has also been used to describe the progression from novice to expert (Laufer and Glick, 1996). As Glick described: "To be an expert, one must participate in a particular work activity and transform it, and in the process be transformed oneself."

This "interactive" definition of learning is similar to that used by Peter Senge (1990). Senge states that:" Taking in information is only distantly related to learning. Real learning gets to the heart of what it means to be human. Through learning we recreate ourselves. Through learning we become able to do something we never were able to do. Through learning we perceive the world and our relationship to it. Through learning we extend our capacity to create, to be part of the generative process of life."

Senge further extends the concept of learning to an organization:
"This .. is the fundamental definition of a learning organization - an organization that is continually expanding its capacity to create its future. For such an organization, it is not enough merely to survive. 'Survival learning' or what is more often termed 'adaptive learning' is important - indeed it is necessary. But for a learning organization, 'adaptive learning' must be joined by 'generative learning' that enhances our ability to create."

Our constructivist definition of learning parallels the changing definition of workplace learning, in which workers are re-perceiving their world and their relation to it, and through active participation, are creating the firm's future. We will explore this kind of learning in the following section and describe how it is occurring in the workplace and environments that are preparing today's workforce.

Formal Workplace Learning

Most high-performance workplaces, and all firms investigated in the current study, provide formal learning opportunities for their workers to acquire skills and knowledge defined and sanctioned by the organization. The availability of formal learning is a critical aspect of high-performance organizations; formal learning provides an opportunity for workers to spend paid time concentrating on learning essential knowledge and skills that allows them to be productive and flexible in performing their jobs. Also, training may allow workers to maintain their employability and advance their careers.

Increasingly, theorists and practitioners understand that formal training is intimately tied to informal learning and the work environment. As Darrah (1995) explains "Workplace training can never be divorced from workplace learning, and neither is simply a matter of efficient pedagogy."

We will define formal learning as that for which the goal and process of learning is defined by the organization. This definition will be explored in depth in the following sections.

Training and Learning

In this report, we will use the term training to mean the act of teaching oneself or someone else in a conscious or otherwise focused manner. In this way, training may be considered a somewhat temporary relationship between an individual and a trainer or organization. The term learning will be used to mean the act of training oneself or, more broadly, the conscious or unconscious process of acquiring or creating knowledge and skills. Learning is not limited by any temporary relationships or other boundaries.

Informal Workplace Learning

Workplace learning has received attention by psychologists and educators, often in the context of theories of formal learning. Only in recent decades has the attention turned to informal learning. The following is a brief review of some of the literature on informal workplace learning relevant to this project.

Much research in informal workplace learning was stimulated by Scribner and Cole's (1973) important work demonstrating that cross-cultural learning differences cannot be attributed to differences in cognitive abilities. Scribner and Cole (1973) and Lave (1988) demonstrate that learning differences can be attributed to selective use of particular learning strategies, which are strongly influenced by the sociocultural context in which the learning occurs.

Sylvia Scribner's landmark study of dairy workers (1986) extended this line of research. Scribner demonstrated that formal training does not account for much workplace learning; rather, workers look to the environment for important cues and information. Scribner called the kind of thinking embedded in a larger purposive activity "practical thinking," and distinguished it from the thinking involved in isolated cognitive tasks performed as ends in themselves.

Others have described specific aspects of practical, or workplace, learning. Marsick (1987a, 1988c) drawing on Mezirow (1981, 1985) developed a theory of workplace learning that combines three different learning approaches: instrumental, dialogic, and self-reflective. Instrumental refers to learning that occurs in response to solving problems in workplace tasks. Dialogic refers to learning that occurs as an individual creates and understands the norms of the workplace culture. And self-reflective learning refers to the ways in which learners come to understand themselves. Marsick proposes that these three types of learning may occur separately, but often occur simultaneously. For example, while engaged in a solving a workplace problem, a worker may learn about the culture and herself.

Marsick and Watkins (1990) have provided a sound articulation of informal and incidental workplace learning based on field studies. They propose that much informal learning takes place in response to break-downs in the workplace. "Both informal and incidental learning often take place under non-routine conditions, that is, when the procedures and responses people normally use fail." Argyris and Schon (1974) proposed that these situations surface tacit assumptions for evaluation and lead to "double loop" learning (in which underlying beliefs may be changed), which is distinct from "single-loop" incremental learning (in which underlying beliefs are not challenged or changed).

The factors influencing informal workplace learning have been investigated. Using a participatory research design, Baskett (1993) identified factors that enhance informal learning. These included embracing a continuous improvement approach, high individual involvement, and taking personal responsibility, among others. However, these findings were not examined in real world work settings.

Lacking in the literature of informal learning is empirical support for these theories and a detailed understanding of how informal learning occurs in today's industrial environments. The present study is unique in that it consists of a large-scale, in-depth applied research study of informal learning, what it is, why it occurs, and what real-world factors affect it.

For the purposes of this project, we will focus on learning that is beneficial to organizations and will not address workplace learning that is destructive or otherwise inconsistent with the organization's goals. Obviously, some of what employees learn may not benefit the firm. For example, employees who learn how to "slack off", or avoid responsibilities, have learned these skills informally (seeing that there is no formal training for these skills). As mentioned, this kind of learning is not incorporated in the report because the Teaching Firm is focused on learning that benefits the organization and the individual.

Teaching Firm Definition of Informal Workplace Learning

The Teaching Firm project directs its attention primarily to informal workplace learning. Informed by the "interactive" and tacit theories of learning, we have approached informal workplace learning as a process - and have thus formed a functional definition.

The definition of informal workplace learning is:

> *Informal workplace learning is learning in which the learning process is not determined by the organization.*

The definition distinguishes between the goals of learning and the process of learning. An organization may have a goal for learning to occur yet it does not necessarily specify how the process of learning should occur. This definition allows for organizations to have explicit goals of increasing informal learning and creating the environment which will facilitate it. However, if learning itself is to be considered informal, the process of learning cannot be specified buy the organization.

Based on this definition, we can draw a continuum between formal and informal learning as well as describe characteristics of the pure forms of each.

Formal learning occurs when the organization has an explicit goal (e.g., an organization wants its workers to learn to operate a new machine) and the process is formal (e.g., it sends the workers to learn about the machine in a classroom with an instructor and a manual). Informal learning occurs any time the learning process is informal, i.e. not determined by the organization, whether or not the learning is in pursuit of an organizational goal.

Organizational goal/informal process

An example of a case where the organization has a formal goal, yet learning happens informally is the situation in which the organization wants the employee to learn the pragmatics of the job by a certain date without a formal learning process. In this case, the new employee may pair up with a more senior employee in a mentoring relationship and get help in finding resources, understanding the task parameters, etc. Although the organization has defined the goal of the learning, it has not defined the process. The individuals involved determine how learning takes place. Consequently, the learning itself is informal.

No organizational goal/informal process

Informal learning also occurs when the organization does not have a specific goal for learning to take place. For example, individuals may broaden their knowledge without any prompt from management by observing operations in other work areas. Employees may socialize with co-workers and, in the process, learn more about production procedures. Additionally, much informal learning occurs indirectly in the pursuit of organizational goals. For example, individuals who participate in a production meeting (to meet an organizational goal) may tacitly learn about organizational culture during the process.

Thus, informal learning is any learning for which the process is not defined by the organization. Informal learning encompasses learning that is directed toward either a company-defined goal or some other objective. Under this definition, the same activity may be considered formal or informal depending on whether the process is formalized. Indeed, we observed activities, e.g., on-the-job training and cross training, that were formal at one research site and informal at another.

	FORMAL LEARNING	INFORMAL LEARNING	
GOALS	Organizational Goal	Organizational goal	No organizational goal
PROCESS	Formal process	Informal process	Informal process

School-Based Learning

For most workers, secondary education (and for some, higher education) constitutes one of the primary learning experiences prior to entering the workplace. As such, school-based learning casts a strong shadow on the way workers approach learning in other domains of their lives, especially work.

Under the influence of Taylor-style mass production systems, American schools were organized in the early part of the century to mass produce students who, although literate, performed routine work without the expectation to think critically or to engage in life-long learning. Special tracks in the school systems produced the professional and technical workers who were prepared to think (Callahan, 1962; Tyack, 1974). Perhaps partially because of the limitations of the current school systems, workers in the present study report that their school-based learning did not adequately prepare them to do their jobs.

Progressive educators have attempted to reform the American school system to better prepare workers for the high-performance workplace, by, for example, working in partnership with the private sector to better prepare all students for critical thinking and cooperative learning. School systems are engaging students in summer programs designed to maintain knowledge and provide students with real-world learning opportunities. These changes are, however, in some cases impeded by entrenched centralized educational structures that do not support or incentivize such programs.

The United States lags behind many European countries in restructuring schools to prepare workers for high-performance environments. Some progressive Northern European school systems in particular have designed apprenticeship and other programs that teach critical thinking and hands-on learning for significant populations of students. German educators have designed an innovative "dual-system" apprenticeship program in which vocational training is part of both the employment system and educational system (Reisse, 1994) The Germans utilize the "Leittext" system of training and learning. In this system, individuals are guided in a manner that enables them to "learn to learn," and construct knowledge.

Many U.S. school systems and firms have developed progressive programs, in some cases modeled after the European approach, to decrease the gap between school- and work-based learning. These programs will be discussed in greater detail in Section on School-to-Career.

RESEARCH FINDINGS

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WHY INFORMAL LEARNING OCCURS

INTRODUCTION

Overview

Business professionals are sometimes unaware of the motivators and drivers for informal workplace learning, partly because they are often unaware of the nature and extent of the informal learning occurring around them. Our research identifies the key drivers of informal learning, and illuminates why it occurs. Specifically, we found that informal learning occurs in the course of meeting larger organizational and individual goals. Most informal learning did not occur for its own sake, but as a means to these ends.

The primary drive for informal workplace learning is the need to meet organizational goals that cascade to workers in the form of incentives. These goals included increased worker participation in decision making and expanded job responsibilities.

Another drive for informal learning is the desire to meet individual goals. Individual goals include financial and psychological goals of recognition and personal achievement.

An alignment of organizational and personal goals is critical to the creation of a culture that engenders informal learning. This is achieved in organizations that display sensitivity to individual goals in the form of opportunities for individual growth paths, and where individuals understand and work towards organizational goals.

Informal learning occurs in the course of meeting larger organizational and individual goals

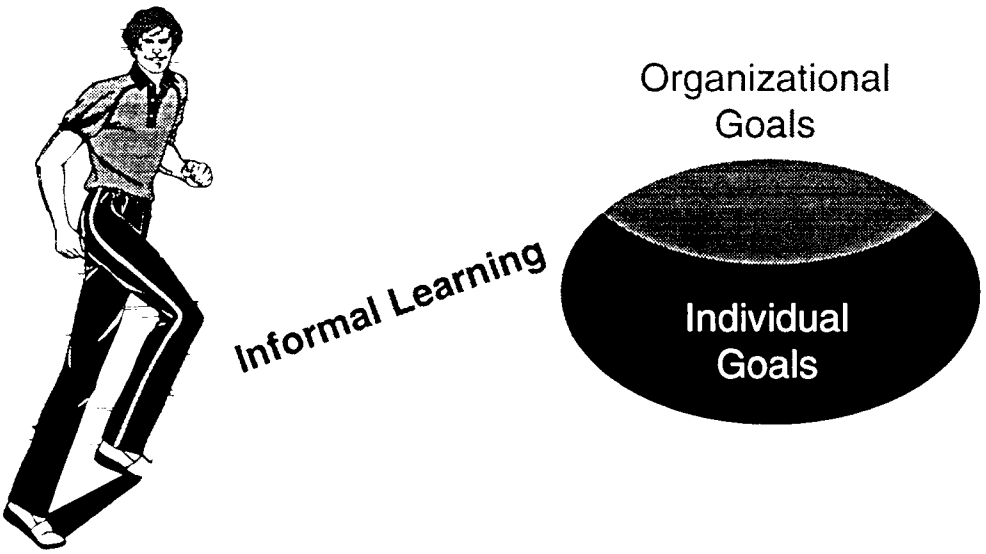
The primary drive for informal workplace learning is the need to meet organizational goals. These goals cascade to individual workers as rewards and reinforcement for acquired knowledge and skills that help the organization in its efforts. As stated by Ray Marshall (in press), because organizations ordinarily get the outcomes they reward, the explicit or implicit incentives of a system are basic determinants of its outcomes. In this way, the organization plays a large role in defining the universe of learning opportunities that occur in the workplace.

Individuals, of course, learn many things that do not directly benefit the organization. Workers learn about business, technology, culture, family, and personal values through everyday interactions in the workplace. However, knowledge and skills that do not directly benefit the organization are not rewarded or encouraged by the organization. Moreover, in high-performance organizations, time is usually not available to learn things that do not directly benefit the organization. We found that information that may not directly benefit the organization is usually acquired by the worker's own initiative and generally on his or her own time. As mentioned in our definition of informal learning, for the purposes of this report, we are focusing on informal learning that is consistent with the organization's goals. Yet, it is important to note that we observed little learning that was destructive to the organization.

Individual goals do play a strong role in defining learning opportunities. Individuals work and learn in ways that help them meet their personal goals for job security, promotion, esteem, mastery, and others. And workers understand, implicitly or explicitly, that learning that benefits the firm can benefit them personally in meeting their individual goals. As such, workers often choose learning opportunities defined by the organization. Thus workers may choose to learn a new skill desired by the organization if it corresponds to their goals. They may also choose to explore other learning paths created by the organization that are more in line with their goals and interests, if available.

Learning for the sake of the organization's benefit may be internalized by some workers as a need to suppress or subordinate personal goals. However, we did not observe this to be commonly occurring. Most workers interviewed experienced job insecurity at some point in their careers or observed it in co-workers or family members. As a result, most workers did not feel the need to subordinate their own goals. In fact, many workers reported that they were consciously using the learning made available by the organization to increase their employability in case they needed or desired to leave to the firm.

In the following section, we will outline the organizational and individual goals that drive learning in the firms studied, and describe how the degree of concordance between organizational and individual goals impact informal learning.


Organizational
Goals
Informal Learning
Individual
Goals

Organizational Goals

An organization's primary goal is to survive in the competitive business environment. For many of the firms studied, growth was considered essential for survival. Senior managers and strategy makers generally steer the organization toward maintaining and increasing profits for the benefit of all owners and employees. Management communicates priorities through formal goals that will help the organization survive and grow, by, for example, creating and implementing new technology, meeting the dynamic demands of the market through customer satisfaction and improved quality, reducing product cycle time, and reducing labor and material costs.

To this end, many organizations have identified secondary goals that will help them achieve their primary goals of survival and growth. Through learning from other businesses and the business literature, many organizations have concentrated on key aspects of a high-performance organization that have been shown to be instrumental in meeting their primary goals. As reported by senior managers interviewed at our host firms, these secondary goals include:

1. Reduced separation between management and worker responsibilities, and worker empowerment. These goals are reflected in organizational and cultural changes that include:
   - Decreased supervision, i.e. operating with a larger supervisor-to-worker ratio;
   - Increased worker participation in decision making;
   - Greater worker involvement in reducing costs and increasing quality; and
   - Greater worker initiative in identifying and solving problems.
2. Expanded job responsibility at the lowest levels that require workers to:
   - Rapidly adapt to new technology;
   - Understand and perform other jobs in the work unit;
   - Work as an effective member of a team;
   - Be accountable for results;
   - Understand quality and production metrics;
   - Communicate effectively with internal personnel;
   - Communicate and develop relationships with external customers and suppliers; and
   - Document processes and results.

The pursuit of these secondary organizational goals has, in effect, changed or evolved the job definition of many workers. The expansion of the job scope has generated an expansion of learning opportunities for workers at all levels of the organization. For many workers, taking on these new responsibilities has stretched them outside their skill base and resulted in development of new knowledge and skills.

Individual Goals

Individuals are unlike organizations in that they strive to satisfy human drives for survival, security, respect, self esteem and personal growth, among others. Individuals seek to satisfy some of these drives through their relationship to their work. In this section, we will outline the specific goals that motivate individuals to learn in the workplace.

The expansion of the job scope has generated an expansion of learning opportunities for workers at all levels of the organization.

All individuals interviewed in this study reported that they seek financial security and/or the opportunity to advance themselves in terms of income and earning potential. These financial goals took the form of job security, salary increases, and promotion.

In parallel, individuals reported seeking other goals, that were primary or secondary, depending on the individual. These non-financial goals may be explicit, conscious driving forces, or implicit, unrecognized motivators. In the context of the workplace, these goals included recognition/acceptance and achievement/development. These three classes of motivators are outlined below — financial, recognition/acceptance, and personal achievement and development.

Motivators to Individual Workplace Learning

Workers reported the following goals related to the desire for recognition:

- Sense of belonging to a social group/community, and
- Esteem gained from recognition from superiors, peers, subordinates.

Workers reported the following goals related to the desire for personal achievement and development:

- Comfort and security from working in an attractive and safe work environment;
- Pride in accomplishment;
- Satisfaction from exercising control over one's own work;
- Mastery of the job;
- Pride in quality workmanship;
- Pride in skill development;
- Satisfaction of overcoming challenges/solving problems;
- Satisfaction of curiosity; and
- Sense of contribution to a greater endeavor.

And importantly, for many individuals, psychological rewards are perceived to be as motivating as financial rewards

The value of these non-financial or psychological goals varies with the individual depending a variety of factors that are outside the scope of this project. The motivational impact of these goals will also depend on the degree to which the individual finds them attainable. In most cases, workers can satisfy some of their psychological goals in the course of working toward their financial goals. And importantly, for many individuals, psychological rewards are perceived to be as motivating as financial rewards. For example, many workers reported that a sense of recognition was very gratifying and as valuable to them as financial rewards.

In some situations, psychological rewards, especially personal achievement, were placed even higher than financial rewards. Some workers studied put pride in quality workmanship above financial goals. For example, when testing machinery for defects before

shipment, some workers used much higher standards than management deemed a business necessity. These individuals were uncomfortable releasing a product unless it met their personal functional and cosmetic criteria, despite the fact that this behavior caused conflict with management and in some ways weakened their job security and potential for advancement.

It is also important to note that some behaviors that appear "non-goal" directed are often engaged in pursuit of psychological goals. For example, socializing may be engaged in as a way to establish social bonds and a sense of community. Exploration may be engaged in order to satisfy curiosity or sense of mastery.

When the goals of the organization and the individual are aligned, the work environment is a fertile place for learning.

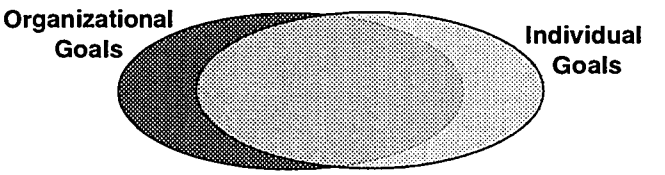
The Overlap Between Organizational and Individual Goals

Concordant Relationship

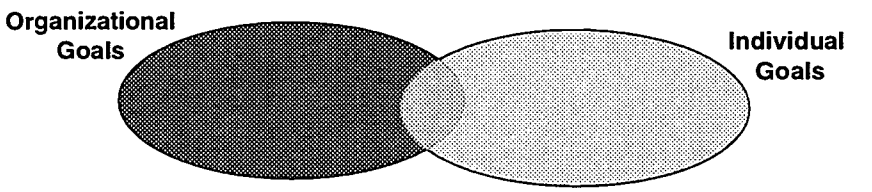
When the goals of the organization and the individual are aligned, the work environment is a fertile place for learning. This situation is represented in part (a) of the following figure. This relationship may be described as a win-win relationship, where the circumstances for learning are ideal.

Models of Concordance Between Organizational and Individual Goals

a) A concordant relationships



b) A discordant relationship



Organizational Sensitivity

Our research indicates that an organization that is sensitive to individual goals provides the resources and opportunities for individuals to learn and create the knowledge and skills that will help them meet their personal goals. The organization may allow individuals to choose learning opportunities that work best for them and thus engage them in further learning. Some senior managers interviewed in this study stated that they observed that by allowing individuals to pursue their personal goals, the organization has benefited.

Individual Understanding

Likewise, individuals who understand the goals of the organization and consciously work towards them will utilize organizational resources to better educate themselves and improve their productivity. These individuals will pursue learning opportunities that allow them to meet these goals, understanding that this will benefit them personally and allow them to satisfy their financial and psychological goals.

Discordant Relationship

An environment in which the goals of the organization and the individual are discordant (see figure, part (b)), is not a fertile place for learning. This may be described as a win-lose or zero-sum situation where the win for one party is perceived as a loss for the other.

Organizations that are insensitive to individual needs generally do not provide learning opportunities and/or choices that allow workers to grow. Similarly, individuals that do not understand, respect, or internalize organizational goals have fewer opportunities for personal growth through workplace activity. A discordant relationship may be one of mutual disinterest or may even be adversarial. Adversarial relationships, of course, engender less positive learning for both the organization and the individual, and may generate learning behavior that is destructive to both. At one site, for example, some workers who had an adversarial relationship with the organization withheld information that would have benefited management. At another site, organizational insensitivity to individual goals resulted in resistance to learning by workers that may have benefited both workers and management.

Given that an organization is likely to prosper and be competitive in concert with its employees ability to learn, it is imperative that it find ways to align its own goals with those of its employees, since such an alignment appears critical to the learning process. An organization that is able to align its profit and market leadership goals with both the psychological and financial goals of its employees will maximize learning opportunities. This is especially true with informal workplace learning since a dissatisfied employee is less likely to pursue an opportunity to learn if it isn't absolutely required by the organization. In contrast, an employee that is recognized by management and rewarded financially is more likely to pursue informal learning opportunities as a way to continually achieve professional mastery, recognition and prosperity. Following is an exploration of the various dimensions of informal workplace learning.

HOW INFORMAL LEARNING OCCURS

INTRODUCTION

Overview

Research has identified 13 work activities where the majority of informal learning occurs. In the course of participating in these work activities, employees develop skills and construct knowledge critical to productivity.

In the course of participating in these work activities, employees develop skills and construct knowledge, critical to productivity.

The *majority* of informal workplace learning occurs during the following activities:

- Teaming
- Meetings
- Customer Interactions
- Supervision
- Mentoring
- Shift Change
- Peer-To-Peer Communication
  - Goal-directed
  - Non-goal-directed
- Cross-Training
- Exploration
- On-the-Job Training
- Documentation
- Execution of One's Job
- Site Visits

The activities appear in the order of those that are richest in informal learning opportunities to those that are less rich in informal learning opportunities and *not* by the activity's observed frequency. In fact, some of the richest learning activities are also some of the least frequently observed.

For example, few employees indicated that they had the opportunity to interact with external customers. However, for those who did, they reported that they informally learned important information and were able to broaden their skill set. In contrast, cross-training was a frequently observed activity, yet it was not as rich in informal learning opportunities.

Also, it is important to stress that not all examples of the activities outlined were equally rich in learning opportunities. Meetings in one workplace may have been a richer learning event than a similar meeting in a different part of the firm or at another organization. Many factors determined the richness of learning and those that have a direct affect will be identified.

Prior to the current empirical work, no existing literature specifically described *how* informal workplace learning occurs. This work constitutes the first large scale empirical analysis specifically examining where in the workplace informal learning occurs.

Unlike previous assumptions that states the majority of learning happens during breakdowns or under conditions of surprise, our research indicated that the *majority* of informal learning occurs during *everyday* work activities.

Argyris and Schon (1974) suggest that much learning takes place under conditions of surprise, the non-routine circumstances that require heightened attention, experimentation, and determination of the nature of a problem. They state that critical reflection is called for in these circumstances, that is digging below taken-for-granted beliefs and assumptions so that one can reframe the situation.

Our research indicated that during breakdowns, although *some* employees had learning opportunities, many did not engage in meaningful learning. Most employees were furloughed or given "an extended lunch" during breakdowns. This was due to the highly mechanized and automated nature of the manufacturing plants, the infrequency of breakdown occurrences, and the nature of the companies, particularly organizations where union constraints were an issue.

For example, researchers observed that in one union shop, during a breakdown, the division of labor was such that only *very few* skilled employees were able to work on the line, fixing mechanical failures or adjusting line flow. In such cases, though some learning did occur, *very few* employees in the entire workforce were exposed to formal or informal learning opportunities. For those who did learn, the information was not passed on to other employees because of job security fears.

In the following pages, an in-depth understanding of each activity will be outlined. Each activity will be organized into five main parts:

- The definition of the activity;
- Specific research examples;
- The relationship between the activity and informal learning;
- The direct factors that intrinsically affect the workplace activity (in order of most affective to least affective); and
- A best practice scenario based on field research observation.

Note: Employee names have been changed to ensure confidentiality.

Teaming

Teaming brings together employees with different skills and responsibilities within an organization to address short- and/or long-term problems and/or goals. Essentially, a team is a group of people with similar or complimentary skills who are committed to a common purpose, performance goals, and approach for which they hold themselves mutually accountable.

Typically, teaming enhances an organization's productivity, efficiency and performance by emphasizing shared values and goals, flexible job definitions and minimum status differentials with incentive systems. Team work, seen as a way to increase the impact of personnel by pooling individual talents along with various knowledge, skills and perspectives, also enhances organizational adaptability and flexibility in relation to the changing demands of a competitive market.

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In practice, organizations implement teams in a variety of ways according to their goals, needs, resources, product, available labor pool and technologies. However, teams maintain certain common features. Generally, teams work with small groups of co-workers, sharing tasks and responsibilities for a well-defined segment of work. Team members decide how to employ work practices, scheduled members for various shifts/training and assigned jobs. They often participate in planning and setting goals, monitoring results and managing budgets. And, in some cases, hiring/firing is part of the teaming effort.

Examples of teaming

Researchers observed four common types of teams: work or production teams, process improvement teams, total customer satisfaction (TCS) teams and research and development (R&D) teams, among others.

Work or production teams tended to blur the line between employees and supervisors, since the team effort emphasized members taking over much of the supervisory tasks. Although in some cases this level of employee empowerment enhanced productivity, some employees (both front-line workers and supervisors) stated that they felt "uncomfortable" with the redefinition of roles, responsibilities and job definitions.

Other observed work or production team practices included job rotation. Some teams rotated members through all team tasks—functional, managerial and administrative. However, rotation came with some necessary slow downs during periods of training and learning, which was usually balanced with business needs and individual preferences and abilities. To be effective, all individuals in

these work or production teams required both the understanding of an individual task and the responsibility to keep the entire system working.

Often, researchers observed several different types of process improvement teams, including cross-functional and cross-hierarchical teams, that were assembled to develop a specific procedure. Many employees stated that in order for these types of teams to be successful, a sense of job security must be perceived to alleviate fears among workers that they will not lose their jobs due to productivity improvements. This was particularly true in many of the high-tech firms we studied, where there was a constant perceived threat of robotics and automation.

Employees also stated that the communication between departments and across the corporate power structure enhanced their team work. For example, one engineer stated that working on a process improvement team with other employees "higher in the pecking order" made him work harder and "do better."

Many of the R&D teams observed looked to future products as possible revenue generators. Though most of these teams were made up of engineers, many had to learn cost-accounting and research skills, requiring them to seek out assistance beyond their usual scope. Usually, these teams were given the opportunity to originate ideas and the autonomy to determine their outcomes as well the freedom to explore various options.

Finally, total customer satisfaction teams (TCS) encouraged employees to organize around an implementation of an important idea. TCS team work centered around the demonstration and presentation of the feasibility and impact of the improvement to audiences outside the team. These tasks emphasized skills which were not routinely used by employees in executing their jobs in the work group. TCS teams typically consisted of workers from different work groups and different occupational levels, such as engineers and technicians.

Teaming and informal learning

Research indicated that many hourly workers worked well within various team structures and processes — ranging from formal to informal. For hourly workers, work or production teams gave them a greater sense of autonomy and job satisfaction by giving teams the authority to decide outcomes and the means to achieve goals; access to appropriate resources and scheduling; a reward structure; and job security.

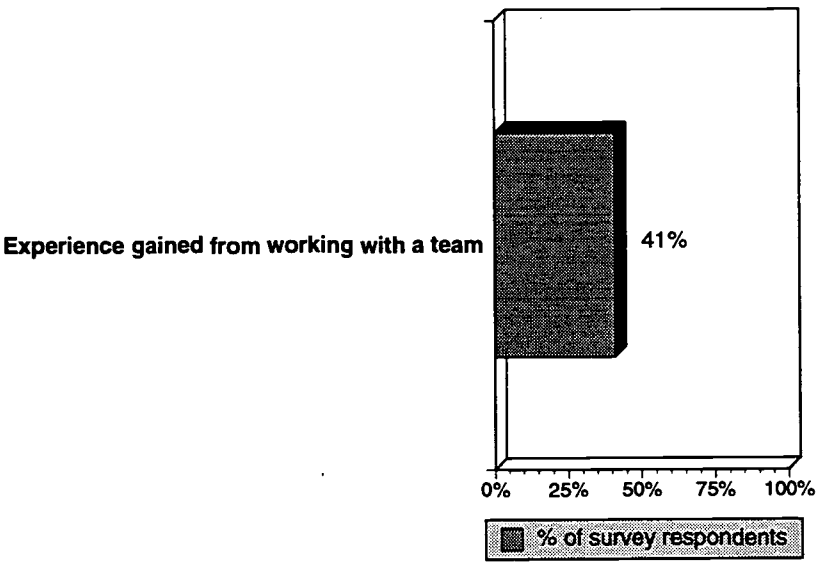
For professionals seeking accomplishment and personal fulfillment, teaming allowed for them to participate in company practices in a meaningful way and provided a sense of belonging.

For example, one cross-hierarchical process improvement team at a large manufacturing plant (made up of engineers, managers and senior-level employees) provided an opportunity for exposure to various higher-level employees. One engineer indicated that during team meetings he was able to reflect on his work as part of a larger, company

process and this gave him a sense of relevance. The team also created a network of like professionals that the engineer could call upon for information.

Many employees stated that working on a team raised self-esteem and confidence levels, as team-building skills enhanced their personal development and growth. Many employees indicated that their ability to work together as a team also helped them to respond to problems and goals in a cooperative, non-competitive style and this could be applied to other work situations. Team members also expressed the increased capability to deal with certain group dynamics such as social situations (i.e., making presentations), interpersonal circumstances (i.e., analytical and problem-solving skills) and different personality types. About 40% of employees indicate that they have learned their job by participating in a team.

Important Way I Learned How To Do My Job



According to many employees, one of the most important informal learning opportunities embedded in the team effort was the expansion of responsibilities and skills. Working in teams provided employees with experience in supporting responsibilities traditionally done by other categories of workers (i.e., quality control, scheduling, training, etc.). Team members also performed various tasks as a result of job rotation and thus developed new and relevant skills.

In addition, team members increased their ability to devise and communicate ideas in a clear and persuasive manner; articulate their position and transfer ideas; problem-solve; listen; and understand conflict-resolution. Across the firms, many team members also stated that they developed a deeper understanding of the work process as a whole through the teaming initiative, due to the integration of employees from different departments.

Factors that affected informal learning and teaming

Factors that affected informal learning and teaming included:

- The authority of team members to decide outcomes and the means to achieve them;
- Job security;
- Clear and achievable team goals;
- A team climate of trust, including honest communication;
- A diversity of perspectives;
- Creativity and tolerance of risk-taking among team members;
- Collective decision-making;
- Cooperative problem-solving among team members;
- An effective team leader;
- The access to necessary resources;
- A reward and incentive structure;
- A good management-employee relationship; and
- The appropriate time schedules for a team to achieve its goals.

Best practice scenario - Teaming

At one large electronics firm, work teams were designed around a production line to meet common production goals. By rotating jobs every few months, each team member learned the pragmatics of various stations and machinery and was able to "fill in" when a fellow team member was on break or absent.

Team members' roles and expectations were clearly defined and explained in team meetings (once a week) and posted on white boards. Team members were held accountable for costs and savings associated with production line processes and possible improvements as well as the documentation that accompanies such endeavors.

A certain level of decision-making (team members chose who, when and how to rotate and voted-in the team leader) and problem-solving were in the hands of team members and they felt "empowered" to take necessary action to achieve goals. The team leader consistently referred to possible production line process problems and team members were given the opportunity to brainstorm, with other team members and engineers, for solutions.

When asked if the teaming initiative was seen as "flavor of the month," team members stated that the "fad-free management" steered away from simply experimenting with teams and consistently provided necessary resources and the sense that participation in collective efforts to achieve and surpass goals would benefit the employee and company. When goals were met, teams were recognized with various company-wide recognition programs and the company productivity was measured against these goals.

Team members could identify three areas of informal learning within this team structure:

- During team meetings and when working on a day-to-day basis with fellow employees, team members learned interpersonal and team dynamics skills;
- Since the team leader consistently emphasized the need to work on productivity improvement, team members had the opportunity and time to identify, map and come up with possible process improvements; and
- By being held responsible and accountable for various production initiatives, team members perceived a better understanding of basic business operations (i.e., materials handling, inventory and budgeting).

Meetings

At all of the firms, business discussions or meetings were generally organized around a business need or problem, follow-up initiative, brainstorming session or work team activity. At most firms, management encouraged employees at all levels to participate in meetings and voice their opinions, and meetings were set up to encourage such discussion.

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Examples of meetings

Research indicated that opportunities for business discussions were centered around:

- Daily start-up meetings. At most manufacturing facilities, work team members, team leaders, supervisors and engineers met once a day to discuss everyday production goals and staffing issues.
- Work or production team meetings. Weekly or bi-weekly meetings were held at many of the sites to discuss productivity, personnel and mechanical issues.
- Supervisors meeting. Weekly meetings called by the supervisor manager to discuss production issues or company-wide initiatives.
- Problem-solving meetings. Sometimes cross-departmental and/or cross-hierarchical meetings were held.
- Crisis meetings. Emergencies dictated the necessity of such meetings and these meeting usually included mid- and senior-level management.

- Process improvement and R&D team meetings were held to assess the demands of future projects.
- Upper management meetings (i.e. steering committee meetings and high-level team meetings). To discuss larger issues on production, the company or business developments.
- Informal meetings. Varying from casual "chats" to spur-of-the-moment cubicle discussions.
- Project meetings. Meeting time varied as needed.

Meetings and informal learning

Many employees stated that during meetings informal learning occurred mainly by observation, participation and asking questions.

Through observation, employees viewed the dynamics of a meeting, including how it was called, who was included and how it was facilitated. Even before meetings began, employees had the opportunity to learn about organizational policy — particularly by noticing who had the power to call a meeting and under what conditions. Employees also stated that by watching other meeting participants, they had an opportunity to learn different interactive techniques and understand whose (and what) ideas are respected and encouraged.

By sharing ideas and information and participating in group discussion— asking questions, listening and exchanging ideas — employees were able to critically reflect on different approaches to problems and find creative solutions that were not apparent to any one individual. And, sharing ideas helped individuals learn how those ideas actually fit into the workplace culture.

For those who conducted the meeting, the experience provided a first-hand opportunity for them to develop their presentation skills, lead brainstorming discussions and address an agenda.

Factors that affected informal learning and meetings

Factors that affected informal learning and meetings included:

- Active participation of all meeting participants;
- Clearly stated meeting agendas and goals;
- A productive relationship among meeting participants;
- A culture that encourages an open exchange of opinions and ideas during and after meetings;
- Creativity and open-mindedness of the meeting facilitator;
- Instruction for those employees who run meetings (i.e. training on how to facilitate a meeting or meeting dynamics); and
- Making the necessary resources available (i.e., conference room, time, etc.).

Best practice scenario - Meetings

At one mid-sized manufacturing facility, the organization encouraged meetings by consistently inviting all employees to various types of meetings; supported employee participation in such meetings by giving them the opportunity to share ideas and give feedback to the facilitator; and provided an accessible and comfortable communal conference room.

Researchers observed a meeting called to resolve a customer service and shipping problem. The meeting involved three different departments, customer service, shipping and administration and included various levels of employees and supervisors. The facilitator (Sheila, a long-time employee and customer service supervisor), who called the meeting, conducted the gathering by first clearly and concisely sharing her information and ideas about the problem and then allowing for all meeting participants to engage in constructive interactions to try and to solve it. Sheila also provided documentation to all of the participants, giving a detailed record of the problem dating back for several months.

During the meeting, a new employee (Chris) in the shipping department was able to provide insight into the reason behind the problem (an uncertainty in the way he was inputting computer data). A tenured employee in customer service department (Mary) stated that she could help teach Chris the necessary module in the computer software system.

When follow-up research was conducted, Mary and Chris had met several times to go over the software and had reported back to Sheila and the shipping supervisor, verbally and with documentation, that Chris had successfully learned the new skill.

Customer Interactions

Most employees at the research firms were expected to provide the same level of product quality and satisfaction to internal and external customers. However, research indicated some discrepancy. Generally, in firms with a low level of customer discussion and feedback, employees were usually only notified when there was a serious or chronic customer complaint regarding quality, scheduling, or conformity to specifications. Typically in firms with higher levels of customer discussion and feedback, employees frequently interacted with customers to ensure product quality, speed and efficiency.

Most employees at the research firms were expected to provide the same level of product quality and satisfaction to internal and external customers.

Examples of customer interactions

At one mid-sized firm, employees who test the product before it gets shipped were reluctant to ship a product if there was even the slightest scratch. In one case, they were unaware of the external customer's need — to ship the product out on time no matter the exterior's cosmetic condition as the product would not be publicly displayed — and focused on cosmetic imperfections. As a result, shipment was held up. Although the supervisor tried to explain the situation, the employee would not release the product for shipment.

The supervisor asked an external customer representative to tour the factory. When the representative was introduced to the employee who was responsible for testing, the supervisor encouraged the two to talk. After the discussion, the employee realized that the customer's needs were not being met and understood that holding up the product for shipment due to cosmetic changes was unnecessary.

Customer interactions and informal learning

Through customer interaction, employees stated that they learned specifically about information on industry standards and expectations as well as information on new products and those from the competition. Customer interactions also enhanced employees ability to articulate and communicate company goals and objectives, integrate feedback and, most importantly, understand the Bigger Picture — in term of the industry and the overall production process.

Factors that affected informal learning and customer interactions

Factors that affected informal learning and customer interactions included:

- An orientation of employees toward a customer-driven production process;

- Opportunities for frequent interaction and contact between factory personnel and external customer representatives; and

- Proximity of work stations in the actual production sequence (for internal customer interaction and feedback).

Best practice scenario - Customer Interactions

At one small firm, the customer feedback program included the routine documentation of external customer calls from the customer service department. Since customer service representatives were part of the teaming effort, if there was an external customer problem, a customer service representative presented a copy of the documentation during the team meeting. The group was able to brainstorm about the problem and come up with possible solutions.

After the meeting, the team leader took the original documentation and notes on the discussion and brought it to the production floor. Usually, the team leader would hold a meeting to discuss the problem and any ideas were documented and implemented.

Supervision

Supervision is the process through which formally designated employees (supervisors) provided workers with orientation into formal company policy and management expectations; day-to-day job monitoring; authority and assistance in resolving workplace problems; hands-on instruction; consistent informal feedback; and formal performance evaluations to subordinates.

In the area of supervision, research indicated a shift of supervisory responsibilities — from the traditional first-line supervisor to the work team leader and team members. Though most other supervisor-supervised relationships worked in the more traditional way (with subordinates receiving instruction and feedback and meeting the demands of the job), teaming blurred the boundaries between employees and supervisors or managers.

In the area of supervision, research indicated a shift of supervisory responsibilities — from the traditional first-line supervisor to the work team leader and team members.

Work team leaders stated that their position— dealing with issues of accountability, motivation, scheduling and often times discipline— was more difficult to define, since they were acting as a liaison between team members and the supervisors but positioned somewhere vaguely between them.

Team members stated that achieving the goals of their new roles, including the authority to decide outcomes and means to achieve goals, took time away from their original production task. In effect, employees, who were once classified simply by what task they performed, were asked to also incorporate non-production oriented assignments and more managerial responsibilities to their daily job.

Examples of supervision

At one site, researchers observed a supervisor's (Bob) initial behavior to a new employee (Ron). This included providing task directives, job expectations and information from the earliest of stages of Ron's experience.

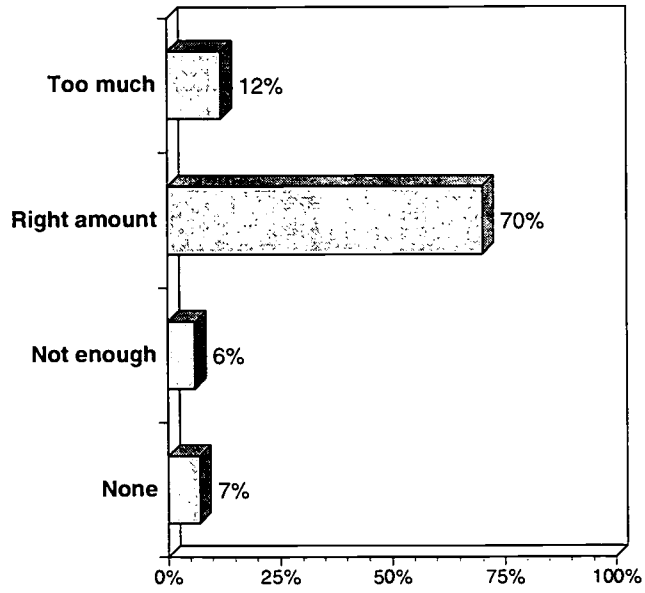
Over the week, as Ron's task capabilities increased, Bob's behavior expanded to include positive and negative reinforcement in the form of appraisals about job-specific skills; general and specific feedback; incentives about specific job tasks; and personal goal setting in relation to the Ron's job.

When asked, Ron stated that Bob's personality was "easy to get along with" and he felt comfortable asking questions, receiving and integrating feedback. Ron also indicated that he "could tell right off the bat" that he would work better with Ron than his other supervisor at his previous job who was "a pain in the butt."

Supervision and informal learning

Since supervisors influenced and had authority over workers, research indicated that there was a strong correlation between styles of supervision and levels of learning. For example, many employees stated that the nature of the supervisor—"his or her personality and leadership style" — related to the amount of learning, formal and/or informal, that occurs. At times, an overbearing supervisor can inhibit learning.

How Much Supervision Do You Have?



Supervision was a learning experience for the supervised (who received the feedback and instruction) and the supervisor (who was generally required to provide feedback, answer questions, and overall balance business objectives and goals).

While the supervisor and the supervised interacted, subordinates informally received information about certain job-specific issues, including the pragmatics of the job and various work processes. Importantly, subordinates were able to elicit information on the boundaries of responsibilities and behaviors. By observing the supervisor, subordinates also informally learned about information on cultural and social issues, including official and unofficial policies. When a subordinate was challenged by a supervisor, that employee learned to problem-solve, support his or her decision or change procedure. For example, at one research site, a supervisor questioned an employee's decision on a production matter.

For many supervisors, the everyday acts of coaching, observing subordinates, answering unanticipated questions and meeting supervisory demands provided the opportunity to learn how to clearly articulate and communicate company goals and performance expectations and think critically both in job-specific problem-solving and in

balancing company goals and employee needs as well as thinking-on-one's-feet. Supervisors also stated that in the course of meeting their job goals, they enhanced their social, communication and interpersonal skills.

Factors that affected informal learning and supervision

Factors that affected informal learning and supervision included:

- The personal qualities of both the supervisor and the subordinates;
- The frequent interactions between supervisor and subordinate;
- A sense of trust between supervisor and subordinate;
- The social environment's conduciveness to giving and receiving constructive feedback as well as sharing ideas; and
- The physical proximity between supervisor and subordinate.

Best practice scenario - Supervision

At one small manufacturing company, there were two types of supervision activities: those in which the supervisor provided guidance and information to subordinates and those in which the supervisor and subordinates share information with each other.

The principal supervisor (who was also the owner of the company and technical expert) managed the company by walking around (MBWA), constantly interacting with employees and answering questions. Through these interactions, employees learned about various company policies and solutions to workplace problems or technical questions. Also, by receiving instant on-the-job feedback and instruction from an expert, employees felt positive about implementing ideas and were assured knowing that a proficient manager was their immediate supervisor.

The supervisor also kept his door open, encouraging people to stop in and ask questions or simply "chat." Also, employees stated that since the office was small and intimate, they could overhear other conversations and felt comfortable asking questions or eliciting information.

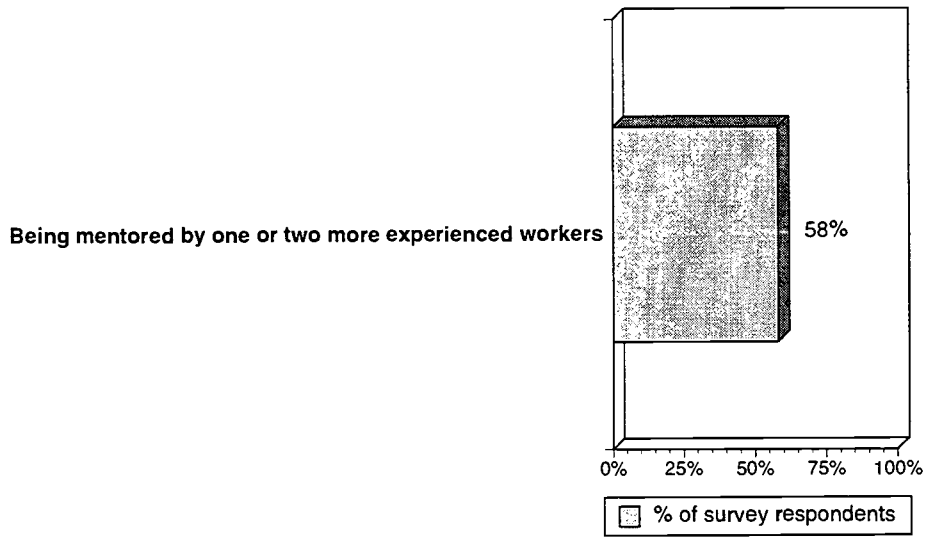
The company environment was conducive to giving and receiving constructive feedback and sharing information. As a result of the supervisor's accessibility and "friendly" nature, employees stated that they continually learned about job basics and company policies.

The supervisor indicated that he adopted the practice of MBWA because his previous supervisor had done so and he had appreciated the "openness" of the style. He also believed that MBWA promoted trust between himself and employees as well as a sense of professionalism (not "sitting behind a desk pushing papers").

Mentoring

Mentoring refers to the teaching and learning process within the framework of the mentor (sometimes referred to as "guru" or "professional guide") and novice relationship. Our research indicated that this typically occurred when a new hire joined the organization and proactively sought professional development, or the more experienced employee sought out the inexperienced employee to give help or advice. The data indicates that almost 60% of employees have been mentored in some way.

Important Way I Learned How To Do My Job



Although mentoring can be formally arranged through management initiatives, it was more commonly observed as a voluntary, informal and loosely structured association between a novice and more experienced employee

Although mentoring can be formally arranged through management initiatives, it was more commonly observed as a voluntary, informal and loosely structured association between a novice and more experienced employee, designed to expedite the novice's learning process (according to their needs and the work demands). The mentor may or may not be an OJT trainer or supervisor. The success of the relationship depends upon the individual personalities of the employees involved in the mentoring relationship and each employee's needs.

Research also indicated that mentoring occurred more frequently between employees at a professional level, as job demands were more varied and employees had more time and ability to engage in discussions during the work day. Also, professional employees stated that a mentoring relationship would be helpful in career development and identifying opportunities to "get ahead" in the industry.

At all of the research sites, mentoring was observed as one of the more unique informal learning experiences in that its success or failure depended on the nature of the mentor/novice relationship. And although the relationship was usually voluntary and based on a mutual assessment of needs, desirable outcomes and corresponding interests, the relationship took on a meaningful character only if the personal and professional needs of the novice were matched by the expertise and temperament of the mentor. For example, as a developmental phenomenon, mentoring involved an honest appraisal of the novice's needs, goals, strengths, weaknesses and personal style.

In order to increase informal mentoring relationships, organizations endorsed the idea of mentoring by:

- Acknowledging expert employees. Many employees stated that some of the more accomplished and expert employees (because of age, status or personal circumstance) were not necessarily recommended as trainers or mentors. Thus their expertise was not readily made known to new employees and their insight and understanding of the company was neglected.

- Promoting interaction between novice and expert. Organizations that promoted communication and interaction between senior (experts) and new employees (novices) as well as the freedom to forge informal mentoring relationships found that informal mentoring relationships organically formed.

Example of mentoring

Various mentoring relationships were observed at the manufacturing facilities. At one firm, a mentor and inexperienced employee were observed engaging in informative activities like direct tutoring and instruction, observing, sharing information and resources, and socializing. They also participated in experiential activities such as delegating and assuming responsibilities, and modeling and imitating, as well as reflective activities such as feedback and advice and reflective observation.

Mentoring and informal learning

When a mentor and an inexperienced employee shared in a meaningful project together, the hands-on experience became a field for experimentation of the practicality and workability of ideas. Within this mentoring relationship, specific information was informally learned, such as industry and disciplinary competence; communication and conceptualization skills; organization values; institutionally acceptable modes of behavior; and informal company culture and workplace politics. From their mentors, new workers typically acquired firsthand information on how to ask questions, where to go for help, employee attitudes toward management, and the best way to attain job security from their mentors.

Factors that affected informal learning and mentoring
Factors that affected informal learning and mentoring included:

- The interpersonal dynamics between the mentor and mentee;
- Sufficient time for mentor and mentee to meet;
- Challenge of task;
- The individual qualities and attitudes of both the mentor and mentee;
- Job security;
- Management support; and
- Available resources.

Best practice scenario - Monitoring
At a large manufacturing site, an engineer (and former first-line supervisor on the same line), Mark, took a new supervisor (Jason) "under his wing" and provided him with an informal checklist of information ranging from where to find a pair of safety goggles to who does what job on the line to how the job fits into the scheme of the company as a whole. Mark then created his own multiple choice "quiz" to help Jason further define his responsibilities by reviewing the information on the checklist. Mark also provided answers to questions about co-workers and company and industry practices. The relationship formed partly because Mark was looking for a promotion and wanted to show enthusiasm for his job, while Jason needed immediate and long-term guidance and took to Mark's personality and attitude.

Although researchers observed the relationship at the beginning (Jason had been hired two weeks prior to the study), Jason explained that from this informal mentoring relationship, he could take advantage of Mark's professional expertise. Mark explained that his commitment provided him with professional challenges as well as the means to achieve necessary and immediate goals (keep the production line process flowing). These specific and shared goals, part of the organization's overall value structure, helped both employees develop institutionally acceptable models of behavior while working within a non-company structured social activity.

Shift Change

The routine, informal communication that took place between employees during the transition from one shift to the next was one of the more commonplace informal learning activities in the manufacturing companies with continuous, multi-shift operations.

Informal interactions among employees between shifts gave workers the opportunity to talk face-to-face about a range of workplace activities that may not be adequately covered in written documents. Commonly discussed activities included mechanical breakdowns, specific job-performance questions, schedule adjustments and company "gossip."

Examples of shift change

At one manufacturing facility, each production line had a different amount of overlap time between shifts. The amount of time that employees had for face-to-face interaction (an overlap of 5 to 30 minutes) between shifts affected the relationship between employees as well as their productivity. For example, on a line where the shift change overlap was only 5 minutes, employees did not share much information about mechanical difficulties. As a result, when a machine broke down, there was no information regarding its history or previous attempts to fix it. Skilled workers had a difficult time pin-pointing the problem and fixing it. On the other hand, on one of the lines where there was a 30 minute shift change overlap, employees spent time talking with each other and writing down pertinent information about machinery or production goals.

Shift change and informal learning

Many employees stated that during shift change overlap time, there was an opportunity to identify and discuss routine problem-solving in the workplace—both ongoing and occasional. Often, workers on one shift developed job performance techniques or effective communication strategies that could be shared with workers on the next shift. Such sharing of information during shift changes also enabled employees to call for a team meeting or management intervention to address recurring problems.

Research indicated that informal mentoring relationships sometimes developed among employees on different shifts because of the overlap time during shift change. The overlap offered the opportunity for more senior employees to provide training or informal mentoring to less experienced employees. In such cases, employees stated that they would come in early or stay late to allow for questions and problem solving discussions. Both employees stated that it depended on their own initiative.

In addition to acquiring specific problem solving and knowledge/skills during shift changes, some employees also stated that cooperating and sharing information with their counterparts on other shifts contributed to a greater sense of identity with their products and/or the production process across shifts. It was not clear, however, whether this sense of identification with a particular product or production process necessarily

translated into a greater sense of identification with the company. In fact, as some workers at a large manufacturing site increased competence and a sense of solidarity with workers across shifts, many employees felt that they produced a quality product in spite of management's lack of support.

Factors that affected informal learning and shift change

Factors that affected informal learning and shift change included:

- Time allowed to exchange information and ideas;
- Management support of personnel interaction during shift change;
- Necessary resources; and
- Balanced competition between shifts.

> ***Best practice scenario - Shift Change***
>
> At one manufacturing site, a 45-minute overlap in shifts provided the opportunity for informal learning in a variety of ways. First, on an employee level, workers indicated that they were eager to share information and expertise with co-workers when they understood that the co-workers' performance will impact the overall performance of all the workers, since it is a continuous process.
>
> Although the company encouraged some competition between shifts, in terms of meeting and surpassing production goals, enhanced competition between shifts sometimes undermined workers' shared identification with production goals across shifts and weakened cooperation. Several employees suggested that competition between shifts actually deterred valuable sharing of information between shifts.
>
> On a professional level, the shift change overlap provided two supervisors the opportunity to engage in an informal mentoring relationship. The new supervisor on the day shift and the more experienced supervisor on the night shift had the chance to share information, implement new ideas and get peer-to-peer feedback. The two supervisors also created an informal notebook of information, including ideas that they tried and succeeded or failed at; data on personnel issues; and data of mechanical breakdowns and how they were fixed. The log book also included personal notes to each other about sports (particularly golf, a passion they both shared) and family. This non-work-related information strengthened their social relationship and thus, their professional one. (For a more detailed look at non-work-related socializing and communication see the following sections on socializing and communication dynamics and social networks).

Peer-to-peer communication

Peer-to-peer communication is characterized by the nature and frequency of personal interactions among employees at all levels, within and beyond an employee's immediate job responsibility.

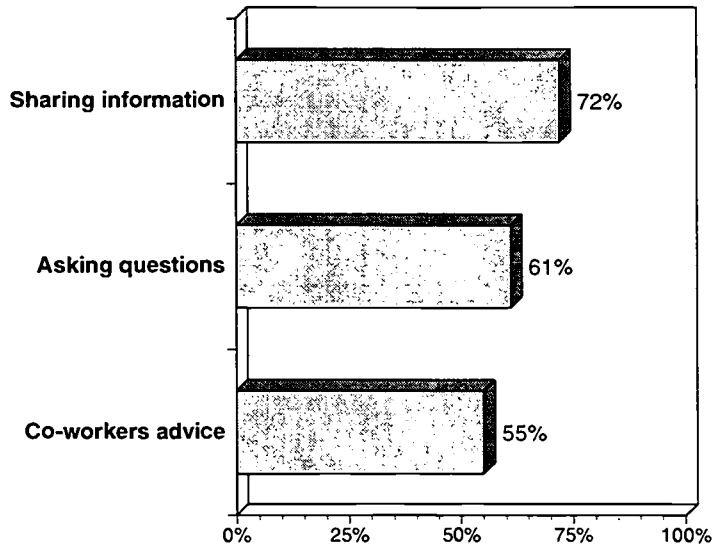
Peer-to-peer communication can be goal-directed, through which employees interact in order to gain information, skills and support relating to job performance, professional development or work-related problem-solving, or non-goal directed socializing, through which employees communicate in a way that has no direct relationship to their job performance or professional development but provided an important employee link that facilitated learning.

Goal-directed

Typically, employees sought out work-related information, advice or assistance from personnel within or beyond their specific work area (i.e., friends, former teachers or mentors outside the company). This also included turning to a peer on the production line and asking a question about the process or company policy; seeking guidance from a friend in another part of the plant about a general work situation (sometimes in the smoking area or cafeteria); or verifying company practices with outside sources.

Some employees enjoyed this type of socializing within the workplace and consciously knew that during such an activity, they were building useful relationships that facilitated and enhanced their work experience.

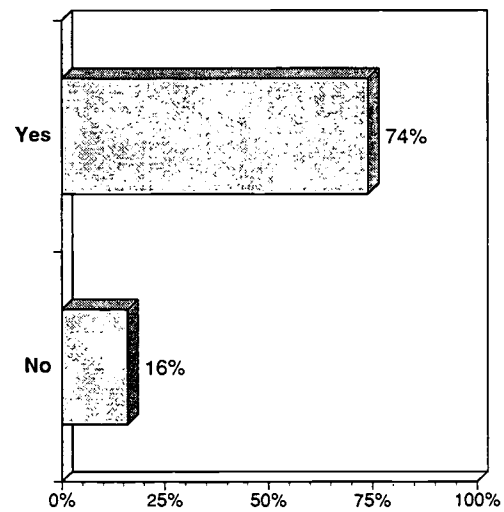
Which of the Following Activities Do You Usually Engage In During A Typical Week?



Non-goal-directed

Research also determined that the relationships developed through non-work-related social networking (work-time conversations not related to work, after-work sports activities, smoking, lunch time, walking groups, barbecues, parties, etc.) provided important links that facilitated learning among employees. For example, researchers observed employees "chatting" with other employees on the floor about non-work-related topics. Information not related to work was also exchanged during smoking and lunch breaks. These social networks provide a relaxed and comfortable type of relationship for employees to interact and either eventually seek out work-related information or ease the business relationship.

Do You Interact With Other Employees Outside of Work or During Breaks?



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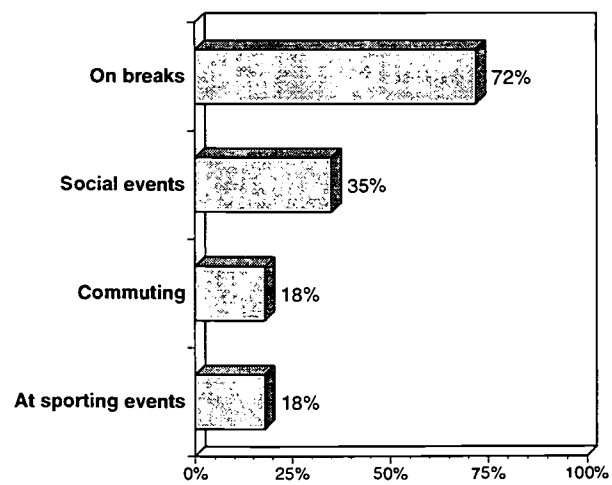
Where Do You Interact With Them?



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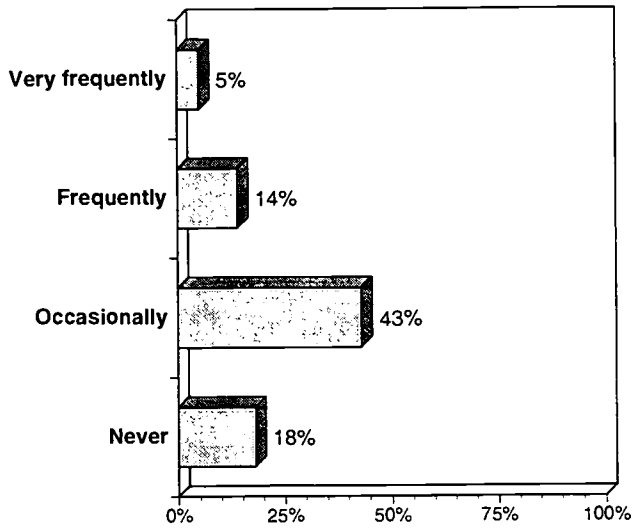
Do You Talk About Work Projects and Business Concerns With Other Employees Off the Job?



After-work activities such as golf leagues or company baseball games provided a social environment to foster relationships, particularly across hierarchies. When these relationships were transferred back into the workplace, employees stated that they found it easier to communicate and interact with employees with whom they were "out on the golf course" or "having a beer after work."

Peer-to-peer communication and informal learning

Through certain types of social interactions, employees learned specific job skills and knowledge as well as broader company business. Also, employees often equated socializing and gossip with learning. For example, one employee who worked at a small company stated that she knew about certain company policies and practices through "the grapevine." When asked how she knew what was actual company policy and what was just rumor, the employee stated that through socializing with different people in the cafeteria and while smoking she learned who to trust and who was reliable.

Also, employees stated that they learned communication and interactive skills when socializing. One employee stated that she learned how to communicate with peers by "hanging out," "talking in the cafeteria," and socializing at the company barbecue.

Factors that affected informal learning and peer-to-peer communication

Factors that affected informal learning and peer-to-peer communication included:

- A work environment of trust and cooperation;
- High morale;

- The size of the company and the work units within it;
- The physical proximity of workers in the same work stations as well as in work stations in sequential or parallel parts of the production process;
- The availability of spaces and opportunities for employees to interact and communicate outside the work stations;
- Management support;
- The style and level of management-sponsored supervision; and
- The level of integration of common job-related goals and objectives among co-workers.

Best practice scenario - Peer-to-Peer Communications

One example observed at a large manufacturing site included an informal morning coffee chat in the company cafeteria between an engineer (Kate), who was not a manager, and skilled workers—all on the same production line with the same production goals. Historically, at this company, the relationship between management and skilled workers had been difficult and even hostile. The engineer stated that she encouraged meetings to "create a better work environment."

In order to foster a more reasonable and productive work environment, Kate specifically designed these coffee chats to be about non-work topics. Sometimes the discussion topics included industry news, parenting or sports (non-work-related topics), and the interaction provided the opportunity to socialize, thus strengthening work relations.

Cross-training

Cross-training, one form of peer-to-peer training, occurred when more established employees from different departments taught and learned from each other in pairs. This arrangement often included an operator in one area learning the work of another within their production unit or work group. Usually, once training was completed, the trainer had no formal authority over the trainee. Typically, trainer and trainee continued to work together as equals in the same work group. When fully realized, cross-training often resulted in every operator of a work group possessing the ability to work at every station within the group.

Examples of cross-training

At one company, the phrase "go where the work is" was used to promote cross-training throughout the company. For example, when an operator was unable to work on his or her machine (due to machine failure, backlog, etc.), the operator was encouraged to seek out opportunities to help out others on the line. Many operators were observed walking over to another operator and asking if he or she needed help. The "working" operator was then observed showing the other operator how to do his or her job. The idea cascaded down through supervisors to their subordinates and became a company norm.

Though there was no financial incentive, the employees indicated that they understood that this type of initiative would enhance productivity and thus benefit the company as well as enhancing their own employability and job security with the firm.

At another site, management had practiced cross-training on one line as an experiment, with workers routinely rotating from one station to another until they learned the skills and knowledge necessary to operate every machine. However, management determined that there were too many machines in the unit for rotating workers to remain "fresh" on each unit and discontinued cross-training. Employees stated that they "missed" this practice since they now have all of this machine-operating knowledge and no outlet to use it, and that they got "bored" repeating the same daily routine each day on the same machine.

Another example of cross-training at one large electronics company occurred on an informal basis and was not part of a standard company practice. On the shop floor, the close arrangement of work stations in sequential parts of the production process enabled employees to informally observe, ask questions, and learn about their respective job responsibilities as well as the machinery adjacent to them in the production process. Although they were not formally required to learn new skills, employees were able to informally gain the knowledge and fill in for absent workers when asked by a supervisor.

Cross-training and informal learning

The cross-training process occurred at different times, on different levels of formality — from the highly formalized (abiding by ISO procedures) to the informal (replacing absent employees on a moment's notice with no previous training). During both

instances, the highly interactive teacher-learner relationship provided instruction for the learner on operating procedures, segments of the production process and the system-at-large.

Through cross-training, trainees learned new job-specific skills (i.e., how to perform the work at various stations on the line or how to reach certification level at different workstations); the character of co-workers (i.e., personality and work ethic); how to integrate feedback; and effective social skills. Also, research indicated that cross-training expands an employee's *horizon of observation*—when an employee learned another task within the entire production process, particularly when it took place out of his/her department, the employee's understanding of the task was redefined within the context of the whole process (Hutchins, 1993).

The cross trainer enhanced his or her teaching and communication skills. Successful cross-training depended on how skills and knowledge were taught to other employees. Many employees of the firms researched stated that they learned from teaching co-workers how to work machinery and that the process refreshed their memory.

Finally, as employees were not necessarily bound by their task, cross-training impacted the social relationship between trainer and trainee, specifically influencing the level of peer-to-peer communication and an employee's social network.

Factors that affect informal learning and cross-training

Factors that affected informal learning and cross-training included:

- Tolerance for mistakes
- Job security;
- Union-mandated job requirements;
- A system of reward and recognition;
- Management support;
- Follow-through on learning;
- A clear understanding of cross-training goals;
- Sufficient time to learn and reflect on new skills;
- Challenge of the task;
- An effective cross trainer;
- Work habits of both trainer and trainee; and
- Access to resources (i.e., manuals).

Best practice scenario - Cross-training

Through a cross-training initiative, one company encouraged all of its employees to perform the work at every machine in their work unit. Employees learned the operating procedures of various machines and thus, new segments of the production process (further stressing the larger overview of the production process). Cross-training also created a sense of team work among employees and developed productive social and interaction skills as well as interpersonal dynamics. Daily and weekly production goals were posted on white boards and if an employee caught up or there was a back log of work and she wanted to meet her unit's production goals that day, she could assist another operator. This benefited the company's interest—as knowing different machines allowed employees to contribute where work needed to be done. And, employees benefited from incentives and rewards—when trained in all the jobs of a work unit, the employee received the title of partner and a significant pay increase.

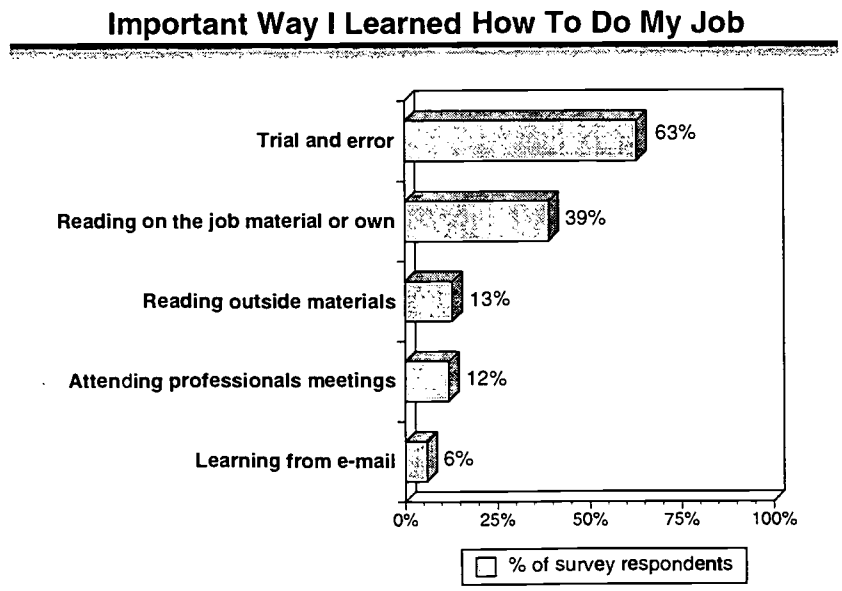
Exploration

Exploration is the process through which individual employees initiate activities such as self-directed informal study, resource identification and use, and continuing education.

While all exploration can in a broad sense be goal-directed, exploration activities can be divided into those that are directed toward task-specific goals (such as solving a particular job-related problem or acquiring a particular skill) or psychological goals such as the satisfaction of curiosity and personal development.

Specific activities through which employees engage in self-initiated exploration include:

- *Personal Reflection.* Generally the initial and most significant activities in employee exploration, the time to think and reflect about work-related problems and issues — without immediate reference to more formal instructional resources — helps develop an employee's own personal perspective on work assignments, career and the company as a whole.
- *Experimenting.* Through a series of trials and errors, many employees stated that they were able to "try out" or "test" theories, ideas and new processes. However, employees also stated that in order to experiment with these new concepts, they had to perceive management as being cooperative and even helpful in providing the time and necessary resources.
- *Identifying and acquiring various media resources, including written materials, tapes, audio-visual resources, interactive computer training programs, company-wide computer databases, etc.* Employees identified and used these types of resources to address specific work-related problems or career-advancement issues, or simply to expand their general understanding of the organization or tools (i.e., "play around with computer software"). The availability and quality of such useful resources—whether print, electronic or video—affected employees' level of informal learning.



Exploration and informal learning

As employees explored various aspects of the production process or company practices, many stated that they developed a better understanding of the big picture. More explicitly, with the freedom to explore — listen, watch, analyze and experiment — employees learned about the relationship of their own job to the company's overall production process. They also acquired a sense of accomplishment and self-confidence. Employees that initiated their own efforts to solve problems or gain skills or information, stated that their confidence increased and they felt a personal sense of fulfillment.

Factors that affected informal learning and exploration

Factors that affected informal learning and exploration included:

- Level of individual motivation;
- Level of individual work habits;
- An environment of trust; and
- Management support.

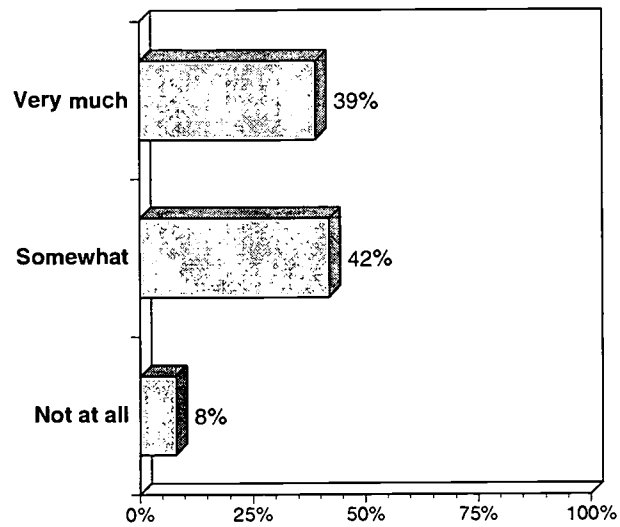
> ***Best practice scenario - Exploration***
>
> At one manufacturing company, the on-line internal database software system is networked to all of the workstations and provides basic data module training as well as an updated report on customers. All employees have access to the modules (i.e. sales and marketing, tech support, etc.) and are required to update customer files when necessary and can refer to a module if necessary. For example, if a sales person is making a call and wants to look up the history of the company's relationship with the potential customer, he or she can access an archive of phone calls from the tech support department, or mailings sent out by administration and shipping staff, etc.
>
> Employees are encouraged to explore various parts of the software system and many stated that they learned about the company as a whole through this process. Employees are also encouraged to suggest enhancements or changes to the software system and communicate these ideas to administration and programming staff. Through this procedure, employees indicated that their active involvement in the enhancement process resulted in acceptance of their improvement suggestions.

On-the-job training (OJT)

Through OJT, newly assigned employees received peer-to-peer training in workplace instruction regarding formal job requirements. Typically, a more experienced peer involved in similar responsibilities provided OJT. Usually, peer trainers had no authority over the trainee beyond those specified by initial OJT requirements.

Typically, after completing OJT, the peer trainer reported the trainee's level of skill competence to the supervisor, then trainer and trainee gradually began to work together as peers. Informal mentoring relationships may or may not have developed out of OJT, depending upon the demands of the job and the relationship between the participants, but such informal, ongoing relationships were not generally specified by management. As can be observed in the following chart, a fair amount of employees enjoyed providing OJT.

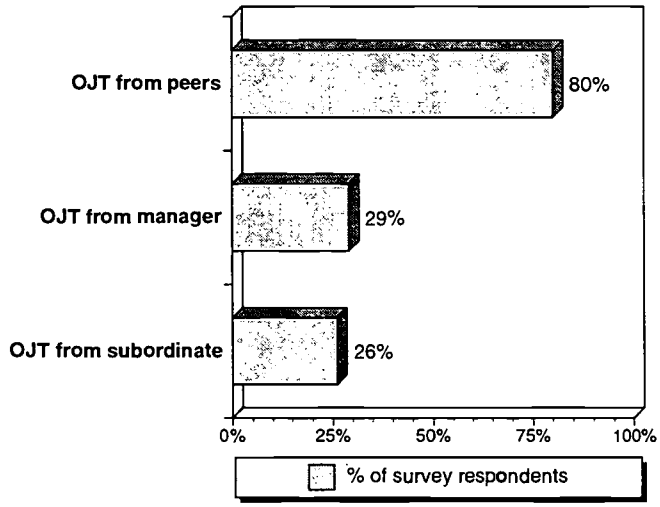
Did You Enjoy Providing On the Job Training?



Generally, OJT lasted from a few hours to a few weeks, depending on the task's complexity and the trainee's ability. An employee responsible for performing a single task or series of tasks repetitively on a daily basis received a less intensive OJT period than someone responsible for operating complex equipment with multiple applications.

Some organizations promoted OJT through formal training initiatives, assigning trainers to new employees during job orientation and following up the training with formal checklists of necessary skills. Some organizations promoted OJT informally, by simply encouraging employees to ask the closest worker on the assembly line to show the new employee how to do his or her job.

Which of the Following Resources/Experiences Provided You With Important Information You Need To Do Your Job Well



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Some organizations promoted OJT informally, by simply encouraging employees to ask the closest worker on the assembly line to show the new employee how to do his or her job.

Example of on-the-job training

At one mid-sized manufacturing plant, a new machine shop hire (Gilbert) was assigned to a formal OJT trainer (Owen), who demonstrated the nuts-and-bolts of a task and then watched Gilbert perform the task for several hours. Owen then oversaw Gilbert's work practices for a few more hours, continuing interaction. The following day, Gilbert worked independently but with an occasional approving or disapproving discussion from Owen. By the end of the week, Gilbert stated that he felt comfortable working on his own. Taking that cue, Owen worked next to Gilbert with periodic interaction, but generally to ask if everything was okay. These latter interactions reflected less of a trainer-trainee association and more of peer-to-peer.

On-the-job training and informal learning

The highly interactive structure of hands-on OJT may be formal or informal, depending upon management's criteria for learning. For example, research indicated that at many manufacturing firms, OJT responsibilities and outcomes were formal in order to meet ISO standards. One site maintained formality with a management sanctioned guideline, checklist and final skills test; all governed by strict ISO standards. In this case, OJT was formal because the process was formal.

While another company, though its more skilled workers were bound by company certification and federal industry rules, gave little or no formal guidelines to peer-assisted OJT for those employees responsible for more repetitive, less technical tasks. Instead, management simply stated "Work with that guy for a while until you get the hang of it and then let me know when you can go out on your own." This OJT was informal because the process was informal.

Though some informal learning occurred during the more formally structured OJT, in the latter, more informal process, OJT provided richer opportunities for several kinds of learning for both the trainee and trainer.

Through observing the trainer and asking questions, the trainee learned job specifics and gained exposure to the actual work environment, including information about the pragmatics of the job (the formal procedures). An employee also gained insight into management and peer expectations. Through interactions with more experienced employees (OJT trainers), new employees learned both formal management expectations and informal peer expectations regarding quantity and quality of work, as well as the discrepancies between the two. Through such interactions, the trainee also learned how to integrate feedback.

By communicating skills to an employee, the OJT trainer improved his teaching skills; more specifically, understanding the difference between simply showing someone how to do a job and teaching them. Also, the trainer took pride in teaching his task, as it provided him with a personal sense of accomplishment, expertise of his job and a sense of respect among employees.

Factors that affected informal learning and OJT

Factors that affected informal learning and OJT included:

- Tolerance for mistakes;
- Job security;
- A system of reward and recognition;
- Follow-through on learning;
- Management support;
- Clear understanding of goals;
- Sufficient time to learn and reflect on new skills;
- Challenge of the task;
- An effective trainer;
- Work habits of both the trainer and trainee; and
- Access to resources.

Best practice scenario - On-the-job Training

At one large manufacturing company, when new employees received OJT, informal learning practices included a certain amount of trial and error on the job, and time to observe, ask questions, share information, read and network. These factors played a key role in a new employee's orientation to the pragmatics of the job. However, employees at this firm also stated that the allowed reflection time gave them opportunities to come up with questions that were not immediately apparent. Additionally, this time allowed them to ask questions about the company's culture, including the hierarchy, internal politics, corporate values and accepted methods of behavior and communication. Acculturation occurred more frequently through informal training techniques, since these employee expectations are rarely explicit and much more difficult to learn through formal methods.

At this same company, researchers observed one trainer (John) who was particularly good at training—having been a Sunday school teacher, with years of experience training new employees, and was motivated and patient with trainees' initial mistakes—as opposed to being just proficient at performing the job task. Since the job required learning a more complex task, John also closely observed the trainee (Dan) over a long period of time, as his work station was located nearby. This also gave John the opportunity to provide constant, real-time feedback.

John eventually reported to the first-line supervisor that Dan was ready to work independently but with an occasional "check" from John. This was key since timing of the trainer-trainee separation is also a consideration. Once OJT was considered completed, John announced in the weekly team meeting that Dan had successfully completed the practice session. The team congratulated Dan with a certificate of achievement. Soon after, Dan was observed slowly gaining the confidence to work on his own, still asking John questions but eventually working with him as a peer.

Documentation

Employees at all seven companies routinely documented their work in written form, both in response to the formally specified requirements of their jobs and informally, to meet their own needs. Formal, institutionally required or sanctioned documents (such as ISO documentation, internal newsletters, vendor manuals and daily work log books in either electronic or written form) were generally publicly displayed and readily available for the use or review of anyone involved in the production process. Informal documents (such as privately prepared job-performance manuals or instruction sheets) may or may not have been available for use by other employees involved in the same part of the process.

Informal documents (such as privately prepared job-performance manuals or instruction sheets) may or may not have been available for use by other employees involved in the same part of the process.

Example of documentation

At one large company, at the end of each shift, operators and skilled tradesmen compile a daily work log in a notebook and supervisors contribute to a running electronic log that is maintained on a networked computer. Most employees on the next shift refer to the log (written or electronic) before beginning their daily routine. However, some supervisors reported that the log is not archived nor can it be cross-referenced. During the overlap in shift change, any questions about the logs can be answered.

Informal learning and documentation

Research indicated that documentation preparation provided the opportunity for employees to learn specific job-related knowledge and skills. It also increased critical thinking and communication skills, including writing and verbalization; increased a sense of belonging to the company through the feedback process; and improved understanding of the job, as a distinct process. Resource documentation developed and supplemented by employees was an important complement to formal OJT.

Factors that affected informal learning and documentation

Factors that affected informal learning and documentation included:

- Individual motivation;
- Management support;
- Availability of resources;
- Tolerance for mistakes; and
- Job security.

Best practice scenario - Documentation
One medium-sized electronics firm created their ISO documentation with maximum employee input — each employee was asked to write down the procedure that he or she followed. Then, the document went through a series of edits between management and worker.

The final document provided useful, job-specific information with an emphasis on local (rather than general) skills information because it was initiated by the person actually performing the particular set of skills. Employees stated that during cross-training, they referred to these documents as often as their trainer because they know that someone who actually works on the machine wrote the document.

Execution of One's Job

On a daily basis, employees were engaged in the execution of their job, that is the repetition of specifically assigned tasks. At the same time, employees were typically unaware of learning through this daily task repetition and were more focused on the accomplishment of their tasks, avoidance of mistakes and conflicts, and securing the comfort of familiar domain.

For example, when asked how they learned to do their job and why they do it in a certain way, many operators and assemblers simply stated "by doing it everyday."

For example, when asked how they learned to do their job and why they do it in a certain way, many operators and assemblers simply stated "by doing it everyday."

However, based on observation of direct work experience, employees tended to develop action-centered skills or their own sequence or pattern of work procedures that may have increased speed and thus productivity.

Example of execution of one's job

At one large production facility, crane operators were responsible for moving heavy equipment, bundles of parts, and completed products throughout the plant. During each shift, specific quadrants of the facility were represented by a lead operator, who assumed responsibility for training, coordinating and supervising additional operators, according to the requirements of the shift.

Throughout the entire facility, manually operated cranes were suspended from overhead tracks which ran parallel and perpendicularly to the production-line flow. Crane operators maneuvered the lifting device by using a large swivel box worn around the waist. The box controlled both the speed and direction of the crane across the facility, and the lift and pull of the crane itself. Old-fashioned hook cranes (with an iron hook attached to a heavy steel cable) were commonly used throughout the facility. High-powered suction cranes (with a series of electronically activated suction cups attached to a long steel plane) lifted and transferred completed products at the end of the production line.

Newly hired operators received all of their training — including safety requirements — on the job from the lead operator on their shift or another experienced lead operator. Since the crane mechanism was operated entirely by sense of feel (with no numerical coordinates), it was especially important that new operators were allowed sufficient time to "get the feel of the equipment" in a safe, lightly supervised work setting. Research indicated that new employees required anywhere from three days to two weeks to become comfortable operating the cranes without direct supervision.

In addition to the physical operation of the crane, operators were also responsible for learning the coding system through which parts were pulled and delivered throughout the factory. Each part was given a specific numerical code, along with a letter prefix indicating its destination. Digital display boards were suspended above each section of the production process, from materials and fabrication to final assembly. Each day, operators received work orders, including the sequence for pick-up and delivery, from the display boards in their particular quadrant of the facility.

Since the parts moved overhead were so large and heavy, safety played a huge role in crane operation. The basic safety guideline of all crane operators was that parts or products should — under no circumstances — be moved directly above a passageway or production site inhabited by other employees. In the course of performing their jobs, experienced crane operators also learned to schedule safe deliveries in advance by anticipating the movements of employees in each section of the production process.

Informal learning and the execution of one's job

The main types of learning that occurred within the framework of job execution included knowledge and skills relating to the job routine and how to deal with crisis situations, mistakes, changes in the environment and organizational policies.

Most employees also stated that the content of what they learned from performing their job on a daily basis includes job-specific knowledge, the ability to meet deadlines (and manage the stress/work pressures of meeting those deadlines) and some critical thinking skills.

Factors that affected informal learning and execution of one's job

Factors that affected informal learning and execution of one's job included:

- Level of individual motivation;
- Management support;
- Employee empowerment;
- Challenge of task; and
- Level of individual work habits.

Best practice scenario - Execution of Job

At one mid-sized manufacturing site, employees who were required to perform routine, repetitive tasks on a particular production line were motivated in the daily execution of their jobs and encouraged to think proactively, critically and analytically. This was emphasized by their work team leader and supervisor as well as the supporting engineer and skilled workers.

Through the supervisor and work team leader, the company goal — to exceed the expected productivity rate — and certain policies, like cooperation and teamwork, were clearly and consistently communicated to the employees. The supporting line engineer also encouraged employees to work with him in order to come up with improved ways to do their jobs. And skilled workers explained certain basic mechanical and electrical elements of the machinery to enable workers to repair minor breakages.

As a result, each employee on the line actively sought out new, refined and streamlined ways to work at their task in order to meet the company goals. The daily execution of their task, no matter how repetitive, became an exercise in identifying, analyzing, thinking and implementing new ideas.

Site Visits

Some host firms require employees to visit sites where the company product is used. By having employees visit external customer sites, they are able to see the product in actual use or see how the product is used in the next step of the production process.

Example of a site visit

One firm regularly sent employees to the company's corporate headquarters, where the factory's product was shipped to and used in the next part of the production process. Through interaction with these company customers, employees stated that they had the opportunity to discuss certain aspects of the production process. From such discussions, employees stated that they were able to better pack and ship the product so that the customer could easily place the parts on the assembly line. This sped up the process and increased productivity.

Site visits and informal learning

By visiting external customer sites, employees were able to get a better understanding of the big picture and, as previously explained, expand the scope of their horizon.

Employees also stated that by seeing how the products are actually used in the field, they adjusted their working guidelines and sped up the process without compromising their professional standards to meet external customer needs.

Also, from visiting external sites, employees stated that they adjusted their priorities and informal guidelines in response to face-to-face conversations and interactions with clients regarding their needs and actual product use. Employees reported that they were able to integrate the knowledge and understanding gained from these interactions into their intuitive approach to their work.

Factors that affected informal learning and site visits

Factors that affected informal learning and site visits include:

- Frequency and quality of external customer interactions;
- Opportunity to see the product in use; and
- Flexibility to integrate and implement ideas gained from visiting external sites.

Best practice scenario - Site Visits

At one large company, a line supervisor planned to take his production team to another company factory. This factory receives its parts from the supervisor's production team. Prior to the visit, team members stated that they were unable to articulate customer needs and didn't fully understand the overall production process. However, after visiting the site, seeing the next part of the production process and interacting with customers, team members stated that they learned about certain customer needs. Specifically, team members learned that their customers in the other factory require parts packed in a certain fashion. When they returned to their own site, they were able to implement what they had learned and received a letter of satisfaction from the customer and the production manager.

Summary

This section outlined how informal learning occurs in the workplace and can be summarized by the following key findings:

- Informal learning occurs during a variety of *everyday* work activities. Some are social or individual in nature; formal or informal in structure; and inherently goal-directed or non-goal-directed. However, all embody an *informal learning process.*

- The *majority* of informal learning occurs during the following work activities:

  - Teaming
  - Meetings
  - Customer Interactions
  - Supervision
  - Mentoring
  - Shift Change
  - Peer-To-Peer Communication
    - -- Goal-directed
    - -- Non-goal-directed
  - Cross-Training
  - Exploration
  - On-the-Job Training
  - Documentation
  - Execution of One's Job
  - Site Visits

- Unlike previous research that states learning is fundamentally social and most effective when it is integrated in social participation, research indicated that individuals also learned informally in a meaningful way when participating in individual activities.

- Unlike previous research that states the majority of learning happens during breakdowns, research indicated that the *majority* of informal learning occurred during *everyday* work activities.

As previously stated in this section, there are direct factors that intrinsically affect everyday work activities and either facilitate or inhibit the learning process. However, these activities and factors do not occur in a vacuum and are also influenced by various contextual factors. These contextual factors will be outlined in the following section.

CONTEXTUAL FACTORS IMPACTING THE ORGANIZATION

INTRODUCTION

Overview

The following section describes how the context within which workplace activities occurs can impact informal learning. Contextual factors are not directly connected to the informal learning activity (as discussed in the previous section); rather, they are part of the environment in which informal learning occurs. For example, the incentive structure in an organization and whether or not an organization is unionized are contextual factors which impact the amount and quality of learning within that organization.

Contextual factors are not directly connected to the informal learning activity (as discussed in the previous section); rather, they are part of the environment in which informal learning occurs.

The fact that we have defined some factors as contextual does not in any way diminish their importance, or the extent to which they impact informal learning. Research shows that contextual factors impact learning as strongly as direct factors.

The consequences of this finding is that the same activity implemented in two different organizational contexts will result in different learning opportunities. In one organization the activity can lead to a lot of learning while in the other it may lead to very little (or a different type of) learning.

Research has identified a variety of contextual factors which impact informal learning. These factors have been grouped into those which impact the organization, and those which impact the individual.

The contextual factor found to have the strongest impact on informal learning is organizational culture. This section outlines those factors which constitute organizational culture, and how it impacts informal learning. Also presented are a variety of other contextual factors, including incentive structure, the presence of a union and job security.

Many of the contextual factors that impact the individual are not under the direct influence of the organization. For example, an employee's mental capacity and personality greatly impact informal learning and are difficult for an organization to change.

THE ROLE OF CONTEXT IN INFORMAL LEARNING

Research indicates that both the organization and the individual function within a context which impacts informal learning. These two contexts will be described in the following sections.

On an organizational level, there are three major contextual categories or levels which impact informal learning:

- Industry level;
- Company/firm level, and
- Cultural level.

On an individual level, there are four major categories of contextual issues which impact informal learning:

- Internal motivation;
- Personality;
- Mental capacity; and
- Work experience.

We begin with a discussion of contextual factors which can impact the organization.

Organizational Factors Impacting Informal Learning

Culture

Culture is a term which is easy to use yet difficult to define. Conversationally it is often used to refer to the sum of the norms in a community—a kind of aggregate or generalization that represents the characteristics of how most people within the community tend to behave and think (e.g., they are a hard working culture). While there is often consensus in a culture about how to behave, most members of the community would have a difficult time explaining how the norms are generated or manifested, and what exactly the norms are.

One of the central findings of this study is the strong connection between culture and informal learning.

The impact of culture on behavior cannot be underestimated. It impacts our deepest thoughts as well as our most superficial behaviors. In the workplace, the culture of an organization can often determine whether it will adapt and thrive in the competitive environment or succumb to it.

One of the central findings of this study is the strong connection between culture and informal learning. The culture of a business—the norms, beliefs, values, and practices which pervade an organization—was an overriding factor in determining the extent and variety of informal learning found in that business. While formal learning is also facilitated by the culture of an organization, it is not as highly dependent on it as informal learning is. Unlike formal learning that can occur even in cultures that do not facilitate learning (e.g., through compulsory management courses), informal learning is often learner initiated, self-motivated, and will depend on the individual's experience within the organization.

Given the important role of corporate culture, it was imperative to determine the factors which constitute culture. Our research successfully identified numerous cultural variables that are essential contributors to informal learning. These cultural variables can be grouped into two main categories:

- Organizational practices
- Social norms and values

Taken together, these two sets of variables can be seen as representing the corporate culture of an organization. The following section will describe these two variables and outline the factors that constitute them.

Organizational Practices

The practices of the organization that impact corporate culture involve all the organizational behaviors that communicate meaning and values from management to employees. They are any actions that employees perceive as representing the ideals, values, and beliefs of the organization. Organizational practices represent "top-down" rules, as they are practices put-forth by management that trickle down through the organization. The following are a list of four central factors that the research found to contribute to the corporate culture of an organization.

- *Policies and Practices*

  The policies and practices of an organization communicated not only the behavioral practices of the organization, but also its underlying values. Dress codes, policies towards mistakes and errors, family benefits, the frequency of technological upgrading, the extent to which management follows through on its practices, and management communication style, all send a message to employees about the "type" of organization they are working in.

  Additionally, mission and vision statements tended to define the overall goal of the organization. They suggest the path, and outcome to be attained. Mission and vision statements have a very large impact on the organization, as they tend to unite the various divisions across the organization with common goals.

  At one company, employees could recite the mission statement and had copies printed by their workspace and even in their wallets. When asked if they could explain the statement, most explained it in detail, emphasizing that they have internalized these goals and reference them on a daily basis.

  The impact of the policies and practices on the organization and learning is further discussed below in the section on "The interaction between culture-as-presented and culture-as-experienced".

- *Leadership Style*

  The style of the leader of the organization usually trickled down and impacted the organization as a whole. Whether leaders were authoritarian (theory "X"), or more cooperative (theory Y) in their approach greatly determined the culture of the organization. (see also leadership section in following chapter on "company factors that affect informal learning").

  In one organization, employees stated that they liked the head of the plant. He constantly walked the floor, ate lunch with employees and followed-through on employee ideas. As a result, when new initiatives were announced, employees stated that they were more likely to accept them as a means to achieve goals. In particular, when the plant manager wanted to

encourage cross-training, employees readily accepted his motto "go where the work is" and often used it to describe cross-training practices.

- *Incentives*
  The incentive structure in an organization was a strong communicator of its values. Those behaviors that the corporate culture embraces were reinforced, while those perceived to lack value were discouraged. (See also incentive section in following chapter on "company factors that affect informal learning").

- *Symbols*
  Every culture has its symbols — posters on the wall stressing "teamwork," the type of protective glasses worn by line workers, the modern furniture, the founder of the company and his reputation, or the size of senior management's offices. All these are symbols and representations of the corporate culture. Symbols are not necessarily created to communicate cultural meaning, but nonetheless, employees often infer meaning from them.

Social Norms and Values

Social norms are implicit or explicit rules for acceptable behavior, values, or beliefs. Groups tend to have certain expectations about how other group members should behave. Members in good standing conform to those rules. Members who do not are perceived as different, difficult, and eventually deviant.

The social norms in an organization are a major component of the corporate culture. Just like the organizational practices described above, social norms influence how employees behave and what they think. However, organizational practices often involve explicit rules and are generated or initiated by management. They can be perceived as a top-down process. Social norms, on the other hand, are often generated from within the organization's employee base. They can be seen as representing a bottom-up process.

The following are a number of central factors that our research identified as constituting the social norms within organizations.

- *Work Habits*
  The way in which employees perform their job is driven by many social forces. For example, one organization we looked at had a culture of "excellence", where it is the norm to push oneself to perform at as high a level as possible. Another organization had a culture of "comfort" where employees work at a pace that is steady and convenient. In such cultures an employee is often perceived as deviant if she works faster than others. Work habits develop over time and are known by all workers.

Some organizations value safety above all else, where people will stop the work process even if a remote risk is at hand. The level of risk tolerance can differ in different cultures and even for different work teams within an organization. Every job has its unique characteristics and will be governed by specific norms.

- *Trust*
  Trust is one of the fundamental pillars of an organization. A high level of trust greatly facilitates the flow of operations and adaptation to change. Change usually involves uncertainty, and trust will often determine the extent of internal resistance through the transition. In general, two dynamics of trust are important: trust between employees and management and trust among employees.

  Trust is a sensitive issue that is built over time. Consistency in behavior is key for trust to occur. Management that is consistent and stands by its word, tends to generate more trust among employees than management's that do not deliver on their promises. The research indicated that at organizations where trust is lacking employees tend to treat management initiatives as the "flavor of the month."

  In general, two dynamics of trust are important: trust between employees and management and trust among employees.

  Another dimension of management-employee trust that we discovered is the extent to which management is perceived as having employees interest at heart or whether management is primarily self-motivated. Employees were more receptive to management's plans, as harsh as the plans may be, if management was perceived to be caring about employees.

  Trust among employees impacted their tendency to help one another and work together. Trust among employees is a dimension that is often under the surface, not discussed openly, yet known to all employees. Employees did not talk about the lack of trust in the focus groups but discussed it in one-on-one interviews. In some cultures we investigated, employees identified "back-stabbing" as a common phenomenon, while others reported that cooperation was the norm.

- *Competitiveness*
  Research indicated that a moderate level of competition among employees can be invigorating for a work place. It can motivate employees and create a context where striving to improve is part of the norm. Competition in moderation implies that while people are trying to perform better than each other, they are not trying to harm each other. Competitiveness without trust can often turn the work environment to an unpleasant setting where workplace competition takes on personal overtones. The balance between competition and trust is an important social dynamic within an organization.

Research indicated that a moderate level of competition among employees can be invigorating for a work place.

  Competition among teams can improve the work process, increase the sense of community, and provide a playful experience. At one organization where the performance of different teams was mapped on the bulletin board, competing teams would take pride in their teamwork and effort. In this case, the sole motivator for competitiveness was recognition from other team members.

  A downside to competitiveness is that it can create barriers to sharing information. At one research site with 3 shifts that competed for productivity goals, employees from one shift would not share with the other shift factors that they found to improve the work cycle.

- *Cooperation/community*
  Employees often identified with their work group and felt a sense of belonging to a community. The identification occurred with their immediate work group, people who work on their line, a specific professional work group, the organization as a whole, or any other category of employees with whom they interacted. Such ties often generated important work connections and created a cooperative environment.

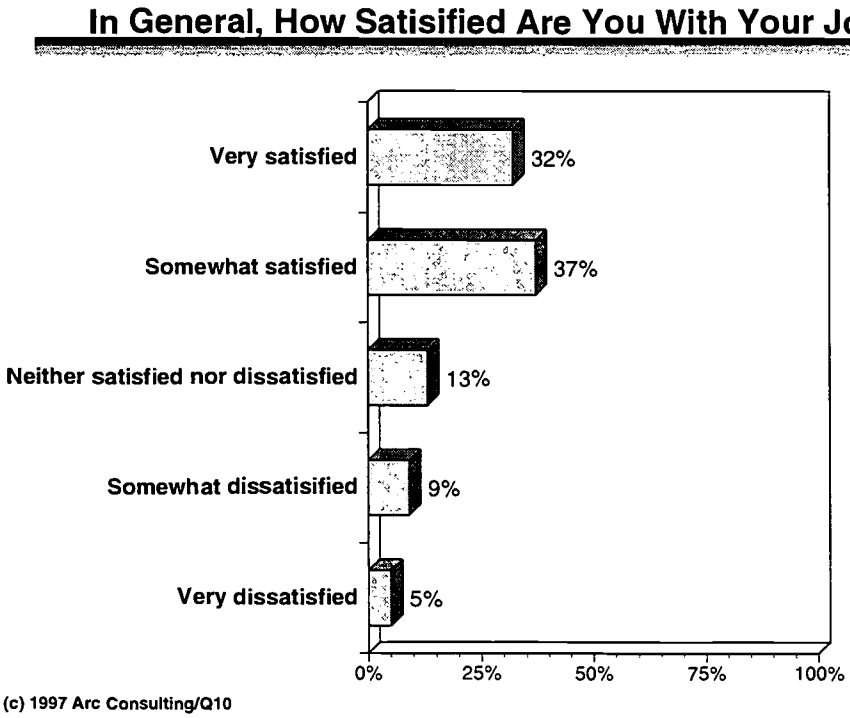
  Groups tended to be created when employees interacted with each other and were interdependent in the sense that they share similar goals (often work goals). Members of a group tended to perceive the world as differing between the "in-group" and the "out-group" (i.e., anyone not in their group). Group members tended to help each other in their daily routine, shared information, and stuck together when problems arose. Work groups tended to socialize on the worksite, sit together in the cafeteria (e.g., supervisors

ate together rather than "mixing" with supervisees). Each work group represented a small sub-culture within the organization with its own rules and norms. The sense of inclusiveness and exclusiveness sometimes generated competition between different groups who worked on similar work processes.

At one small company, most employees stated that they felt a sense of community among their peers and supervisors. Because of the company's size, employees were easily able to get to know one another and trusted each other.

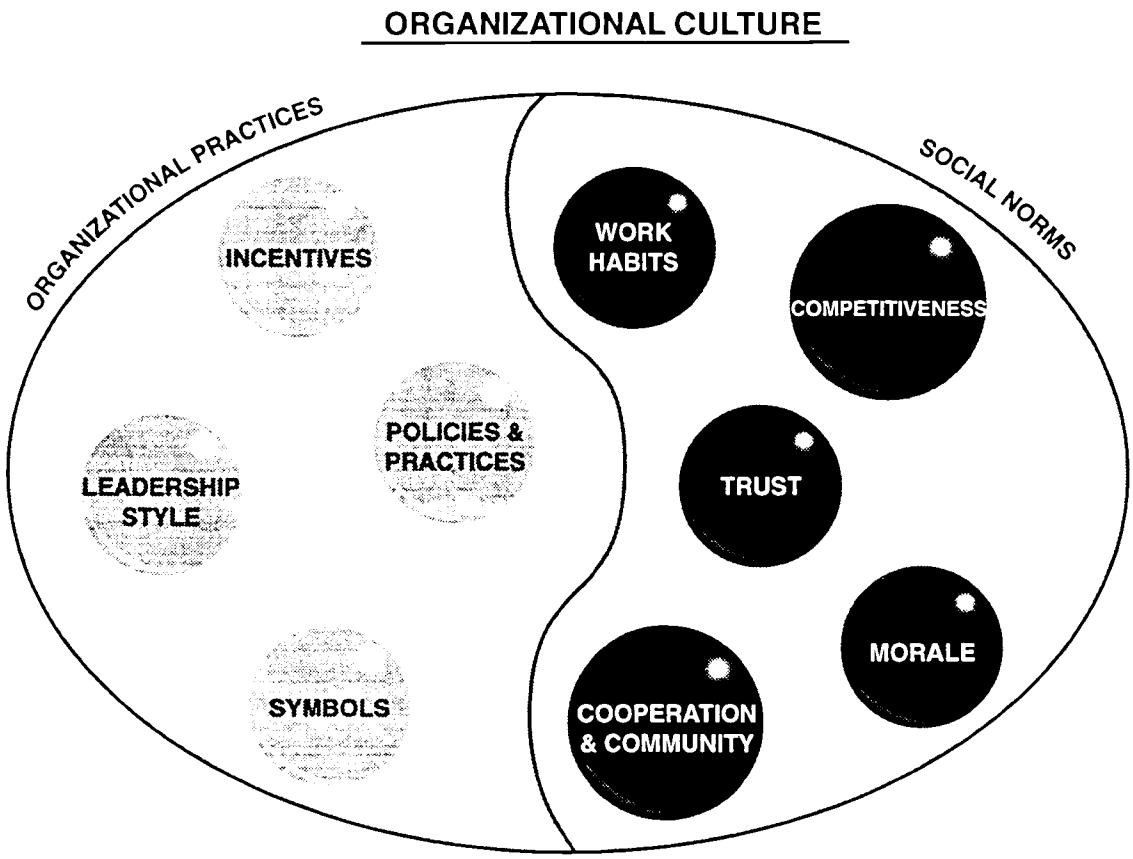
- *Morale*
  The morale within an organization typically refers to the overall satisfaction level as well as expectations for the future. Morale is a phrase that reflects the extent to which there is an overall positive or negative attitude towards the organization. In a sense, morale can be seen as a gauge of the overall experience of employees within the culture. Most of the factors discussed above in the culture section impact morale (primarily job security).

  Research indicates that on average, employees at the organizations studied had a moderate job satisfaction level.



In summary, two main factors that impact culture have been outlined—organizational practices (top-down), and social norms and values (bottom-up)—interacted rather than functioned as isolated forces. The organizational practices created the boundaries and the parameters in which the social norms arose. The organizational practices often created a reality in the workplace, and the social norms tended to react and respond to the new conditions or fill in the gaps where no policies existed. That is not to say that all social norms were reactive. Social norms can arise independently of any organizational practice (e.g., research shows that employees can develop trust and cooperation independently of management's policies). Taken together, the social norms and organizational practices constitute the corporate culture of an organization, and determine the overall experience of the workforce.

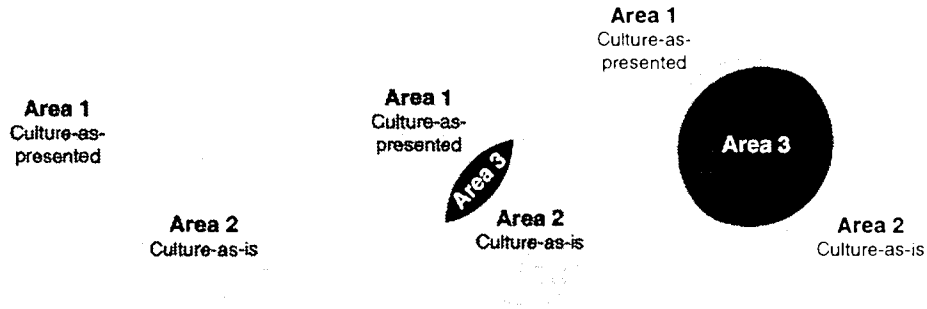
The following chart summarizes the factors that constitute and contribute to the organizational culture.



The Interaction Between Culture-as-Is and Culture-as-Presented

The previous section outlined the factors that contribute to, and constitute, culture within an organization. One of the key findings of the study is the highly correlative relationship between corporate culture and informal learning. Research also identified that the impact of culture on learning varies greatly depending on the overlap between the actual culture of an organization (culture as experienced), and the presentation of the culture by the organization (culture as presented by management). In other words, when the culture that employees experience on a daily level, matches the culture that management claims to exist in the organization, then employees will be more receptive to learning. The figure below outlines three possible states for this relationship between culture-as-is and culture-as-presented. The relationships between the two variables are discussed in the following examples.

When the culture that employees experience on a daily level, matches the culture that management claims to exist in the organization, then employees will be more receptive to learning.



A **B** **C**

In Figure A, the two versions of the corporate culture are widely divergent. There is no overlap and the credibility of the culture-as-presented is very low. This indicates that a legitimate crises may be at hand and the disaffection among employees is likely to be high. An example of this type of culture would be a company that preaches the value of training, but provides no time or support for training among its employees.

In Figure C, there is a close overlap. The two aspects of corporate culture are nearly coincident. Strategic planning and corporate initiatives are more likely to succeed, since the presumed and actual culture of the business are essentially the same. An example is an organization that preaches that learning is essential and follows through by making it mandatory that all of its employees receive training every year.

In Figure B, there is substantial overlap, but culture-as-experienced still falls short of the ideal in many ways. Because external forces such as markets, competitors, and technologies tend to move the circles closer or further apart; the efforts of a company to realize its cultural ideals more perfectly must be constant.

The connection of these aspects of corporate culture to informal learning practice occurred in three ways.

First, workers learned the culture-as-presented both through official channels (corporate initiatives, posters, pronouncements, etc.) and in the course of performing their job. It was through performing one's job — and the informal learning that this involves — that a worker arrived at an independent judgment concerning culture-as-experienced within the organization.

The relationship between culture-as-presented and culture-as-experienced was also learned informally. Workers learned through informal, on-the-job experiences whether the organization really promoted empowerment or really expected its employees to do exactly as they are told. The official version became the measure against which the culture was reconstructed through informal learning. When employee reconstruction's mirrored the image of the organization's culture (culture-as-experienced corresponds to culture-as-presented), then the culture was invigorated. When these standpoints diverged, the potential for cultural criticism was born. Workers formally learned the content of Area 1 and informally learned the content of Area 3. The overlap in Area 2 is learned in both ways.

Secondly, each worker was not only a learner but also a creator of the organization's culture. Through their actions on the jobs, everyone had a hand in creating the culture. Here too, the cultural contribution was either be in line or out of line with the official version. As long as personal objectives and company goals were consistent with each other, benefits flowed to the worker and the company simultaneously. Corporate culture at some organizations included an explicit goal designed to create a binding alignment of personal and corporate goals — company values internalized by each worker. When individuals found themselves at cross-purposes with the company, however, a number of strategies came into play, including accommodation, exit, subterfuge, and realignment. Workers learned informally how to execute these strategies. Area 3 of Figure 1 is the stage on which these strategies were played out.

Thirdly, when a corporate culture explicitly promoted learning as a value, goal, and practice, the possibility opened up for the company to incorporate criticism and shortcomings into a process which strengthened the alignment between culture-as-experienced and culture-as-presented. In this type of culture, a report of failure to achieve a certain level of quality may result in the formation of a team to find ways to reduce defects. For example, a work group couldn't become a fully empowered team until all its members knew how to operate all the machines in that group, which, in turn, triggered cross-training. In this model of culture-as-experienced, employees began to seek and expect learning opportunities to improve their performance and advance in their careers.

In order for a Teaching Firm to exist in a corporation, learning must first become both an explicit goal of the corporate culture and an aspect of the culture-as-experienced. The second goal will never occur without the first. In this model, "learning" as a dominant aspect of the culture must appear in both Areas 1 and 2. It can not become dominant in the culture-as-experienced circle without also being in Area 1. The overall image of the company must fit either B or C.

Industry Factors Affecting Informal Learning

Research has revealed that the industry in which an organization functions impacts the extent of informal learning within the organization. Consequently, some industries, by their very nature, are more likely to generate informal learning than others.

Growing industries often generate greater receptivity to informal learning.

- *Competitiveness of industry*
  Industry competition tends to "activate" the players (organizations) in the market. This is one of the foundations of the capitalist system. Competition leads organizations to become resourceful, to develop ideas, anticipate the future, be dynamic, and in constant change. We found that employees tend to understand the level of industry competitiveness and often set their standards appropriately. Employees tend to be more receptive to change in industries that function in a highly competitive environment. Alternatively, organizations that tend to be dominant in their market and lack major competitors, tend to be less driven towards learning at the individual level.

  Competition can be a motivator when the challenge is attainable. However, unattainable challenges can be debilitating. Organizations that set unattainable standards or function in a competitive environment that is overwhelming (e.g., increasing productivity by 90% in the next year) often end up demoralizing employees and suppressing any personal initiatives.

  At one highly competitive organization, employees stated that they were constantly aware of other companies producing their product, as it was a very visible market. Many employees used the competitive energy when working on the production line, saying things like "We need to improve our numbers in order to beat company X" or "If we don't stay current, we'll lose out in this industry."

- *Growth and Decline*
  The extent to which an industry is growing or declining impacts learning within the organization. Growing industries often generate greater receptivity to informal learning. In such industries, morale tends to be higher, and job security is increased. The expansion in the industry tends to create more jobs, which require new skills, a greater shuffling of tasks, and more opportunity for advancement.

Declining industries tend to generate job insecurity. Downsizing, shifting market demands, unstable economies, all create insecurity and lower workforce morale. Our research indicated that while some employees were motivated to learn and expand during insecure times, most tended to focus their efforts on keeping their job, staying out of trouble and avoiding risks. During insecure times, most employees will avoid learning and "conquering" new territory, but rather will focus on holding their own ground. For example, at one organization with job insecurity employees hid work manuals they had created so that management would not know how to perform their tasks.

Many of the organizations who participated in the research project had gone through (or where in the process of going through) downsizing. This had a great effect on employees — ranging from anger to job insecurity. Employees stated that their motivation to learn and willingness to come up with new ideas was low. Even at unionized organizations, where lay offs are based on seniority, employees often resisted new learning initiatives.

- *Pride in Industry*
  Certain industries manufacture products with higher prestige than others. This prestige increases the opportunity for employees to identify with the product they produce. Our research indicated that identification with the product greatly increases the level of personal involvement with the product, the social status associated with the job, and consequently the level of motivation for developing and learning within the industry. In particular, pride enhances employees' tendency to perceive their jobs in terms of a career or as a long term involvement with the industry. The long term perspective tends to increase the motivation to develop and contribute. When an employee can say: "I am proud to make this product" their relationship with, and commitment to the industry is deepened.

- *Challenge of Tasks*
  Jobs that are more complex require more skill and generate greater learning opportunities. More complex jobs involve a longer learning curve and a greater sense of accomplishment once mastery is attained.

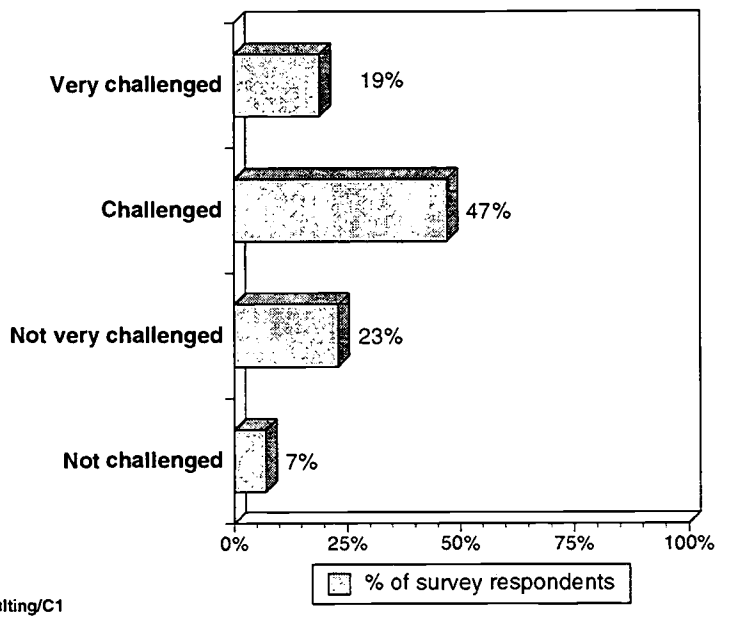
  In general, the research revealed that industries with more complex jobs offer more opportunities for informal learning. In high-technology and high performance industries, jobs tend to be more demanding. The rapidly changing nature of the high-tech industries requires employees to constantly adapt to their environment and learn new skills. Often, there is no formal training available because the technologies are new. Consequently, one person may know how to manage the task and this individual will informally communicate that knowledge to line leaders or other employees, who then communicate it further. In general, industries with more complex

jobs are more likely to attract self-motivated learners who seek out complexity and growth in their job. And, as previously mentioned, employees in competitive industries often understand the nature of the competition and are more receptive to change.

While complex tasks tend to offer more learning opportunities, the complexity of the task always interacts with the experience and capability of the learner. Those who are less experienced or capable may find a more simple task challenging to learn. Therefore, the important factor underlying informal learning is the extent to which the individual finds the task challenging (rather than the complexity of the task). "Challenging" refers to the interaction between learner and task whereas task complexity focus solely on the task. In summary, research indicates that informal learning thrives when individuals find the task challenging. The following chart shows that approximately one third of the employees interviewed do not feel challenged by the job.

The important factor underlying informal learning is the extent to which the individual finds the task challenging (rather than the complexity of the task).

To What Extent Do You Feel Challenged By Your Job?



Company Factors Affecting Informal Learning

Our research showed that a number of important company variables significantly impact informal learning within the organizations. These variables will be described in the following section.

- *Incentive Structure*
  Providing incentives for learning is one of the fundamental attributes of a Teaching Firm and one of the most important factors of informal learning in the workplace. It is well understood, that employees respond positively to positive reinforcement. Incentives reinforce the desired learning behaviors and greatly increase their occurrence.

  Based on the research, what follows is a number of different ways that organizations can reinforce learning within the organization.

One of the surprising findings of the research study was the strong impact of recognition on informal learning.

- *Promotion Criteria*
  The criteria by which organizations determine who gets promoted communicates to employees the importance of learning. Organizations that promote on the basis of merit reinforce the value of quality performance. In such cases, employees will strive to learn in order to enhance their performance and potential for advancement.

  Some unionized organizations tend to promote on the basis of seniority. This tends to eliminate promotion as an incentive to learning. Employees often feel that there is no sense in working harder or learning new skills. The tendency is to "sit back and let time go by".

- *Recognition*
  One of the surprising findings of the research study was the strong impact of recognition on informal learning. Employees at all levels of the organizations sought out performance based recognition. In one organization teams that performed well were recognized each week. Teams were often presented with particular titles to reflect their experience and good work. Additionally, at one site the production capacity of each work team was posted on the bulletin board. There was competition between the teams to outperform each other. In general, the findings suggest that employees will strive to learn and advance if their efforts are recognized.

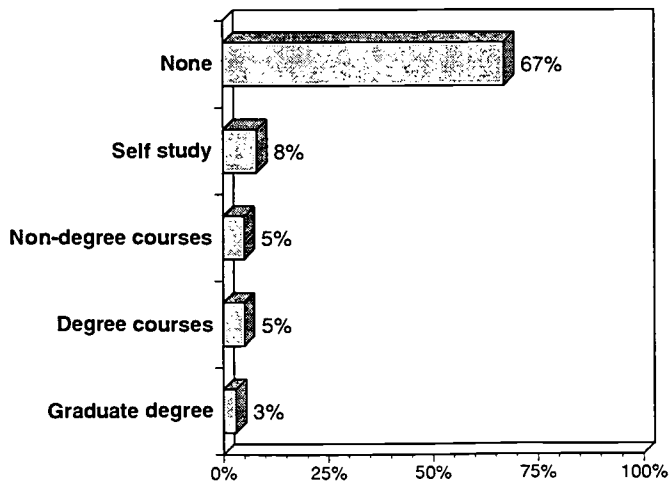
Another kind of recognition involves the distribution of authority. Employees often seek out positions of recognition and authority such as line leader or team leader. These experienced workers would often be in charge of a line or a number of employees.

Employees sometimes belittle the recognition factors and positions of authority when they are not facilitated by monetary incentives. Nonetheless, employees with positions of authority are respected and recognized by all employees.

At one organization, employees stated that Tina, who had been a team leader for a few years, was highly respected by her fellow team members. They cited her many years of experience and wide social networks as helping her credibility as team leader. Although Tina stated that she felt poorly financially compensated, she enjoyed the experience of being a team leader and the non-monetary rewards it brought her — respect from her peers and enhancement of certain leadership qualities.

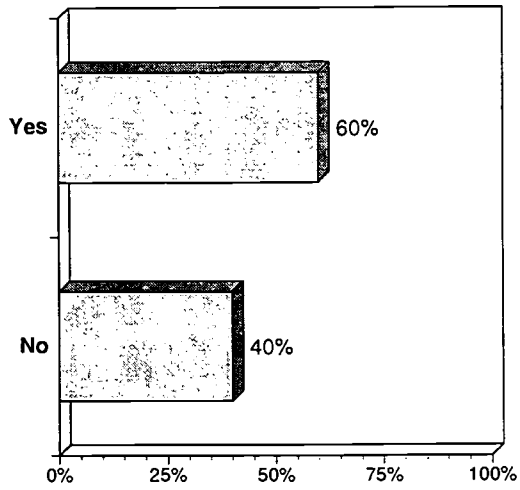
- *Financial incentives*
  Financial incentives are an extremely direct way of reinforcing learning. Learning that is financially rewarded is valued and sought out by employees. Additionally, providing incentives for learning, communicates the value that the organization places on learning. Research data suggested that providing financial incentives for learning within the organization, or for acquiring professional skills and degrees outside of the organization, tended to enhance employees perception of the importance and value of learning. Research suggests that many organizations do not provide incentives for educational pursuits outside of their company.

Are You Taking Educational Courses Outside of Your Company?



EDC

Is This Outside Educational Pursuit Encouraged By Your Company?



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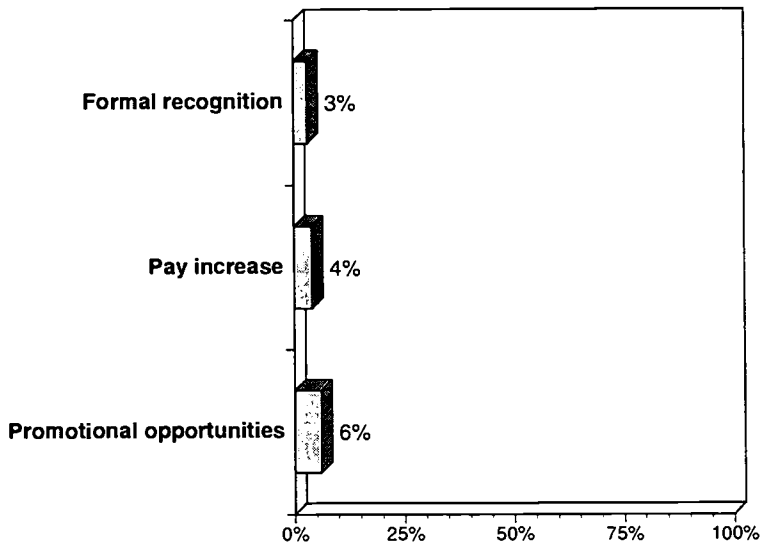
How Is It Encouraged By Your Company?



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- *Employee Stock Ownership Program (ESOP)*
  ESOP can be a very important form of incentive. Providing employees with company stocks can significantly increase their level of identification with the company. ESOP encourages employees to develop and learn within the organization. Research suggests that ESOP functions as a greater incentive when it provides employees with monthly payments, rather than retirement benefits.

Employees from the ESOP firms that were part of the study varied in opinion on the benefits of being an employee-owned organization. Some liked the feeling of owning a piece of the company, and stated that their stock options directed their productivity level and motivation to come up with new ideas. Others felt that the ESOP plan simply provided them with a possible retirement fund and that it had no bearing on their daily work habits.

- *Job Security*
  Job security plays an essential role in informal learning. In general, job security can either increase or decrease the level of informal learning in the organization. The effect of job security is mediated by the extent to which job performance is reinforced or incentivised. When the organization values and incentivises quality job performance, informal learning can thrive.

Job security can either increase or decrease the level of informal learning in the organization.

Job security can decrease informal learning by reducing motivation to enhance one's job performance. When employees feel that their job is secure, and the criteria for getting fired is low (i.e., it is difficult to get fired), they may be unmotivated to develop, and expand their job scope. This is particularly the case when job retention and promotion in the industry is dependent on seniority more than performance. In one research site where job security was reinforced by the union and advancement was based on seniority, we observed very little informal learning. Employees tended to focus on the routine process of their job, rather than attempt to enhance performance. This behavior was often explained by "What will I get by trying out new things?"

However, there are conditions where job security can increase the tendency to engage in informal learning. When job security is paired with reinforcement for job performance or career advancement, employees are motivated to learn, take risks and explore new opportunities. Also, the combination of job security and reinforcement enables more job-related communications among employees who may feel competitive, yet secure. This is the ideal context for informal learning. Informal learning thrives when a balance is maintained between the opportunity for loss and the opportunities for gains.

When job security is low, and quality performance is not incentivised, the level of informal learning within an organization or industry is often low. employees tend to focus on increasing job security. As such, employees will attempt to perform their job in the best possible way so as not to get laid off. In other words they will avoid taking risks and standing out in any way that may be perceived as a threat. Additionally, seeing that quality is not reinforced or incentivised, employees will not take on any extra activities and will avoid challenging tasks. The result of this situation is that employees perform their job in a basic manner without much growth or development.

When job security is low, yet quality performance is incentivised, employees often engage in a moderate level of informal learning activities. Employees seek the reinforcement of the incentives, yet are constrained by their desire to increase job security. In general, the threat of job security is greater than the power of incentives to generate quality performance. Consequently employees will be guided by their desire to increase job security and will seek out informal learning opportunities that do not conflict with this goal.

The relationship between job security and incentives and their impact on informal learning is described in the following chart.

Informal learning thrives when a balance is maintained between the opportunity for loss and the opportunity for gain.

	JOB SECURITY	
REINFORCEMENT OF PERFORMANCE	**High**	**Low**
Yes	Very High	Moderate
No	Very low	Low

**When job security is high and employees are reinforced for quality performance, informal learning is highest.*

- *Unions*

Traditional

Research reveals that the impact of unions on informal learning is mixed. They can both inhibit and facilitate informal learning. The traditional role of the union was found to often inhibit informal learning. However, unions are developing a new role which can facilitate informal learning.

Unions are developing a new role which can facilitate informal learning.

Traditionally, unions have been the protector of the worker, negotiating with management for job security and wages. Unions and management negotiated the elaboration of complex classification systems with strict job definitions in which employers, in exchange for control over the work process, were prohibited from asking one person to perform the task of another.

Our findings revealed that the union in its traditional role can often become a barrier to learning within the organization. Unions seek to hold traditional job definitions and limit the extent to which individuals can develop within the organizations. Even individuals who want to learn additional tasks are discouraged as it is seen as imposing on some else's job security. In general, unions discourage high achievers and workers performing at a high level because it is perceived as "overshadowing" or diminishing the contribution of other workers. Additionally, high achievers can lead to unsustainable speed-ups in the production process or other forms of "management by stress" harmful in the long run both to workers and to the firm. As expected, this kind of work norm will greatly inhibit informal learning.

Additionally, unions tend to seek job security for employees. As previously discussed, job security can have a mixed effect on informal learning depending on the level of incentives for quality performance.

Unions often fight for the right to retain jobs based on seniority. This fact has negative impact on informal learning. It does not incentivise, and even discourages learning, and self initiative.

Progressive
The above described traditional role of the union is rigid and stems from the mentality generated by the mass production era in which the division between management and employees was clear and fixed. However, the global competitive economy and the Information Age have created a very different playing field. Nowadays, organizations need to be more flexible and productive otherwise they will not be able to compete. It is in the interest of both management and employees that the organization be able to compete successfully.

Just as companies' interest in the Teaching Firm model stems from the shift to a global economy, unions can consider flexible, dynamic strategies for the new market environment. Just as the Teaching Firm notion suggests that the traditional barriers between management and employees need to be restructured, unions can rethink their relationship with management. It is in the interest of both parties to create organizations that thrive.

While it was not the role of this research project to determine how unions should conduct their affairs, a number of examples from the research data have shed light on positive union behaviors which facilitate informal learning within the organization.

Job security is a strong contributor to informal learning when it is paired with incentives. Consequently, unions can emphasize their role in this domain. In one research site, a progressive union directed its role to maintaining job security and a good relationship with management. Management understood the union's concerns and the union understood management's concerns about competitiveness. The relationship between the union and management was healthy and the atmosphere was one of working towards a common goal of keeping the organization competitive. In this vein, Ray Marshall (1997) suggests that in order to create high performance work organizations, unions should provide employees with a sense of job security, while allowing for flexibility within the organization.

- *Leadership Style*
The leadership style of the organization reflects the relationship between management and employees. In general, our research findings have identified two kinds of management styles. These styles are usually referred to in the Industrial/Organizational literature as theory "X" and theory "Y".

Theory X was prevalent in the 1950's to 1970s and is also common today. It is mostly a top down authoritarian leadership style whereby management makes the decisions and communicates it downward through the organization. According to Theory X, employees should have strict guidelines determining their actions, and have little say in the organization.

A strong hand within the organization is the key to success within the marketplace.

Theory Y suggests that the key to successful management is to have a more cooperative leadership style. Organizational leaders should seek feedback from employees and communications between management and employees should be interactive rather than top-down. According to Theory Y, employees often know best about their job and should be empowered to make decisions. Employee mistakes and risk taking (within reasonable bounds) are accepted as part of the general manufacturing process.

The spirit of Theory Y is consistent with the concept of the Teaching Firm. Theory Y reinforces the interaction between management and employees and promotes worker empowerment, which is essential to generate employee initiatives and growth. Research has confirmed this notion. For example, at a large manufacturing company where a transition was taking place from Theory X to Theory Y, employees indicated a significant increase in informal learning activities. Employees exhibited greater enthusiasm and commitment to management goals and more initiative and self-learning.

Research suggested that the designation of *Type X* was sometimes used pejoratively to describe people who resisted employee involvement. Additionally, some employees indicated that they found the transition from theory X to Y to be disorientating.

- *Management -Employee Relationships*
  Relationships between management and employees affects the overall atmosphere in the workplace. In general, different companies have different management-employee relationships. However, most relationships can be described in terms of the amount of existing tension.

  In general, there is an inherent tension between management and employees. Management usually wants employees to produce more and employees want higher wages. However, the extent of the tension between the two depends to a large extent on mutual understanding and acceptance of each others goals. The greater the overlap in the understanding and goals, the lesser the tension between the two. (See cultural section above for discussion of overlap between management and employee goals).

  When tension between management and employees is high, employees feel alienated and resist management's goals. There is a sense that "I am not working for myself, but rather I am working for the company; all I want is my paycheck." The alienation between the individual and the company creates an atmosphere where learning is perceived as contributing to the company rather than to the individual. In such cases, employees tend to perform their job in the least effective manner.

When relationships between management and employees are good, there is receptivity on both sides to contribute to the common goal. Employees are more likely to seek out learning opportunities, and performing one's job in the best possible way is an organizational and personal value. Employees are more likely to teach and assist one another, and engage in exploratory activities when the opportunity arises.

- *Geographic Location*
  The research demonstrated that the geographic location of organizations can impact the level of informal learning within the organization. Research showed that organizations located within small communities tended to play a greater role in employees lives. In small communities the organization often played both a professional and social role. The organization had a greater presence in the community and people from the organization often interacted outside of work. When transferred into the workplace, these connections reinforced learning.

  Also, organizations within or around academic centers or universities were more likely to have an explicit value for knowledge. Research revealed that employees working around knowledge centers (universities, research centers, etc.) valued education and knowledge even if they themselves were not well educated. These employees valued "learning" for its own sake.

  Proximity to customers enables employees to understand how their product is being used. At one research site located in a small retirement community, employees indicated that they had never met their customers or seen how they used their products. Such knowledge could have provided them with a understanding of their product, and how they could improve the product to meet customer needs.

- *Labor Pool Characteristics*
  According to the research, the character of a workforce will strongly impact receptivity to informal learning within the organization. For example, a younger workforce is often more receptive to learning, and more likely to seek out learning experiences. Younger employees are often more ambitious, and motivated to

When relationships between management and employees are good,

employees are more likely to seek out learning opportunities.

Organizations within or around academic centers or universities were more likely to have an explicit value for knowledge.

develop within the organization. Another important factor is the "time to retirement". Employees close to retirement lack incentives for development and consequently are often resistant to new experiences. At one site which included a large retirement community, the organization found it difficult to find people with appropriate computer skills or who were willing to learn computer skills.

Another important factor is the homogeneity of the workforce (in terms of demographics such as: age, gender, nationality, etc.). Homogeneity can increase the sense of community and communication and can facilitate the flow of information in an organization. However, it may have other drawbacks. For example at one site where most workers came from a similar country and cultural background, informal learning was thriving because of the cultural tradition of hard work. However, this culture was also lacking in self esteem and was resistant to taking on new challenges. In general, homogeneity tends to breed certain characteristics but often lacks others.

Heterogeneity tends to infuse new approaches and orientations to the organization. A varied workforce tends to generate more perspectives and often a greater questioning of assumptions. However heterogeneity may create greater communication problems. At one organization where many employees in management were foreigners, floor employees often stated that communications from management are sometimes loaded with assumptions that are unclear to them and confusing.

The education level of a workforce will also impact the level of informal learning. A more educated workforce will often be more comfortable engaging in complex tasks and more comfortable with learning opportunities. However, this does not mean that less educated workforce will not seek out such opportunities. The education level affects the difficulty of the tasks at hand. The difficulty of the task must be appropriate for the education level of the worker in order for informal learning to thrive. As previously mentioned, it is the challenge of the task, not its complexity, that determines informal learning.

- *Size of the Organization*
  In general, research did not identify major differences between larger and smaller organizations in terms of informal learning. However, some differences were observed in terms of the type of informal learning taking place.

  The data indicated that an organization's size contributes to the sense of community and the level of understanding of one's place within the organization. In a small organization (+/-50 people) employees will all know each other and the sense of community will often increase the extent

to which employees can ask each other questions and learn from one another.

In a smaller organization it is also possible for employees to understand how their job contributes to the organization as a whole. By understanding the role of each division, it is possible for employees to see the "big picture" and develop an understanding of how they can best facilitate the organization. In general, what holds true for small companies can often hold for small divisions within large organizations, if they are sufficiently communal or isolated within the organization.

At one small organization, employees sat close enough to each that they could see and hear what there peers were doing. Employees stated that they knew exactly who did what job and how their task fit into the big picture. Because of their close proximity, they were able to informally learn each other's jobs and fill in when an employee was sick or on vacation.

The actual product an organization manufactures can impact learning in the organization.

Large organizations have other advantages. For one, there are more career paths. Employees can grow and develop in a greater variety of directions. Cross training may involve learning a new skill in an area that is more removed from one's original skill. Additionally, at larger organizations employees can observe a greater variety of leadership styles.

- *Product*
  The actual product an organization manufactures can impact learning in the organization. As previously discussed, the social status of a product can impact the extent to which employees identify with the product. However, other factors are also important.

  The complexity of the product that an employee works on affects the extent to which employees can understand the product. When products are too complex and technical, employees often feel overwhelmed by the complexity which causes them feel alienated from the product, and less likely to identify with it. Such alienation inhibits informal learning. In general, the more an employee understand their product, and how it relates to the whole organization, the better.

At one company, the product was highly technical with the production process very complicated. When asked about the product, many employees stated that they had no idea what it was or did. "It's a big box with a lot of wires," one employee noted. She also stated that she was unlikely to experiment with a "scary" piece of electronics that she had no idea how to use.

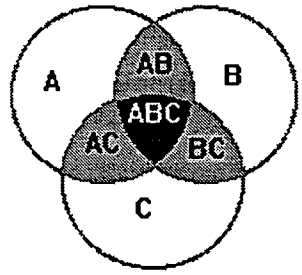
- *Available Resources*
  Learning is greatly enhanced when necessary resources are available. Some of the research sites had learning centers. Aside from providing formal learning, these centers provide opportunity for employees to informally pick up material and learn about specific company issues. Other sites had libraries where employees could read or pick up material to take home. Some organizations had internet access where employees could learn and gain knowledge. Internet access was sometimes restricted to internal company issues. Still, this allowed employees to communicate with employees at other company sites, and learn about company issues.

  In general, the availability of learning resources sends an important message to employees. It communicates management's commitment to, and value of, learning and knowledge. Making knowledge available to employees is often perceived by employees as management's part in facilitating informal learning within the organization.

  At one company, there was a library of company reference materials as well as literature from customers, vendors and the competition. It was located near the cafeteria and employees were encourage to take out materials and read over lunch. Researchers observed several employees borrow materials and start informal conversations in the cafeteria.

- *Physical Space*
  The physical workplace is the totality of the spaces within the structures that contain the tools, equipment, activities and operations of an organization. The impact of the physical workplace on informal learning depends on the degree to which it contributes to the promotion of, and opportunities for participation, interaction and communication between workers.

  For example, the diagram below demonstrates that the informal learning activities occur in time and place at the intersection (shaded areas) of interrelated individual and group functions (jobs) at three major levels of the organization.



Level 1 — Overall organization
Proximity of department/functions

A, B & C	Major function areas or departments in larger firms such as administration, engineering and manufacturing
AB, BC, AC	Common or shared functions and interactions between directly related departments such as production and engineering.
ABC	Common or shared functions by entire organization, such as lobby, cafeteria, conference, training, human resources, health service, library and classrooms, etc.

Level 2 — Teams /cross functional units within organization

A, B, C	Operational groupings within departments or components of small or medium size firms i.e. product line teams in production or engineering, marketing, customer service, management and administration.
AB, BC, AC	Co-location of cross functional, shared or directly related operations such as between marketing and customer service.
ABC	Common or shared functions by department or small/medium firms i.e. conference, meetings, printing, central computer, cafeteria, break rooms, etc.

Level 3 — Individual workers

A, B, C	Individual jobs or responsibilities i.e. supervisors, assemblers, technician, mechanics, plant manager, department heads, engineers, drafters, etc.
AB, BC, AC	One-on-one interactions between individuals and individuals and technology.
ABC	Cross functions within operational units, i.e. mentoring, supervision, on the job training.

Physical and environmental factors can determine the frequency and quality of face-to-face employee interactions, and thus informal learning. Physical characteristics can foster or inhibit the emergence of informal learning activities.

The design, location and environmental quality of spaces available for peer-to-peer communication, meetings and socializing within these opportunity sectors emerged as the most significant factor impacting levels of interaction as facilitators of informal learning in the physical workplace.

For example, at one small firm (Level 3) where there were no formal mentoring or cross-training policies, employee workstations were close enough to each other that employees could overhear each other and ask questions. Thus, informal cross-training occurred and mentoring relationships were formed.

The following physical space variables were observed to affect informal learning:

Proximity of departments/functions
In many manufacturing sites (Level 1), floor-level employees work in production facilities while engineers and support personnel work in cubicle-style office space, either in the same or an adjacent building. Interactions between engineers and floor-level employees varies with the distance between their two work sites. In some facilities, the departments are close by, and both engineers and production employees frequently walk to the other department to communicate. In contrast, in some firms, engineers and production employees are located in separate buildings, and consequently have limited opportunities for communication.

Co-location
Refers to the conscious location of cross-functional workers in the same work area in order to facilitate communication. (Level 2) For example, in one firm studied, design engineers, manufacturing engineers, and production employees were moved to adjacent work stations while working on a development project. The primary objective of most co-location initiatives is to improve the rate and efficiency of plant operations, along with the ability of appropriate personnel to respond quickly and effectively to workplace problems when and where they occur. Co-location offers a rich context for informal workplace learning, as workers with disparate responsibilities communicate face-to-face on a daily level. In addition, employees who previously performed their responsibilities primarily in one environment now have regular first-hand contact with the personnel, equipment and production processes on which their work has an impact.

Size
The size of a company's production facility plays a role in the ability or inability of floor-level employees to learn informally in the workplace. The size of the space and distance between employees working on parallel work stations and sequential points in the production process affects how workers interact and share information. Workers in facilities with a close arrangement of equipment and processes reported more frequent contact and sharing of information than workers in more spaced arrangements.

Noise

The noise level produced by the assembly operations directly affects the amount of verbal communication between employees. Workers involved in loud activities, such as bolting and riveting, typically learned to communicate by physical gestures while they are in their work stations, reserving more complex discussions and questions for break periods. Thus, high noise level can be a very strong inhibitor to informal workplace learning.

Contextual Factors That Impact Informal Learning on an Individual Level

The previous section described contextual factors which impact informal learning on an organizational level. Following is a description of the contextual factors which impact informal learning on an individual level. These are factors related to individuals themselves which impact the extent to which they will learn informally. Every individual is unique and has a variety of qualities and skills related to informal learning. Our research identified four major categories which are particularly important to informal learning. We begin with a discussion of motivation, one of the primary factors influencing informal learning.

While motivation is an intrapersonal dimension, it is not outside of the bounds of organizational influence.

- *Internal Motivation*
  Employees motivated to learn will, no doubt, learn more than those which are not motivated. Motivation is one of those internal factors which activate individuals in their environment. As discussed in the Individual Goals section employees' are motivated by three primary motivators: Financial security, recognition/acceptance, and achievement/development.

The Interaction Between the Organization and Individual Motivation

While motivation is an intrapersonal dimension, it is not outside of the bounds of organizational influence. For example, by providing incentives for particular behaviors, organizations can produce motivation within individuals. An organization that provides incentives (such as promotion criteria) for high quality performance will create motivation among its employees for higher quality performance.

Most of the factors that an organization can influence involve external reinforcement, such as financial incentives, recognition, career advancement, increased authority and responsibility, etc. As such, it would seem that the organization can not do much to increase the tendency for people to be personally, and internally motivated to learn.

It would seem that the best an organization can do is select employees who seem to be internally motivated to learn.

However, research identified numerous factors which organizations can influence and which increase the tendency for individuals to be personally motivated to learn. The primary factor is what can be termed: "A climate of learning and growth". Research has observed that organizations in which learning is integral to the culture, an organizational value, tend to create a context where individuals learn to appreciate the value of learning. In a context where learning is reinforced, valued, appreciated, and discussed openly, individuals internalize the value of learning, and incorporate it into their behaviors. When the context in which people work places an emphasis on learning, then workers are more likely to internalize the value of learning. At one research site, where learning was an explicit organizational value, almost all employees, some to a greater extent than others, discussed learning as a personal value.

However, there are dimensions to motivations that are less influenced by the organization. Some employees are more personally inclined and motivated to grow and develop as compared to others. What determines the differences between these individuals may be deep factors rooted in their childhood, or other psychological and socio-economic factors. Consequently, there will be difference between individuals' tendency to learn. However, research suggests that providing a climate of learning will generate more learning initiatives on behalf of all workers, even those who are less inclined to learn.

- *Personality*
  The personality of an employee will impact the extent to which they engage in informal learning activities. The interviews we conducted clearly demonstrated that people have varying inclinations and attitudes towards learning. High achievers and self-starters were more likely to seek out opportunities to develop and grow within the organization. Traits which tended to facilitate informal learning include: ambition, curiosity, competitiveness, sociability, imagination, ability to reflect, critical thinking, and self confidence.

  While such traits are important for informal learning, the research did not identify a "informal learning personality type" per se. As with the motivational differences between workers discussed above, our research suggested that a climate of learning will increase the tendency of individuals with most of the above-described traits to engage in informal learning activities.

- *Mental Capacity*
  Mental capacity refers to the ability of individuals to process information and acquire knowledge. As expected, people differ on this dimension, and individuals with a greater mental capacity are more able to learn informally. Research indicates that some employees learn faster than others, and some

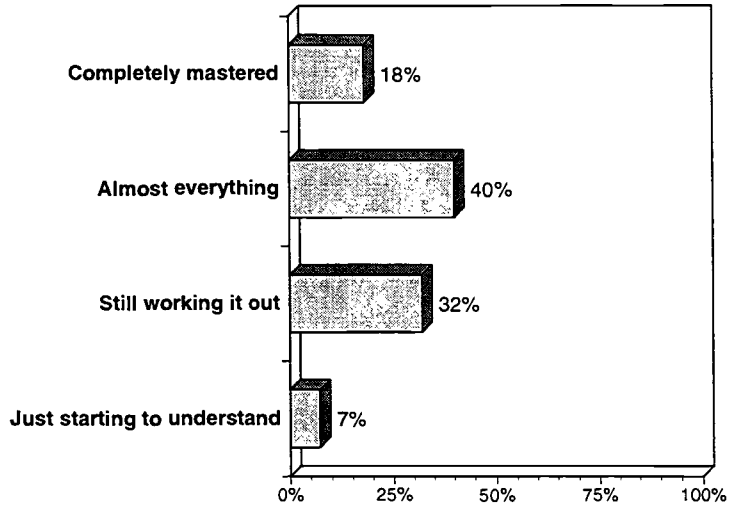
are more able to grasp complex issues. We attribute some of these variations in performance to mental capacity (or intelligence).

- *Perceived Level of Experience*
  Research indicated that the perceived level of mastery an employee has with the job will impact the extent to which they engage in informal learning activities. For informal learning to thrive, employees must perceive that they still have a need to learn, and can improve their performance. Employees who think that they have mastered their job will not focus their attention on learning opportunities. On the contrary, a sense of complete mastery will often generate resistance to learning as it is perceived as threatening to one's sense of self and personal mastery.

  Again, the key to increasing the likelihood that more experienced employees will engage in informal learning activities, is to provide a climate of learning. When learning is an explicit organizational value, and is part of the corporate culture, employees at all levels will seek it out. Research indicates that in such a culture, learning often becomes a value in which employees pride themselves. In such a culture, it becomes more difficult to perceive oneself as having mastered one's job because the organization emphasizes that mastery is a process and not a goal. No-one has completely mastered their job. Also, in such a culture, ignorance is not an issue of shame which somehow suggests that you do not know enough about your job. Rather, it provides opportunity for personal growth and increased competence. As one older front line employee remarked in an organization where learning was an explicit corporate value.

The following chart demonstrates that employees have varying levels of perceived competence. In general, research suggests that employees often accept that they can still improve their skills.

To What Extent Do You Feel That You Know How To Do Your Job?



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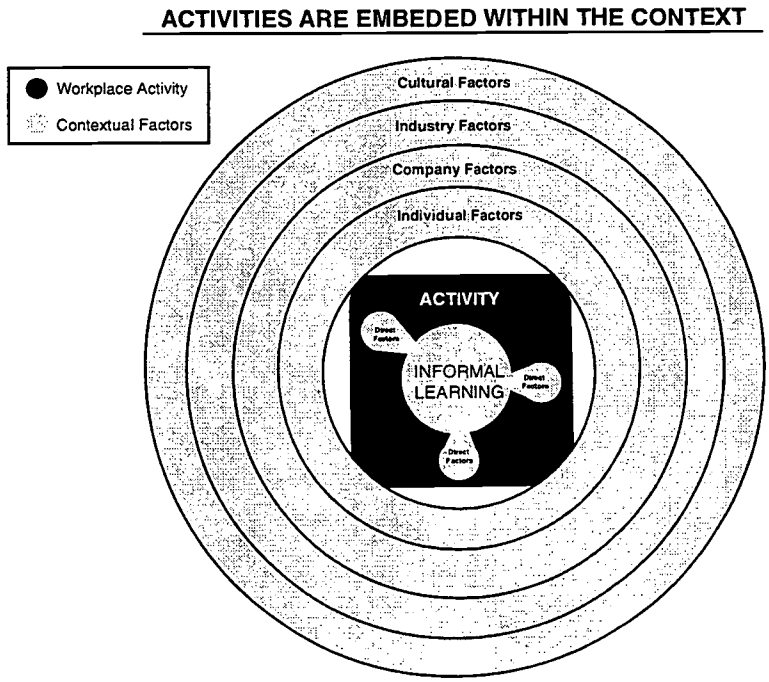
The Interaction Between Informal Learning Activities and the Context Within Which They Occur

The previous two sections provide an in-depth analysis of workplace informal learning activities and contextual factors. As discussed, the research shows that the contextual environment within which an activity occurs greatly influences the level of informal learning. Consequently, the same activity done the same way in different corporate cultures may produce very different levels of informal learning.

In general, contextual factors often interact with one another and are difficult to evaluate in isolation. For example, an organization with an incentive structure which provides recognition for learning may not generate much informal learning if there is alienation between employees and management. In this regard, contextual factors can be perceived as "open-ended" factors because their affect on informal learning varies and is difficult to foresee (without understanding the interaction of other contextual factors).

In general, activities should be seen as being embedded within the contextual factors. Seeing that the contextual factors are open-ended, understanding an activity within a particular organization requires a thorough analysis of the contextual factors that interact with the activity in that organization. The relationship between workplace activities and informal learning cannot be understood outside of the context.

The following diagram summarizes the connection between the previous chapter on "how learning occurs" and the current chapter on "contextual factors." The diagram represents a graphic depiction of the relationship and interdependence between the contextual factors, activities and informal learning. As can be seen, the 4 categories of contextual factors encompass the workplace activities and consequently influence them. Informal learning occurs within the activities and is influenced by the direct factors.



WHAT IS LEARNED INFORMALLY

INTRODUCTION

Overview

Research for the current study revealed that employees learn a broad range of knowledge and skills informally. We observed a vast continuum of informal learning that extended from the most basic mechanical procedures to more highly developed problem-solving, communication and career-development skills. Employees involved in the study indicated that much of what they learn informally is either not currently provided—or not adequately treated—through formal training or resources.

We observed a vast continuum of informal learning that extended from the most basic mechanical procedures to more highly developed problem-solving, communication and career-development skills.

In analyzing the research findings, we were able to categorize this broad range of informally acquired knowledge and skills into four distinct but overlapping areas.

- Employees learn the specific knowledge and mechanical skills that enable them to master the *pragmatic* demands of their jobs.
- Employees also learn a variety of *intrapersonal* skills (such as stress-management, critical thinking, task-integration) which enable them to successfully perform their jobs in relation to the rapidly changing demands of the workplace.
- Employees learn and develop social and communicative skills (such as giving constructive feedback, teaching, working effectively in a group setting) which enable them to adjust to the *interpersonal* needs of the workplace.
- Employees learn information about the actual *culture* of the workplace which allows them to perform their jobs in conformity to both formal management and informal employee expectations—in a way that contributes to their own personal and professional development.

The acquisition of knowledge and skills in one area of learning may or may not result in the development of a comparable level of expertise or maturity in relation to other types of learning. Through our analysis of these differences, we have determined

that learning in its broadest dimensions (such as the acquisition of knowledge and skills that contribute to cultural and interpersonal development) transfers into learning in more specific dimensions (intrapersonal or pragmatic development) more readily than other directions of transfer (i.e., specific to broad).

What is learned

This section of the report describes what individuals learn in the course of meeting routine production goals and in the midst of a rapidly changing workplace environment.

Individuals constantly learn and develop while executing their day-to-day job responsibilities, acquiring a broad range of knowledge and skills. Through our research, we observed a vast continuum of informal learning that extended from the most basic mechanical procedures to more highly developed problem-solving, stress-management, communication and career-development skills. From the responses of managers and employees included in the study—and confirmed by research observations and participation—the majority of what individuals learn about their jobs, and the environment and relationships through which they work, is learned informally.

Individuals constantly learn and develop while executing their day-to-day job responsibilities, acquiring a broad range of knowledge and skills.

This section on the content of informal learning is summarized by the following findings:

- The developmental context for informal learning in the workplace is the progression of employees and groups of employees from inexperience to maturity; competence and expertise.

- Individuals and groups of individuals in the workplace develop maturity, competence and expertise in four dimensions of learning:

  - Pragmatic,

  - Intrapersonal,

  - Interpersonal, and

  - Cultural.

- The development of expertise or maturity in one dimension of learning may or may not result in the development of another dimension of learning. In many cases, we found that learning in the "broader" dimensions of cultural and interpersonal skills led to learning in the more "specific" dimensions of pragmatic and intrapersonal learning. Learning at the more specific level led less frequently to learning in other dimensions.

- In order to encourage and facilitate the development of workers in relation to each of these dimensions of workplace learning, it is necessary to understand and address the unique features of each type of learning, as well as the dynamics and tensions interconnections among them. Research indicates that this finding is particularly relevant when translating skills and expertise from one area of learning to another.

Four Types of Informal Learning

Research revealed that there are four basic areas in which employees learn and develop competence, maturity and expertise in the workplace. These include:

- Pragmatic development;
- Intrapersonal development;
- Interpersonal development; and
- Cultural orientation and adaptability.

These types of informal knowledge are listed in order of the most specific and directly applied to a particular task (pragmatic) to the most broad (cultural). Note that throughout this section, we have chosen to use a functional definition of each type or dimensions of learning — in other words, characterizing individual learning according to what was actually observed in the workplace and in response to the ways in which employees themselves categorize and describe their own learning experience. We will not attempt here to address the unique meanings that individual terms (such as "intrapersonal" or "cultural") occupy in any specific disciplinary context (such as cognitive, social or developmental psychology; critical or organizational theory; or cultural studies). Specifically:

- *Pragmatic development* refers to the skills, knowledge and technical facility required to execute one's job successfully on an everyday basis. An example of a pragmatic skill is the operation of a machine.

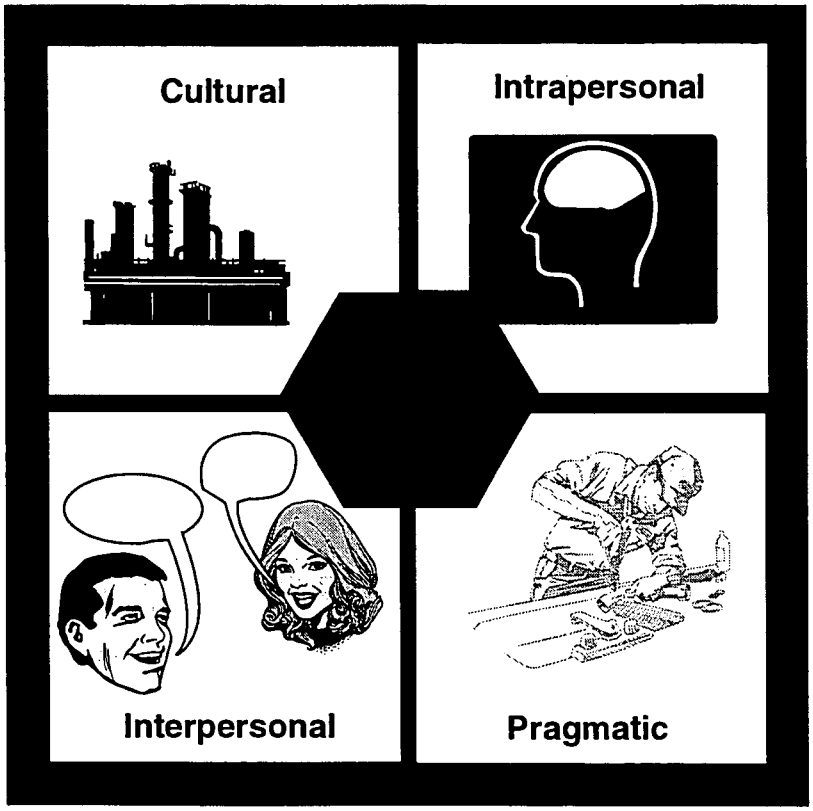
- *Intrapersonal development* refers to the ability of employees to think critically, solve problems, and exercise creativity in the execution of their daily job. An example of an intrapersonal skill is the identification of production problems.

- *Interpersonal development* represents the ability of employees to expand and develop communication and pedagogical skills. An example of interpersonal learning is learning how to work as an effective team member and deal with different personalities.

- *Cultural orientation and adaptability* describes the capacity of employees to understand and adjust to both the formal (management-determined) workplace culture and the informal social norms and mores of the actual work environment—and to integrate both of these (including the tension between them) in relation to their own personal goals, expectations and values. Cultural learning includes learning about the "big picture" and organizational goals.

A taxonomy of workplace learning and the relationship between specific information and workplace activities is presented at the end of this section. This section elaborates the specific dimensions of informal learning in the workplace observed during the research.

4 Types of Skills Learned



Pragmatic Development

Pragmatic development refers to the acquisition of the appropriate knowledge and skills necessary to perform a job or task effectively (or successfully produce a part or product) according to predetermined specifications (management, professional, various regulatory, personal, etc.) in a workplace setting. While most companies in the study provided some type of formal classroom training or orientation on the pragmatic requirements of one's job, employees at all companies indicated that most of their basic job-related skills and information were acquired on-the-job.

Employees at all companies indicated that most of their basic job-related skills and information were acquired on-the-job.

Research identified the following skills and information that are commonly acquired by workers in the process of achieving expertise in the professional/pragmatic area of their jobs:

- *Basic pragmatic knowledge and skills* These skills encompass machine operation, following ISO procedures, use of technical resources, and writing computer code (for engineers). Research indicated that even in the present shift toward problem-solving and team-building skills, the majority of employees still regard the acquisition of basic pragmatic knowledge and skills as an important part of their work, and the most reliable way for assessing their current level of achievement.

- *Specialized knowledge and skills* Research revealed that the specialized knowledge and skills required for professional certification or to meet internally or externally mandated safety and quality standards are provided by formal classroom training and orientation (along with incremental formal training opportunities to upgrade existing skills to conform to new responsibilities or standards). However, virtually all the workers in the study indicated that specialized knowledge and skills were learned on the job in the midst of the pressures and demands of the real production process;

- *Orientation regarding availability of standard resources* (tools for minor adjustments and repairs, informal training and trouble-shooting manuals, computer software, etc.) The ability to identify and make use of standard resources for performing one's job is an important and often-overlooked part of the formal orientation and on-the-job-training programs of many organizations. Employees indicated that their timeline for job mastery is significantly reduced

if they have ready access to supportive documents and other resources (and that they are much more comfortable performing their jobs without close supervision or personal assistance). Research indicated that employees were most receptive to job-related resources precisely as they were needed to fulfill their jobs or solve a specific problems—and not as part of a list of general resource materials provided during formal orientation or classroom training. Consequently, employees indicated that job-related resources were most effective in facilitating informal learning when they were introduced and reinforced by other sources or activities (such as informal day-to-day contact with supervisors or experienced co-workers, informal mentors, regular meetings to discuss problems and refer resources, the ongoing use of issue- or problem-specific manuals, etc.) which were available on the job as issues actually arose and problems actually occurred;

- *Orientation regarding formal and informal personnel resources* (including mentoring and appropriate channels for peer and supervisory feedback) Employees indicated greater disposition for learning in work environments where questioning and observation are actively encouraged, and/or the appropriate formal or informal mentors/co-worker instructors are clearly identified.

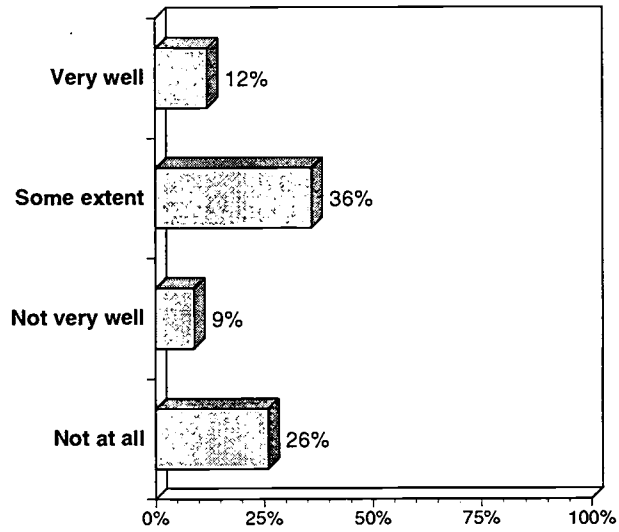
Intrapersonal Development

Intrapersonal development refers to the acquisition of personal qualities and skills which enable employees to enhance and expand the scope of their work beyond the basic pragmatic requirements of the job, or to perform basic tasks in new, frequently unanticipated circumstances. These skills include cognitive skills such as problem solving, critical thinking, and creativity as well as affective learning skills, such as dealing with stress and emotions on the job. Research indicates that the learning and development of intrapersonal skills plays a crucial role in employees' ability to cope and work effectively in the high-performance environment.

Employees in the study identified the need for intrapersonal skills in order to meet a number of specific demands in their work These demands included identifying and solving problems, understanding production needs, adapting to accelerated production schedules, taking on expanded work responsibilities, dealing with shifts in management style and production processes, and upgrading technology (especially in relation to the integration of new computer programs and applications into the design and production process).

Much intrapersonal knowledge is learned informally. As the following chart demonstrates, employees believe that formal pre- employment training did not provide them with the problem solving skills to perform their job.

To What Extent Did Your Formal and/or Pre Employment Training Prepare You With Problem Solving Skills For Your Job



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Research identified the following skills and information that are acquired by workers who achieve maturity or expertise in the intrapersonal dimensions of their overall job performance:

- *Self-discipline, self-initiative and the ability to follow through on assignments* As described above, both employees and management indicate that the ability to take responsibility for one's own learning and job-related development is a key factor in and indicator of achievement of job mastery on the pragmatic level. However, research also indicates that self-initiated learning on the intrapersonal level is an ongoing process which begins again with the introduction of each new assignment or responsibility.
- *Analytical and problem-solving skills* Another key factor is the degree to which one is able to understand the rationale behind specific tasks and responsibilities (beyond the mechanical processes through which tasks or responsibilities are correctly performed) and to use this analytical knowledge to address problems that arise in the course of performing one's job.
- *Maturity in managing stress and frustration on the job* Managing job-related stress and frustration is an important component of intrapersonal maturity. Research revealed a variety of coping mechanisms through which employees respond to job-related stress, including: identifying the appropriate personnel and resources for formally identifying problems and frustrations on the job; seeking the advice and guidance of trusted, more experienced co-workers; and identifying the appropriate co-workers with whom it is safe to informally complain and discuss work-related problems.

- *The ability to perform under the pressure of deadlines and accelerated production goals* Employees also develop the ability to understand their basic job responsibilities and to reformulate their approach to job fulfillment in relation to newly introduced pressures and demands (such as accelerated production schedules, increased quality or safety standards, etc.).

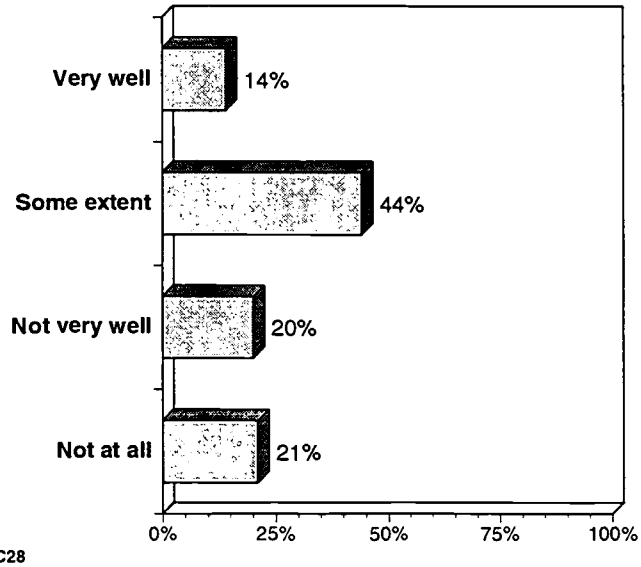
- *The ability to respond positively to critical feedback and to learn from one's mistakes* Research showed that employees with a high level confidence in their own achievement, external critical feedback (from co-workers, supervisors and clients) and internal critical feedback (self-criticism) are simply a means to an end, i.e., tools and resources for identifying obstacles to the optimum performance of one's job.

Workers reported that formal training was not sufficient to provide them with the interpersonal communication skills they need to do their job effectively.

Interpersonal Development

Interpersonal development refers to the development of social and communication skills which enable workers to perform their jobs by sharing information, teaching others, providing feedback, receiving instruction and working collaboratively with their co-workers. Again, workers reported that formal training was not sufficient to provide them with the interpersonal communication skills they need to do their job effectively.

To What Extent Did Your Formal and/or Pre Employment Training Prepare You With the Interpersonal Communications Skills For Your Job

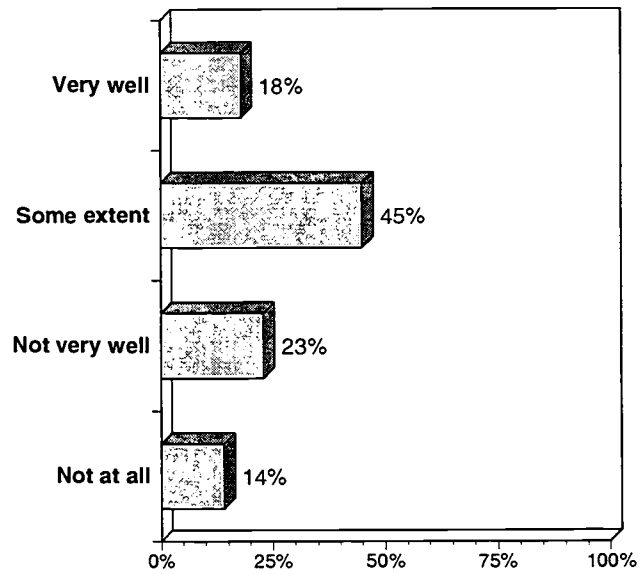


Research identified the following interpersonal skills and information that are acquired by workers who develop skills and expertise in the interpersonal dimensions of their overall job performance:

- *The ability to train and provide informal feedback to co-workers and internal customers* Research for the study revealed that informal peer-to-peer training and communication are important interpersonal skills acquired by workers. Also, the ability to provide constructive feedback to internal customers and suppliers at sequential parts of the production process was reported by workers to be a valued skill that they learned informally.

- *Working effectively as part of a team* The ability to work effectively as part of a team has become an increasingly important skill for employees at all of the companies included in the study. Workers reported the following skills to be effective in teaming: contributing in a verbally appropriate manner, adapting to interpersonal dynamics, and demonstrating patience and acceptance. As the following chart demonstrates, many employees did not learn teaming skills formally but rather acquired the skills informally.

To What Extent Did Your Formal and/or Pre Employment Training Prepare You With Teamwork Skills For Your Job



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- *Presenting ideas and suggestions in a persuasive manner* Many employees reported that one of the most difficult skills to learn is the ability to communicate ideas and suggestions regarding production, personnel or other issues in a clear and persuasive manner.

Cultural Development

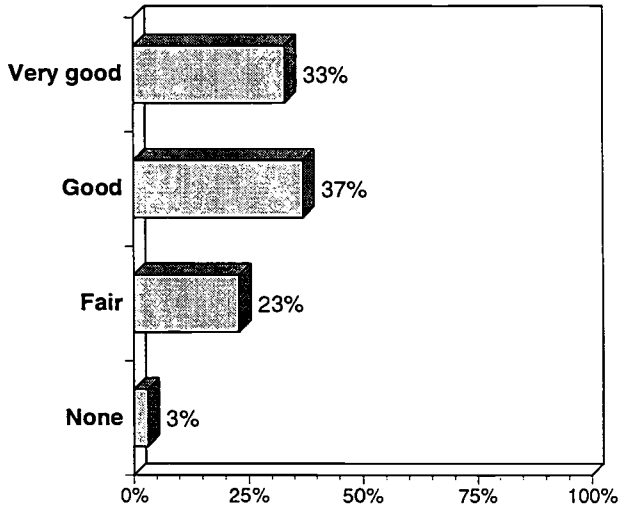
Cultural development refers to the acquisition of skills and knowledge about the organization's culture and greater business practices. This knowledge includes the formal and informal values and beliefs of an organization, the bigger picture in which one's work is embedded, and ways to navigate the culture for personal advancement.

Research identified the following skills and information that are acquired by workers who achieve maturity or expertise in their ability to adapt to the cultural context and complexities of their job:

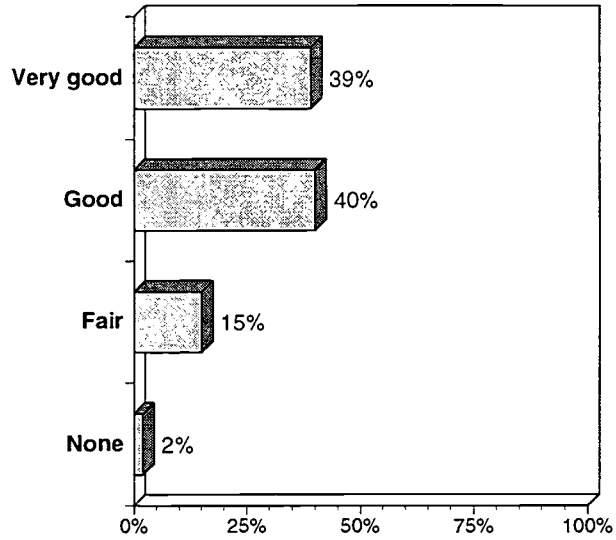
- *Balancing formal management expectations and the informal expectations of co-workers* In several companies involved in the study, floor-level employees learned how to manage the tension between working rapidly and diligently enough to meet formal management productivity goals and quality standards and not working at a level of productivity that would alienate co-workers by "showing them up" before management.

- *The ability to reflect on and think critically about the relation of one's job responsibilities to the greater production process* This includes understanding larger business operations and a sense of the "big picture," i.e., a greater sensitivity to the responsibilities, expectations and job-related needs of co-workers and the organization as a whole.

To What Extent Do You Understand the Way In Which the Product You Work On Is Used By Other Workers On Other Parts of the Line or Process?

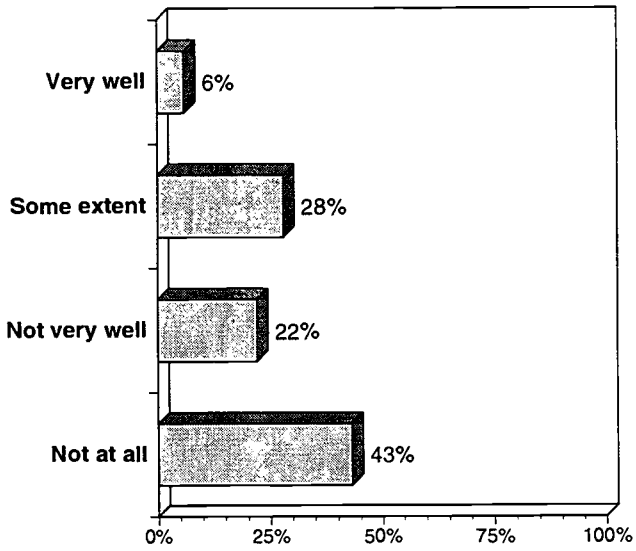


To What Extent Do You Understand the Way In Which Your Job Contributes to the Organization As A Whole?



- *Professional advancement* This knowledge includes understanding how to achieve personal and professional goals within the organization. Employees stated that they learn on-the-job which behaviors are valued and which are not—and that these informal standards do not always conform to the formal expectations communicated by management. Research revealed that the tension between formal statements and policies regarding career advancement is a source of frustration and an obstacle to learning for employees in many companies. Employees at those sites where formal and informal standards are not in line explained that certain employees have much greater skills in identifying and conforming to the tacit, unwritten guidelines for professional success than they do in actually learning and mastering the pragmatic demands of their jobs, while others perform their jobs at a consistently high quality and level of effectiveness, but either never master or refuse to conform to the unofficial criteria for advancement. The following chart demonstrates that career development was not a skill employees acquired through formal means.

To What Extent Did Your Formal and/or Pre Employment Training Provide You With Career Development Skills For Your Job



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Development in One Type of Learning May or May Not Transfer into Development in Other Types of Learning

Research with workers at the host companies revealed that development in one area may or may not translate into increased skill or maturity in other areas. We observed that learning at the broad level, as in cultural or interpersonal learning, transfers into learning at the more specific level, such as intrapersonal or pragmatic more readily than other directions of transfer. Notably, learning at the specific level was not observed to readily transfer into learning at broader levels.

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In the following table, we outline the strength of the transfer between types of learning as revealed by our research findings. For clarity, we present the broad-to-specific transfer in the left half of the table, and the specific-to-broad transfer on the right.

Broad-to-Specific Transfer	Strength of Transfer	Specific-to-Broad Transfer	Strength of Transfer
Cultural to Interpersonal	High	Pragmatic to Intrapsychic	Low
Interpersonal to Intrapersonal	High	Intrapsychic to Interpersonal	Medium
Intrapsychic to Pragmatic	High	Interpersonal to Cultural	High
Cultural to Intrapersonal	High	Pragmatic to Interpersonal	Low
Interpersonal to Pragmatic	Medium	Intrapsychic to Cultural	Medium
Cultural to Pragmatic	Medium	Pragmatic to Cultural	Low

Our research shows that knowledge and skills learned at the broad level, i.e. cultural and interpersonal learning, often transfers into learning at the intrapersonal and pragmatic level.

Learning at a broad level transfers into learning at a more specific level

Our research shows that knowledge and skills learned at the broad level, i.e. cultural and interpersonal learning, often transfers into learning at the intrapersonal and pragmatic level. As outlined above, learning cultural knowledge shows a high degree of transfer to interpersonal learning. For example, workers reported that understanding their organization's culture allowed them to gain understanding about how to interact with people in an effective, culturally sensitive manner.

Also, cultural knowledge transferred into intrapersonal learning. Employees with a high level of cultural development (e.g., with a clear understanding of formal performance timelines, organizational priorities, personal career goals, and the expectations of their co-workers regarding individual work habits) demonstrated facility in intrapersonal skills such as managing stress, dealing with unanticipated problems, and learning the mechanics of their jobs. Several employees complained that their ability to learn their jobs or to deal with the pressures associated with increased deadlines was diminished by their lack of cultural development (e.g., confusion over management expectations, lack of clarity about their own goals and expectations).

As a further example of this kind of transfer, employees reported that learning intrapersonal skills through participating in teams and other activities transferred into development of pragmatic skills, such finding short-cuts and more efficient ways to do their jobs. At one site, a worker explained that after participating in a team problem-solving

meeting, he discovered new critical thinking approaches, and was able to find a better way to operate his machine so that it did not frequently break down.

Learning at a specific level does not transfer easily into learning at a broader level

Our research shows that knowledge and skills learned at the more specific level, i.e., pragmatic and intrapersonal learning, does not easily transfer into learning at broader levels. For example, workers reported that pragmatic learning, such as machine specific knowledge and skills, does not usually increase their ability to learn in other areas. Research revealed that tenured employees with strong skills in pragmatic areas may be ill-equipped in terms of their interpersonal and pedagogical skills to communicate their knowledge and skills to their co-workers. We observed many examples of employees with technical expertise who were ineffective teachers or trainers.

Our research shows that knowledge and skills learned at the more specific level, i.e., pragmatic and intrapersonal learning, does not easily transfer into learning at broader levels.

Also, we observed many workers with very developed pragmatic knowledge who had undeveloped cultural knowledge. Some workers reported frustration by their inability to navigate the corporate culture and advance their careers, despite their pragmatic expertise. Our research showed that these individuals were often unaware of critical company values and which behaviors were desired.

Overall, these findings show that workers who are exposed to opportunities for development of interpersonal and cultural knowledge are frequently able to transfer this learning into development in other areas. It also shows that workers cannot easily learn interpersonal and cultural knowledge in the daily execution of their jobs, in the absence of exposure to opportunities to develop this broader knowledge set. In fact, we found that pragmatic knowledge rarely transfers to other areas of learning.

Similarly, this analysis clarifies some of the dynamics of knowledge transfer from one area to another However, in the real world, learning often transfers to multiple dimensions simultaneously.

TAXONOMIES AND IDEAL INFORMAL LEARNING ENVIRONMENT

EDC

OVERVIEW

In this section, we have designed five taxonomies in table format representing the findings:

- Taxonomy of informal learning by activities;
- Taxonomy of informal learning by content area and activity;
- Taxonomy of informal learning by content;
- Taxonomy of contextual factors and their impact on work activities; and
- Taxonomy of direct factors and their impact on work activities.

This is an opportunity for the reader to see all of the findings in one place, and make a connection between the various dimensions of the report; more specifically what is learned, how it is learned and what impacts the learning process.

The taxonomies represent research findings that have already been elaborated upon in the text of this document signifying the relationship among how employees learn (through activities), what they learn (pragmatic, intrapersonal, interpersonal and cultural), and what contextual and direct factors effect informal learning. However, the reader should note that these taxonomies, while useful tools, should not be used without a comprehensive cultural analysis of their own firm.

Also, we have created an ideal informal learning environment—an idealized depiction of a work environment that would provide the ultimate environment or context for informal learning.

1. Taxonomy of informal learning by activities
This taxonomy demonstrates the relationship between the type of activity (in the far left column), what is learned (second column), the facilitators and inhibitors (third column), as well as the contextual factors that effect informal learning.

This taxonomy can be used to pinpoint which learning activities promote which type of learning and the contextual factors that effect learning in each situation. For example, in the area of supervision, the supervisor learns how to manage people and the supervised learns how to integrate feedback. However, certain factors (in this case, individual personalities and management/employee relations) should be taken into consideration when implementing supervision as they may have a direct impact on the effectiveness of learning during supervision.

On-the-job Training

TYPE OF ACTIVITY	TRAINER LEARNS	TRAINEE LEARNS	DIRECT FACTORS	CONTEXTUAL FACTORS THAT LEARNING AND OJT
On-the-job training ◦ Introduction to a company and task ◦ Interacting with new person (trainer)	◦ Communication skills ◦ Instruction skills ◦ Self-esteem/pride ◦ Feedback/ evaluation ◦ Integrate new perspective	◦ New job-specific skills/knowledge ◦ How to integrate feedback ◦ Company expectations ◦ Social norms ◦ Quality/safety standards	◦ Time to learn and reflect on new skills ◦ Effective trainers ◦ Follow-through on learning ◦ Tolerance for mistakes ◦ Clear understanding of goals	◦ Respect ◦ Challenge of task ◦ Personal work habits ◦ Homogeneity of workforce ◦ Recognition

Cross-Training

TYPE OF ACTIVITY	TRAINER LEARNS	TRAINEE LEARNS	DIRECT FACTORS	CONTEXTUAL FACTORS THAT AFFECT LEARNING AND CROSS-TRAINING
Cross-training • Working in a new area • Interacting with new person (trainer)	• Communication skills • Instruction skills • Self-esteem/pride • Feedback/ evaluation • Integrate new perspectives • Bigger picture	• New job-specific skills/knowledge • How to integrate feedback • Bigger picture • Quality/safety standards	• Management support • An appropriate incentive system • A clear understanding of goals • Access to resources	• Physical conditions • Union • Growth/decline • Job security • Recognition • Size • Variety of work experience • Respect

Execution of One's Job

TYPE OF ACTIVITY	ASSEMBLE/ OPERATOR LEARNS	SUPERVISOR LEARNS	DIRECT FACTORS	CONTEXTUAL FACTORS THAT AFFECT LEARNING AND THE EXECUTION OF ONE'S JOB
Execution of one's job • Repeating processes • Responding to daily variables	• Job-specific skills/knowledge • Technical competence/skills • Problem-solving • Critical thinking	• Job-specific skills/knowledge • Technical competence/skills • Problem-solving • Critical thinking • Stress management • Prioritizing	• Time to learn and reflect on new skills • Tolerance for mistakes	• Compensation • Availability of resources • Challenge of task • Personal work habits • Tenure of job • Recognition • Incentive structure • Product type • Social norms • Recognition • Union • Level of technology

Supervision

TYPE OF ACTIVITY	SUPERVISOR LEARNS	SUPERVISEE/ SUPERVISED LEARNS	DIRECT FACTORS	CONTEXTUAL FACTORS THAT AFFECT LEARNING AND SUPERVISION
Supervision *Supervisor:* • Delegating responsibility • Coaching • Sharing with and challenging subordinates • Answering unanticipated questions *Supervisee/supervised:* • Receiving feedback and instruction • Observing supervisor's behavior towards self and others • Asking questions • Eliciting information on boundaries of responsibilities and acceptable behavior	• How to manage people/motivate diverse types of people • Communication skills • How to balance demands of their job	• Leadership style • Work processes • How to integrate feedback • What resources are available • Performance expectations • Boundaries of acceptable behavior and levels of risk-tolerance • Quality/safety standards	• Social environment conducive to giving and receiving constructive feedback as well as sharing ideas • Follow-through on learning • Frequent interactions between superivosr and subordinate • Physical proximity between supervisor and subordinate	• Union/ management-employee relations/incentive structure • Individual personalities • Individual motivation • Trust • Leadership style • Challenge of task • Respect • Physical conditions

Mentoring

TYPE OF ACTIVITY	MENTOR LEARNS	MENTEE/ MENTORED LEARNS	DIRECT FACTORS	CONTEXTUAL FACTORS THAT AFFECT LEARNING AND MENTORING
Mentoring • Feedback and advice • Direct tutoring • Observing • Sharing information and resources • Modeling	• How to be a role model/modeling • Communication skills • Instructional skills	• Specific job skills/knowledge • Career development • Cultural issues/how to navigate the corporate culture • Networking and resources • Boundaries for risk-taking	• Interpersonal dynamics between the mentor and mentee • Cultural environment • Management support	• Time • Flexibility • Individual motivation • Respect • Size of the organization • Individual qualities and attitudes of both the mentor and mentee

Meetings

TYPE OF ACTIVITY	PARTICIPANT LEARNS	FACILITATOR LEARNS	DIRECT FACTORS	CONTEXTUAL FACTORS THAT AFFECT LEARNING AND MEETINGS
Meetings • Observation • Asking questions • Participation	• Social norms • Whose input is listened and responded to • Who is invited • How meetings are called • Who the other participants are • Interactive techniques of the participants • Presentation style of the facilitator • Priorities of the facilitator • Problem-solving techniques • Bigger picture • Company priorities/ objectives	• Presentation skills • Communication skills • How to run a meeting • Meeting an agenda • Dealing with participants' concerns	• Active particpation of all • Follow-through on learning • A productive relationship among participants • Creativity and open-mindedness of the facilitator	• Social norms • Leadership style • Respect • Physical space

Teaming

TYPE OF ACTIVITY	TEAM MEMBERS LEARNS	DIRECT FACTORS	CONTEXTUAL FACTORS THAT AFFECT LEARNING AND TEAMING
Teaming • Participation in collective efforts to achieve production goals • Group problem-solving • Cross-functional collaboration	• Communicate with others • Conceptual skills • Bigger picture • How to work together cooperatively • Understand other perspectives • How to be persuasive • How to compromise/ negotiate • Understand collective/ group goals	• Authority of team members to decide outcomes and the means to achieve them • Job security • Clear and achievable team goals • A team climate of trust • A diversity of perspectives • Creativity and tolerance of risk-taking among team members • Collective decision-making • Access to resources • Appropriate time schedules and goals	• Respect • Social norms • Personal work habits • Competitiveness • Physical conditions • Individual qualities • Job security • Challenge of task • Variety of job experiences • Availability of resources • Leadership style

Shift Change

TYPE OF ACTIVITY	PARTICIPANTS LEARNS	DIRECT FACTORS	CONTEXTUAL FACTORS THAT AFFECT LEARNING AND SHIFT CHANGE
Shift change • Communicating during overlap	• Different approaches to work processes • Company practices, initiatives and "gossip" • Production line information (machine-related or production-oriented)	• Time allowed to exchange information and ideas • Necessary resources • Management support	• Challenge of task • Policies and practices • Compensation • Competition • Personal work habits • Time

Peer-to-Peer Communication

TYPE OF ACTIVITY	GOAL-DIRECTED PARTICIPANTS LEARNS	NON-GOAL-DIRECTED PARTICIPANTS LEARNS	DIRECT FACTORS	CONTEXTUAL FACTORS THAT AFFECT LEARNING AND SOCIALIZING
Peer-to-Peer Communication *Goal-directed* • Build business relationships through conversations *Non-goal-directed* • Build non-business social networks through conversation	• Personality of co-workers • How to persuade • Communication skills • Bigger picture • Cultural issues (i.e., who is getting promoted)	• How to form and maintain relationships • Personalities • Share and reciprocate • Let off steam • Transfer relationships from a social to business setting	• Freedom to explore • Tolerance of mistakes • Management support	• Size of organization • Social norms • Individual motivation • Homogeneity of workforce • Sense of community • Hierarchy • Variety of job experience • Time • Physical space • Trust among employees

Documentation

TYPE OF ACTIVITY	PARTICIPANTS LEARNS	DIRECT FACTORS	CONTEXTUAL FACTORS THAT AFFECT LEARNING AND DOCUMENTATION
Documentation • Pen-to-paper or electronic logs (of both numbers and letters) • Personal notes	• Writing and conceptual skills • Procedural knowledge • Ability to see symbols and abstractions (if charting numbers)	• Management support • Social environment conducive to sharing ideas	• Management-employee relations • Job security • ISO needs • Internal motivation • Incentives

Exploration

TYPE OF ACTIVITY	PARTICIPANTS LEARNS	DIRECT FACTORS	CONTEXTUAL FACTORS THAT AFFECT LEARNING AND EXPLORATION
Exploration • Thinking, reflecting, analyzing • Looking around • Experimenting • Identifying and acquiring resources	• Bigger picture • New work processes (i.e., more efficient short cuts) • Use resources to their full extent • Question procedures • Reframe ideas • Gain new knowledge/solutions • Stimulate more learning	• Freedom to explore • Tolerance of mistakes • Management support	• Time • Compensation • Availability of resources • Challenge of task • Freedom to explore • Personal motivation • Level of technology • Incentive • Recognition • Personal work habits • Trust among employees

2. Taxonomy of informal learning by content area and activity

For this taxonomy, each social and individual activity is represented in a column and, in some cases, split into trainer/trainee, supervisor/supervisee, mentor/mentee, etc. The activity is then related to what is learned (represented by rows), using a high, moderate or low rating for impact on informal learning.

For example, during on-the-job training, the trainee learns little about a company's issues (low) but a lot about job-specific skills (high). So if an organization wants to emphasize a better understanding of cultural issues among employees, it may consider on-the-job training not to be the ideal activity to communicate this knowledge.

CONTENT AREA (What is learned)	ACTIVITY (Where it is learned)																			
	Learning	Meetings: Participant	Meetings: Facilitator	Customer Interaction: Internal	Customer Interaction: External	Supervision: Supervised	Supervision: Supervisor	Mentoring: Mentee	Mentoring: Mentor	Shift Change	Peer-to-Peer Communications: Goal	Peer-to-Peer Communications: Non-Goal	Cross-Training: Trainee	Cross-Training: Trainer	Exploration	OJT: Trainee	OJT: Trainer	Documentation	Execution of One's Job	Site Visits
Integrate New Perspective	High	High	High	High	High	High	Moderate	High	Moderate	High	High	High	Moderate	Moderate	High	Low	Moderate	Moderate	Low	High
Self-Esteem/Pride	High	Moderate	High	Moderate	High	Moderate	Moderate	High	High	Moderate	High	High	Moderate	High	Moderate	Moderate	High	High	Moderate	High
Communication Skills	High	Moderate	Low	Moderate	Moderate	High	Low	High	Low	High	High	Moderate	High	Low	High	High	Low	High	High	Moderate
Job-Specific Skills	Moderate	Moderate	Low	Moderate	Moderate	High	Low	High	Low	High	High	Moderate	High	Low	High	High	Low	High	High	Moderate
Problem-Solving	High	High	High	Moderate	Moderate	High	High	Moderate	Moderate	High	Low	Moderate	Low	Moderate	High	Low	Moderate	Moderate	High	Low
Critical Thinking	High	High	High	Moderate	Moderate	Moderate	High	Moderate	Moderate	Moderate	High	Moderate	Low	Moderate	High	Low	Moderate	High	High	Low
Understanding the Bigger Picture	High	High	High	High	High	Low	Moderate	High	Low	Moderate	High	High	High	Moderate	High	Low	Low	Low	Low	High
Cultural Issues	High	High	High	High	Low	High	Moderate	High	Low	High	High	High	High	High	Low	Moderate	Low	Low	Low	Low
Integrate Feedback/Evaluation	High	Moderate	Moderate	High	High	High	Low	High	Low	Moderate	Moderate	Moderate	High	Low	Low	High	Low	Low	Low	High
Networking	High	High	Moderate	High	High	Moderate	Low	High	Low	Moderate	High	High	High	High	Low	High	Low	Low	Low	Low
Understand Company Quality Issues	Moderate	High	Low	High	High	High	Low	High	Low	Moderate	Moderate	Low	High	Low	Moderate	High	Low	High	Low	High
Technical Competence/Skills	Low	Low	Low	Moderate	Moderate	High	Low	High	Low	High	Moderate	Low	High	Low	High	High	Low	Moderate	High	Low
Company Expectations/Priorities	High	High	Moderate	High	Low	High	Low	High	Low	Moderate	High	Moderate	Moderate	Moderate	Low	Moderate	Low	Low	Low	Low
Social Norms	High	High	High	Moderate	Low	Moderate	Moderate	High	Low	High	High	High	Low	Low	Low	Moderate	Low	Low	Low	Low
Identifying Resources	Low	Moderate	Moderate	Low	High	High	Moderate	High	Low	Moderate	High	Low	High	Moderate	High	High	Low	Low	Low	Low
Understanding Company Goals	High	High	Low	High	Low	High	Low	High	Low	Moderate	High	Low	Moderate	Low	Low	High	Low	Moderate	Low	Low

CONTENT AREA (What is learned)	ACTIVITY (Where it is learned)																			
	Learning	Meetings: Participant	Meetings: Facilitator	Customer Interaction: Internal	Customer Interaction: External	Supervision: Supervised	Supervision: Supervisor	Mentoring: Mentee	Mentoring: Mentor	Shift Change	Peer-to-Peer Communications: Goal	Peer-to-Peer Communications: Non-Goal	Cross-Training: Trainee	Cross-Training: Trainer	Exploration	OJT: Trainee	OJT: Trainer	Documentation	Execution of One's Job	Site Visits
Prioritizing Skills	Moderate	Low	High	High	High	Low	High	High	Low	High	Low	Low	Low	Low	Moderate	Low	Low	Low	High	Low
Stress Management	Low	Low	Low	Low	Low	Low	High	Moderate	Low	Low	Low	High	Low	Low	Low	Low	Low	Low	High	Low
Balance Demand of Job	Moderate	Low	Low	Low	Low	High	Low	High	Low	Moderate	Low	Low	High	Low	Low	High	Low	Low	High	Low
Boundaries for Risk-Taking	High	High	Low	High	High	High	Low	High	Low	Moderate	Moderate	Moderate	High	Low	Moderate	Moderate	Low	Low	Low	Low
Understanding Production Metrics	High	High	Low	High	Low	High	Low	Low	Low	High	Low	Low	Moderate	Low	Low	High	Low	High	Low	Low
Understand Internal Customer Needs	High	High	High	High	High	Moderate	Low	Low	Low	Low	Moderate	Low	High	Low	Low	High	Low	Low	Low	Low
Understanding Business Operations	High	High	Low	Moderate	Moderate	Moderate	Low	High	Low	Low	Moderate	Low	Moderate	Low	Moderate	Low	Low	High	Low	Low
Learning About Other Work Process	High	High	Moderate	High	Low	Low	Low	High	Low	Low	Moderate	Low	High	Moderate	Moderate	Low	Low	Low	Low	Low
Understand External Customer Needs	High	High	High	Moderate	High	High	Low	Low	Low	Low	Moderate	Low	Low	Low	Low	Low	Low	Low	Low	High
Leadership/Management Skills	High	Moderate	High	Low	Low	Low	High	Low	High	Low	Low	Low	Low	High	Low	Low	High	Low	Low	Low
Career development	Low	Moderate	Low	Moderate	Low	High	Low	High	Low	Low	High	Low	Moderate	Moderate	Moderate	Moderate	Low	Low	Low	Low
Instruction Skills	Low	Low	Low	Low	Low	Low	High	Low	High	Low	Low	Low	Low	High	Low	Low	High	Moderate	Low	Low
Safety In Workplace	Low	Low	Low	Low	Low	High	Low	Low	Low	Low	Low	Low	High	Low	Low	High	Low	Low	Moderate	Low
Enhance Writing Skills	High	Moderate	Moderate	Low	Low	Low	Low	Low	Low	Low	Low	Low	Low	Low	Low	Low	Low	High	Low	Low
Formal Presentation Skills	Low	Low	High	Low	Low	Low	Low	Low	Low	Low	Low	Low	Low	Low	Low	Low	Low	Low	Low	Low

Key:

High=High impact on informal learning

Moderate=Moderate impact on informal learning

Low=Low impact on informal learning

3. Taxonomy of informal learning by content

Each area of content learning (pragmatic, interpersonal, intrapersonal and cultural) is represented by the first column and then corresponding types of activities (column two) and occasions for learning (column three) are associated.

For example, if an organization wants an employee to learn a particular skill, it can look to this taxonomy to see which activity is the most effective and within the specific activity, which occasions for learning promote the skill acquisition. For example, if an organization wants employees to understand cultural issues like production metrics and business operations , then teaming and cross-training are effective, and the peer-to-peer communication within such activities is a fertile occasion for this type of learning.

Taxonomy of Informal Learning by Content

CONTENT OF LEARNING	TYPES OF ACTIVITIES	OCCASIONS FOR LEARNING
• Pragmatics/professional - Job-specific skills/ knowledge - Technical competence/ skills - Enhance writing skills - Safety issues - Identifying resources	• On-the-job training • Cross-training • Supervision • Mentoring • Goal-oriented peer-to-peer communication • Execution of one's job • Shift change • Exploration	• Observing superiors, mentors and peers • Asking questions • Delegating and assuming responsibilities • Instructing others • Direct tutoring and instruction • Trial and error • Sharing information • Socializing • Job rotation • Giving/receiving feedback and/or advice • Personal reflection • Reading • Networking

CONTENT AREA (What is learned)	ACTIVITY (Where it is learned)																			
	Teaming	Meetings: Participant	Meetings: Facilitator	Customer Interaction: Internal	Customer Interaction: External	Supervision: Supervised	Supervision: Supervisor	Mentoring: Mentee	Mentoring: Mentor	Shift Change	Peer-to-Peer Communications: Goal	Peer-to-Peer Communications: Non-Goal	Cross-Training: Trainee	Cross-Training: Trainer	Exploration	OJT: Trainee	OJT: Trainer	Document-ation	Execution of One's Job	Site Visits
Integrate New Perspective	High	High	High	High	High	High	Moderate	High	Moderate	High	High	High	Moderate	Moderate	High	Low	Moderate	Moderate	Low	High
Self-Esteem/Pride	High	Moderate	High	Moderate	High	Moderate	Moderate	High	High	Moderate	High	High	Moderate	High	Moderate	Moderate	High	High	Moderate	High
Communication Skills	High	Moderate	Low	Moderate	Moderate	High	Low	High	Low	High	High	Moderate	High	Low	High	High	Low	High	High	Moderate
Job-Specific Skills	Moderate	Moderate	Low	Moderate	Moderate	High	Low	High	Low	High	High	Moderate	High	Low	High	High	Low	High	High	Moderate
Problem-Solving	High	High	High	Moderate	Moderate	High	High	Moderate	Moderate	High	Low	Moderate	Low	Moderate	High	Low	Moderate	Moderate	High	Low
Critical Thinking	High	High	High	Moderate	Moderate	Moderate	High	Moderate	Moderate	Moderate	High	Moderate	Low	Moderate	High	Low	Moderate	High	High	Low
Understanding the Bigger Picture	High	High	High	High	High	Low	Moderate	High	Low	Moderate	High	High	High	Moderate	High	Low	Low	Low	Low	High
Cultural Issues	High	High	High	High	Low	High	Moderate	High	Low	High	High	High	High	High	Low	Moderate	Low	Low	Low	Low
Integrate Feedback/Evaluation	High	Moderate	Moderate	High	High	High	Low	High	Low	Moderate	Moderate	Moderate	High	Low	Low	High	Low	Low	Low	High
Networking	High	High	Moderate	High	High	Moderate	Low	High	Low	Moderate	High	High	High	High	Low	High	Low	Low	Low	Low
Understand Company Quality Issues	Moderate	High	Low	High	High	High	Low	High	Low	Moderate	Moderate	Low	High	Low	Moderate	High	Low	High	Low	High
Technical Competence/Skills	Low	Low	Low	Moderate	Moderate	High	Low	High	Low	High	Moderate	Low	High	Low	High	High	Low	Moderate	High	Low
Company Expectations/Priorities	High	High	Moderate	High	Low	High	Low	High	Low	Moderate	High	Moderate	Moderate	Moderate	Low	Moderate	Low	Low	Low	Low
Social Norms	High	High	High	Moderate	Low	Moderate	Moderate	High	Low	High	High	High	Low	Low	Low	Moderate	Low	Low	Low	Low
Identifying Resources	Low	Moderate	Moderate	Low	High	High	Moderate	High	Low	Moderate	High	Low	High	Moderate	High	High	Low	Low	Low	Low
Understanding Company Goals	High	High	Low	High	Low	High	Low	High	Low	Moderate	High	Low	Moderate	Low	Low	High	Low	Moderate	Low	Low

Key:

High=High impact on informal learning

Moderate=Moderate impact on informal learning

Low=Low impact on informal learning

table 1

CONTENT AREA (What is learned)	ACTIVITY (Where it is learned)																			
	Teaming	Meetings Participant	Meetings Facilitator	Customer Interaction Internal	Customer Interaction External	Supervision Supervised	Supervision Supervisor	Mentoring Mentee	Mentoring Mentor	Shift Change	Peer-to-Peer Communications Goal	Peer-to-Peer Communications Non-Goal	Cross-Training Trainee	Cross-Training Trainer	Exploration	OJT Trainee	OJT Trainer	Document-ation	Execution of One's Job	Site Visits
Prioritizing Skills	Moderate	Low	High	High	High	Low	High	High	Low	High	Low	Low	Low	Low	Moderate	Low	Low	Low	High	Low
Stress Management	Low	Low	Low	Low	Low	Low	High	Moderate	Low	Low	Low	High	Low	Low	Low	Low	Low	Low	High	Low
Balance Demand of Job	Moderate	Low	Low	Low	Low	High	Low	High	Low	Moderate	Low	Low	High	Low	Low	High	Low	Low	High	Low
Boundaries for Risk-Taking	High	High	Low	High	High	High	Low	High	Low	Moderate	Moderate	Moderate	High	Low	Moderate	Moderate	Low	Low	Low	Low
Understanding Production Metrics	High	High	Low	High	Low	High	Low	Low	Low	High	Low	Low	Moderate	Low	Low	High	Low	High	Low	Low
Understand Internal Customer Needs	High	High	High	High	High	Moderate	Low	Low	Low	Low	Moderate	Low	High	Low	Low	High	Low	Low	Low	Low
Understanding Business Operations	High	High	Low	Moderate	Moderate	Moderate	Low	High	Low	Low	Moderate	Low	Moderate	Low	Moderate	Low	Low	High	Low	Low
Learning About Other Work Process	High	High	Moderate	High	Low	Low	Low	High	Low	Low	Moderate	Low	High	Moderate	Moderate	Low	Low	Low	Low	Low
Understand External Customer Needs	High	High	High	Moderate	High	High	Low	Low	Low	Low	Moderate	Low	Low	Low	Low	Low	Low	Low	Low	High
Leadership/Management Skills	High	Moderate	High	Low	Low	Low	High	Low	High	Low	Low	Low	Low	High	Low	Low	High	Low	Low	Low
Career development	Low	Moderate	Low	Moderate	Low	High	Low	High	Low	Low	High	Low	Moderate	Moderate	Moderate	Moderate	Low	Low	Low	Low
Instruction Skills	Low	Low	Low	Low	Low	Low	High	Low	High	Low	Low	Low	Low	High	Low	Low	High	Moderate	Low	Low
Safety In Workplace	Low	Low	Low	Low	Low	High	Low	Low	Low	Low	Low	Low	High	Low	Low	High	Low	Low	Moderate	Low
Enhance Writing Skills	High	Moderate	Moderate	Low	Low	Low	Low	Low	Low	Low	Low	Low	Low	Low	Low	Low	Low	High	Low	Low
Formal Presentation Skills	Low	Low	High	Low	Low	Low	Low	Low	Low	Low	Low	Low	Low	Low	Low	Low	Low	Low	Low	Low

Key:

High=High impact on informal learning

Moderate=Moderate impact on informal learning

Low=Low impact on informal learning

table 2

Taxonomy of Informal Learning by Content

CONTENT OF LEARNING	TYPES OF ACTIVITIES	OCCASIONS FOR LEARNING
• Intrapersonal - Problem-solving skills - Critical thinking skills - Learning about alternative work processes - Boundaries for risk-taking - Self-esteem/pride - Personal reflection - Stress management - Integrate feedback/ evaluation - Integrate new perspectives - Balance demands of the job - Prioritizing	• Teaming • Goal-oriented peer-to-peer communication • Supervision • Meetings • Customer interaction • Mentoring • Execution of one's job	• Interaction with peers, subordinates and superiors • Expanding the scope of the job/assign new responsibilities • Internalization of organizational policies • Answering unanticipated questions • Instructing others • Interaction • Asking questions/questioning assumptions • Reflective observation

Taxonomy of Informal Learning by Content

CONTENT OF LEARNING	TYPES OF ACTIVITIES	OCCASIONS FOR LEARNING
• Interpersonal - Interactive skills (i.e., peer-to-peer communication or subordinate-to-superiors communication - Formal presentation skills - Teamwork dynamics - Instruction skills - Leadership/management skills - Communication skills - Group pressures - Conflict resolution	• OJT • Cross-training • Mentoring • Supervision • Teaming • Meetings • Peer-to-peer communication • Customer interaction	• Collective work on production goals • Interactions with peers, superiors, subordinates, customers and suppliers • Instructing other • Job rotation • Receiving/giving feedback and advice • Particpating and/or conducting a meeting • Sharing ideas and information

Taxonomy of Informal Learning by Content

CONTENT OF LEARNING	TYPES OF ACTIVITIES	OCCASIONS FOR LEARNING
• Cultural - Formal presentation skills - Teamwork dynamics - Professional advancement - Social norms - Bigger picture - Company business at-large - Understanding company goals - Understanding business operations - Understanding production metrics - Understanding quality standards - Understanding company expectations/priorities	• Mentoring • Teaming • Supervision • Meetings • Cross-training • Goal-directed peer-to-peer communication • Internal customer interaction	• Observing peers and supervisors • Asking questions • Socializing • Networking • Receiving feedback and advice • Shift change • Peer-to-peer or subordinate-to-superiors communication • Exploration

4. Taxonomy of contextual factors and their impact on work activities
Here we present the effects of contextual factors (columns) on work activities (rows) with a rating of high, moderate or low for impact on informal learning.

For example, the labor characteristics of a company's workforce has a moderate effect on documentation; a low effect on the execution of one's job; and a high effect on teaming. So if an organization wants to improve their teaming initiative, they should consider the characteristics of their labor pool when predicting the outcomes of the teaming initiative.

Taxonomy of Informal Learning by Contextual Factors

CONTEXTUAL FACTORS	IMPACT ON INFORMAL LEARNING
Industry:	
Competitiveness of industry	High
Growth or decline	High
Pride in industry	Low
Challenge of industry	High
Company:	
Incentive structure	High
Promotion criteria	High
Recognition	High
Job security	High
Unions	High
Leadership style	Moderate
Management-employee relations	High
Geographic location	Low
Characteristics of labor pool	Moderate
Size of organization	Moderate
Product	Low
Available resources	High
Individual:	
Internal motivation	High
Personality	High
Mental capacity	Moderate
Personal work experience	Moderate

Note: The impact of culture on informal learning is not included in this taxonomy as it interacts with informal learning in such a significant and dynamic manner and its effects have been discussed in length in "Contextual Factors Impacting the Organization."

5. Taxonomy of direct factors and their impact on work activities

Some of the more important direct factors that effect work activities are represented in each column and include:

- Time away from production;
- Availability of effective trainers/facilitators in work activities;
- Tolerance for mistakes;
- Challenge of task;
- A clear understanding of immediate work goals;
- Authority of employees to decide various outcomes/empowerment to make decisions;
- An open forum (direct work environment) for exchange of opinions and ideas;
- Active participation in direct work experiences; and
- Frequent interactions between employees.

Again, we correlate these direct factors and their effect on work activities (represented by rows) with a rating of high, moderate or low. So, for example, an organization can note that more frequent interactions between employees has a high impact on teaming but a lower impact on the execution of one's job.

ACTIVITY (Where it is learned)		CONTEXTUAL FACTORS											
		Policies & practices	Trust: Employee to employee	Promotional incentives	Sense of cooperative-ness	Frequent interactions	Growth	Mgm't leadership style	Tolerance for mistakes	Internal competive-ness	Trust: Manage-ment to employee	Availability of company resources	Personal work experience
OJT	Trainee	High	High	High	Moderate	High	Low	Low	High	High	Moderate	High	Low
	Trainer	High	High	High	Moderate	High	Low	High	High	Moderate	Moderate	High	Moderate
Cross-training	Trainee	High	High	High	High	High	High	Moderate	High	High	High	High	Moderate
	Trainer	High	High	High	High	High	High	Moderate	High	Moderate	High	High	Moderate
Execution of one's job		High	Low	High	Low	Low	High	High	High	High	High	Moderate	High
Meeting	Participant	Moderate	High	High	Moderate	High	High	Moderate	Low	Moderate	High	Low	Moderate
	Facilitator	Moderate	High	High	Moderate	High	High	Moderate	Low	Moderate	High	Low	Moderate
Mentoring	Mentee	Moderate	High	High	High	High	High	Moderate	High	Low	Moderate	Moderate	Moderate
	Mentor	High	High	Moderate	High	High	High	Moderate	High	Low	High	Low	High
Teaming		High	High	High	High	High	High	High	High	High	High	Moderate	High
Supervision	Supervisee	High	High	Moderate	High	High	High	High	High	Moderate	High	Moderate	Low
	Supervisor	Moderate	High	Moderate	High	High	High	High	High	Moderate	High	Moderate	High
Shift change		High	High	Low	High	High	Low	Low	Low	High	Low	Low	Low
Socializing	Goal	High	High	High	High	High	High	High	Low	High	Low	Low	Moderate
	Non-goal	High	High	High	High	High	High	High	Low	High	Low	Low	Low
Exploration		High	Moderate	High	High	Low	High	High	High	High	Moderate	High	High
Peer-to-peer communication		High	High	High	High	High	High	High	Moderate	High	Low	Moderate	High
Documentation		High	High	Low	High	Low	Low	Moderate	High	Low	High	Moderate	Low

Key:

High=High impact on informal learning

Moderate=Moderate impact on informal learning

Low=Low impact on informal learning

The contextual factors listed in tables 4,5 and 6 are presented in rank order (those with the most "high" to those with least).

ACTIVITY (Where it is learned)		CONTEXTUAL FACTORS: Work habits	Internal motivation	Personality	Active participation	Financial incentives	Job security	Challenge of task	Clear understanding of goals	Recognition	Authority of employees to [illegible] to make decisions	Open forum for exchange of opinions and ideas	Time away from production
OJT	Trainee	High	High	High	High	High	High	High	High	High	Low	High	High
	Trainer	High	High	High	High	High	High	High	High	High	High	High	High
Cross-training	Trainee	High	High	High	High	High	High	High	High	High	High	High	High
	Trainer	High	High	High	High	High	High	High	High	High	High	High	High
Execution of one's job		High	High	High	High	High	High	High	High	High	High	Low	High
Meeting	Participant	High	High	High	High	High	High	High	High	High	High	High	High
	Facilitator	High	High	High	High	High	Moderate	High	High	High	High	High	High
Mentoring	Mentee	High	High	High	High	High	High	High	High	High	High	High	High
	Mentor	High	High	High	High	High	High	High	High	High	Moderate	High	High
Teaming		High	High	High	High	High	High	High	High	High	High	High	Low
Supervision	Supervisee	High	High	High	High	High	High	High	High	High	High	High	High
	Supervisor	High	High	High	High	High	Moderate	High	High	High	High	High	High
Shift change		High	High	High	High	Moderate	High	High	High	Low	High	High	High
Socializing	Goal	High	High	High	High	High	High	Moderate	High	High	High	High	High
	Non-goal	High	High	High	High	High	High	Moderate	Low	Moderate	High	High	High
Exploration		High	High	High	High	High	High	High	High	High	High	High	High
Peer-to-peer communication		High	High	High	High	High	High	High	High	High	High	High	Low
Documentation		High	High	High	High	High	High	High	High	High	High	High	High

The contextual factors listed in tables 4,5 and 6 are presented in rank order (those with the most "high" to those with least).

Key:

High=High impact on informal learning

Moderate=Moderate impact on informal learning

Low=Low impact on informal learning

ACTIVITY (Where it is learned)		CONTEXTUAL FACTORS: Competitiveness of industry	Unions	Labor characteristics	Management employee relation	Effective trainers/facilitators	Product	Size of organization	Geographic location
OJT	Trainee	Moderate	Moderate	Moderate	Low	High	High	Low	Low
	Trainer	Low	Moderate	Moderate	Low	Low	Low	Low	Low
Cross-training	Trainee	Moderate	High	Moderate	Low	High	Moderate	Moderate	Low
	Trainer	Low	High	Moderate	Low	Low	Moderate	Low	Low
Execution of one's job		High	High	Low	Moderate	Low	High	Low	Low
Meeting	Participant	Low	Low	Low	Moderate	High	Low	Low	Low
	Facilitator	Low	Low	Low	Low	High	Low	Low	Low
Mentoring	Mentee	High	Low	Moderate	Moderate	High	Moderate	Moderate	Low
	Mentor	Moderate	Low	Moderate	Moderate	Low	Low	Low	Low
Teaming		High	Moderate	High	Moderate	Low	Low	Moderate	Low
Supervision	Supervisee	Moderate	High	Moderate	High	High	Low	Low	Low
	Supervisor	Moderate	Low	Moderate	High	Low	Low	Low	Low
Shift change		Low	Moderate	High	Low	Low	Low	Low	Low
Socializing	Goal	High	Low	High	Moderate	Low	Moderate	Moderate	Low
	Non-goal	High	Low	High	Moderate	Low	Moderate	Moderate	Low
Exploration		High	High	Low	Moderate	Low	Moderate	Moderate	Low
Peer-to-peer communication		High	Low	Moderate	Low	Low	Moderate	Low	Low
Documentation		Low	High	Moderate	High	Low	Low	Low	Low

The contextual factors listed in tables 4,5 and 6 are presented in rank order (those with the most "high" to those with least).

Key:

High=High impact on informal learning

Moderate=Moderate impact on informal learning

Low=Low impact on informal learning

ACTIVITY (Where it is learned)		CONTEXTUAL FACTORS											
		Work habits	Internal motivation	Personality	Active participation	Financial incentives	Job security	Challenge of task	Clear understanding of goals	Recognition	Authority of employees to decide outcome/empowerment to make decisions	Open forum for exchange of opinions and ideas	Time away from production
OJT	Trainee	High	High	High	High	High	High	High	High	High	Low	High	High
	Trainer	High	High	High	High	High	High	High	High	High	High	High	High
Cross-training	Trainee	High	High	High	High	High	High	High	High	High	High	High	High
	Trainer	High	High	High	High	High	High	High	High	High	High	High	High
Execution of one's job		High	High	High	High	High	High	High	High	High	High	Low	High
Meeting	Participant	High	High	High	High	High	High	High	High	High	High	High	High
	Facilitator	High	High	High	High	High	Moderate	High	High	High	High	High	High
Mentoring	Mentee	High	High	High	High	High	High	High	High	High	High	High	High
	Mentor	High	High	High	High	High	High	High	High	High	Moderate	High	High
Teaming		High	High	High	High	High	High	High	High	High	High	High	Low
Supervision	Supervisee	High	High	High	High	High	High	High	High	High	High	High	High
	Supervisor	High	High	High	High	High	Moderate	High	High	High	High	High	High
Shift change		High	High	High	High	Moderate	High	High	High	Low	High	High	High
Socializing	Goal	High	High	High	High	High	High	Moderate	High	High	High	High	High
	Non-goal	High	High	High	High	High	High	Moderate	Low	Moderate	High	High	High
Exploration		High	High	High	High	High	High	High	High	High	High	High	High
Peer-to-peer communication		High	High	High	High	High	High	High	High	High	High	High	Low
Documentation		High	High	High	High	High	High	High	High	High	High	High	High

Key:

High=High impact on informal learning

Moderate=Moderate impact on informal learning

Low=Low impact on informal learning

The contextual factors listed in tables 4,5 and 6 are presented in rank order (those with the most "high" to those with least).

table 3

ACTIVITY (Where it is learned)		CONTEXTUAL FACTORS											
		Policies & practices	Trust: Employee to employee	Promotional incentives	Sense of cooperative-ness	Frequent interactions	Growth	Mgm't leadership style	Tolerance for mistakes	Internal competive-ness	Trust: Manage-ment to employee	Availability of company resources	Personal work experience
OJT	Trainee	High	High	High	Moderate	High	Low	Low	High	High	Moderate	High	Low
	Trainer	High	High	High	Moderate	High	Low	High	High	Moderate	Moderate	High	Moderate
Cross-training	Trainee	High	High	High	High	High	High	Moderate	High	High	High	High	Moderate
	Trainer	High	High	High	High	High	High	Moderate	High	Moderate	High	High	Moderate
Execution of one's job		High	Low	High	Low	Low	High	High	High	High	High	Moderate	High
Meeting	Participant	Moderate	High	High	Moderate	High	High	Moderate	Low	Moderate	High	Low	Moderate
	Facilitator	Moderate	High	High	Moderate	High	High	Moderate	Low	Moderate	High	Low	Moderate
Mentoring	Mentee	Moderate	High	High	High	High	High	Moderate	High	Low	Moderate	Moderate	Moderate
	Mentor	High	High	Moderate	High	High	High	Moderate	High	Low	High	Low	High
Teaming		High	High	High	High	High	High	High	High	High	High	Moderate	High
Supervision	Supervisee	High	High	Moderate	High	High	High	High	High	Moderate	High	Moderate	Low
	Supervisor	Moderate	High	Moderate	High	High	High	High	High	Moderate	High	Moderate	High
Shift change		High	High	Low	High	High	Low	Low	Low	High	Low	Low	Low
Socializing	Goal	High	High	High	High	High	High	High	Low	High	Low	Low	Moderate
	Non-goal	High	High	High	High	High	High	High	Low	High	Low	Low	Low
Exploration		High	Moderate	High	High	Low	High	High	High	High	Moderate	High	High
Peer-to-peer communication		High	High	High	High	High	High	High	Moderate	High	Low	Moderate	High
Documentation		High	High	Low	High	Low	Low	Moderate	High	Low	High	Moderate	Low

Key:

High=High impact on informal learning

Moderate=Moderate impact on informal learning

Low=Low impact on informal learning

The contextual factors listed in tables 4,5 and 6 are presented in rank order (those with the most "high" to those with least).

table 4

ACTIVITY (Where it is learned)		CONTEXTUAL FACTORS							
		Competiveness of industry	Unions	Labor characteristics	Management employee relation	Effective trainers/ facilitators	Product	Size of organization	Geographic location
OJT	Trainee	Moderate	Moderate	Moderate	Low	High	High	Low	Low
	Trainer	Low	Moderate	Moderate	Low	Low	Low	Low	Low
Cross-training	Trainee	Moderate	High	Moderate	Low	High	Moderate	Moderate	Low
	Trainer	Low	High	Moderate	Low	Low	Moderate	Low	Low
Execution of one's job		High	High	Low	Moderate	Low	High	Low	Low
Meeting	Participant	Low	Low	Low	Moderate	High	Low	Low	Low
	Facilitator	Low	Low	Low	Low	High	Low	Low	Low
Mentoring	Mentee	High	Low	Moderate	Moderate	High	Moderate	Moderate	Low
	Mentor	Moderate	Low	Moderate	Moderate	Low	Low	Low	Low
Teaming		High	Moderate	High	Moderate	Low	Low	Moderate	Low
Supervision	Supervisee	Moderate	High	Moderate	High	High	Low	Low	Low
	Supervisor	Moderate	Low	Moderate	High	Low	Low	Low	Low
Shift change		Low	Moderate	High	Low	Low	Low	Low	Low
Socializing	Goal	High	Low	High	Moderate	Low	Moderate	Moderate	Low
	Non-goal	High	Low	High	Moderate	Low	Moderate	Moderate	Low
Exploration		High	High	Low	Moderate	Low	Moderate	Moderate	Low
Peer-to-peer communication		High	Low	Moderate	Low	Low	Moderate	Low	Low
Documentation		Low	High	Moderate	High	Low	Low	Low	Low

Key:

High=High impact on informal learning

Moderate=Moderate impact on informal learning

Low=Low impact on informal learning

The contextual factors listed in tables 4,5 and 6 are presented in rank order (those with the most "high" to those with least).

table 5

Ideal Informal Learning Environment

The following is an idealized depiction of a work environment that would, in the best of all worlds, provide the ultimate environment or context for informal learning. The scenario is an abstraction based on the contextual factors that our research found to be important for informal learning. Not all the contextual factors that impact informal learning are included, but rather, included are a selection of the most important dimensions that can be generalized and used for most organizations. The objective of the scenario is to provide the readers with a goal or picture to strive towards.

The Ideal Informal Learning Environment

Company X is a manufacturing firm that produces high-technology products in an industry growing at a steady pace. The competitive marketplace requires the organization to change and adapt to customer needs. Consequently, the organization is constantly in the process of increasing productivity and innovation.

At company X, management has made learning a central part of the mission statement of the organization. This notion is communicated to employees both in messages and also in actions. For example, the organization stresses that new ideas are appreciated and therefore each one, regardless of its worth to the organization, is responded to. Innovative individuals are often promoted and when teams find ways to increase productivity by streamlining the production process, they are publicly acknowledged and recognized. In general, company X has incorporated an incentive structure into the organization to reinforce learning and its products.

Job security at the organization is high and employees feel confident that they won't be laid off unnecessarily. A reasonable level of risk-taking is encouraged and errors are perceived as an integral part of the exploration process. When errors do occur, they are discussed so as not to repeat them in the future.

Employees are empowered to make decisions regarding their job, and management perceives and treats employees as the experts about the tasks they perform. Before making any changes in a work task, employee input is sought out and outcomes are always explained and discussed with employees.

Employees and management share the same vision of the company. Both share a genuine understanding of the current state of the organization, as well as its goals and aspirations.

At company X, management makes an effort to understand and take into account employees' goals and job aspirations. Management discusses with employees how the organization can work together to meet employees' goals while at the same time pursuing the organizational goals. Consequently, there is a sense among employees that it is in their own interest to have the company succeed.

THE RELATIONSHIP BETWEEN INFORMAL AND FORMAL LEARNING

EDC

OVERVIEW

A key topic in our research was the nature and value of formal learning in meeting worker needs. In the course of this investigation, we gained an understanding of how workers develop mastery through a combination of informal and formal learning. We saw that informal learning was ubiquitous and served to fulfill most learning needs. However, when both formal and informal learning opportunities were available, employees had even richer opportunities for development.

We identified important differences between formal and informal learning. In general, we noted that informal learning was highly relevant to employee needs and involved knowledge and skills that were attainable and immediately applicable. These are features that facilitate learning for many workers. We note, however, that informal learning has some features, such as variability, that make it unsuitable for all workplace uses.

Importantly, research revealed that formal and informal learning augment one another. Yet, workers reported that informal learning plays a stronger role than formal learning in reinforcing knowledge by providing opportunities for application and active experimentation. These two learning types were also shown to interact, such that much informal learning occurs simultaneous to and following formal learning.

Formal and informal learning also interact synergistically. Workers who come to formal learning setting with real-world experience with the subject matter are better able to learn in this setting. Likewise, workers who have had opportunities to consider models of their work processes are better prepared for informal learning.

Informal Learning Differs From Formal Learning In Meaningful Ways

Our data analysis revealed that formal and informal learning differ in a number of ways. In the following section, we outline some of the characteristics that distinguish these types of learning as manifest in the high-performance firms studied. It is important to stress that these characteristics are common to the "pure" forms of these learning types and many of the observed learning events. However, they are not characteristics of all formal and informal learning observed. Also, these characteristics are also not necessarily essential features formal and informal learning, but those that research revealed to be commonly linked to them.

Relevance of Content

The relevance of the learning content to a worker's needs will determine the effectiveness of a learning event. Informal learning generally emerges from specific worker needs, and is thus, by definition, extremely relevant. Formal learning can vary from extremely relevant to completely irrelevant to worker needs, and commonly falls somewhere near the middle of this range.

The relevance of the learning content to a worker's needs will determine the effectiveness of a learning event.

Variability of Acquired Knowledge

The number of knowledge "sources" will determine the variability of the acquired knowledge. Formal training observed in this research was generally structured such that a limited number of trainers communicated information in a systematic fashion. Thus formal learning provided specific information with minimal variability. This learning is effective for many applications and is especially effective for applications that require specific knowledge and those for which deviations from a prescribed procedure carry grave consequences, e.g., "mission critical" and safety information.

In contrast, our research indicated that informal learning is often acquired from a broad range of sources; e.g., from many individuals and resources. Consequently, the knowledge acquired may vary widely across learners. This learning is effective for applications that allow for individual style and approach and applications for which deviations from prescribed procedures do not carry negative outcomes.

Gap Between Current and Target Knowledge

Our research indicated that learning occurs most readily when the "target" or new knowledge is easily attainable to the learner. That is, if the learner has an enriched set of relevant basic knowledge, the learning is facilitated. Research showed that informal learning is often

initiated by the learner in the form of incremental steps toward a goal. Thus, informal learning usually involves an attainable knowledge gap. We observed formal learning to vary from extremely unattainable to easily attainable knowledge. For example, a software training class can include students with no computer knowledge and students who have mastered an earlier version of the software.

The research indicated that a variety of factors may contribute to this knowledge gap in formal training events. To be financially viable, formal training generally must address a significant number of employees, and cannot be tailored to individual needs. The training material must be addressed to the average knowledge level of the target learners in order to maximize its learning potential.

Learning builds on itself with ongoing opportunities to use and challenge it.

Learner involvement

The "constructivist" school of thought describes learning as a process in which the learner is an active participant. As Engestrom (1994) writes: "The student literally constructs a picture of the world and forms explanatory models of its different phenomena. He or she always selects and interprets information, not working like a camera or a tape recorder. The learner's activity and existing models orient and direct his or her attention, selection, and interpretation (p 12)." Research revealed informal learning to be generally constructivist in nature. Constructivist learning has been shown to facilitate retention and to be a very effective way to acquire skills such as communication and problem solving.

In contrast, learning that results from the process in which a teacher presents information is called "instructional" learning in the educational literature. In instructional learning, the instructor determines what is learned and how the learning process is structured. Instructional learning is effective in providing specific information to interested learners. Most formal training observed in this study was instructional in nature, but some included both constructivist and instructional elements. These two learning styles are not necessarily incompatible. A learning event may include both constructivist and instructional components.

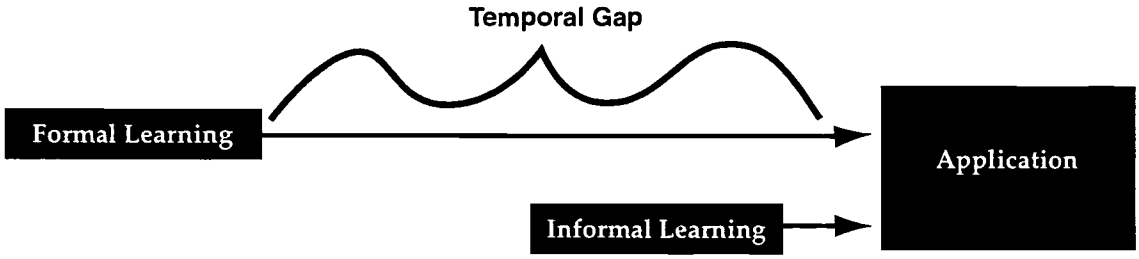
Temporal Relationship to Application

Learning builds on itself with ongoing opportunities to use and challenge it. All learning, be it formal or informal, is most effective if it is closely related in time to the application of the knowledge.

Our research revealed that informal learning typically arises spontaneously with everyday needs and is applied immediately

thereafter. For example, a worker required to use a software application at his or her workplace may engage in a number of informal learning activities, such as accessing written documentation, peer questioning, and trial and error, etc., in order to perform the immediate job. In contrast, formal training and school-based learning often occur long before they are applied. A worker may be required to attend a training class, for example, on a new software program before the program is made available to his or her worksite. In general, the longer the gap between the leaning and use, the weaker the effect of the learning.

Temporal Gap Between Learning and Application.



Other Factors

We understand formal learning to often represent "core" knowledge that the organization aims to communicate. Informal learning, in contrast, includes much knowledge that is not sanctioned or even recognized by the organization. For example, informal learning may include understanding unwritten company values and who carries real power in promotional decisions. Formal learning is generally scheduled; informal learning generally occurs spontaneously as needs arise. Formal learning often occurs in a setting that is different from that where the learning will be applied, e.g., a classroom or space away from the work environment, while informal learning typically occurs in the workplace as part of work activity.

Formal learning has specified learning outcomes, determined by the organization; informal learning may or may not have specified outcomes. For example, exploration, which is not directed toward any specific goal, is usually informal. Finally, formal learning is generally conducted via an instructor with specific training goals who is accountable for results. Informal learning may be engaged in by one or more workers who need not report or document results.

The following table describes the characteristics of formal and informal learning observed in this research. We reiterate that these are characteristics common to the "pure" forms of each and not necessarily features of all manifestations of informal and formal learning. In fact, few observed learning events observed were purely formal or informal in nature, i.e., few had all of the characteristics outlined in this table.

Formal learning	Informal learning
of variable relevance to worker needs	extremely relevant to needs
communicated information is constant across learners	communicated information is variable across learners
variable gap between current and target knowledge	small gap between current and target knowledge
instructional	constructivist
variable temporal gap to application	immediately applicable
represents core "organizationally beneficial" knowledge	core and other knowledge
scheduled	arises spontaneously
occurs in a setting other than that where the knowledge is used	occurs in the setting where knowledge is used
has specified outcomes	with / without specified outcomes
with a "trainer" who is accountable for results	with /without reported results

Informal and formal learning interact

Research revealed that formal and informal learning interact and augment each other in many ways. In the following section we outline how our research showed these interactions to occur. Specifically, we found that learning exists along a continuum of formal and informal dimensions, informal learning is ubiquitous, and formal and informal learning occur simultaneously, in a dynamic, and synergistically.

Formal and informal learning exist along a continuum

In today's high performance workplace, formal and informal learning events may be best described as existing along a continuum, with pure forms at each pole. With an increased understanding of the strengths of each approach, formal and informal teaching and learning approaches have begun to merge.

With an increased understanding of the strengths of each approach, formal and informal teaching and learning approaches have begun to merge.

Research shows that some formal training has been structured to take into account informal learning opportunities, i.e., encouraging individual participation, using group activities, and conducting training classes in the work environment, etc. At the same time, informal learning has been increasingly formalized to encourage greater distribution of informally-acquired knowledge, by, for example, company-encouraged "peer feedback" meetings, and greater structure in designing on-the-job training and mentoring programs. And companies are increasingly creating "learning centers" where books, audio tapes, videos and other "formal" resources are available for loan for use during workers' free time. In fact, there were few observed formal learning events that did not include some of the characteristics of informal learning described above.

Informal learning is ubiquitous

We observed informal learning to be ubiquitous. It was present in all observed workplace environments, emerging in day-to-day production activities. It is the essential way in which individuals grew with the ever-changing needs of the business environment. We never observed an absence of informal learning, only greater and lesser amounts of it in any given workplace. While it may or may not be supplemented by formal training, workers can and do learn much of what they need through available and individually created informal learning activities.

Formal and informal learning occur simultaneously

We observed every formal learning experience, from school to workplace training, to be "surrounded by" informal learning opportunities that occur at the same time. In a sense, these opportunities are embedded in the formal learning experience.

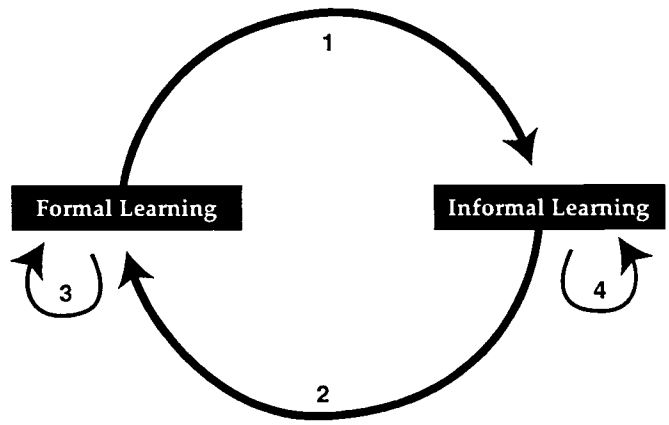
Research revealed the following informal learning opportunities embedded in formal learning:

- Understanding what information is valued by the company
- Understanding what perspective is preferred - i.e. company values
- Observing whether input/questions are desired and/or rewarded
- Observing who is included - who (what job titles) are more or less privileged/valued, considered smart, useful, etc.
- Observing how formal training is structured/how presentation may facilitate comprehension
- Observing the strengths and weakness of the classroom facilitator/how presentation style impacts others
- Sharing ideas and information with the facilitator and fellow "learners" during class - seeing the different perspectives and different knowledge bases
- Understanding company expectations for the individual
- Understanding how the individual stands - in terms of knowledge, mental capacity, etc., - in comparison to others in the organization

Formal and informal learning occur in a temporal dynamic

Workplace learning occurs through a temporal dynamic between formal and informal learning. Formal and informal learning stimulate interest in more learning that challenges, reinforces, and augments the acquired knowledge. We have already described how these learning types occur simultaneously and will now describe how we observed them to occur sequentially.

Temporal Dynamics Between Formal and Informal Learning



Learning can take any sequence through this model

Sequences:

1. **Formal to informal**
2. **Informal to formal**
3. **Formal to formal**
4. **Informal to informal**

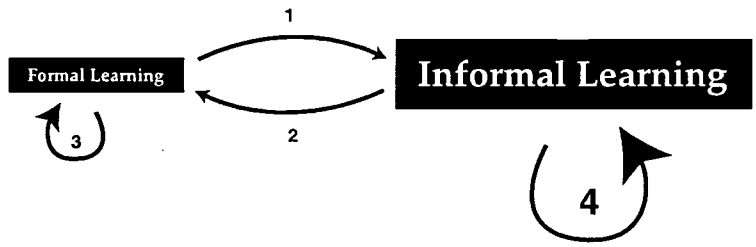
The model describes learning as a dynamic process that may occur as any sequence of formal and informal learning events. As shown, learning may begin as a formal process, such as a school lecture, and then continue as an informal process, such as working as part of a team to complete an assignment, or using the knowledge on the job (formal-to-informal, Segment 1). The classroom lecture may, instead, be followed by another lecture that builds on the first (formal-to-formal, Segment 3). Learning may start as an informal process, e.g., being shown a work process by a peer, and followed by a formal learning process, e.g., going to a training class on machine safety (informal-to-formal, Segment 2). Peer-training may also be followed by another informal process, e.g., a supervisor showing the worker how to document work (informal-to-informal, Segment 4).

Ongoing opportunities for more learning, formal or informal, increase retention of information and skills and stimulate greater interest in learning and skill enhancement.

Ongoing opportunities for more learning, formal or informal, increase retention of information and skills and stimulate greater interest in learning and skill enhancement. As described in detail in the findings section, we found that in most cases, informal learning plays a stronger role than formal learning in reinforcing knowledge gained both formally and informally. In the context of the model, Segments 1 and 4 are described by workers as being the most useful and meaningful sequences because they allow for application of the knowledge. The formal-to-formal sequence (Segment 3) is described as weakest in terms of learning, because, as one worker explained "I need to use the information, try it out, before I really understand it." This is consistent with literature in developmental psychology that shows that "spaced learning" is more effective than learning that is "clustered." This finding is useful in understanding some of the weaknesses of school-based learning, where learning traditionally follows the formal-to-formal sequence.

The quality and content of formal learning events will determine the strengths of the reinforcing links between formal and informal learning. The weaker the quality of a formal learning event, (i.e., the less applicable the content) and the longer the temporal gap to the application, the weaker the value of the links to and from formal learning (Segments 1, 2, and 3). When formal learning is weak, the opportunities for formal training to stimulate other learning is likewise limited. An organization where informal learning is the weaker learning type was not observed in the firms studied

Temporal Dynamics Where Formal Learning Plays a Small Role in Meeting Worker Needs



In many cases, the greater the teachers' and learners' experience with real-world work environments, the greater their opportunities to learn in the formal setting.

Formal and Informal learning occur in a synergistic dynamic

As described earlier, formal training is generally instructional and typically occurs outside of the physical space in which work generally occurs, as in a school classroom or seminar setting. In the classroom, learning often occurs on an abstract level, using models and symbols, so that learners can frame problems and manipulate abstractions of real situations. This exercise may help workers to see the larger picture in which their work is embedded, including steps and processes of which they have no direct experience or observation. In contrast, informal learning is more typically constructivist and occurs most commonly in the work setting where learning is directly related to work, with current technology and people.

These instructional/off-worksite and constructivist/on-worksite learning styles interact in the workplace. Individuals come to the formal learning setting with real-world experience that helps them to create necessary mental models. Teachers/facilitators use examples of current work environments to facilitate this process. In many cases, the greater the teachers' and learners' experience with real-world work environments, the greater their opportunities to learn in the formal setting. This is particularly salient for schools; when teachers and students have had work experiences relevant to the academic study, learning opportunities are richer. [See section on School-to-Career for further data.]

Likewise, informal workplace learning is facilitated when workers have had opportunities to consider their work outside of the physical work space. Our research shows that workers who have had exposure to models of their work processes have an enriched understanding of their jobs and are better prepared for solving problems on the job. For example, engineers who attended a training class that explained the work flow process that they participated in reported that they had a better idea as to how problems originated and could better resolve problems when they arose.

THE SCHOOL-TO-CAREER INITIATIVE AND INFORMAL LEARNING

EDC

OVERVIEW

An important element of the Teaching Firm Project is an investigation into the relationship between informal learning and school-to-career initiatives for students and educators. Student programs consist of course work in high schools and community colleges, coordinated with workplace experiences that stress hands-on work-based learning. Teacher/counselor programs consist of summer workplace internships in which educators are provided with hands-on opportunities to learn current business practices and workplace learning.

We interviewed educators and students engaged in school-to-career programs at a number of our host firms to gain insight into their perceptions of the value of informal workplace learning and the gaps between school-based and work-based learning.

Educators and students identified many areas where they saw critical gaps between school- and work-based learning. Interestingly, many of the perceived gaps were in areas that our workplace research showed to involve much informal learning. The gaps identified included teamwork, communication skills, professionalism, individual initiative, goal-directed learning, understanding quality, and critical thinking.

Teachers reported to be profoundly influenced by their experiences and to have gained insight into what workers need to learn effectively in the high performance environment. Most teachers used this understanding to enrich their teaching through relevant content and greater use of informal learning approaches in the classroom.

Students were also strongly affected by their experiences in the school-to-career programs. As result, they reported experiencing a greater appreciation for academic subject areas, comfort in applying hands-on and informal learning approaches to many learning challenges, and greater interest in pursuing four-year college degrees.

The success of these programs may be attributed, in part, to their creative blending of formal and informal learning approaches such that students and teachers can best utilize elements of each in a dynamic and synergistic fashion.

A critical element of a Teaching Firm is the firm's commitment to the development of both its incumbent and future work force as well as its relationship with education providers, such as the K-12 system and community and technical colleges. A Teaching Firm works closely with local schools and colleges, to share its accumulated knowledge and skills with educators at local schools and colleges, and to ensure a well-trained work force to meet its own labor needs.

Most firms in this study have some type of involvement with the public education system in their community, focusing on school improvement or work-force preparation and/or development. Our research investigated the relationship between learning that occurs through school-to-career programs and informal workplace learning.

A Teaching Firm works closely with local schools and colleges, to share its accumulated knowledge and skills with educators at local schools and colleges, and to ensure a well-trained work force to meet its own labor needs.

Background

Traditionally, school has been the prototype of formal learning, which prepares students to be good citizens. However, in recent years, many high-performance organizations have recognized that traditional school-based education does not adequately prepare students to be good workers. In a dynamic technical workplace, informal communication and collaboration is often as important as academic knowledge. To bridge this gap, many high-performance organizations have designed programs to expose students and educators to workplace learning and current industry concepts and practices through hands-on experience and course work. These programs, generally called school-to-work or school-to-career programs, involve partnerships with state and local political organizations and local high schools and community colleges.

School-to-career programs consist of various programs for students and some programs for teachers. The student programs generally consist of a two- or four-year course of study beginning in high school, leading to community or technical college, with a possible workplace internship coordinated with specific course work. The internships stress hands-on, work-based learning. For many programs, completion results in the award of an associate degree or technical certificate and/or an offer of employment or entry to further education.

Many teacher and counselor programs consist of summer internships (lasting four to six weeks) during which teachers and counselors are provided with hands-on instruction in the workplace, educated about current business practices, such as quality initiatives and high-performance operations, and allowed to observe the workplace and talk to workers, supervisors, and other employees. In general, teachers

are not instructed; rather they come to understand how workers learn in the workplace through exploration and conversation. As part of the programs, teachers develop a lesson plan that they can take into the classroom.

Objectives of the Programs

Organizations understand that to best prepare their future workforce, they need to understand the gap between what students take from school and what they need to be effective workers. Educators understand that to best prepare students for the work environment, they need to understand the demands of the workplace. Working together, organizations and educators have begun to transform the educational system to meet these needs.

Educators understand that to best prepare students for the work environment, they need to understand the demands of the workplace.

Specifically, the objectives of the school-to-career programs studied are:

- To promote and support the integration of academic and vocational education;
- To link high schools, community colleges and industry;
- To help students to be better students and lifelong learners;
- To teach students to think critically and explore solutions for themselves;
- To enhance students' ability to take responsibility for their own goals and deadlines;
- To teach students how to plan and implement goals and tasks cooperatively;
- To provide students with first-hand exposure to a real-work environment;
- To produce graduates who are capable of performing entry-level tasks in skilled occupations;
- To increase the pool of qualified workers by setting worker standards (core competencies) in manufacturing; and
- To reduce training costs for entry-level employees.

The Study's Research Objectives

The goal of the Teaching Firm research into school-to-career programs was to understand how educators and students perceive the process of informal workplace learning and how this understanding affects their teaching and learning behavior. Research was conducted with both educators and students, and is addressed separately below.

Specifically, the objectives of the research with educators was to understand:

- What teachers/counselors perceive to be the critical gaps between school- and work-based learning;
- How this perception affects teaching content and style;
- How teachers perceive student reactions to educational changes; and
- The ways in which the benefits of the school-to-career program extend beyond the classroom.

Our objectives in studying students was to understand:

- What students perceive to be the critical gaps between school- and work-based learning;
- How this perception affects their approach to learning;
- How students respond to educational changes enacted by school-to-career programs; and
- The transfer of benefits to other classes and environments.

Methodology

Research conducted at three firms in cooperation with educational partners included:

- A total of 50 in-depth interviews;
  - 15 teachers/counselors
  - 27 students
  - 5 adult apprentices
  - 3 educational administrators
- Observation of 5 classroom environments; and
- Observation of 9 students employed in the workplace

Findings: Educator Perspectives

Gaps Between School- and Work-based Learning

Workplace internships profoundly affected teachers' understanding of differences between how students and workers learn. For some teachers, observation of an industrial environment where workers learn and solve problems by hands-on methods was a first time exposure to activity-based learning. Some teachers reported their first real understanding that many individuals benefit from a hands-on learning as well as an academic approach. One high school teacher explained "Not all kids like to think and learn in the ways I've been teaching them. There's a large block of kids losing ground that are hands-on learners...the experience was a real eye-opener."

For some teachers, observation of an industrial environment where workers learn and solve problems by hands-on methods was a first time exposure to activity-based learning.

"Work needs people who can work together. Kids have to learn how to work as part of a team, not just as part of a group."

From their industrial experience, teachers identified the following areas where a significant gap exists between school-based and work-based learning. These are skills that research showed to be learned more or most effectively through informal learning practices.

- *Teamwork*

  Teamwork was seen as an essential mode of working and interacting in the industrial environment that is lacking in the school environment. As one teacher put it "Work needs people who can work together. Kids have to learn how to work as part of a team, not just as part of a group." She noted that in the workplace, people depend on and are responsible to their coworkers. Yet the individual competitiveness of the school environment, fed by the grading and class ranking system, discourages teamwork. "The class ranking system doesn't fit the workplace. It's the opposite of the way you need to think at work, where you need to win together."

  To address this discrepancy, teachers reported designing more team assignments. One teacher initiated an approach in which he had informal teams tackle problem-solving tasks out of classroom, starting with in-class teamwork that helps "set up" the out-of-class approach. To motivate students to help their classmates, he assigned project grades for the team based on the lowest score of the individuals in the team.

  Some teachers, however, found student resistance to teamwork initiatives, especially when the reward structure did not support it and when students would only be working with a given team for a short time. Yet the teachers see a movement toward student acceptance, especially as more teachers use these approaches and they

become standard school practices. One teacher challenges students to accept teamwork. For example, she intentionally paired an extroverted student with a shy student and allowed them to work through some cultural issues so that the extrovert gradually began to seek out and respect his shy partner's input. "He switched from task-orientation to process-rich learning."

- *Communication Skills*
  Teachers also saw that students need to develop their written and oral communication skills in order to be effective workers. One teacher noted that the new "horizontal" style of management demands effective peer communication and that employers are looking for this skill in new employees. He started a program in the classroom, for example, using role-playing and communication coaching on a range of subjects, including interviewing techniques. Another teacher incorporated technical workplace communication materials into her classes. Students are assigned technical articles to read and must give presentations based on their own data gathering.

"Kids are not putting out the energy that businesses need in their employees. Employers do not want workers who moan and groan."

- *Professionalism*
  Many teachers identified "professionalism," - including regular attendance, meeting deadlines, and responsibility - as a quality that students lack. Several teachers reported initiating the standards for attendance and deadlines that they saw in the workplace into their classes. As one teacher described it: "What do we need to teach? To be on time, everyday. Because in the workplace, if you have poor attendance you get fired."

  To prepare kids for when they graduate, one high school technology teacher began grading students on their professionalism, and has started a new department of "Philosophy and Policies" for standards of attendance, professionalism, and responsibility. He said he wants to prepare kids for when they leave school. "Kids are not putting out the energy that businesses need in their employees. Employers do not want workers who moan and groan."

  In one school system studied, this gap between approaches to school- and work-based learning was

recognized as a serious system-wide concern. To address the problem, administrators have made professionalism part of the system curriculum. Professional behavior now accounts for 20% of students grades for all subjects. Although it is too early to evaluate this program (it had just begun at the time of this writing), this initiative appears to be a positive step toward addressing this gap between work- and school-based approaches.

- *Individual Initiative*
  Another quality identified as not reinforced in the school environment is the ability to take initiative. Teachers recognized the need to train students to find information and to complete tasks without supervision. "Being in the workplace makes it clear to teachers what employers are looking for in their employees. It's not just technical knowledge, it's follow through and the ability to take initiative and act independently.

  One community college faculty member commented that she observed workers learning by exploration, by trying different approaches without direction or supervision. To encourage her statistics students to learn by exploration rather than by the "cookbook" style, she presented problems by setting goals and letting the students find ways to reach the solution. She explained, "This represents a leap from memorizing to critical thinking."

"Now when students ask 'Why do we need to learn this?' I know why, and can give an industry example."

Impact on Teaching

All teachers reported some change in the content of their curriculum as well as significant changes in their approach to teaching and interacting with students as a result of their experience in the workplace.

- *Enriched Content*
  One benefit universally cited by teacher-interns was the exposure to "real life" applications of academic concepts, which they took back to the classroom to give greater meaning to their lesson plans. As one teacher put it "Now when students ask 'Why do we need to learn this?' I know why, and can give an industry example." Another teacher explained to her statistics class that rounding numbers depends not on a rule, but on the application, by using examples from industry. "The students saw that when you are talking about a budget of billions of dollars, rounding to too few decimal points can mean a difference of thousands."

Almost all teachers implemented the lesson plan they created, and/or one presented by a fellow teacher-intern. Plans included a "real life" application for a programming assignment, an interactive (Hypercard) database of career and school information, and an application of Continuous Quality Improvement and team approaches to English classes, among others. Several teachers found ways to apply interdisciplinary learning approaches to their subject area.

- *Teaching Style*
  Following the internship, teachers reported an increased understanding of the value of informal learning, and integrated informal learning approaches into their teaching styles. In addition to using activities that foster informal learning (such as teaming), they began integrating constructivist approaches into their pedagogy. One teacher reported switching from lecture-style to facilitation-style classes. "Now I present material as learning-centered, not teaching-centered." Another described how she started learning *with* students, by participating in class projects, rather than only disseminating information. In this way, she modeled a constructivist approach to learning, in which she is seen as a co-creator of information, not just a source of knowledge.

  In addition, many teachers began using concepts of continuous quality improvement, such as customer focus in working with students. For some teachers, this meant reframing students as the "customer" and getting their input on decisions concerning the curriculum. In this way, they modeled some industry approaches to empowerment.

Perceived Impact on Students

Teachers reported that their students were generally receptive to their new teaching concepts and approaches. And importantly, they saw that students became better informal learners. After experience with taking initiative and collaborating with others, they were more comfortable and skilled in informal learning approaches such as constructivist and hands-on learning. Many were more comfortable with finding resources and arriving at their own solutions to problems.

Also, many students appreciated the industry examples and saw greater relevance to the subject matter they were studying. Students showed greater interest and responsibility when they learned about career opportunities. "The kids don't know what is out there, they didn't know that they could do CAD for a living. Once they understood that, they became much more interested - and better students."

Students in the school-to-career programs were also more engaged and professional following their summer work experience. "They know what is expected of them and what's not tolerated." One student was described as "having a different mentality, more sense of control, a vision of where he was going." A high school technology teacher said

that his school -to-career students like the feeling of expertise they gain when they can explain concepts to other students. "Being an expert at something improves their self-esteem and can turn a kid around, especially if they're not strong in academics."

Transfer of Benefits

The benefits of school-to-career internship programs extended beyond the classroom. Teachers found opportunities to apply the concepts and approaches they learned in industry when counseling students about academic and career opportunities. They also used these approaches with fellow teachers and administrators to design and upgrade the curriculum. Some teachers have applied "industrial-style" process standardization and inventory control in their schools. Even after the internships ended, teachers continued informal learning by networking with other teacher-interns and industry professionals. Some teachers have used these contacts to arrange guest speakers at their schools in order to expose students from other classes to industrial concepts.

Findings: Student Perspective

Gaps Between School- and Work-based Learning

Like educators, students were profoundly affected by the school-to-career programs they participated in. For most students, the industrial experience was their first exposure to the real-world work setting, other than part-time service jobs that they did not see as a step towards a career. Working and learning as a contributing member of a team with other employees who demonstrated responsibility for work was a key activity - an activity that differed significantly from experiences at school. Students gained new insight into the relevance of their technology and other program classes and saw their school-based learning as a meaningful step towards a career. [Classes taught as a component of a school-to-career program will be referred to here as program classes.]

Student behavior and attitudes were influenced by their experience in the work place as well as their experience with new curricula structured by teachers and administrators involved in school-to-career programs. Students noted that the program classes were different in style and form than courses taught in the traditional manner. Specifically, they used a more work-based approach requiring more initiative and critical thinking.

Students identified many of the same gaps between work-based and school-based learning as those observed by teachers. Yet, because many of them personally experienced shifting to a new approach to learning, they articulated the perceived gaps in a different manner. Students identified the following as areas where a significant gap exists between school- and work-based learning.

- *Goal-directed learning*
  For most students studied, the most profound difference between work- and school-based learning was that work-based learning is directed to a clear and meaningful goal. Many students did not see their school-based learning as directed toward a clear goal or even necessary for their needs in life after graduation. Thus, for these students, work-based learning was a more meaningful and engaging process than school-based learning.

  From their industrial experience, students were exposed to real career paths and gained greater appreciation for school-based learning that they saw as applicable in the real world. Students also understood the direct link between productive working and learning and financial rewards, which for many, were much more motivating than grades.

For most students studied, the most profound difference between work- and school-based learning was that work-based learning is directed to a clear and meaningful goal.

- *Understanding Quality*
  Many students perceived a gap between the quality expected in the workplace and that accepted in the traditional school classroom. Students reported learning that in the workplace nothing is finished until it meets the company's quality standards. This was quite different from their school approach to handing in assignments that met only their personal criteria and for which no objective quality standard is set. As one student explained, "A lot more is expected of you, you have to be perfect."

  In order to achieve the quality demanded in the workplace, students reported taking a greater interest in understanding the product and the consequences of compromised quality. This interest typically took the form of informal discussions with peers and supervisors

- *Critical Thinking*
  Students recognized that the workplace demands critical thinking skills that differ from those normally used in their school work. They noted that the school structure breaks up the day into small time units for different subjects and problems, while at work they spend much longer time periods reflecting on and solving a problem. A student-intern reported once spending all his breaks and lunch time trying to debug his computer program, a dedication he said he never shows to his school work. Some program

teachers instituted longer class periods to model workplace learning. A student in this course reported "it's not finished until it's finished in this class.

Students also noted that work-based learning involves hands-on learning. They can try out solutions and get immediate feedback, as opposed to waiting for an opportunity to answer in class, or for feedback from a written assignment. Students also reported that if they get the wrong answer in school, the teacher usually provides the correct solution before they have the opportunity to explore other solutions on their own.

- *Individual Initiative*
  Another key gap noted was individual initiative. Students realized that they need to take initiative in the workplace to be successful. In school they were given assignments and methods, while in the workplace they often were expected to find information they needed to get the job done. Many had little experience finding resources and attempting problems without instruction. One student explained "I realized I have to work out problems for myself and learn from my own mistakes."

- *Professionalism*
  Student interns were expected to meet the same standards of professionalism as those of incumbent workers, including attendance, meeting deadlines, and responsibility. Students reported that this was a significant shift from the way they approached school, where absences and lateness was routine and tolerated. Many school-to-career courses adopted professional standards to model the demands of the workplace. Students who are late or miss classes are expected to learn material on their own time. "If I miss a class or get behind, I have to work that much harder," explained one student-intern.

- *Teamwork and Communication*
  Teamwork is an approach to working and learning that students rarely experienced in school, but an essential way of interacting in the workplace. Students experienced initial difficulty in understanding the importance of their contribution to a team effort, but ultimately showed appreciation for the team approach. This contrasted to the individual approach to learning that schools reinforce through individual grading systems.

Impact on Learning

Students in the school-to-career programs studied reported gaining insight into the value of the subject matter they learn, as well as their approach to learning.

Appreciation of Subject Matter

Students who worked in the industrial environment reported greater appreciation for the material they learned both in the workplace and in school. Significantly, the experience showed them the real-world value of learning technology and problem-solving skills. Many never understood that skills like computer-aided design and mathematics could be used in a meaningful manner and lead to lucrative careers. As a result of this insight, students reported taking a much greater interest in academic topics, especially those they planned to apply in the workplace during internships and in careers after graduation.

Approach to Learning

Following their industrial experience, students reported a greater understanding of the active, hands-on approach to learning. Importantly, many expressed that they really enjoyed the hands-on problem solving approach and sought ways to use this learning approach.

Many students reported feeling a greater sense of self-esteem as a result of their participation.

Response to Educational Changes

The curriculum designed by teachers participating in the school-to-career program was very well received by students. Students reported enjoying the challenge of the critical thinking approach and the pride in behaving in a professional manner. Program classes are typically smaller than average and students receive more attention than in other classes. Also, students noted a difference in attitude and approach in the technology teachers, who showed genuine interest in their learning accomplishments and their career paths. This attitude was also reported by students in their first year of the program who had not yet done a workplace internship.

One interesting finding is that many of the students participating in school-to-career programs reported an increased interest in pursuing a four-year college degree. Many of the students did not plan on college before enrolling in the program, but became more interested in learning and education as a result of the experience. This reinforces the value of engaging students in the learning process.

Transfer of Benefits

Industry experience was beneficial to students in ways not directly related to their technology courses and work. Many students reported feeling a greater sense of self-esteem as a result of their participation. They gained a sense of control over their lives and a feeling of success and mastery that they had not experienced before. This was especially true for students who had not been academically successful.

Many students reported applying new learning approaches to other academic courses. For example, one student reported initiating a group approach to his creative writing class. Instead of writing a poem alone at home, he called several friends from class and organized a poetry workshop. "I learned that I work better when I can get feedback from others and try to integrate it into my work," he explained.

Relationship Between School-To-Career Learning And Informal Learning

Blending of formal and informal learning

In many ways, the school-to-career curriculum represents a synthesis of many of the strengths of both formal and informal learning In particular, the curriculum includes learning that is relevant, easily attainable, and constructivist. And most importantly, in this curriculum, formally learned information could be applied soon after learning. This distinguishes it from most other school-based learning for many student participants.

Informal learning simultaneous to formal learning

Formal school-based learning in this curriculum is rich in concurrent informal learning. Program classes are structured such that learners can share information and learn from their teacher and fellow students. Also, teachers in the program model a presentation of information that facilitates knowledge creation.

Temporal dynamics between formal and informal learning

One of the greatest strengths of the school-to-career programs studied is the harnessing of the power of positive dynamics between the formal and informal learning. Formal classroom learning was followed by application of the learning and on-the-job training. The workplace learning was again followed by further formal learning that augmented it, etc. In this way, knowledge was reinforced and strengthened. Summer internships kept knowledge and skills fresh.

Synergistic Dynamics

Students reported benefiting from an understanding at both an abstract level and a direct hands-on level. They reported being able to use their work-based knowledge to enrich their school-based learning. Likewise, they enjoyed using abstract concepts in the laboratory as well as in the workplace.

Conclusion

The school-to-career programs that we studied are very successful in helping educators understand critical gaps between school- and work-based learning, and have motivated teachers to make substantial changes to their teaching content and approach. Because teachers have been allowed to explore the work environment, the internships themselves model the effectiveness of informal, self-directed learning and demonstrate the ways in which they challenge and inform formal learning.

Of particular interest to the Teaching Firm research is the finding that teachers identified readiness for informal learning activities such as teamwork, communication and exploration, as critical student needs. The fact that teachers perceived that students in the school-to-career programs improved in these areas suggests that the hands-on learning experience improves their readiness for informal workplace learning.

Teachers identified readiness for informal learning activities such as teamwork, communication and exploration, as critical student needs.

The results of the research with students supports these findings. Students identified many of the same gaps in their workforce preparedness identified by their teachers. And importantly, students embraced the approaches they learned through hands-on workplace experience and gained a sense of mastery and direction in their lives.

Students embraced the approaches they learned through hands-on workplace experience and gained a sense of mastery and direction in their lives.

Also interesting to note is that research finding also suggest that the goals of informal learning in the workplace is different from learning in school. Individuals in the workplace learn for the organization's and the individual's benefit. Whereas individual's in school learn for just for the individual.

In summary, this research suggests that exposure and experience with informal learning prior to employment may serve as critical preparation for informal workplace learning activity.

SUMMARY OF RESEARCH

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Our research report presents a large-scale empirical investigation into the nature of informal workplace learning. We analyzed an enormous amount of data regarding what informal learning is (presenting a functional definition and description of the types of informal workplace learning), why it occurs, how it occurs, and the various factors that facilitate and inhibit informal workplace learning.

Research findings

Our research revealed the following findings:

- *Why informal learning occurs*
  Our research revealed that informal learning generally occurs in relation to the achievement of larger organization and individual goals. Also, our research describes how concordances of individual and organizational goals impact informal workplace learning.

- *How informal learning occurs*
  The majority of informal workplace learning occurs in the course of the everyday work activities through which employees interact, share ideas and resources, and perform their jobs. These activities may be individually or socially organized; formal or informal in structure; and/or goal-directed or non-goal-directed — depending on the needs they address and circumstances out of which they arise.

  Significantly, research for the current study revealed that informal learning occurs frequently through individually organized workplace activities. Unlike previous research, which states that learning is fundamentally social and most effective when it is integrated in a form of social participation (Communities of Practice article, 1990), research for the current study indicated that — in addition to socially organized work activities — individual activities are also a rich occasion for informal workplace learning.

  Also, our research contradicted previous research findings that a significant amount of workplace learning occurs during breakdowns or "under conditions of surprise" (Argyris and Schon, 1974). In contrast to these findings, our research indicated that for most employees, opportunities for learning were generally inhibited or completely precluded during major breakdowns, production-line terminations and production-flow errors.

- *Contextual factors greatly affect informal learning*
  The culture of a business is crucial to informal workplace learning. The beliefs, values and practices which pervade an organization determine the extent and variety of learning present. Research revealed that it is crucial for management seeking to increase informal learning, to understand the critical role played by culture (particularly the integration of formal management statements and policies, and informal social norms) in creating

an environment for informal learning. An activity may provide a very different informal learning experience in one organization relative to another with different integrated cultural variables.

The degree of informal learning at a firm is determined by the convergence of several key contextual factors in the workplace, including external industry/economic factors (such as level of competition, market fluctuations, etc.); formal company policies and practices; social and environmental factors (such as physical work conditions, social norms, work habits, etc.); and the personal characteristics and developmental needs of individual employees within the organization.

- *What is learned informally*
  The content of informal learning encompasses information that is not strictly job specific. In addition to job specific (pragmatic) knowledge and skills, research for the study revealed that individuals in the workplace also develop knowledge and skills in relation to other dimensions of the workplace experience: intrapersonal (e.g., problem-solving, coping with stress, dealing with novel situations); interpersonal (e.g., interacting, cooperating and sharing skills/information with other employees); and cultural (e.g. what behavior is acceptable, what actions are culturally rewarded and lead to career advancement, how mistakes are treated, etc.). The developmental context for informal workplace learning is the progression of employees and groups of employees from inexperience to maturity, competence and expertise, in these four dimensions of learning.

  Each of these dimensions of learning is characterized by a unique set of goals and objectives, individual and group dynamics, and appropriate criteria for assessment and assistance. The development of expertise or maturity in relation to one dimension of learning may or may not result in the development of a comparable level of expertise or maturity in relation to other types of learning.

  In order to encourage and facilitate the development of workers in relation to each of these dimensions of learning in the workplace, it is necessary to understand and address the unique features of each type of learning, as well as the dynamic interconnections among them.

- *Relationship between informal and formal learning in the workplace*
  Formal and informal learning differ in a number of significant ways. Interestingly, formal and informal learning styles are approaching one another with formal learning incorporating informal learning elements. Also, we noted that workplace learning occurs through a dynamic interaction between formal and informal learning. Formal learning stimulates informal learning activities that augment and reframe it.

- *Implications for student and employee development*
  Through the formal-informal learning dynamics of school-to-career programs, students learn how to apply academic knowledge to workplace settings and gain greater respect for and facility in the types of learning required by the workplace.

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THE IMPACT OF INFORMAL LEARNING ON ECONOMIC PERFORMANCE IN SELECTED U.S. MANUFACTURING FACILITIES

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EXECUTIVE SUMMARY

At the outset of this study, the economic analysis team of the Teaching Firm Project faced four formidable challenges:

(1) Informal learning was neither well understood nor defined as a quantifiable variable at the beginning of the Teaching Firm field research.

(2) No reliable cost data were available for the firm's investment in informal learning.

(3) It was not clear that a measure of informal learning could be applied to workplaces retrospectively; yet any longitudinal data gathered by the project during its brief period of field research was certain to be retrospective.

(4) Conducting analysis on economic and financial performance of the firm or any its business units required access to information that several firms considered proprietary.

Despite these obstacles, the study made progress in analyzing the benefits of informal learning. Our findings revealed a range of positive impacts associated with informal learning in metrics of production performance that were valued by the firms studied. Field work was conducted in selected production facilities of seven firms widely regarded as high performance work places: Boeing, Data Instruments, Ford, Siemens, Merry Mechanization, Motorola, and Reflexite.

Identifying an Adequate Definition of Informal Learning

Existing studies in the economics literature have focused on the returns to the individual and society of *formal training and education.* The returns on investment in formal training to firms recently has drawn increasing attention from economists and human resource practitioners. But even where formal training is carefully designed and targeted at narrow objectives, results are questioned in part due to the problems of isolating the effects of training from other variables, such as changing market conditions, technological changes or other influences. Isolating the effects of the training has often necessarily relied on the subjective judgment of interested parties, whose estimates are commonly viewed with skepticism.

Returns to *informal training* were first studied by Jacob Mincer who used the number of years of work experience as a proxy measure of the extent of informal training. Surveys of workers in the 1990s made by the U.S. Bureau of Labor Statistics and others have begun to probe the extent of informal training more directly, as reported in the answers to various questions and through logs of training activities made by workers on the job. However, to date no consensus has emerged on a specific methodology or even on appropriate wording to define and elicit the extent of *informal training.*

The term *informal learning* introduces larger challenges beyond *informal training*. Informal learning is a broader term than informal training, commonly covering a wider field of content than informal training. Informal training most commonly deals with learning the pragmatic skills associated with job tasks, whereas the Teaching Firm Project has revealed informal learning covers not only the pragmatics job skills, but also intrapersonal and interpersonal skills, and negotiating the culture of the workplace (Education Development Center, Inc., 1997, p. 126). Based on their field research in the seven study firms, Teaching Firm field researchers have defined the term:

> *Informal workplace learning is any workplace learning in which the process through which workers learn is neither determined nor designed by the organization, regardless of the goals toward which the learning is directed, or the settings or activities in which learning occurs.*

It should be emphasized that this definition allows for organizations to have explicit goals for informal learning and to create the environment which will facilitate it.

In the absence of agreement on a specific definition for informal learning during the course of the study, the economic analysis team used two approaches in researching the seven firms selected for the Teaching Firm field work.

First, at Motorola, we studied the impact of informal learning on production performance measures, using a carefully selected proxy variable for informal learning — rates of participation on voluntary short-term teams aimed at improvements in production goals specified by the firm. Motorola called these teams "Total Customer Satisfaction" teams; these were cross-functional teams composed mostly of direct line workers who met for about an hour a week over a nine-month period. Although the goals of the teams were set by management, the specific objectives, processes, methods, team membership, and leadership were left to the discretion of team members. In effect, these teams became crucibles for informal learning. Our analysis revealed very strong relationships between participation rates on teams and the unit's performance in reducing production costs and cycle time. No statistically significant relationships were found in quality improvements, but such improvements could have been more greatly influenced by engineering process characterization teams, a form of teaming not included in the data base available to us. Although full data on costs of this teaming effort were not available, estimates of production cost reductions experienced in just one of the dozen cases analyzed indicated that the savings more than offset the expense of the entire teaming effort.

In a second approach at the remaining six firms, we used responses from two questions on a written survey administered to workers characterizing the extent of informal learning in their jobs. At two study sites — Siemens in Wendell, North Carolina and Reflexite in New Britain, Connecticut — we found all the data and conditions needed to conduct such an analysis. These included an adequate response rate to the worker

survey and comparable performance data available on at least four separate production units. We modeled the relationship between the extent of informal learning reported by the workers and the performance of their production units. Our analysis revealed relatively small but statistically significant positive relationships between the extent of informal learning reported by workers and production performance, as measured and valued by the firm. Detailed tables regarding the quantitative results of the modeling analysis at Motorola, Siemens and Reflexite can be found in the appendices.

The report concludes with a discussion of lessons from the field research and suggests directions in future research, including implementing a series of quasi-experiments with collaborating firms to measure the costs and benefits of promoting informal learning.

INTRODUCTION AND BACKGROUND

For more than three decades, calculating the returns to investments in education and training has been a popular topic in labor economics. Most of this literature has been devoted to replicating, extending or refining the pioneering work on human capital theory conducted by Gary Becker (1964), Jacob Mincer (1974), and Theodore Schultz (1961, 1963, 1971, 1981 and 1983). A chief focus has been the returns of formal education and training to individuals by calculating the present values of enhanced future income streams.

A second theme of the economics literature has focused on the effectiveness and efficiency of government-funded or subsidized training programs and interventions in the labor market. These evaluations examine the benefits and costs of public initiatives from the perspective of the government, the general public, or taxpayers.

During the 1990s, economists have increased their focus on examining the benefits of formal training to firms. Notable in this regard are studies by Ann Bartel (1994) and Lisa Lynch (1992 and 1994) and the work regarding the effects of human resources variables on firm performance in various industry studies sponsored by the Sloan Foundation. The Sloan researchers participated in a network organized by Tom Kochan of the Massachusetts Institute of Technology (See the Symposium "What Works at Work?" published in the April 1996 issue of *Industrial Relations*).

The practitioner literature regarding the evaluation of training likewise has evolved significantly, largely promoted through the American Society for Training and Development (ASTD). As one might anticipate, most of this literature is focused on the firm's perspective . Donald Kirkpatrick (1994) conceptualized a four-level approach to evaluating formal training that has received wide recognition and praise among practitioners. Kirkpatrick's four levels are **(1) reaction**–of the participants to the training usually measured in surveys distributed at the end of the training session; **(2) learning**–gains in skills and knowledge achieved by the participants usually measured by pre and post tests; **(3) behavior**–focused on whether the skills and knowledge gained in training are applied and practiced. This is usually measured on the job three months or more after training; and **(4) results**–or ultimate outcomes of the training in terms of company goals. Ideally, according to Kirkpatrick, evaluation should be conducted at all four levels because the agreement or coherence in the findings across the levels strengthens the conclusions significantly. However, largely due to the high cost of such evaluations, this is rarely done by firms in practice.

As an integral part of its research, the Teaching Firm project sought to ascertain the economic impact of informal learning on the performance of selected U.S. manufacturing companies and facilities. Specifically, the economic analysis team aimed to compile evidence to determine the value of informal learning to production units in metrics valued by their managers. If the importance and value of informal learning could be confirmed, it would hold important implications for manufacturing companies

in the U.S. to create and encourage an environment that emphasizes and nurtures informal learning.

Existing Empirical Studies of Informal Training

While no existing empirical studies of informal *learning* are currently available, there is an emerging literature on the subject of informal *training*. However, informal training is variously defined in this literature.

Jacob Mincer was the first labor economist to attempt to quantify informal training as an economic variable and to measure its impacts on individual wages and productivity. While a breakthrough in the further articulation and extension of human capital theory, Mincer's work relied on labor market experience and tenure as proxies for informal learning (Mincer 1962). It was not until more direct measures of informal training were sought, starting in the 1970s, that labor economists began to encounter the formidable definitional and measurement difficulties in the empirical study of informal training. Reflecting on the enormity of these difficulties, Charles Brown wrote in 1989:

> *Informal training is produced jointly with the primary output of the worker, and is therefore more elusive. Workers learn from watching other workers, may share easier ways to do the work either while working or during breaks, and are indirectly instructed whenever a supervisor constructively criticizes their work. Knowing whether informal training is happening in any given week is difficult to determine; one hopes that for most workers it never ends (Investing in People 1989).*

Compounding the problem, the data sets that researchers have used to analyze informal training have focused mainly on the incidence and determinants of formal training. Furthermore, analyses of the returns to this type of training have been confined to the effects on individual wages and productivity rather than on firm performance. Informal training, let alone informal learning, has begun to receive serious treatment in empirical studies only recently.

The first surveys which attempted to include more direct measures of informal training emerged in the late 1970s and 1980s. These were the Panel Study of Income Dynamics (PSID 1976); the Employment Opportunity Pilot Project (EOPP 1982); the Current Population Survey Supplement (CPSS 1983); and the 1986 follow-up of the National Longitudinal Survey of the High School Class of 72 (NLSHS72-86). These surveys are remarkable for their lack of rigor in defining and measuring informal training. The EOPP measured learning on the job by asking employers a series of questions regarding the training provided to the most recent worker hired during the first three months of employment. The choices for types of training included formal training, informal training by managers, informal training by co-workers, and informal training by watching others. The employer was also asked the question, "How many weeks does it take a new employee to become fully trained and qualified if he or she has no experience in this job, but has had the necessary school-provided training?" Although they leave

informal training to be defined by individual respondents, these efforts were directed at ascertaining a more precise measure of informal learning than Mincer's use of years of labor market experience and tenure as proxies.

In 1976, the PSID, the earliest of these data sets, asked workers of varying tenure a similar question to that put to employees by the EOPP. They were asked about the number of hours a new employee during the first three months spends "away from normal work activities filling out forms and being told about the company history, benefits, and rules" and "in training activities in which he or she is watching other people do the job rather than doing it himself." Also, workers were asked, how many hours "management and supervisors spent away from other activities giving informal individualized training or extra supervision?" and "coworkers who are not supervisors spent away from their normal work giving informal individualized training or extra supervision?" (Loewenstein 94, p. 5). It failed to collect data on the intensity of training beyond the number of hours spent on it.

The 1983 CPSS asked workers about the receipt of formal and informal training on their current job. The questions were, "Since you obtained your present job did you take any training to improve your skills? Did you take the training in a) school, b) a formal company training program, c) informal on-the-job, and d) other?"

In summary, these early data sets have several flaws. They generally equate informal training with on-the-job training (OJT) and fail to distinguish between structured OJT which later researchers and most training practitioners define as formal training and unstructured OJT which is considered informal training. Some studies have left it to the respondents themselves to define informal training, seriously undermining the validity and usefulness of the results. In other cases, informal training is defined by providing a few examples such as being "assigned to work with someone for instruction or guidance" (NLSHSC72-86).

Many studies on employer-provided training conducted in the early 1990s aimed to build upon Mincer's work and were based on these early data sets (e.g., Altonji and Spletzer 1991; Lynch 1992; Lillard and Tan 1992; and Barron, Berger, and Black 1994). These studies made significant advances in the development of the theoretical underpinnings and methodological tools for studying employer-provided training as an economic variable. They indicated that training and learning outside of formal training has a significant positive effect on wages and productivity. However, the lack of rigor in the early data sets must be taken into account in assessing the value of these studies. They did not establish a solid empirical foundation. The failure in these early data sets to precisely define and sort out the differences between formal and informal training not only diminishes the robustness of results in regard to informal training but also those of formal training since these two types of training are likely to be interdependent.

Both the growing interest in training as a strategic competitive advantage in the global economy and the deepening recognition by training researchers and practitioners of the need to more carefully describe and analyze the full panoply of training and learning at the workplace was reflected in a significant advance in the empirical study of informal training in the early 1990s. A wave of new data sets explored more direct measures of informal training than the preceding wave. In 1992, the University of Kentucky conducted a survey of employers for the Small Business Administration (SBA) which was explicitly designed to improve upon the 1982 EOPP. Among the refinements made by this survey was to ask respondents to indicate the number of weeks and average hours per week spent in training, offering a way to measure the intensity of training. In another study conducted by the University of Kentucky for the W.E. Upjohn Institute, researchers surveyed both employers and workers to analyze the variation in their responses in regard to the receipt of training (Barron 1997).

The National Longitudinal Survey of Youth (NLSY), a data set of individuals aged 14 to 22 in 1979 who have been interviewed annually since 1979 (starting in 1994 individuals were interviewed every other year), included questions about informal training for the first time in 1993. NLSY has collected information on formal training since its inception (See Lynch 1992 for analysis of the 1979-1983 surveys, and Loewenstein and Spletzer 1993b and Veum 1993, 1994 for analysis of the 1988-1991 surveys). This survey attempted to distinguish three types of training: formal, informal and learning-by-doing. It measures learning-by-doing as distinct from informal training by asking those employees who indicated they could not perform adequately 100 percent of their duties at the start of their jobs: "How long did it take before you were fully comfortable doing this kind of work on your own?

The 1993 BLS Survey of Employer-Provided Training (SEPT 93) was designed to collect information on the existence of various types of formal training that were provided or financed by private nonagricultural establishments during 1993. Although largely limited to formal training, which the BLS defines as "training that has a structured format and a defined curriculum," the survey also gathered information on informal training, though equating it with on-the-job training (OJT).

In 1994, the National Center on the Educational Quality of the Workforce conducted a survey of employer-provided training under the direction of the Census Bureau which also collected information on informal training. It asked four questions regarding informal training:

1. "Unstructured or informal training includes situations in which employees learn by observing others doing a job or are shown how to do a job in an informal one-on-one situation. Does your establishment provide informal (in-plant) instruction by supervisors or coworkers?"

2. "Which of the following employees provide informal instruction and training at your establishment?" (Supervisors, co-workers, others)

3. "For a newly hired non-managerial worker most directly involved in your establishment's primary product, how many hours of informal training on average would the newly hired worker receive by each of these individuals (supervisor, co-worker, other) before becoming fully proficient in a job?"

4. "On average, what percentage of a supervisor's time is spent providing informal training?"

In the most useful and empirical study to date, a second BLS survey on employer-provided training conducted in 1995 (SEPT95) followed up on the first survey with a greater focus on informal training. Similar to the 1993 NLSY, the 1995 BLS survey looked at both formal and informal training, as well as a third type of learning called "self-learning." The study collected information from both employers and their employees to estimate the amount and proportion of time spent in formal and informal training activities. The survey also constructed estimates of the wage and salary costs of time spent in training for both formal and informal training. Costs were reported by broad occupation groupings.

The 1995 BLS survey was designed as a personal visit survey. Based on field research, the Bureau believes that a personal visit is necessary to collect accurate and complete information on intensity measures of training, both formal and informal. It also used employee logs in which respondents daily recorded their different training experiences. BLS field economists provided survey respondents, two randomly-selected employees from each firm in the sample, with the materials needed to keep track of training activities over a two-week period. While this methodology was well designed to capture a richer, more immediate collection of training data, it limits the scope of training activities to those that workers consciously recognize as training activities.

As in the earlier survey, the BLS SEPT95 defined formal training as "training that is planned in advance and has a structured format and a defined curriculum." It defined informal training as "unstructured, unplanned, and easily adapted to situations or individuals." It included On-the-Job Training (OJT) as informal training. Other examples of informal training included having a co-worker show you how to use a piece of equipment, or having a supervisor teach you a skill related to your job. Employee respondents were asked *not* to report these activities: (1) casually exchanging information that is a routine part of your job; and (2) learning something that is not related to your job.

The daily log determines the type of training activities by asking two questions:

1. Who or what helped you learn the skill or information (learned today)?; and
2. How did you learn the skill or information?

Table 1
U.S. Bureau of Labor Statistics (BLS) Training Algorithm
Used in 1995-96 Survey of Formal and Informal Training

Question 1	Question 2	Type of Training
trainer, instructor, or lecturer	classroom activity or group discussion/ meeting or hands-on demonstration	Formal
clients, suppliers, manufacturers	classroom activity or group discussion/ meeting or hands-on demonstration	Formal
manager, supervisor, or co-worker	classroom activity	Formal
computer tutorial or workbook	classroom activity or group discussion/ meeting	Formal
video	classroom activity or group discussion/ meeting	Formal
figured it out myself	classroom activity	Formal
trainer, instructor, or lecturer	one-on-one discussion or watched someone do their job	OJT
clients, suppliers, manufacturers	one-on-one discussion	OJT
manager, supervisor or co-worker	group discussion/meeting or one-on-one discussion or hands-on demonstration or watched someone do their job	OJT
computer tutorial or workbook	one-on-one discussion or hands-on demonstration	OJT
video	one-on-one discussion or hands-on demonstration	OJT
computer tutorial or workbook	On my own	Self Paced
video	On my own	Self Paced
figured it out myself	On my own	Self Learning

SOURCE: *Daily Labor Report*, May 30, 1995, (accessed through Lexis); Don Long interview with Michael Horrigan, U.S. Bureau of Labor Statistics, September 10, 1995, Washington D.C.

Available responses listed to question (1) are a trainer, instructor, or lecturer; clients, suppliers, manufacturers; manager, supervisor or co-worker; computer tutorial or workbook; video; figured it out myself; and other. The responses under (2) are classroom activity; group discussion or meeting; one-on-one discussion; hands-on demonstration; watched someone do their job; on my own; and other. Table 1 shows the algorithm used by BLS to determine the type of training described in the employee log. The extent of informal training depends on the degree to which it encompasses OJT.

The answers to the two questions determined whether the training was labeled as "formal," "OJT," "self-paced," or "self-learning" as indicated below. On-the-job training (OJT), self-paced, and self-learning were classified as informal types of training.

In summary, only recently has attention focused on informal training. This new focus stems, in part, from the growing recognition that informal training is more prevalent in the United States than is formal training of workers. Indeed, one study estimated that while American employers spent $30 billion for formal training, they spent anywhere from $90 billion to $180 billion for informal training (Carnevale and Gainer, 1989, p. 15). Moreover, the authors concluded that "informal training is the principal means by which technical, economic, strategic and regulatory changes are gradually integrated into the workplace, especially among the nation's small employers" (p. 15).

In the wake of growing interest in informal training, in 1993, the BLS and other government surveys, such as the Employment Opportunity Pilot Project (EOPP), began collecting data on informal training and existing surveys were re-analyzed to yield information on informal learning (Loewenstein and Speltzer 1994). However, as Loewenstein and Speltzer concluded: "*Comparisons across surveys are hampered by differences in the wording of training questions, different sample compositions, and censoring problems*" (p. 7). The absence of consensus on a conventional taxonomy for informal learning has significantly hampered research in this arena to date.

Beyond Informal Training: Informal Learning

As previously indicated, nearly all of the economic research work to date has been devoted to formal education and training processes. Only recently has attention expanded to include informal training. Informal *learning* moves the analysis significantly beyond informal *training*. The description and conceptualization of informal learning is only now emerging. Whereas formal training is generally structured, scheduled, and systematically designed to achieve explicit performance goals (Rothwell and Kazanas, 1992), informal learning can be unstructured, unscheduled and unplanned. Improving our understanding of informal learning processes and its benefits is in large part what the Teaching Firm project is about. As a result of the field work, Teaching Firm researchers have developed the following definition of informal learning:

Any workplace learning in which the **process** through which workers learn is neither determined nor designed by the organization, regardless of the goals toward which the learning is directed, or the settings or activities in which learning occurs. (Education Development Center, 1997, p. 5).

Three Options for Measuring the Benefits of Informal Learning

To date, three approaches offer potential as feasible approaches to measure the benefits of informal learning on company performance objectives, such as reducing production costs and cycle time or improving process or product quality.

Approach #1: Use carefully selected proxy variables as measure of informal learning.

Approach #2: Use worker perceptions or opinions about the extent of informal learning as the informal learning variable.

Approach #3: Construct quasi-experimental designs for prospective research projects based on the inhibitors and facilitators identified by ethnographic research field staff to be implemented by production unit(s) in a cooperating firm (or firms) over a period of time and carefully track the costs (i.e., investments) and results.

The Firms Studied

Firms and manufacturing facilities to serve as study sites were chosen for inclusion as part of the Teaching Firm project in collaboration with state partners. All of the firms and facilities selected were widely regarded as high performance work organizations that encouraged learning of all types. Companies selected for study in the Teaching Firm project included Boeing, Data Instruments, Ford, Siemens, Merry Mechanization, Motorola, and Reflexite. All except one were manufacturing entities: Merry Mechanization, the exception, produced software for customers in manufacturing. The companies differ significantly in terms of the characteristics of the products they produce (e.g., in terms of the nature, the size and the level of complexity of the products, expense, cycle time) as well as the competitiveness of the markets in which they exist. The size of the companies, in terms of sales and employment, also varied considerably. In the case of the smaller companies Data Instruments and Merry Mechanization, the Teaching Firm field work encompassed a study of the entire company. Among the others (Boeing, Ford, Motorola, and Reflexite, and Siemens), it was necessary to focus on individual manufacturing facilities as study sites.

Challenges to Determining the Economic Impact of Informal Learning

The economic analysis team of the Teaching Firm project faced several formidable challenges, including the following:

(1) Informal learning was neither well understood nor defined as a quantifiable variable at the beginning of the Teaching Firm field research.

(2) It was not clear that a measure of informal learning could be applied to workplaces retrospectively; yet any longitudinal data gathered by the project during its brief period of field research was certain to be retrospective.

(3) No reliable cost data were available for the firm's investment in informal learning.
(4) Conducting analysis on economic and financial performance of the firm or any its business units required access to information that several firms considered proprietary.

Given these challenges, we took a modest approach to the pilot study at Motorola. Our primary aims were to check the feasibility of various study designs and to explore the causal linkages between informal learning and changes in a variety of performance indicators valued by the firm, including improvements in production costs and productivity, product and process quality, and flexibility and adaptability.

We began the field work at Motorola with a plan to identify three or more comparable production units in which the field team could conduct intensive work. In this way, the various components of the field team would be working with a consistent unit of analysis. Our hope and expectation was that through field work, Teaching Firm researchers could develop a practical gauge of informal learning in these three units and that Motorola maintained performance data on these same production units. We could then investigate the relationship between that measure of informal learning and available indicators of performance in the three arenas we hypothesized would be important: (1) productivity and costs, (2) product and process quality, (3) flexibility and adaptability. We also sought the availability of information to control for other sources of human capital, including data on educational background and job tenure.

We anticipated that data on the cost of informal learning would not be available. But we advised the field researchers to be alert to the various costs of informal learning so that we at least might better understand the categories of such costs in studying other firms.

APPROACH 1: USING CAREFULLY SELECTED VARIABLES AS PROXIES FOR INFORMAL LEARNING

In our field research at Motorola, we were presented with an attractive offer that provided us access to data we needed to conduct an economic analysis and resolved the problem of lacking a good measure of informal learning. A manager at the first manufacturing site studied by the field researchers suggested that participation on

teams was a good indicator for informal learning in his division. After investigating further and conferring with the field team, we agreed that the short-term project teams in this Division were indeed crucibles of informal learning, especially for direct line workers. Thus, we followed up on this manager's invitation to research the relationship between the rate of participation on short-term project teams and various indicators of economic performance of interest to the Motorola Corporation.

The four largest departments in the Division were selected for this exploratory study. They encompassed work cells across all shifts. Although the products and technologies differed somewhat, all products were in a mature stage of development.

Several kinds of teams staffed by direct line workers had been fostered by the Division's management. Most were Total Customer Satisfaction (TCS) teams, voluntary, short-term project-focused teams which were part of a corporate initiative begun in 1989. But other types of teams were also registered, including cross functional teams and prime teams. The later were initiated by Division management specifically to address strategic problems identified annually by a senior work group at the Division level.

The administrative data collected by the division over the past three years offered rich potential for making direct connections between the accomplishments of teams and improvements in performance on indicators of direct interest to the corporation. With this information, we might even be able to go beyond correlation to be able to demonstrate causal linkages. Teams registered their name, membership, their chosen problem, and their goal with the Training Department. Managers reported that many teams achieved measurable results quickly during their average nine-month life span. In addition, examining the savings claims made by TCS teams in competitions/showcases offered promise of a beginning approach to constructing a model for calculating return on investment (ROI). The team participation record for every worker in each department had been recorded quarterly since the end of 1992. In addition, performance indicators related to areas of Motorola's corporate concerns (e.g., quality, cost, cycle time, and customer satisfaction, and employee empowerment) had been compiled on a monthly basis since early 1993 under a "Pay for Performance" program for each department. These data were used to determine group performance factor in determining the annual merit raises of employees.

The analysis was inviting for several reasons. It gave us a reasonable interim measure of informal learning. We could use participation rates on voluntary teams as a proxy variable for informal learning and consider its relationship to performance indicators. It offered a practical means of making use of an apparently rich collection of retrospective data on teaming and performance compiled over almost a three-year period. The proposed study addressed issues of interest to Motorola managers which gave them incentive to share proprietary data with us. Available data on team participation, performance indicators for the work cells, certain demographic characteristics (used for control variables), and earnings and advancement patterns for individuals in the

selected departments were provided to us. Another advantage of undertaking this pilot study was that it would give us experience in the challenges of working with real data.

Example: Participation on Voluntary Project-Specific Teams as a Proxy Variable for Informal Learning

The way teams are used at this manufacturing site fosters informal learning. The teams are voluntary, temporary and directed to solve specific problems or projects directly related to corporate strategic objectives. The teams generally met weekly for an hour over a period of nine months, on average. Some team members carry out assignments between meetings.

The Division's managers promoted teams as a part of a conscious strategy to foster employee development. As The Teaching Firm project field team discovered, these teams are crucibles for stimulating informal learning. Teaching Firm researchers observed considerable informal learning associated with the teams at this manufacturing site, compiling several examples of how informal learning occurs in teams, and collecting testimony from individual workers about the effects of teams on their own learning and work performance. Moreover, as one Motorola manager pointed out, "the real work of TCS teams offer a better applied learning environment than *any* classroom simulation."

The teams are supported through formal courses, including a special course on team-building, courses on statistical process control (SPC) and the use of analysis techniques, and other courses on quality. Further, the TCS process and contest scoring criteria offer guidance and help assure that teams direct their efforts toward achieving corporate objectives. Teams are urged to select a project related to a current key corporate initiative, to identify their customer requirements, set aggressive goals, benchmark best practices and use analysis techniques, explore alternative solutions, plan implementation carefully, verify improvements and results, and institutionalize improvements on a permanent basis, sharing solutions with other Motorola groups.

Teams are left to their own initiative to work out solutions to the problems they identify. Each team has an engineer or supervisor who serves as an advisor. However, the team leader is generally from the direct labor staff. Teams can choose to work on any aspect of a subject related to a corporate objective (e.g. in 1995, these objectives included improving quality, cycle time, profit, participative management, and product, manufacturing, and environmental leadership). The specific problem to be addressed and solutions are left to the discretion of the team. Keen emphasis is placed on developing direct line workers as team leaders.

The promotion of project-focused teams is only one of several strategies used by this manufacturing site to promote learning and teaching among direct line workers. The use of self-directed teams in production work cells is also encouraged. Since worker empowerment became a company wide objective at Motorola, the empowerment status

of work cell teams at this manufacturing site is measured on a regular basis and improvements are promoted. Also, beginning in 1990, Motorola corporate policy required every employee to receive at least five days of formal training each year. A key objective behind this policy was to expand access to training by direct line workers. Considerable efforts have been made in recent years to raise the basic skills of production employees. The company has tested the basic skills of all incumbent employees on the Motorola's Basic Aptitude Test Battery (BATB) and offered free tutoring on work time to help employees to pass this test. In the latest initiative in this campaign, certain work cells in the production of new products were being limited only to workers who had passed the BATB test. Initiatives were underway to promote cross training for other jobs, especially within one's work cell. There are also efforts to increase suggestions made by employees. Likewise, Motorola is known for several workplace practices often identified as high performance. For example, it has a profit-sharing plan and an extensive array of benefits as well as a corporate culture that supports initiative, risk-taking, integrity, and respect for the individual.

The extent of supervisory support for teams varied considerably across the various work cells studied. Teaming was not encouraged by all supervisors, especially initially. Several were reluctant to let their workers leave the production line to attend weekly team meetings, particularly when the department was under significant pressure to meet production goals.

Findings of the Exploratory Study at Motorola

Benefits to the Firm.

We discovered that although the manufacturing site had collected a considerable amount of information that could have quite useful to our research, records were not maintained over time. Despite valiant efforts from our collaborators at Motorola, we were unable to recover much usable data for years prior to 1994. Production staff understandably are oriented to the present rather than the past and they see little use in maintaining data once it has served the immediate purpose for which it was collected.

Nevertheless, we were able to obtain monthly data on performance indicators and team participation rates in four departments over a 21-month period from January 1994 through September 1995 with a few gaps in two of the departments. This information was supplemented with data supplied by the Human Resources and Training Departments, including ages of workers, their tenure with the firm, and gender.

The modeling effort was limited by data availability in several respects. The sample size was small—monthly data on four departments over a 21-month period. Second, since we had no direct measures of informal learning, we used participation rates on teams as a proxy variable for informal learning. Third, not all the data necessary to build an "ideal model" were available. However, there was sufficient data to enable us to conduct some econometric modeling.

Using ordinary least squares (OLS), we estimated three types of models (cost, quality, and cycle time) for each of the four departments for a total of 12 different types of model estimations. Within each type, several versions were estimated before the best model was uncovered.

The preliminary results of this exploratory modeling are encouraging and indicative (See appendix for details). Among the 12 different models, we found six in which the proxy for informal learning—team participation—was statistically significant. Three of those six models involved costs and three concerned cycle time. The relationships were quite strong, explaining from 39% to more than 63% of the variation in the dependent variable.

The analysis supported the hypothesis that informal learning influenced costs in three departments. In two of those departments, greater team participation was associated with lower costs, but in the third it was correlated with higher costs (perhaps in part because that department's teams were focused on objectives other than cost reduction). In three departments, cycle time was reduced as team participation increased.

Curiously, none of the models for quality identified team participation as a significant variable, even though several teams had focused on making quality improvements over the time period studied. Nevertheless, in every one of the four departments, team participation was statistically associated with improvements in production costs and/or cycle time which alone may justify the efforts.

The Payoff to Teaming and Informal Learning

At best, econometric modeling reveals correlation — not causation. Yet to calculate a return on investment with confidence, one should be reasonably certain that the investment caused the return. In order to gain a better understanding and documentation of causal factors, we asked the manager to explain changes in the various performance indicators for the departments studied by annotating graphs with written comments. His explanations suggested that a wide array of (often exogenous) factors were involved when performance declined, ranging from supplier problems to difficulties in adjusting to a new process or product. Improvements in performance were commonly attributed to the work of effective teams.

Preliminary estimates of the payoff to encouraging informal learning through teaming appear quite substantial. Among the models which showed statistical significance, we had sufficient information to estimate the savings in production costs for one department during 1994.

Also, there was evidence that the teams in this department had caused the improvements. The manager reported that four effective teams were focused on

reducing direct labor unit costs during this period. Each team had projected cost savings from their work but these projections were no longer available by the time of our study.

Our estimates of the savings in production costs statistically attributable to teams in this department for 1994 alone was three to five times greater than the estimated direct investments in fostering teaming and informal learning (i.e., the time workers spent in team meetings and activities, the cost of formal courses provided to support the teams, and the expenses of the TCS Showcase/Competitions). The comparison does not even count the benefits of production cost savings in subsequent years.

The gains in other cases may not be as dramatic. Calculating their value can be accomplished only with more information and with the assistance from Motorola officials. For example, Motorola staff have the metrics to place a value on a 20-percent reduction in cycle time in a given product line. Determining the payoff to informal learning and teaming will only be possible through a collaborative process between Teaching Firm project researchers and the study firm in which the proprietary concerns of the firm are fairly addressed.

The exploratory study at Motorola demonstrated that using carefully selected proxies is a feasible and promising approach to measuring informal learning and its impact. We developed an economic model that accommodates variations in performance indicators available from different production departments. Using team participation rates as a proxy for informal learning, the study found relatively powerful statistical relationships between teaming and performance generated within only a 21-month period. Preliminary analysis indicated effects sufficient to produce very significant financial benefits for the firm.

APPROACH 2: INVESTIGATING RELATIONSHIPS BETWEEN SELF-REPORTED INFORMAL LEARNING BY INDIVIDUAL WORKERS TO THE PERFORMANCE OF THEIR PRODUCTION UNITS

The specific form of economic analysis that follows was limited to specific facilities of Siemens and Reflexite. Unfortunately, a comparable economic analysis of the impact of informal learning on Boeing, Data Instruments, Merry Mechanization, Motorola and Ford was not possible for a number of reasons. At Boeing, the huge size of the company, its complex managerial structure, physical location of facilities, and limited access to data considered proprietary by management presented formidable challenges to the economic team. Consequently, product line identification problems as well as difficulties in identifying and obtaining performance data led us to delete Boeing from this form of economic analysis. Data Instruments was a much smaller company but the decision to limit the study to an examination of one of the company's two production lines made it impossible to use the research model we had developed. Merry Mechanization made more than one product and had more than one product line but the company

maintained little performance data. At Motorola, the project did not have access to the needed performance data which was kept proprietary by the firm. At Ford-Electronics, we found excellent metrics available. However, Ford conducts on-the-job training as a highly structured and formal process and the wording of the worker survey introduced confusion about whether this primary method of training used at Ford was formal or informal. The confusion confounded the analysis and although an analysis was conducted, the validity of its results were questioned.

Sufficient economic performance data were obtained from the two remaining manufacturing facilities. However, these data were limited in both breadth and depth.

Siemens— Wendell, North Carolina

Siemens AG, headquartered in Munich, Germany, is the world's fifth largest electrical and electronics company. Siemens USA is comprised of several operating companies providing a broad range of products, systems, software and services in the manufacturing, service and consumer sectors. Siemens' sales in the U.S. comprise ten percent of Siemens' total world sales.

The manufacturing site selected for study by the Teaching Firm was the Power Transmission and Division facility located in Wendell, North Carolina. It is part of the division of the Siemens Energy and Automation Company headquartered in Alpharetta, Georgia. The Wendell facility also has divisional offices. Primary products at the Wendell, NC facility are circuit breakers, controllers, switchgear and power distribution systems for the electric utility industry.

The Wendell facility was acquired by Siemens from Allis Chalmers in 1985 and there have been some cultural and managerial difficulties associated with the change in management. Interviewees noted the management change as a factor affecting morale. The same persons also mentioned the existence of a different worker culture in rural North Carolina; workers are reportedly respectful, take orders, and are more friendly than in other places. At the time of the project's worksite studies, during January and February 1997, one of the four production lines was expected either to be moved or closed down shortly. During January 1997, the plant employed a total of 800 employees working two shifts, of whom about 400-450 were direct line workers in manufacturing operations. The facility is non-union. An apprenticeship system established with funding, guidance and encouragement from Siemens AG and Siemens USA as well as other School-to-Work initiatives are in their early formative stages at the plant. The average age of the worker is 35-40 years old. Turnover has been minimal and the labor force has been declining. In the recent past, the plant had some disappointing experiences with teaming. Yet the facility's managers expressed a determination to make teams successful in implementing continuous improvement and other initiatives in manufacturing. The four production lines at Wendell produce low voltage switchgear (LVS), medium voltage switchgear (MVS), medium voltage control (MVC), and motor control center (MCC). Every item produced by the plant is built to customer specifications.

The facility uses a just-in-time production system. The company is proud that storage of production parts has been reduced to two weeks, thereby considerably reducing inventory carrying costs. The facility has received several awards as well as certification under ISO 9000 (quality) and ISO 14000 (environmental) standards. The physical space in which production takes place appears to be adequate. Observed production tended to be labor intensive, involving detailed wiring and other hand tasks. Siemens-Wendell customers are power companies and other companies in need of heavy-duty circuit breakers and power distribution controls. Siemens estimates that it produces between 15-35 percent of the various markets it serves. Although we have by no means studied the competitiveness of this industry, it is most likely a very competitive one.

Reflexite—New Britain, Connecticut

In Connecticut, the Reflexite facility at New Britain was chosen as a study site for the Teaching Firm project. Reflexite makes a unique product. Reflexite's founders (two brothers) invented and patented a microprism technology for producing reflective materials and their company remains the only authorized producer using this process. Materials produced with microprism technology are more advanced than conventional glass beads. Because microprisms provide more reflective surface area than the glass beads, they reflect up to 250 percent more light than the beads. Reflexite produces materials that serve four main markets:

Vehicle conspicuity — This class of products enhances the nighttime visibility of tractor trailers and industrial vehicles.
Marine safety — These items increase the visibility of navigational buoys, channel markers, and day boards. They also are used on life vests, life rafts, and survival suits.
Traffic control — Reflexite materials enhance both the daytime and nighttime visibility of traffic control devices used in temporary roadwork zones and highway maintenance areas. These products include cone collars and "roll-up" signs that are soft enough not to pose a danger to occupants of vehicles that hit them.
Personal safety — Tapes, strips, hot dots, and emblems safeguard joggers, pedestrians, and cyclists by making the individuals more visible at night.

Reflexite is distinguishable from its competition in at least two ways. First, Reflexite is the only company with microprism technology. The second is the company's Employee Stock Ownership Plan (ESOP). This is a true ESOP in the sense that all employees are active owners as well. They receive regular checks based upon the company's performance and they are involved in much of the decision-making

Reflexite North America production facilities are located in Connecticut—one in New Britain and another in Avon. The Avon facility is the site where R & D occurs and it is also the location at which the prismatic material is manufactured and shipped worldwide. The New Britain facility receives the prismatic material on rolls and then processes it to produce various sizes and shapes and colors of products. This processing is primarily composed of adding an adhesive material and a peel-off backing and

preparing the product for shipping. The technology utilized in the plant is quite old and most tends to be labor intensive. Plant officials estimate that 80% of the costs of production are for the prismatic materials (shipped from the Avon facility) and most of the rest of the costs are for labor. The products are shipped directly to customers who use them as is (e.g., cone collars) or, who add the reflective material to their own product (e.g., reflective strips added to orange vests).

The manager of the New Britain plant indicated that he uses the following monthly production metrics in the assessment process: on time delivery, scrap rate, production dollars per labor hour, and sales dollars per labor hour.

The manufacturing floor is arranged such that there are five separate "work centers" that produce different categories of products. Although Reflexite is embarking on a comprehensive program to cross-train every worker to be able to labor in every work center, employee-owners are assigned to one primary work center. The work centers and the product categories they produce are:

#1 — polyester roll goods
#2 — vinyl tapes for garments
#3 — vinyl cone collars
#4/5 — roll-up signs and vinyl shapes (dots, triangles, whales, etc.)
#6 — polyester shapes

The two polyester work centers require higher skill levels than the others because the machines used are more complicated than are those in other work centers.

Total employment at the facility was 77 persons in April of 1997. During the month of May 1997 (the month for which employment figures are available), 52 employees were employed in the five manufacturing work centers. Many Reflexite employees are of Polish origin. Turnover is low and it has been a few years since new manufacturing personnel were hired. In fact, employment in the five work centers has declined. The average tenure of employees is approximately 10 years. This is due in part to increased competition and a decline in orders. In short, markets for Reflexite's products have been down for the past two years. The company is seeking to develop reflective products based on newer technologies.

Reflexite does not have a history of teaming that has been measured and could serve as a proxy for informal learning. Each work center has a team or work center leader. The workers in each center usually filled this position on a rotating basis.

Methodology

The following analysis involves the construction of a number of models that are all estimated using ordinary least squares (OLS) regression techniques. Data utilized in constructing the models are of two different types, obtained from surveys of workers and from the firm's records.

Worker Surveys

The ethnographic research team conducted an employee survey during the latter days of their site visits to various plant studied. All workers were eligible to participate in the survey but only surveys from production lines studied by Teaching Firm field researchers were used in the economic analysis. In addition, Ford managers suggested that we exclude individuals who had held their present job or position for less than one year. Analyses of the findings indicate that this exclusion had little impact on the results. This could possibly be due to the fact that employment in all three manufacturing facilities had been declining for the past few years. In general, this decline is market-related and, perhaps, a result of domestic and international competitive forces.

Most employees had more than five years tenure with their respective companies but not necessarily in the position they presently occupy. Most formal training or learning typically occurs during the first year of employment in a new position. Considerable informal learning is likely to happen during the first year as well.

To measure the economic impact and importance of informal learning to these three plants, we needed a quantifiable measure (variable) of informal learning. Consequently, two questions were inserted in the worker survey administered at the three facilities that sought to quantify the extent and intensity of informal training experienced (see Table 2). Our preliminary economic analysis, presented at a Teaching Firm project workshop at Motorola University in August of 1997, utilized the first survey question, in which each worker was asked to distribute 10 points according to the degree to which they learned their job formally or informally. Thus, a reported score of 10 would mean all learning was informal while a score of 0 would mean all learning occurred formally.

Subsequently, we developed a more robust measure of informal learning by using a second question in the survey as one of our variables in the analysis that follows. Specifically, this variable measures the simple existence of informal learning characterized as either (i) "a little" or "a lot" or (ii) "not much" or "nothing." Hence, the existence of formal learning is not a factor that possibly could add to any confusion. Using this new measure eliminates reliance on asking workers to report the extent of their informal learning in numerical terms. Since most of us are unaware of the exact extent of our informal learning, such a measure is perhaps in an early stage of development anyway.

Selected demographic characteristics, i.e., demographic variables, gleaned from the worker survey instrument and included in the estimation models are: education level, sex, age, job satisfaction level, years at current job, and experience at the particular company.

At Siemens, approximately 16% of all workers responded to the survey. After deleting unusable responses, the total sample used in the regression analyses was 116. A small number of respondents were excluded as they had less than one year experience at Siemens. The resulting number of respondents in the sample by product line is: LVS, 21;

MVS, 44; MVC 28; and MCC, 38. Since total employment in the four production units in January of 1997 was approximately 425 persons, the sample represents almost 31% of those employed in the four studied units.

There were 45 work center employees who responded to the worker survey at Reflexite (or approximately 63% of total employment at the New Britain facility). One respondent failed to indicate his/her work center and that survey was deleted from the sample. Therefore, the number of respondents in the sample by product line is: WC1, 5; WC2, 7; WC3, 5; WC4/5, 15; and WC6, 12 where WC stands for work center. Total employment in these five production units in May of 1997 was approximately 52 persons. Hence, the sample represents almost 87% of those employed in the five units. The number of observations in our regression models varied because every respondent did not necessarily answer all questions.

Table 2
Selected Questions on Informal Learning from the Teaching Firm Written Survey of Workers Used for Economic Analysis

We would like to try and understand the extent to which you think that you learned your job by formal (classroom and pre-employment training) relative to informal learning means. Please divide 10 points between formal and informal in a way that represents the extent to which you learned how to do your job in each of these ways. For example, if most of your job you learned by formal means, then you might give formal learning 8 points and informal learning 2 points. (Your points should sum to 10).

Formal learning ___ points
Informal learning ___ points

Informal learning includes anything not learned in formal training. Some people would describe informal learning as learning how to solve problems on the job, finding out who to ask about certain problems, how to do other jobs, and learning our work going on in other departments. **In general, do you tend to learn things about your job informally?**

___ I learn a lot informally
___ I learn a little informally
___ I do not learn much informally
___ I do not learn anything informally

SOURCE: Employee survey forms distributed by the Teaching Firm Project at Ford Electronics-North Penn, Reflexite in New Britain, and Siemens in Wendell, North Carolina.

Production Performance Data Provided by Firms

Siemens—Wendell, North Carolina facility

The economic analysis team utilized existing performance data for all four product lines at Siemens. The production lines are again listed below. The four production units are:

LVS — Low Voltage Switchgear
MVS — Medium Voltage Switchgear
MVC — Medium Voltage Control
MCC— Motor Control Center

The latest economic performance data available in January 1997 (the time of the site visit) were for the month of December 1996. The data types and variable names are listed below along with a short definition. Only two types of performance data were available across all four production lines.

Productivity
PRODTIVY = earned hours/available hours

Process Quality
DEVIATION = deviations per vertical section

Reflexite—New Britain, Connecticut facility

The economic analysis team utilized existing performance data for all five work centers at Reflexite:

#1— polyester roll goods
#2— vinyl tapes for garments
#3 — vinyl cone collars
#4/5 —roll-up signs and vinyl shapes (dots, triangles, whales, etc.)
#6— polyester shapes

The most recent economic performance data available at the time of the site visit for Reflexite conducted in May 1997 was for the month of April 1997. The data type and variable names are listed below along with a short definition. Five performance indicators were available for each of the five work centers. On-site observation indicated that there appeared to be a lot of scrap materials generated in the process of preparing the products for shipment. Facility personnel pointed out that the SCRAP performance indicator (see below) probably underestimates the true amount of scrap material.

Productivity
PRODHR = dollar production per labor hour
PRODEMPL = dollar production per employee

Process Quality
SCRAP = material scrapped
OVERDUE = overdue work

Other
INVENT = inventory on hand (i.e. not sold)

Analysis

Using ordinary least squares (OLS) regression techniques, several models were constructed and regressions were run in which we attempted to measure the impact of informal learning on the economic performance indicators furnished by the three different companies. Data supporting these regressions and the findings that follow appear in the appendix to this document. To review, the informal learning measures, INFLERN, INFLERND1, and INFLERND2, were used as independent variables in the regressions. INFLERND1 AND INFLERND2 are dummy variables used to measure the existence of informal learning (discussed below). We also used INFLERN, which measures the intensity of informal learning through the use of a self-reported (via the worker survey) dosages, or units, of informal learning. Only one of these measures appeared in any particular regression model. Three sets of parallel models were estimated separately for the two different companies. The parallel models differed by which one of these three variables appeared in the model. The informal learning variables and other independent variables represent factors that may affect the economic performance indicators (the dependent variables). Only when one of the informal learning variables is statistically significant has a table for that regression been included in the appendix. The regressions (presented in the appendix) had the following variables:

Siemens—Wendell, North Carolina. The performance metrics PRODTIVY AND DEVIATION were employed as dependent variables. The independent variables initially included in the regressions are: CURRJOBY (years on current job at Siemens); SIEMEXPY (Siemens experience in years); demographic variables such as age (AGE), sex (SEX), and education (ED); job satisfaction (SATIS); performance variables (other than those being measured as a dependent variable); and dummy variables representing three of the firm product lines.

Reflexite—New Britain, Connecticut. Performance metrics utilized were PRODHR, SCRAP, and OVERDUE. PRODEMP was not used because it measures, in general, the same firm performance as PRODHR. INVENT was not used as it is not a measure of productive efficiency. The independent variables initially included in the regressions were: CURRJOBY (years on current job at Reflexite); demographic variables such as age (AGE), sex (SEX), and education (ED); job satisfaction (SATIS); performance variables (other than those being measured as a dependent variable); and dummy variables representing four of the firm work centers.

Results

The number of independent variables used in each model varied for each dependent variable (the economic performance indicator) but always included an informal learning independent variable. A specific product line dummy variable takes the value of one for that product line and zero for the other production units.

Adjusted R-squares for the Siemens facility vary considerably, depending on the regression being analyzed. One adjusted R-square is over 0.99 while others are lower. Except for one or two regressions, this means that some factors influencing the dependent variables (selected economic performance indicators) have not been captured in the regressions. None of the demographic variables were found to be significant in any of the Siemens regressions.

Adjusted R-squares for Reflexite also varied considerably, depending on the regression being analyzed. Adjusted R-squares are either relatively high and, when low, they tended to increase when the number of observations increased. This means, in general, that some factors influencing the dependent variables (selected economic performance indicators) have not been captured in the regressions. At all the firms, none of the demographic variables were found to be significant in any of the regressions.

The results of all of the Siemens regressions reveal that informal learning has a positive impact on performance indicators. That is, the signs of the coefficients are as expected and that an increase in informal learning does positively impact productivity and the quality of the products produced (see appendix). For Siemens, the impacts are uniformly small regardless of the signs of the coefficients. Hence, we can say, that informal learning improves process quality and productivity for all four product lines studied at Siemens.

The results of practically all of the Reflexite regressions revealed that informal learning has a beneficial impact on performance indicators. That is, the signs of the coefficients of all but one regression are as expected, revealing that an increase in informal learning does positively impact productivity and the quality of the products produced (see appendix). Informal learning, using all three measures of informal learning in the regressions, reduces the dollar value of overdue orders by at least $45,000 as opposed to no informal learning. This is approximately 80% of the mean dollar value of overdue orders in the sample. Informal learning reduces the dollar value of scrap material by at least $44. This is slightly less than 10% of the mean value of scrap material in the sample. Informal learning increases productivity per labor hour by as much as 2% of the average value of productivity per labor hour. Hence, we can say that informal learning improves process quality and productivity for all five product lines studied at Reflexite.

Analysis of data for those responding to the informal learning questions from the worker survey, used in the regressions as an independent variable, strongly supports the existence (and possible strength) of informal learning in all company facilities. For the four production units at Siemens, the informal learning means ranged from 68% to 99%. The same informal learning means ranged from 57% to 100% at Reflexite.

Any cross sectional comparison of facilities that form part of very different companies producing different products is fraught with potential difficulties. Bearing in mind many of these difficulties we will attempt a very temporal excursion into such a mine field. We should also keep in mind that not only are these companies in different industries producing different products under varying competitive conditions but that there are also different technologies and worker skills that should be taken into consideration.

The ethnographic and the economic analysis teams also found that the concept of teaming varied considerably from facility to facility. The Motorola teams we analyzed as a proxy variable were voluntary, short-term, project-specific teams, based on a shared worker-management concept used across functional lines to solve problems. At the Ford and Siemens facilities, teaming was used as a management tool for organizational and supervisory purposes. Siemens, however, had abandoned this latter type of teaming and was attempting to institute a small number of teams more like the Motorola type. Reflexite did not have any teams. Thus it was not appropriate to replicate the proxy analysis we conducted at Motorola using the teaming variable.

Across all companies and facilities we observed some similarities. We found that informal learning existed in all facilities and that workers generally considered it a more important source of learning than formal learning and training. The statistical means of the responses to the two questions on informal learning in the worker survey for all firms were quite high, indicating support for both the existence and importance of informal learning in the work environment. Such a finding should not denigrate formal learning or training which is well justified in importance in other studies for imparting specific types of knowledge and skills. Unfortunately, the various regression estimates used to measure the impact of informal learning on select economic performance indicators may not always catch all impacts of informal learning. Nevertheless, at the Siemens and Reflexite facilities where we could conduct an analysis, there is strong indication that informal learning has favorable economic impact. Unfortunately, at Siemens the models we used indicated that the size of the impact was small. In the case of Reflexite, the existence and intensity of informal learning was much stronger.

In order to better measure the intensity of informal learning in the future, some modifications in the questions asked workers are necessary (see discussion in the last portion of this section). More and better economic performance data are needed as well as a larger sample of facilities and companies from other industries. When we include, for comparison purposes, the Motorola facilities studied in pilot phase, we can only speculate about whether the intensity of informal learning would have been stronger at that facility. We do know, however, that attitudes towards and involvement in teaming were much stronger at Motorola and that our pilot study showed that this had a very positive and significant effect on informal learning. In short, it is possible that teaming (its nature and existence), as well as its embodiment (or, lack thereof) adversely affected the nature and intensity of the impact of informal learning on the economic performance indicators of the companies studied using our second approach to analysis.

Conclusions and Implications regarding Approach #2

This economic analysis of the effects of informal learning on firm performance data at Siemens and Reflexite yielded statistically significant results. The regression analysis reveals that informal learning has a beneficial impact on the economic performance data available. The implication is that activities to enhance, encourage, and implement a positive environment for informal learning will produce some positive economic benefits for the company. The mean values from the two worker survey questions are high, indicating the importance and significance of informal learning in the work place at these two facilities.

Our objective was to determine the numerical impact of informal learning on firm performance. Before the project fieldwork began, we thought that we might find that informal learning would increase productivity by lowering errors in production. The findings of our research confirmed that this hypothesis is true. In addition, we also thought we could learn more about the relationship of informal learning on other performance indicators if the performance data were available. Economic performance data from the companies were limited. Nevertheless, we undertook the task and found the effects were positive in most instances. We also believed we could analyze the strengths of these effects. Analysis of the strength of these relationships confirmed the relationships but they were smaller than expected.

There is another possible explanation for such findings. Using responses to worker surveys, we tried to design two variables that would measure the existence and significance of informal learning. Analysis using the question (INFLEARN variable) that attempted to measure both the existence and intensity of informal learning may be complicated by containing both an existence and intensity measure. Hence, for comparison purposes, the variables INFLERND1 and INFLERND2 measure only the existence of informal learning (which no doubt varies in magnitude from respondent to respondent). Therefore, our analysis is less ambitious than it once was as it now is confined to just measuring the impact on firm performance of the existence rather than the intensity of informal learning. Future research is needed to measure the intensity of informal learning and the effects of other demographic, economic, social, and cultural variables.

Nevertheless, the economic analysis portion of the Teaching Firm project does tend to support the ethnographic research. Our analyses and findings indicate that firms should take the necessary steps to encourage and nurture the existence of informal learning. Non-economic and ethnographic forces can affect economic performance indicators either positively or negatively. These factors need to be quantified and measured to understand the total impact of informal learning on economic performance indicators. If negative cultural forces are at work in the plant environment they are quite likely to affect the relationship between informal learning and economic performance indicators. The fact that several of the plants have had workforce reductions is an example of

economic forces that also make any learning environment difficult. Such a distortion may affect the relationships between the independent and dependent variables causing the results not to be those anticipated.

CONCLUSIONS

To date, the picture revealed by our economic analysis of informal learning is promising and indicative of promising results but it is incomplete. Results at Motorola demonstrated a generally strong positive relationship between informal learning (as proxied by participation rates on voluntary project teams) and the performance of the production units in which the participants worked. In addition, in the single case for which we were able to obtain data on costs and benefits, there was a significant payoff to the investment that Motorola made in teaming.

Subsequent investigation of the relationships between perceptions of the informal learning environment as reported on worker surveys showed small but statistically significant positive relationships between informal learning and production performance at three other firms. At Siemens and Reflexite, the relationships were strong. Unfortunately, our results at Ford were likely confounded by mis-characterizing on-the-job training as informal learning in the worker survey, despite the fact that it is highly structured and specified by the company there.

Several possible explanations may account for the mixed results, including the following:

(1) Informal learning may not be correctly specified in our economic models. From the inception of the project, a critical challenge for the economics team has been getting the variable "informal learning" correctly specified in a format that was in quantified terms useful in economic modeling. This was especially true at Ford where on-the-job training was characterized as an example of informal learning in the worker survey whereas it may better qualify as formal training because it is so structured and specified by the firm.

(2) Informal learning may be only a part of a larger coherent whole. Recent work by economists such as Shaw and Ichniowski and MacDuffie has demonstrated that coherent "bundles" of innovations show greater impacts than do individual innovations (Ichniowski, Casey; Kathryn Shaw and Giovanna Prennush 1997; MacDuffie 1995). According to one developing conception, workers must not only be skilled, but they also must be empowered to use those skills, and motivated to do so. Thus there may be at least three dimensions important to performance:

(a) **Learning/skilling,** including formal as well as informal learning (The organization fosters learning of all types and at all levels of the organization.)

(b) **Empowerment**, evidenced in measures of autonomy, initiative, and the atmosphere for risk-taking (e.g., change in job scope, broadened understanding of the full or whole system, customer interaction, continuous improvement projects, ambitious production or improvement goals, etc.), and other measures of alignment of individual goals with organization goals

(c) **Motivation**, as indicated by measures of job security and perceived job security, job satisfaction, concordance between company culture as presented vs. company culture as experienced, trust between workers and management, the firm's explicit incentive system (including compensation, recognition/ acceptance, personal achievement, and promotion and development policies, appropriate challenge or "stretch")

In summary, informal learning is a much more interesting and complex variable than formal learning because it contains elements of all three dimensions. Informal learning requires workers to be motivated and empowered to take initiative and autonomous action to gain skills and to apply them. In a sense, if an accurate and efficient measure of the level and quality of informal learning can be identified, it may be a good "flag" indicator that all three dimensions are operating effectively. In other words, if informal learning is thriving, it is a sign that workers feel appropriately empowered and are motivated as well.

FUTURE RESEARCH ON INFORMAL LEARNING

Any future research endeavors should seek to develop better ways to define and measure the existence and level of informal learning. Most measures of intensity and the existence of learning will always be worker (i.e. learner) based. However, future studies should also examine the ability of the employer or manager to facilitate informal learning. In addition, it would be beneficial to account in some way for the level of understanding that employers and managers have of informal learning.

The following recommendations could make the preceding regression models significantly stronger and thus contribute significantly to a better model of informal learning:

1. Ensure that top managers (including production and financial managers) are involved in the project. Cooperation and commitment from top company personnel is essential to acquiring economic performance data.
2. Include a broader sample of industries—not just manufacturing.
3. Include more and better economic performance indicators.
4. Inclusion of time series data would make any model(s) stronger. Our experience is that the facilities in this study rarely maintained economic performance data for longer than 12 to 18 months. In order to obtain time series data, longitudinal studies of greater duration will be necessary.

5. Ensure that survey respondents clearly understand the differences between formal and informal learning if worker based surveys are to be used. Focus groups should be held to verify the existence and understanding of informal learning.

SUGGESTED OPTIONS FOR FUTURE RESEARCH

At the outset, it should be emphasized that the most effective implementation of every one of these research options requires the participation and collaboration of the partner firms in the detailed design and implementation of this research.

(a) Conduct additional case studies of the effects of informal learning, using carefully selected variables considered close proxies of informal learning.

(b) Investigate the advantages of avoiding decay in knowledge and skills acquired in an informal learning system which are thought to produce learning more on a "just in time" basis (i.e., more proximate to the need for the learning) than does scheduled formal training. Compare the rates of decay of informal learning to available evidence on decay of knowledge in formal learning. What are the costs and benefits associated with the proximate nature of informal learning and its decay rates, as compared with formal learning?

(c) Investigate the impact of more comprehensive "coherent bundles" of human resource innovations and work practices. MacDuffie (1995) provides one example of a study of "coherent human resource bundles." Using data from a comprehensive 1989-90 worldwide survey of 62 automotive plants, MacDuffie constructed three bundles or packages of practices—(1) work systems, (2) human resource practices, and (3) the level of use of buffers in the production process. He defined these elements and designed a questionnaire to measure them, a somewhat subjective exercise. The work systems bundle "captures how work is organized, in terms of both formal work structures and the allocation of work responsibilities, and the participation of employees in production-related problem-solving activity" (MacDuffie 1995). It has six elements:

- The percentage of the work force involved in formal work teams.
- The percentage of the work force involved in employee involvement groups.
- The number of production-related suggestions received per employee.
- The percentage of production-related suggestions implemented.
- The extent of job rotation within and across teams.
- The degree to which production workers carry out quality tasks.

To derive their effects, MacDuffie chose to add, not multiply, these elements together within a bundle so that the absence of one element would not negate the

influence of the entire bundle. Bundles, however, are both added and multiplied together to derive their interactive effects.

MacDuffie's framework describes work and learning as a dense social system, involving considerable interaction among work systems practices, human resource management policies; and the use of buffers. To illustrate their interdependence, the minimization of buffers serves a feedback function, providing valuable information about production problems; work organization facilitates responsive problem solving; and training and compensation empower employees to commit themselves to these enlarged responsibilities.

(d) Develop and implement a series of quasi-experiments to measure the costs and benefits of promoting informal learning. Construct a model based on coherent "bundles" indicated by field research conducted and reported by ethnographic researchers in the initial seven firms studied. Then, develop and implement a series of quasi-experiments in collaboration with cooperating firms to improve the environment for informal learning by implementing facilitators and eliminating inhibitors to informal learning. In this endeavor, we propose to track the nature and costs of the investments made and the results and benefits over a period of time.

A quasi-experimental design looks like an experimental design but lacks a key ingredient — random assignment. With respect to internal validity, quasi-experimental designs often appear to be inferior to randomized experiments. But there is something compelling about these designs; taken as a group, they are easily more frequently implemented than full randomized designs.

The classic quasi-experimental design is the use of nonequivalent groups. In its simplest form, the nonequivalent groups design requires a pretest and posttest (or before and after comparisons) for treated and comparison groups. It is identical to the analysis of covariance design except that the groups are not created through random assignment. The lack of random assignment and the potential nonequivalence between the groups, complicates the statistical analysis of the nonequivalent groups design, but it is likely that some form of this classic design would be suitable to the proposed analysis.

Quasi-experiments can provide powerful scientific evidence of impact; but they require excellent collaboration between the researchers and participating firms, including a committed persistence to maintain the conditions needed by the demonstration at both the treatment site and comparison site throughout the entire period of the experiment.

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REGRESSION ANALYSIS FOR MOTOROLA: USING TEAMING AS A PROXY FOR INFORMAL LEARNING

Table 1

Model Estimation Results for Each Department for the Dependent Variable Cost.

	Department A		Department B		Department C		Department D	
Variable	Estimate	t-ratio	Estimate	t-ratio	Estimate	t-ratio	Estimate	t-ratio
Intercept	1.14998	7.726	-0.175	-0.22	1.23603	23.42	See Note	
TEAMPCT	-0.555143	-2.05	31.5	3.3	-0.628	-5.83		
F	4.19		10.89		34.03			
Adj. R-sq	0.138		0.553		0.623			

Note: For Department D, no model was found that contained TEAMPCT (the proxy for informal learning) as a statistically significant variable.

Table 2

Model Estimation Results for Each Department for the Dependent Variable Cycle Time.

	Department A		Department B		Department C		Department D	
Variable	Estimate	t-ratio	Estimate	t-ratio	Estimate	t-ratio	Estimate	t-ratio
Intercept	See Note		66.8	6.98	168.605	11.05	294.253	5.128
TEAMPCT			-440	-3.86	-115.575	-3.71	-196.646	-1.985
F			14.86		13.79		3.94	
Adj. R-sq			0.634		0.39		0.211	

Note: For Department A, no model was found that contained TEAMPCT (the proxy for informal learning) as a statistically significant variable.

REGRESSION ESTIMATES FOR REFLEXITE

LS // **Dependent Variable is PRODHR**
Date: 10/02/97 Time: 08:31
Sample: 1 45
Included observations: 28
Excluded observations: 17

Variable	Coefficient	Std. Error	t-Statistic	Prob.
C	169.7356	32.80671	5.173808	0.0000
INFLERN	1.027926	0.539599	1.904981	0.0679

R-squared	0.122480	Mean dependent var	228.1071
Adjusted R-squared	0.088729	S.D. dependent var	64.96970
S.E. of regression	62.02041	Akaike info criterion	8.323676
Sum squared resid	100009.8	Schwarz criterion	8.418834
Log likelihood	-154.2617	F-statistic	3.628952
Durbin-Watson stat	0.982386	Prob (F-statistic)	0.067900

LS // **Dependent Variable is PRODHR**
Date: 10/02/97 Time: 08:35
Sample: 1 45
Included observations: 21
Excluded observations: 24

Variable	Coefficient	Std. Error	t-Statistic	Prob.
C	136.9557	50.55366	2.709116	0.0144
INFLERN	1.520412	0.695539	2.185947	0.0423
CURRJOBY	3.398556	4.885463	0.695647	0.4955

R-squared	0.210910	Mean dependent var	235.1905
Adjusted R-squared	0.123234	S.D. dependent var	71.83984
S.E. of regression	67.26780	Akaike info criterion	8.548927
Sum squared resid	81449.22	Schwarz criterion	8.698144
Log likelihood	-116.5614	F-statistic	2.405550
Durbin-Watson stat	1.112332	Prob(F-statistic)	0.118614

LS // **Dependent Variable is PRODHR**
Date: 10/02/97 Time: 08:36
Sample: 1 45
Included observations: 31
Excluded observations: 14

Variable	Coefficient	Std. Error	t-Statistic	Prob.
C	378.8518	2.586537	146.4707	0.0000
INFLERND2	-3.900930	1.844469	-2.114933	0.0442
SCRAP	-0.020623	0.000394	-52.31534	0.0000
DVB	-116.2687	2.397957	-48.48656	0.0000
DVC	-92.02969	2.549289	-36.10014	0.0000

R-squared	0.995085	Mean dependent var	235.3548
Adjusted R-squared	0.994328	S.D. dependent var	66.35036
S.E. of regression	4.996837	Akaike info criterion	3.364300
Sum squared resid	649.1778	Schwarz criterion	3.595588
Log likelihood	-91.13375	F-statistic	1315.884
Durbin-Watson stat	0.525944	Prob(F-statistic)	0.000000

LS // **Dependent Variable is SCRAP**
Date: 10/02/97 Time: 08:37
Sample: 1 45
Included observations: 31
Excluded observations: 14

Variable	Coefficient	Std. Error	t-Statistic	Prob.
C	18247.73	257.0812	70.98041	0.0000
INFLERND2	-190.0017	88.87319	-2.137897	0.0421
PRODHR	-48.03315	0.918147	-52.31534	0.0000
DVB	-5605.416	126.0739	-44.46135	0.0000
DVC	-4410.556	160.1420	-27.54153	0.0000

R-squared	0.992378	Mean dependent var	4855.452
Adjusted R-squared	0.991205	S.D. dependent var	2571.462
S.E. of regression	241.1511	Akaike info criterion	11.11754
Sum squared resid	1512001.	Schwarz criterion	11.34883
Log likelihood	-211.3089	F-statistic	846.2914
Durbin-Watson stat	0.525238	Prob(F-statistic)	0.000000

LS // **Dependent Variable is SCRAP**
Date: 10/02/97 Time: 08:37
Sample: 1 45
Included observations: 25
Excluded observations: 20

Variable	Coefficient	Std. Error	t-Statistic	Prob.
C	10280.61	2281.167	4.506734	0.0002
INFLERN	-53.44153	27.06746	-1.974383	0.0610
ENGLISH	-2823.872	1344.798	-2.099848	0.0474

R-squared	0.205665	Mean dependent var	5056.240
Adjusted R-squared	0.133453	S.D. dependent var	2737.853
S.E. of regression	2548.626	Akaike info criterion	15.79879
Sum squared resid	1.43E+08	Schwarz criterion	15.94505
Log likelihood	-229.9583	F-statistic	2.848070
Durbin-Watson stat	1.341583	Prob(F-statistic)	0.079440

LS // **Dependent Variable is SCRAP**
Date: 10/02/97 Time: 08:38
Sample: 1 45
Included observations: 21
Excluded observations: 24

Variable	Coefficient	Std. Error	t-Statistic	Prob.
C	6426.888	1761.912	3.647679	0.0018
INFLERN	-43.57843	24.24115	-1.797705	0.0890
CURRJOBY	141.7604	170.2697	0.832564	0.4160

R-squared	0.214485	Mean dependent var	4716.000
Adjusted R-squared	0.127206	S.D. dependent var	2509.475
S.E. of regression	2344.438	Akaike info criterion	15.65117
Sum squared resid	98935009	Schwarz criterion	15.80038
Log likelihood	-191.1349	F-statistic	2.457453
Durbin-Watson stat	1.472438	Prob(F-statistic)	0.113865

LS // **Dependent Variable is OVERDUE**
Date: 10/02/97 Time: 08:38
Sample: 1 45
Included observations: 31
Excluded observations: 14

Variable	Coefficient	Std. Error	t-Statistic	Prob.
C	274110.3	19497.86	14.05849	0.0000
INFLERND2	-45762.52	23915.89	-1.913478	0.0663
DVB	146685.2	29047.60	5.049822	0.0000
DVC	-217154.8	32670.94	-6.646727	0.0000

R-squared	0.774852	Mean dependent var	245636.0
Adjusted R-squared	0.749835	S.D. dependent var	129769.3
S.E. of regression	64906.04	Akaike info criterion	22.28131
Sum squared resid	1.14E+11	Schwarz criterion	22.46634
Log likelihood	-385.3473	F-statistic	30.97364
Durbin-Watson stat	0.602371	Prob(F-statistic)	0.000000

LS // **Dependent Variable is OVERDUE**
Date: 10/02/97 Time: 08:39
Sample: 1 45
Included observations: 31
Excluded observations: 14

Variable	Coefficient	Std. Error	t-Statistic	Prob.
C	122503.6	63337.43	1.934143	0.0640
INFLERND2	-46810.97	21895.81	-2.137897	0.0421
PRODHR	564.3200	226.2050	2.494729	0.0193
DVB	186741.1	31060.99	6.012077	0.0000
DVC	-152953.0	39454.39	-3.876703	0.0006

R-squared	0.818337	Mean dependent var	245636.0
Adjusted R-squared	0.790389	S.D. dependent var	129769.3
S.E. of regression	59412.73	Akaike info criterion	22.13122
Sum squared resid	9.18E+10	Schwarz criterion	22.36251
Log likelihood	-382.0210	F-statistic	29.28049
Durbin-Watson stat	0.525238	Prob(F-statistic)	0.000000

LS // **Dependent Variable is OVERDUE**
Date: 10/02/97 Time: 08:39
Sample: 1 45
Included observations: 31
Excluded observations: 14

Variable	Coefficient	Std. Error	t-Statistic	Prob.
C	323908.7	32068.69	10.10047	0.0000
INFLERND2	-48364.93	22868.30	-2.114933	0.0442
SCRAP	-9.319537	4.887493	-1.906813	0.0677
DVB	126219.6	29730.62	4.245443	0.0002
DVC	-207331.1	31606.88	-6.559683	0.0000

R-squared	0.802474	Mean dependent var	245636.0
Adjusted R-squared	0.772086	S.D. dependent var	129769.3
S.E. of regression	61952.33	Akaike info criterion	22.21493
Sum squared resid	9.98E+10	Schwarz criterion	22.44622
Log likelihood	-383.3185	F-statistic	26.40712
Durbin-Watson stat	0.525944	Prob(F-statistic)	0.000000

LS // **Dependent Variable is PRODHR**
Date: 10/02/97 Time: 08:34
Sample: 1 45
Included observations: 25
Excluded observations: 20

Variable	Coefficient	Std. Error	t-Statistic	Prob.
C	151.6313	57.07920	2.656508	0.0144
INFLERN	1.264915	0.677280	1.867640	0.0752
ENGLISH	0.723063	33.64944	0.021488	0.9830

R-squared	0.166101	Mean dependent var	225.0400
Adjusted R-squared	0.090292	S.D. dependent var	66.86147
S.E. of regression	63.77155	Akaike info criterion	8.422781
Sum squared resid	89469.82	Schwarz criterion	8.569046
Log likelihood	-137.7582	F-statistic	2.191046
Durbin-Watson stat	0.767070	Prob(F-statistic)	0.135596

REGRESSION ESTIMATES FOR SIEMENS

Dependent Variable is PRODTIVY
Sample (adjusted): 3 115
Included observations: 76

Variable	Coefficient	Std. Error	t-Statistic	Prob.
C	77.82814	4.48E-13	1.74E+14	0.0000
AGE	-1.75E-14	4.50E-15	-3.883806	0.0002
ED	-1.57E-13	2.67E-14	-5.906571	0.0000
SEX	-2.77E-13	1.11E-13	-2.500120	0.0149
EXPSIEMN	3.79E-15	8.46E-15	0.448574	0.6552
EXPJOB	-1.08E-15	1.39E-14	-0.077913	0.9381
INFLERN	-5.71E-15**	1.83E-15	-3.125336	0.0026
DVB	8.073488	2.53E-13	3.19E+13	0.0000
DEVITION	-2.348837	1.33E-13	-1.77E+13	0.0000

R-squared	1.000000	Mean dependent var	77.21132
Adjusted R-squared	1.000000	S.D. dependent var	1.994088
S.E. of regression	3.94E-13	Sum squared resid	1.04E-23
F-statistic	2.41E+26	Durbin-Watson stat	2.071226
Prob (F-statistic)	0.000000		

**As the extent of informal learning rises, actual hours versus standard hours fall (productivity improves)

Dependent Variable is PRODTIVY
Sample (adjusted): 3 115
Included observations: 97

Variable	Coefficient	Std. Error	t-Statistic	Prob.
C	77.82814	1.09E-13	7.16E+14	0.0000
INFLERN	-6.10E-15**	1.17E-15	-5.196894	0.0000
DVB	8.073488	1.54E-13	5.23E+13	0.0000
DEVITION	-2.348837	8.13E-14	-2.89E+13	0.0000

R-squared	1.000000	Mean dependent var	77.11278
Adjusted R-squared	1.000000	S.D. dependent var	2.013081
S.E. of regression	2.92E-13	Sum squared resid	7.96E-24
F-statistic	1.52E+27	Durbin-Watson stat	1.872344
Prob (F-statistic)	0.000000		

**As the extent of informal learning rises, actual hours versus standard hours fall (productivity improves)

Dependent Variable is DEVITION
Sample: 1 115
Included observations: 115

Variable	Coefficient	Std. Error	t-Statistic	Prob.
C	0.852595	0.105544	8.078133	0.0000
INFLERN	-0.002634**	0.001442	-1.825852	0.0705
DVB	1.806826	0.084040	21.49965	0.0000

R-squared	0.804986	Mean dependent var	1.080174
Adjusted R-squared	0.801504	S.D. dependent var	0.843968
S.E. of regression	0.376013	Akaike info criterion	-1.930525
Sum squared resid	15.83517	Schwarz criterion	-1.858918
Log likelihood	-49.17275	F-statistic	231.1588
Durbin-Watson stat	1.799224	Prob(F-statistic)	0.000000

**As the extent of informal learning rises, defects fall (product quality improves)

Dependent Variable is DEVITION
Sample: 1 115
Included observations: 115

Variable	Coefficient	Std. Error	t-Statistic	Prob.
C	0.295000	1.01E-15	2.92E+14	0.0000
DVA	0.015000	7.68E-16	1.95E+13	0.0000
DVB	2.175000	7.99E-16	2.72E+15	0.0000
DVC	0.875000	7.61E-16	1.15E+15	0.0000
INFLERN	-8.44E-17**	1.02E-17	-8.275114	0.0000

R-squared	1.000000	Mean dependent var	1.080174
Adjusted R-squared	1.000000	S.D. dependent var	0.843968
S.E. of regression	2.59E-15	Sum squared resid	7.40E-28
F-statistic	3.02E+30	Durbin-Watson stat	1.865714
Prob (F-statistic)	0.000000		

** As the extent of informal learning rises, defects fall (product quality improves)

Dependent Variable is DEVITION
Sample: 1 115
Included observations: 91

Variable	Coefficient	Std. Error	t-Statistic	Prob.
C	0.295000	7.54E-15	3.91E+13	0.0000
AGE	-1.68E-16	7.23E-17	-2.321642	0.0228
ED	-3.09E-15	4.22E-16	-7.335996	0.0000
SEX	-4.94E-15	1.75E-15	-2.818446	0.0061
EXPSIEMN	-1.82E-16	1.30E-16	-1.401175	0.1650
EXPJOB	-3.75E-16	2.09E-16	-1.792889	0.0767
DVA	0.015000	2.37E-15	6.32E+12	0.0000
DVB	2.175000	2.39E-15	9.10E+14	0.0000
DVC	0.875000	2.27E-15	3.85E+14	0.0000
INFLERN	-9.33E-17**	3.05E-17	-3.055433	0.0030

R-squared	1.000000	Mean dependent var	1.061154
Adjusted R-squared	1.000000	S.D. dependent var	0.860265
S.E. of regression	6.74E-15	Sum squared resid	3.68E-27
F-statistic	1.63E+29	Durbin-Watson stat	1.766696
Prob (F-statistic)	0.000000		

** As the extent of informal learning rises, defects fall (product quality improves)

Dependent Variable is DEVITION
Sample: 1 115
Included observations: 105

Variable	Coefficient	Std. Error	t-Statistic	Prob.
C	0.295000	5.51E-15	5.36E+13	0.0000
ED	-3.09E-15	3.55E-16	-8.690584	0.0000
DVA	0.015000	2.03E-15	7.39E+12	0.0000
DVB	2.175000	2.13E-15	1.02E+15	0.0000
DVC	0.875000	2.02E-15	4.34E+14	0.0000
INFLERN	-1.24E-16**	2.69E-17	-4.611546	0.0000

R-squared	1.000000	Mean dependent var	1.071714
Adjusted R-squared	1.000000	S.D. dependent var	0.851824
S.E. of regression	6.51E-15	Sum squared resid	4.20E-27
F-statistic	3.56E+29	Durbin-Watson stat	1.700169
Prob (F-statistic)	0.000000		

** As the extent of informal learning rises, defects fall (product quality improves)

IMPLICATIONS OF THE TEACHING FIRM RESEARCH

EDC

INTRODUCTION : IMPLICATIONS OF THE TEACHING FIRM RESEARCH

The findings of the Teaching Firm research have major implications for various individuals, organizations, and programs. For employers and employees, the implications are significant with regard to improving productivity and developing incumbent workers. The research findings can dramatically change the way we educate students in the K-16 system and adults involved in workforce development programs. For policymakers, the findings can help determine where and how public dollars are spent on workforce preparation and development programs and on economic development efforts.

From this project's start, we wanted to find ways to encourage greater collaboration between the education and training system and the private sector in the preparation and development of the workforce. A primary focus of the study was to determine the importance of business-school partnerships centered on school-to-career activities. We believe that our research will help convince both the private sector and the education and training system of the value of these partnerships.

Our findings extended to the discovery that the ways in which individuals learn informally can have a significant impact on the quality of almost any activity in which individuals are engaged in the pursuit of knowledge and the acquisition of skills. And that is why our research is so provocative. We believe our work can help influence the fields of workforce preparation and development and economic development by providing a vision of how the best firms in the country promote employee development; both through their efforts to support continuous learning aimed at increasing productivity, and through their mutually beneficial relationships with schools and colleges to ensure a future workforce.

We hope firms, schools, colleges, and communities will embrace the concept of a Teaching Firm as one that promotes continuous learning for the benefit of the firm and the individual and work together to encourage the development of such firms.

While our research is based on studies of individuals at work, our findings about what individuals learn (across four dimensions: pragmatic, intrapersonal, interpersonal and cultural) and why they learn (to meet larger goals) are nearly universal to all learning situations, as is the finding which describes the relationship between formal and informal learning. The findings on how individuals learn (through activities) are more context-dependent, as some activities are purely work-related; but similarities or proxies for the activities can often be found in non-work settings.

While the research findings about informal learning can be applied generally to firms and workforce preparation and development programs, the context in which

the findings are applied will vary in each case. Because our findings about the context in which informal learning occurs are so significant and central to our study, the universals that we discovered about informal learning must be viewed through the context and culture of each organization in order to maximize informal learning. Because each organization's context and culture are unique, the way each organization implements recommendations will vary. We cannot prescribe a simple "cookie-cutter" approach to maximizing informal learning. We can, however, provide the research findings and offer the implications thereof, but these must be understood within an organization's context and culture.

This implications section aims to address a number of customer groups that are each involved with workforce preparation or development including firms, the K-12 system, community and technical colleges, and economic development organizations. In most cases, we have tried to indicate implications for each group and for each finding, if appropriate. In some cases, the implications will be somewhat duplicative. While the implications sections are targeted to certain customer groups, we do not suggest that these groups do their work in isolation. We see these groups as completely interconnected and dependent on each other for various services and products. Our point in writing separate implications sections was to show how the findings could be adapted to various organizations and individuals and have a major impact on each. We encourage firms, employees, schools, colleges, and economic development agencies to work together in both their own domains and as partners to create their own teaching firms.

We would also like to say a word about informal learning as it relates to formal learning. In the discussion about formal and informal learning, we do not make value judgments about which should take precedence in certain cases. Rather, we urge educators and trainers to develop an understanding of what informal learning can contribute to the formal learning process, and of the amount of learning that occurs informally. In some cases, educators have been using non-formal methods of learning embedded in formal classroom learning, such as teaming, and we believe these are positive steps. However, our findings suggest that schools and colleges and firms need to have a stronger sense of what individuals learn informally, how they learn informally, what promotes informal learning, and, perhaps most importantly, how to best use and integrate formal and informal learning to the benefit of the learner.

Informal learning is not a replacement for academic, basic, or technical knowledge and skills: it is only a way of learning. We recognize that much knowledge, especially for children in the K-12 system, must be imparted formally in order for those students to master basic and required academic skills necessary for further learning. We believe our work in understanding informal learning will provide educators with new strategies to teach all children and learners to their highest potential. Whether teachers use formal or informal strategies, students and learners still must master the basics and achieve a sound academic foundation.

IMPLICATIONS FOR FIRMS

Recently the business press has placed a considerable amount of attention on the need for innovation and the creation of knowledge in organizations of all sizes. Because the Teaching Firm research reveals the dynamics of individual learning in the workplace, these findings are a key piece of the puzzle in creating organizations that can learn, innovate, and encourage knowledge development. In addition, the research findings indicate practices of a *Teaching Firm*: practices which organizations striving to reach the *Teaching Firm* ideal can use to accelerate productive learning in their own workplaces, in those of their customers and suppliers, and in the educational institutions which provide training to existing and future workers.

The first main finding in the research serves as the foundation for the rest of the findings: Most learning in organizations occurs informally. This finding highlights a predominant method for learning in organizations and enables firms to begin to harness the power of this learning. It also provides firms with a platform for discussions with educators as they collaborate in developing future and current workers. The other findings detail how and where informal learning occurs, what is learned, and what cultural factors hinder or propagate this naturally occurring asset. This empirical support of the high incidence of informal learning gives business leaders the evidence to expand their model of employee development. In addition, the findings provide evidence that informal learning has a positive impact on key operational profitability levers such as productivity, cycle time, and error rates.

Considered together, the findings imply two important notions that give business leaders at every level of the organization access to maneuvering those profitability levers. First, informal learning can be influenced. It is occurring virtually all of the time; because we know why it occurs and what direct and contextual factors affect it, we can create opportunities for it to occur as well as remove its obstacles. Secondly, this research tells us which skills are learned in each specific daily work activity. This means that when a particular skill is lacking in an organization, we know which activities, if properly incorporated into daily work, will provide a forum for learning that skill.

This section is written for operational managers, small enterprise leaders, human resource, training, and organizational development professionals, as well as for union leaders. Each key research finding is revisited along with implications for each of these audiences, as well as the specific implications for individual employees. The implications under each subheading such as "human resources", "training", etc., will be relevant for members of each 'field' and for any manager or employee who is responsible for that particular function. For example, in small firms, line managers and team leaders are often responsible for employee recruitment and selection.

Finding 2: Informal learning happens in the pursuit of larger organizational goals and individual goals.

The next major research finding is that informal learning happens in the pursuit of larger organizational goals and individual goals and that the learning is most productive for firms when these goals are aligned. The research identifies key organizational goals and individual goals, and it found that alignment of these two types of goals is facilitated when the organization shows genuine sensitivity to employee goals and provides employees with a deep enough understanding of organizational goals that they can integrate them as their own.

Implications

Whether in small enterprises or in large organizations, this finding highlights learning as a benefit to clear, well-communicated organizational goals, as well as to translating these goals to a level that is practical and meaningful for individual employees. This also provides empirical evidence for the value to the organization of considering the personal goals of employees, and creating opportunities for employees to meet their own goals while pursuing organizational goals. The alignment of goals is one method to enhancing the learning occurring in the organization and increasing the relevance of that learning to the organization.

Operational or Line Managers

For hands-on managers this finding provides leverage in enhancing learning within their work unit, whether it be a large department or a small work group, and opens up an avenue for discussion with employees. This finding underlines the imperative for managers to create systems which allow employees to develop a deep understanding of organizational goals. As business becomes more demanding, and job requirements of workers at all levels expand, managers must develop their own skill in challenging workers at an appropriate level, in creating an environment in which individual needs can be met, and in coaching employees through the transition to expanded job responsibilities.

This finding enables line managers to address situations in which the informal learning that is occurring in his or her work group is not productive to the organization. For example, if there is an informal consensus within a group to restrict production, and this agreement is reinforced by the need of the group members to belong to a social group, the manager could appeal to other individual needs, such as needs for personal achievement and development.

Human Resources

The organizational goals identified reflect trends in job definition occurring in high-performance organizations. Fortunately, a natural match exists between these organizational goals and the individual's need for development, achievement, recognition, and acceptance. Despite this natural match, it is important that in the process of expanding job definitions care is taken to create a gap between the

employee's current skill level and the new required skill level, to ensure that the gap is challenging without being unachievable. While the need to strike this balance is universal, the appropriate gap size is different for every individual. If the gap is too small or too large, the individual's need for recognition, achievement, and development will be unmet and the person will instead be discouraged and frustrated.

Altering job responsibilities by increasing front-line worker responsibility for quality, productivity, and problem solving entails significant considerations for individual goals to be met. As front-line worker responsibilities increase, supervisory responsibility decreases. This creates a possible threat to the supervisor's sense of accomplishment and feeling of being recognized. If, however, the supervisor understands the larger picture and the rationale behind the change in organizational structure, that understanding might provide some satisfaction when the supervisor recognizes his or her contribution to a larger endeavor and realizes the sense of accomplishment from overcoming the challenge of dealing with this role change. Also, requiring employees to increase responsibilities and skills necessitates an accompanying alteration of incentives, reward and recognition systems.

Recruitment and selection methods can be adjusted to communicate the organization's culture and to screen for people who already have the skills to perform well in a high-performance setting. Though it is not always possible or necessary to hire employees who are already skilled, the selection process offers an opportunity to communicate the culture, ensuring that the newly hired employee understands what will be required of him or her. Including simulation and assessment in the screening process, for example, could give candidates a sense of culture.

Organizations can demonstrate their interest in individual goals by creating, communicating, and offering people varied career paths. Allowing the organization to be flexible enough to facilitate employee movement from one functional area to another is a powerful way to support employee goals.

Organizational Development

Given the emphasis on teams, quality, and effective communication, organizational development staff should be prepared for an increased demand for team-building initiatives, total quality process facilitation, and communication improvement interventions. Although participants in these initiatives will have the opportunity to learn informally from one another in the absence of an outside facilitator, an expert facilitator can model effective approaches and introduce relevant team, quality, and communication principles at appropriate times during regularly scheduled meetings.

As advisors in the development of company-wide messages, organizational development professionals should examine what gets communicated about

organizational goals, how that is translated to individual goals, and what level of management support for and interest in individual goals exists. When reviewing these corporate communication materials, the question is, What is being communicated both directly and indirectly?

Converting organizational goals into individual goals that are relevant to the daily work activities of all employees is a process that organizational development can create. An effective approach to this in one organization that we studied was the use of metrics. This firm developed three key metrics that are applied in every aspect of its business and that powerfully communicate the organization's goals to every individual. Whether or not organization-wide metrics are used, a method for individuals to understand organizational goals and apply them to their own work is essential.

Without alignment of organizational and individual goals, clear communication of organizational goals, and demonstrated management sensitivity to individual goals, informal learning will occur but may not be productive to the firm. Efforts made to affect informal learning without attending to these factors may significantly reduce those efforts' impacts.

Training
Formal training must support informal learning efforts and vice versa to prepare people to succeed in their job in order to meet their own needs as well as the needs of an expanded job. Here the taxonomies are useful in support of activities that will provide the learning content employees need for expanded job responsibilities. It is also useful for training staff to make resources available to employees on an ad hoc basis to support them in meeting individual needs for achievement and development.

Individuals
This finding provides employees the opportunity to pursue their own goals within the organization and to garner the support of managers in that pursuit. This makes a case that employees can use to present management with career path plans or approaches to work that will meet individual needs as well as those of the organization.

Unions
In the past, unions have resisted expansion in job responsibilities and have protected members by avoiding increases in responsibility without commensurate pay. In recent years the relationship between management and unions has in many instances evolved from an adversarial one to a partnership based on common goals. The implications of this finding will be a function of the type of relationship that exists between the union leadership and management. This finding would provide a useful backdrop for discussion between union leadership and membership in creating opportunities to meet individual needs, or in discussion between

management and union representatives. In a less progressive atmosphere, this finding could increase tension.

Finding 3: Informal learning occurs in everyday work activities.
The research focused on activities in which employees are engaged when informal learning occurs. During these activities, employees develop skills and construct information through participating and through actively testing ideas. For each key activity, the research identified specific, direct factors affecting the activity and informal learning in it.

Implications
A teaching firm is an "environment in which teaching and learning are institutionally and culturally embedded in the organization" and as companies strive to create this type of environment, this finding provides the opportunity to adjust work practices to include key activities where learning is now known to occur. By highlighting those factors which directly affect the learning occurring during these activities, this finding gives companies the power to manage those factors, thereby influencing the learning directly.

Operational or Line Managers
Managers can use this knowledge as a way to encourage informal learning by integrating the activities into employees' daily work. This integration of new activities must be grounded in organizational goals, or learning will not occur, and employees are likely to be frustrated.

Managers strongly influence the direct factors affecting informal learning and this empowers them to have an impact on cycle time, error rates, and productivity. For example, two direct factors that affect informal learning in cross-training initiatives, are whether or not sufficient time exists to learn and reflect on new skills and whether or not workers have access to support resources, such as manuals. A manager can create the environment within his or her span of influence where employees are confident that taking time to reflect is a legitimate activity. In addition, managers can provide access to relevant resources so that employees can follow-up after participating in formal training.

Human Resources
Those involved in recruitment and selection may consider integrating a simulation and assessment approach to identify applicants who have the skills to be effective in these activities, as well as skills they can contribute to other employees.

Reward and incentive structures need to recognize learning that occurs in these activities. Employees who work extra time during a shift change to facilitate learning and improve production processes, for example, need to be acknowledged and recognized accordingly.

Organizational Development

An organization's culture must facilitate employee participation in key informal learning activities. The findings reveal differences between formal and informal learning—for instance, that formal learning is always scheduled, whereas informal learning arises spontaneously. To support spontaneous occurrence of these activities, cultural messages need to reflect that the activities are accepted as legitimate. One way to ensure that this point is communicated is to build in the time and physical space for informal exchanges to occur, such as creating a specific meeting area for shift changes to allow for the formal changeover of operations and the informal exchange of ideas.

Another imperative for organizational development staff is to scrutinize the work environment to assess the impact of the direct factors influencing each informal learning activity. Such an investigation will ensure that the appropriate experiences are available to workers and that barriers to participation are removed wherever possible.

Training

It is important to investigate learning needs from the perspective of the learners in order to fully assess their needs and preferred style of learning. With that information, trainers can match learning styles with learning methods, and this hierarchy of learning activities gives trainers a new menu of activities to meet learning needs in and out of the classroom. Some learners may be most effective in a formal training setting; others may prefer the opportunity to see the skill being demonstrated in its natural setting. Knowing the daily activities that are most fruitful for informal learning gives trainers a new set of tools to integrate into the design of formal training. One of the challenges in delivering classroom training in organizations, for example, is that to be cost-effective, it must appeal to a wide range of employees who may have varying levels of preexisting knowledge regarding the topic. When presenting a course on the use of a particular software application, the trainer could match expert computer users with novice computer users and create in-class mentoring relationships that could be continued outside the classroom.

In addition, training professionals as well as managers who recognize the need for learning to occur in close proximity—in both time and space—to the application of the skill or knowledge have a new approach to creating timely learning opportunities. With these daily activities, employees can learn what they need to when they need to, when properly supported to pursue the learning.

An important caution here: For critical information that is specific and must be learned consistently by all employees, formal training methods are best, because they allow for a consistent message to be delivered by only a few trainers. An excellent example of this is safety information.

Individuals
Knowing these daily learning activities as well as the factors that directly affect the informal learning, gives employees some power in creating learning opportunities. Employees who are interested in maximizing their own learning can seek out participation in the activities richest in informal learning. For example, if there is a task force formed to address a particular quality issue in the plant, an employee could volunteer for that assignment for the opportunity to participate in meetings. In addition, employees could influence the factors affecting informal learning. For example, an employee, regardless of position, could encourage active participation of all group members in a meeting, thereby influencing one of the direct factors affecting informal learning in meetings.

Unions
The implications for this finding are also a function of the union-management relationship. In a more adversarial relationship, where increased knowledge is not rewarded, an activity like exploration will not occur, or where cross-training initiatives are discouraged to ensure job security, this finding will be difficult to capitalize on. Conversely, in a more collaborative relationship this finding indicates that due to the increased learning and knowledge in the organization that those activities may result in benefits for both the individual and the organization.

Finding 4: The amount and quality of learning within an organization are greatly impacted by the context or the environment in which the learning occurs.

The same activity occurring in different organizations will yield different learning results, because the context for an activity is different. Three categories of contextual factors emerged at the organizational level, and four at the individual level. Without attending to the context for informal learning, activities known to have vast learning potential may not yield informal learning.

A strong determinant of individuals' receptivity to learning is the degree to which the culture as experienced by employees matches the culture as presented by management: The better the match, the more receptive employees are to learning.

Implications
This finding highlights powerful organizational levers which will enable firms to create a teaching-firm environment. Adjustments can be made to the culture that will appropriately frame and provide a supportive environment for quality, productive learning in the organization. In small enterprises these powerful levers give managers the power to encourage learning, without needing to create internal formal training programs.

In larger organizations where the organizational development, training and overall management functions are housed in very separate parts of the organizations, this finding suggests a new way of working together towards shared goals. Specifically,

work on the culture and the environment has traditionally been the domain of organizational development experts; context, the province of senior managers; and skills development, the concern of trainers. The importance attending to all three: culture, context, and skills development in concert will require a new, cross-disciplinary approach. All three disciplines will need to align their practices to enhance the productivity of informal learning for the firm.

Operational and Line Managers

An employee's manager is the most salient interface between the worker and the overall management culture of the company, and therefore has a huge opportunity to create the culture and therefore enhance informal learning. He or she is often responsible for communicating the sanctioned policies and practices of the company, and at the same time plays a prominent role in creating the "local" culture in a work group. Much of an employee's experience of the organization is often based on interaction with his or her direct manager. Along with direct communication, managers need to be aware that at every moment they are modeling the organization's culture. This gives the manager a great deal of power in influencing the informal learning occurring in his or her work group.

Managers can also play a crucial role in communicating information about company goals, product information, and industry information, which are all part of the context or backdrop that informal learning is set against to determine its productivity in the organization. In addition, managers are key in coaching and assisting employees in translating organization-wide goals into something meaningful for the individual employee.

In larger organizations where line managers are often removed from strategic organizational development initiatives, it will be essential for managers to be closely involved in the cultural assessment and ensure that questions are focused on their specific work group. In smaller organizations, managers can conduct the cultural assessment themselves or engage in informal discussions with employees to assess the employees' cultural experience. In asking employees for their opinions about the organization, and their experience of the organizational culture it is often useful to utilize an outside consultant or some one to whom employees feel free to reveal their true thoughts.

Human Resources

The incentive structure of the organization needs to be designed to value the skills developed through both informal learning and participating in activities that yield informal learning. Given the need for substantial overlap between culture as presented and culture as experienced, having the incentive structure be in line with the values communicated is a concrete way to "walk the talk." The challenge for human resource professionals may be in rallying the support of senior management. Providing financial or time-off benefits for developing skills or for participating in learning activities would demonstrate an organization's commitment to learning.

In the recruitment and selection process, aspects of the culture get communicated to potential employees. It makes sense to review recruitment and selection practices and procedures, to ensure that the culture is being properly communicated to new employees. Human resource professionals would also explore with prospective employees the impact of industry factors. If the company is in a growth industry, for example, and therefore high demands are placed on the employee to learn quickly, individuals with an aptitude for and interest in fast-paced learning would be appropriate for the organization.

Organizational Development

This finding has enormous implications for organizational development efforts. Each aspect of the company culture and context has a wide range of ways that organizational development professionals can work with managers and employees to affect. This finding calls for assessing the relationship between culture as presented and culture as experienced, followed by adjustments of the formal policies and procedures or interventions to facilitate change in the culture as experienced.

Any company documentation regarding corporate policies and practices should be reviewed. Special attention to company-wide literature, as well as any documented policies that apply to system members, should be included in the review. The recognition and reward system should also be reviewed. Other needed data that can be gathered from existing records are workforce demographics—age, gender, tenure, years of experience, and so on— and information about the state of the market of the industry and the products.

It is also essential to gather data from employees. Such data should include employees' views of social norms (work habits, trust level, competitiveness, cooperation, morale, etc.) employees' perceptions about the official policies, practices, and reward system and about the leadership style of managers; employees' perceptions of the discrepancy between culture as presented and as experienced; and employees' views of management's interest in their individual goals. An assessment is needed too of employees' understanding of what company and group goals are and of how their work fits into the overall work of the organization. Data about job security are needed as well.

Once data are analyzed and the disparity between culture as presented and culture as experienced is identified, adjustments in systems, communication methods, leadership style, and so forth can be made to facilitate a closer match between the two versions of the culture. Consistently striving to create the kind of culture that, as experienced, supports informal learning should be a fundamental goal.

Also in the realm of organizational development is the use of space in the organization, something that is often not changed to line up with new company

values or practices. Periodic assessment of the physical layout of work to ensure a logical relationship between layout and organizational values would affect this.

Training
The key for trainers is to be highly conscious, in training design and delivery, to what is being communicated in the informal sense about the organization and its culture. Moreover, trainers will need to understand the "hidden curriculum" embedded in the activities where informal learning is most present. Understanding this curriculum will help trainers to better align formal courseware with informal learning experiences and ultimately to design them into the training process. Trainers should reflect periodically on questions such as these: What do the examples used in training communicate about the organization? Do training sessions start on time? What gets communicated to trainees about how the course evaluation will be used, and what does that communicate about the organization? Does the design of a course communicate an expert-driven model or does it encourage participants to actively train themselves? What does the content communicate?

Individuals
Although managers play a large role in creating the culture of the organization as well as communicating the official policies and practices, and overall goals of the organization, each individual plays a part in creating the culture of the organization. Workers who are interested in creating learning opportunities and developing themselves for lifelong employability can use this finding to examine the role they are playing in creating the "local culture" of the workplace. In addition, in those areas where they see discrepancies between the culture as presented and the culture as is, this empirical data can be used as a foundation for discussion with managers about narrowing the gap.

Unions
The type of union relationship that exists will greatly influence the culture and context of the organization. As with other findings, this finding could influence how management and unions work together in cases where they see themselves as sharing common goals.

Finding 5: Informal and formal learning augment each other and interact synergistically.

Researchers found that informal and formal learning augment each other and interact synergistically. Formal learning and informal learning occur simultaneously and exist along a continuum. Factors that influence the effectiveness of a learning event are the relevance of what is learned to the employee's responsibilities, the gap between current and target knowledge, and the timing of learning in relation to the task.

Implications

This powerful relationship between formal and informal learning provides firms with a rationale for developing mutually beneficial relationships with external training providers, such as K-12 and community and technical colleges. Blurring the boundary between school and work, without jeopardizing the integrity of either system, would enable both companies and educational institutions to maximize the learning potential for the current and future workforce. This type of relationship, where individuals are life-long learners through both work and school, provides far-reaching, long-term access to firms creating themselves as teaching firms.

Organizational Development, Operational and Line Managers

This finding shows organizational development professionals and managers an opportunity to enhance learning in their organizations by creating a culture where time and space are available for employees to participate in (1) informal learning in conjunction with formal training and (2) formal training to support their informal learning efforts.

Training

The role of the training function, whether it sits with a training department in a larger organization or with line managers in smaller organizations, could become more oriented towards coordinating a wide palette of options for employee learning opportunities. Given this dynamic between formal and informal learning there is the opportunity to manage employee development through a continuous cycle from school to work and work to school, and from daily activities to formal training within the organization itself.

For the specific function of providing formal training within the organization, using the taxonomies to inform training design would allow trainers to build informal learning opportunities into formal training sessions. Because of temporal dynamics trainers should encourage managers to add structure to ensure opportunity for informal learning after a formal training session. Trainers could, for example, set up short-term mentoring relationships between participants, or between classroom participants and experts in their own work groups; Web-based chatrooms on classroom topics could be set up or a physical meeting time could be established for training participants after they have had the opportunity to experiment with what they have learned; and exploration time could be built into participants' schedules when they return to work.

Individuals

Understanding this dynamic would allow individuals to be very intentional about their own training, education, and career development. This finding gives employees the opportunities to seek out informal learning activities following formal training and to take advantage of formal training offered within the organization or in partnering educational institutions to augment their informal learning.

Finding 6: Workers develop skills when performing daily activities, and these skills are clustered in four dimensions: pragmatic, intrapersonal, interpersonal, and cultural.

The course that skill development takes is across a spectrum from inexperience to maturity and from competence to expertise. Learning and development in one dimension do not necessarily yield learning and development in other dimensions. Learning at the broad level transfers more readily to the specific level than vice versa.

Implications

In the effort to move towards the teaching firm ideal this finding provides a whole context for skill development and a fresh perspective on skills needed in the workplace. This finding will be particularly useful in discussions between company representatives and educational system members. This skill classification will give those working toward preparing and maintaining workers to be appropriately skilled for the demands of the day, a way to evaluate the gap between where learners are, and where they need to be.

Operational and Line Managers

Managers can play a vital role in coaching employees in the development of these skills. Creating an environment where informal learning can occur to facilitate the development of these skills, and being available to demonstrate their own skill level in these areas, will provide informal learning opportunity for staff.

Human Resources

This finding and the four dimensions provide a more powerful approach for the performance appraisal of current workers and of individuals who are seeking employment. Having an in-depth, realistic understanding of the company culture, for example, would enable human resource representatives to explore a candidate's existing ability to operate in that culture and would simultaneously communicate information about the culture to prospective employees. Again, integrating simulation and assessment into the interview process would allow candidates to demonstrate skill level in specific dimensions and would give a sense of where development might be needed. Given the transferability of "broader" skills to "narrower" skills, the selection process should screen for applicants with previously developed "broader" skills. This would shorten the time it takes for a new hire to be fully functioning in the organization.

Training

In organizations that have a separate training function, the trainers can conduct assessments, organization wide or in specific work groups, to establish which types of skill development are needed. In partnership with managers, trainers could use the taxonomies to identify which activities would be best to facilitate development of those skills and could devise relevant and appropriate ways to build those activities into daily work life. On the other hand, what is needed may be for trainers

to work with organizational development professionals and managers to remove contextual barriers to learning. Trainers could also work with managers to plan individual development paths for employees based on these key skills.

Individuals
Employees can use this skill classification as a navigational chart to plan their own growth and development. A worker can use the skills and their definitions to conduct a formal or informal self-assessment of their development needs. They could also engage co-workers and supervisors in the skill assessment. Armed with an understanding of development needs, an employee can pursue informal and formal methods of developing the needed skills.

Finding 7: Through the formal-informal learning dynamics of school-to-career programs, students learn how to apply academic knowledge to workplace settings and gain greater respect for and facility in the types of learning required by the workplace.
This finding demonstrates part of the value that can be reaped when a firm's movement toward the teaching firm ideal is expanded to include providing opportunities for students to learn informally in a workplace. Given the scope and potential of the school-to-career movement, it is critical that greater numbers of employers participate by offering teachers and youth apprenticeships, internships or other forms of direct work-based learning. Currently, unless employers experience employee shortages they do not recognize the strong business reasons for preparing youth and teachers in the setting of their own workplace. The findings demonstrate that high-performance companies benefit from having a culture and work activities that support informal learning. It is in the interest of schools, teachers, and youth that the learning which occurs in workplaces supports informal learning. This shared agenda between firms and schools should facilitate firms' participation in school-to- career programs; it should also stimulate policymakers to encourage businesses to create powerful learning environments for their employees and school-to-career participants.

Taxonomies
The taxonomies combine the findings and show the relationships between key findings.

The five sets of taxonomies show the following:

- Each informal learning activity, what skills and knowledge are learned, by whom, and what direct and contextual factors influence each activity
- The degree to which identified skills in the four dimensions can be learned in each informal learning activity (e.g., high, moderate, low)
- Each set of skills, types of activities where they can be learned, and occasions within those activities where the skills might be learned
- Each contextual factor and the degree of its impact on informal learning

- Each learning activity and the degree to which each contextual factor influences the effectiveness of informal learning in that activity

Implications

These taxonomies organize the findings in such a way that they can be used by all organizational members. Once a fundamental understanding of the findings is in place, the taxonomies are powerful, easy-access tools for creating cultural and skills assessments and for designing ways to influence the culture and incorporate the 13 key informal learning activities into daily work activities to address skill and knowledge deficits.

Conclusion

These findings create the opportunity for all people in organizations to enhance individual learning thereby creating knowledge and developing skills, naturally in the course of daily work, while pursuing organizational goals. By effectively monitoring and adapting organizational culture and by managing the flow of training between formal and informal, organizations have a strategy for developing themselves as teaching firms. This research adds focus to the vision for increasing the mutual benefit for schools and firms collaborating in the development of future and current workers.

The creation of a culture of teaching and learning in an organization provides benefits to individuals, operational and line managers, trainers, organizational development and human resource professionals. It does this by providing each of those groups more power in effectively conducting their work. Through improved learning individuals can get their personal needs met. Operational and line managers see an increase in the number of levers that they can operate to improve their work groups productivity, cycle time and reduce quality issues. Trainers and organizational development professionals have a wider array of options for producing their desired results. Those responsible for the human resource function are given insight into possible approaches to increase their impact on organizational effectiveness by adjusting recruitment and selection practices as well as by managing the incentive structure and review process to support learning in the organization. Smaller firms have a powerful new way to provide learning opportunities without having to provide resources from a limited pool for formal training. For the company as a whole, conventional knowledge indicates that increased learning will improve organizational flexibility and sustainability, and this research shows that key profitability levers such productivity, cycle time, and error rates are impacted positively through greater informal learning.

IMPLICATIONS FOR K–12 EDUCATION

Introduction

Workplace structures and practices have changed dramatically to remain competitive in the global economy of the Information Age. High performance workplaces and learning organizations demand significantly different skill sets than traditional organizations, and work expectations have changed dramatically. In contrast to the changes in other work organizations over the same time period, public schools are one of the few organizations that have not significantly changed as work environments. Developed and implemented to meet the workforce needs of the first quarter of the 20th century, the organizational structures and instructional practices of most schools today are based on educating industrial age workers rather than information age workers. Creating classrooms for students to develop 21st century skills and knowledge will require a dramatic evolution of teaching practices. The Teaching Firm investigated informal learning at high performance work organizations. While recognizing that schools are in many ways significantly different from the companies studied, we believe the Teaching Firm findings can significantly impact schools and their effectiveness. Teaching Firm findings can help schools create the conditions teachers need to provide the kinds of teaching and learning students will need for the 21st century. In addition, the Teaching Firm taxonomy can identify school-based organizational structures and practices which promote or discourage teacher and student learning.

This narrative describes some of the constraints on informal learning that are present in the majority of American schools for teachers in their workplaces, as well as for students. However, we also attempt to show examples of best practices, drawn either from EDC's extensive experience or from research.

Finding 1: Most learning in organizations occurs informally

The research demonstrates that the majority of informal learning occurs in the course of the routine social and individual work activities through which employees interact, share resources, and perform their jobs.

Implications

Our educational system relies heavily on formal curriculum and instructional strategies. Schooling is highly structured in both process and goals. Many educators believe that individuals learn best through these formal structures. While many individuals are successful in learning through formalized classes, learning could be greatly enhanced by using informal teaching and learning methods, along with formal methods.

This finding provides the rationale for introducing new teaching methodologies and learning opportunities into classroom settings. While there is a significant movement for reform underway, informal learning has received little attention.

Allowing students to participate in informal learning can help them understand the connections between theory and practice. Informal learning can be a way to expose students to life outside the classroom and also allow them to develop the types of skills required by high performance work organizations.

Teachers tend to work alone in their classroom. Unlike the employees in the study, teachers generally do not have opportunities to participate in the activities that have been documented as ripe for informal learning.

Best Practice
This finding suggests that much more on-the-job learning could be utilized by teachers. A powerful strategy that some schools are using is called "action research." Here teachers get together in small groups to identify a specific problem or focus area that they want to study. Action research follows a structure and process designed by the teachers themselves, and in that sense, is informal learning. Most importantly, it is a key strategy for helping teachers move toward reflective collaboration.

Finding 2: Informal learning happens in the pursuit of larger organizational goals and individual goals, and occurs best when goals are aligned.
The research found that a strong alignment between clearly understood organizational goals and the individual goals of employees enhanced informal learning. It found that this alignment is facilitated by an organization's demonstrating genuine sensitivity to employee goals and providing employees with a deep enough understanding of organizational goals to integrate them as their own.

Implications
Research has demonstrated a correlation between the expectation that schools and teachers have of students and students' achievement. Students in schools in which high expectations are constantly reinforced, outperform their peers in less demanding schools. For optimal benefit to students, schools should organize themselves around supporting their students' individual performance.

Best Practice
A number of school districts around the country participate in EDC's ATLAS Communities Project, where a group of school districts commit to the goal of creating authentic communities of practice around teaching, learning and assessment. Participating schools exhibit a strong culture of collaboration and ongoing opportunities for experimentation and reflection with peers.

In the ATLAS Communities Project one major change strategy is to assign all teachers in a school to study groups. We have found that teams, whether interdisciplinary, departmental, within grade or across grade levels, help promote

continuous improvement in teaching and learning. The most important thing is for teachers to meet regularly to discuss their practice and its impact on student work and performance.

Similarly, other large schools have divided themselves into largely self-contained "schools-within-schools," of approximately 200 to 400. Some schools have replaced traditional "home room" period with "family-group" in which students and their teacher share experiences, perspectives, and concerns. A key assumption underlying these practices is that smaller communities where teachers can know each other and their students better will contribute to a greater sense of shared enterprise for all.

Finding 3: Informal learning occurs in everyday work activities.
While conducting their daily work, employees develop skills and construct information through participating and through actively testing ideas. For each key activity, the research identified specific, direct factors affecting the activity and therefore informal learning.

Implications

Teaming

Comparative studies reveal that teachers in the United States have more teacher-student contact than occurs in most other developed nations. While many education reformers call for lower teacher-student ratios and more contact time, other nations place the priority on the importance of teachers working together in teams. These teams enhance knowledge and practice, design curricula, engage in joint planning, reflect on their students' progress, and otherwise focus on school improvement.

In reality, teachers in the United States spend the majority of their day in isolation from colleagues. Typical routine activities include counseling individual students, preparing lessons, and grading performance. Teachers have fewer opportunities than employees in the study firms to *routinely* partner with colleagues.

The hierarchy and structure of the school limit interaction between teachers. Schedules are tight and teachers seldom have free periods scheduled at the same time as their colleagues. This precludes many opportunities to create the kind of flexible, cross-functional problem-solving teams (with the accompanying learning opportunities) that characterize the teaching firms in the study.

Classrooms can also be structured so that students may benefit from the informal learning opportunities associated with teaming. Cooperative learning strategies are one way to promote informal learning in the classroom.

Meetings

Faculty meetings and in-service planning days are the exception rather than the rule in a teacher's routine work life. They are held intermittently rather than on a routine

basis. The meetings that do occur are frequently a forum for administrators to dispense information. They may seek comment on solutions to problems they have developed or decisions they have made in the course of their own workdays. These are not the kinds of action-oriented meetings described in the study.

When teachers find ways to have their students work in groups they are structuring their classroom to take advantage of informal learning. Much of this occurs in extra-curricular activities. Extra curricular activities provide rich opportunity for informal learning for many students. Allowing students to attend meetings, would provide additional opportunities for informal learning about the governance of the education system.

Best Practice
Regularly scheduled staff meetings can provide informal learning opportunities if these meetings are used to share ideas and information, to showcase effective practices, to engage in discussion around a shared text or to explore common issues or concerns. Other opportunities for informal learning can occur on in-service days, or when teachers design curriculum units, examine data as a guide to decision making, or scrutinize student work.

Customer Interactions
Schools are responsible to multiple stakeholders, including parents, taxpayers, communities, students, colleges, and businesses. The school's relationship with parents seldom provides a genuine opportunity for collaboration and learning. Typical interactions tend to be formal affairs (Back to School Night), unrelated to the school's major work (social events, fund-raisers), threatening (disciplinary conferences), or even adversarial (student placement disputes). Many teachers don't frequently interact with the business world. The school-to-career section of the research highlights the benefits of such exposure. By visiting workplaces, teachers learned things that motivated them to change curriculum or teaching methods. More of this type of interaction needs to be encouraged. For students, opportunities to deal with workplaces during school years would be a way to learn certain skills highly desired by the work world. Students can learn about customer-supplier relationships by working in school facilities, such as the cafeteria or front office. Teachers can invite employers to school to discuss the skills they need in the various aspects of jobs.

Best Practice
Many schools are beginning to explore more ways for parents and others in the community to be actively involved. Parents are often enlisted as volunteers and mentors, working with students at home, in school, and in the community. In addition to helping students with academic learning, they can set up "cognitive apprenticeships" in the classroom, at the work site, or in the community. Artists-in-residence, for example, can model what it means to be a painter or sculptor. Alternatively students can volunteer in local cultural organizations.

In addition, involving parents (and other community members) in setting standards is a powerful way of establishing shared expectations and bridging the language of home and school. When business leaders participate in the review of student portfolios or exhibitions, they have a chance to observe students' depths of understanding and skill in communication. Another powerful strategy for engaging both students and parents is student-led, parent-teacher conferences. In schools where students share responsibility for their own learning, they choose what they want to present, structure the parent-teacher conference to showcase their work, and have a chance to reflect with others on their progress.

Supervision

While many traditional supervisory relationships remained in the firms studied, "research indicated a shift of supervisory responsibilities—from the traditional first-line supervisor to the work team leader and team members." (*The Teaching Firm Field Research Report*, p. 63). Schools lag behind in the learning that can be provided by informal supervisory relationships. As stated earlier, teachers are relatively isolated in their classrooms. In the teaching firms, close proximity of supervisors to subordinates was cited as an important contributor to informal learning. In schools, supervision often remains largely a bureaucratic requirement, with a principal or department chair paying a scheduled visit to "observe" the teacher. It is largely a "quality assurance check" on the independence of the teacher to ensure that minimum standards are upheld. The teacher presents a specially prepared lesson and student behavior rises to the occasion (or fails to). A *proforma* follow-up discussion may follow, forms are filled out and filed, and everything goes "back to normal." Supervision seldom takes the form of a continuous or frequent informal interaction helping both supervisor and employee learn things they need to know to make a shared enterprise more successful.

Best Practice

In some schools, principals visit classrooms regularly. In fact, the "walk-through" is seen as a significant aspect of professional development for both supervisors and teachers. Supervisors and teachers work hard to develop a common understanding of what is expected. They spend time together exploring the principles of learning and ways in which these would be exemplified in practice. After the visit, the supervisor shares his or her impressions in a timely manner, in a spirit of critical collegiality. Based on such visits, teachers may identify individual goals and a set of next steps for continuous improvement. And supervisors may identify global issues that warrant school-wide attention. In this way, supervision is closely linked to professional development and centers on the primary mission of the school: teaching and learning.

Mentoring

Again, the structure of the school day provides challenges for teachers seeking mentoring relationships with colleagues. As mentoring is not embedded in the daily

work of teachers, it can only be conducted through conversation, shared reading, conference attendance, and the special efforts of the teachers themselves.

Schools do, however, provide many opportunities for adults to mentor students. These often become powerful vehicles for learning—both formal and informal. Examples include athletics, performing arts, and community service. In many schools, non-teaching staff serve as role models and mentors to students.

A serious problem facing schools today is high turnover among new teachers. As our teaching force matures and prepares for retirement, increasing numbers of new teachers must be prepared. Few of these teachers have much more than teacher education "methods" classes and a semester of student teaching before being asked to manage their own classrooms. We might rethink teacher preparation so that novice teachers have a full year of close supervision as part of training. In addition, we might consider mentoring programs so that beginning teachers have a support system during their first two or three years of professional service.

Best Practice
Example of best practice are schools that use master teachers who coach their peers. These teachers may model effective practice for their counterparts, visit classrooms to observe and give feedback, and otherwise encourage experimentation and reflection. Research suggests that peer support is one of the most powerful strategies for ongoing professional development among teachers.

Cross-training and On-the-Job Training
At one company, the phrase "go where the work is" described a source of informal learning. All associates wanted to be prepared to deal with problems wherever they occurred. Experimentation, and the opportunity to learn from mistakes are hallmarks of on-the-job training. The structure of the school day, however, provides scant opportunity for either formal or informal on-the-job training. The structure and organization of schools can limit the opportunities for schools and teachers to experiment. Thus, the horizon for being creative or field-testing a new idea is restricted.

Related to the concept of cross training, students could help each other learn certain skills and knowledge by sharing and teaching in controlled circumstances. Older students tutoring younger students has been shown to have positive effects on both groups.

Best Practice
Many middle-grades schools are now designed around interdisciplinary teams of teachers who work together to design interdisciplinary units, monitor student progress, and provide links to parents and the community at large. Also, inclusion of students with special needs in the regular education classroom provides schools a

unique opportunity for collaboration and cross-functional training between classroom and special education teachers, ESL teachers, etc.

Documentation
Documentation is another activity that offers high potential for informal learning. For example, "employees at all seven companies routinely documented their work in written form"(*The Teaching Firm Field Research Report*, EDC, Nov. 1997).

Best Practice
One informal learning strategy that has been used to good effect is teacher journal writing. In this, teachers spend a few minutes at the end of each day reflecting on their own practice and its impact on students. Another such strategy is the use of teacher portfolios. As in the case of artist portfolios, teachers make choices about what they want to showcase. This is a key requirement for teachers who wish to be certified by the National Board for Professional Teaching Standards. Teachers must submit portfolios that showcase lesson plans, videos of their performance, samples of student work, and reflections on that work. What makes this certification process so powerful is that teachers must not only provide evidence of their knowledge but also reflect on it.

Execution of One's Job
Like employees anywhere, most teachers would report that the daily conduct of their jobs helps them learn job-specific skills, meet deadlines, manage stress, and develop critical thinking skills. As in the firms studied, the extent to which this occurs will vary depending on level of motivation, management support, empowerment, the challenge of a task, and the level of individual work habits.

Site Visits
As stated above, teachers have few opportunities to visit businesses. They do, however, probably have more opportunities to visit other schools. Research and our own experience reinforce the importance of site visits as a strategy for breaking habits and stimulating change. Visits to innovative schools can give teachers a vision of new possibilities and provides exposure to new colleagues and instructional strategies.

Because teachers do not always have a chance to leave their classrooms, other innovative ways of taking classrooms out of the school may be necessary. Videos, teaching cases, and on-line video tours are just a few ways in which the benefits of visiting other sites can be simulated. What also makes these strategies cost-effective is that they allow multiple individuals to share the same "text." Thus, they can serve as a powerful trigger for discussion.

Finding 4: The amount and quality of learning within an organization are greatly impacted by the context or the environment in which the learning occurs.

A major section of the research report speaks to the influence of contextual factors on the amount and kind of learning that occurs in an organization. The research demonstrates that the same activity occurring in different organizations will yield different learning results, because the context for the activity is different. Contextual factors impact at both the organizational level and with individuals. This finding is the key to the usefulness of the previous findings about where and how informal learning occurs. Without attending to the context for informal learning, activities known to have vast learning potential may not actually yield significant informal learning.

A strong determinant of individuals' receptivity to learning is the degree to which the culture as *experienced* by employees matches the culture as *presented* by management: The better the match, the more productive the learning is to the firm. This is, of course, consistent with the earlier discussion of the importance clarity of purpose and of alignment between organizational and individual goals.

Implications

It must be recognized that the school experience of students is embedded in a larger context. The school's explicit and informal curricula compete with powerful "external curricula" presented by peers, families, community experiences, and the media. In many cases, the messages conveyed by these curriculums contradict those of the school. To be effective, schools and teachers need to find ways to better appreciate the impact of this informal learning on their students.

Without a stronger connection, it should not surprise us that students find school "irrelevant." Students in schools organized around certain principles are likely to experience the school's values as present outside of classrooms as well as inside them. Thus, the culture integrates, at least to a degree, their formal and informal learning. Religious schools site this as part of their advantage. However, it can also be seen in thematically organized "academies," and in secular schools with strong traditions of accomplishment.

The message sent by the incentives in an organization also play a significant role in shaping context. If students are rewarded only for compliance, they are less likely to become creative, bold thinkers. If teachers receive pay increments for graduate courses or professional development credits, they will pursue these rather than participate in curriculum design workshops, action research efforts, or other informal learning activities. Thus, the context can contradict the promotion of informal learning in the workplace.

Challenge

As the report states in reference to firms: "Competition can be a motivator when the challenge is attainable. However, unattainable challenges can be debilitating." To the extent that we rely on teachers to solve society's intractable problems, we set ourselves up for disappointment and our teachers up for disillusionment.

Factors That Affect and Provide the Context for Informal Learning

Schools find it harder than business to align their diverse constituency to their complex mission. Using criteria identified in the research, we can see how wide the discrepancy is:

Education is under fire from many quarters. As with their compatriots in "declining industries," the impact can be for "employees to avoid learning and conquering new territory, [choosing instead] to focus on holding their own ground" (*The Teaching Firm Field Research Report*, 1997.)

The research found that more informal learning occurred when employees identified with the industry and believed it was prestigious. The status of teachers in our society has declined relative to what it once was.

Incentive structures in education tend to reward the results of formal learning more than the results of the kind of informal learning discussed in the report. Similarly, the performance-based recognition that was a high motivator in the study is less available in schools. In addition to the traditional methods of rewarding formal training, schools should explore ways of recognizing teachers for their informal learning as well.

Promotion opportunities are limited within the teaching field, and those that do exist are frequently influenced more by seniority than by merit. Instead of aspiring to be a master teacher, an ambitious educator often follows a career path into administration. Preparation for this necessitates a different kind of informal learning.

The report states that "learning is greatly enhanced when necessary resources are available." (*The Teaching Firm Field Research Report, 1997*). With many schools lacking even the rudimentary materials needed to teach their students, it is not surprising that professional development materials too are in short supply.

Finding 5: Informal and Formal Learning augment each other and interact synergistically.

Formal learning and informal learning occur simultaneously and exist along a continuum. Nothing in the report or in this discussion should be interpreted as minimizing the importance of formal learning in organizations. However, the research shows that numerous factors influence the effectiveness of learning events—whether formal or informal. These include: the relevance of what is learned

to the employee's responsibilities; the gap between current and target knowledge; and the timing of learning in relation to the task confronted.

Implications
This finding opens up several exciting avenues for more intentional use of formal and/or informal learning for students and teachers.

To promote such changes in classrooms at all levels will require teachers to be trained and prepared differently from the way they are now. Schools of education at colleges and universities must take into account the amount of informal learning that occurs and enable teachers to create environments where formal and informal learning can enhance each other. The greatest problem with professional development in schools today is an over reliance on one-shot workshops that are designed and conducted by outside change agents who are unconnected to daily life in the school and do not provide opportunities for in-class modeling, practice or reflection. This disembodied formal training bears little resemblance to the kind of learning community that we see in high performance work organizations.

Our research indicated, for instance, that formal training is appropriate 1) for providing information that is "mission critical" (for schools, the basic academics) and 2) when exposure to abstract concepts of the work/academic area and the larger concepts need to be conveyed. Informal learning—in the form of extracurricular activities, or work-based learning experiences—can be used for developing and teaching people skills, as well as critical thinking, problem solving, and finding and using information.

Finding 6: Workers develop skills when performing daily activities, and these skills are clustered in four different dimensions: pragmatic, intrapersonal, interpersonal, and cultural.
Individuals and organizations develop along a continuum from inexperience to maturity, and from competence to expertise. The research states that informal learning occurs in four dimensions: pragmatic, intrapersonal, interpersonal, and cultural. Learning and development in one dimension do not necessarily yield learning in other dimensions. *Learning at the broad level transfers more readily to the specific level than vice versa.*

Implications
Most educators would quickly note that student learning also occurs in each of these four dimensions. A comprehensive education provides challenges and guidance in each of the four areas. Over-emphasis on a single one (whether insistence on "basic skills," or on a "nurturing environment" that lacks pragmatic rigor) thwarts growth rather than promoting development.

Less self-evident, but more important in its implications, is the finding that broader aspects of learning (cultural and interpersonal) transfer readily into application at more specific levels, while narrowly focused learning is less transferable.

This would seem to reinforce the significance of exposure to a wide range of perspectives, as opposed to the narrow focus of fact-based curricula. It would seem to call for explicit emphasis on critical thinking skills, communication, and group activity. As the research implies, businesses will increasingly identify these as vital competencies for workers. In turn, the development of these skills should also become the part of explicit agenda for schools. A truly "liberal arts" approach (including study in the physical and natural sciences) might best prepare young people for the technologically sophisticated, interactive workplace of the future.

Finding 7: Through the formal-informal learning dynamics of school-to-career programs, students learn how to apply academic knowledge to workplace settings and gain greater respect for and facility in the types of learning required by the workplace.

Implications

In the study's School-to-Career section, both students and teachers provide powerful evidence of the effects that informal learning at work had on their performance in school. Teachers and students in work-based learning experiences cited an increased willingness to try different approaches, a new appreciation of the importance of deadlines, and improved skills for working in teams, and a higher motivation to examine a particular subject more deeply.

The finding about the amount of informal learning that occurs also supports the argument for increasing the amount of work-based learning, where students are placed in actual work situations in which they have opportunities to learn informally. The findings from the school-to-career programs studied as part of our research indicated that students who had informal work-based learning opportunities learned a variety of skills and developed attitudes that are critical to on-the-job success. These included: an understanding that learning can be and often is related to a clear and meaningful goal (as opposed to some students' belief that school has no relation to their current or later life or careers); an understanding of the need for quality and the consequences of compromised quality; critical thinking; and the importance of immediate feedback for learning and improvement. Employers are seeking students with such skills but often complain that these are lacking.

The danger is that school-to-career will be identified as a separate vocational program. It would be most unfortunate if we were to lose the many valuable lessons the initiative has to teach us about the impact informal learning can have in the broader educational setting. School-to-career programs, themselves, and the K-12 system as a whole, could include many more informal learning opportunities,

whether at a work site or in simulated work environments. Classroom activity should be structured for informal interactions—such as teaming, mentoring, pairing students, and using students as teachers—to occur. Physical space of classrooms or schools can be set up to encourage teams of students and greater interaction among students from different classrooms and grades. In these ways, the context and culture of schooling could more closely resemble the context and culture of the modern workplace.

Best Practice: Athletics
Sports provide a model for demonstrating many of the findings of the research. Some of the most readily identifiable informal learning will be found in the athletic department.

Clear mission understood and shared by all. For better or worse, the scoreboard is far less ambiguous than many of the other measures used in schools. Coaches and athletes share the same objective—winning the contest, or at least improving performance. They realize that in athletics, one doesn't grade on a curve, and both teacher and students pass or fail together.

Employees as partners. As in the teaching firm where associates' development is critical to organizational success, coaches know that they can't win without players. They go to great, sometimes extreme, lengths to help their players develop. As one coach once said, "Don't complain about your players; they're the only ones you've got. Coach 'em."

Emphasis on learning rather than teaching. Good coaches instinctively recognize that students have diverse learning styles. They use varied techniques to ensure that they reach all of their students. They use film, chalk talks, and simulations, as well as drills to develop athletes' natural talents and help them "put it all together."

The context for learning. If we follow a good team at practice we will feel the intensity and purpose. We will observe: meetings; mentoring of individuals; discussion of specific performance problems and ways to solve them; posting of performance goals and results; and physical activity as instructions are carried out.

Best Practice: Service Learning
Service learning is a relatively recent innovation in teaching. Many of the findings in *The Teaching Firm Field Research Report* provide endorsement of this approach as a spur to informal learning.

It should be understood that service learning is not the same as community service. By itself, community service can provide many opportunities for informal learning. Service learning, however, goes one step further and combines the informal aspects of community service with formal opportunities for explicitly linking the service to the school's academic mission.

The service objective (working in a soup kitchen, tutoring younger children, organizing for a political cause, cleaning up a polluted stream, etc.) provides the necessary sense of shared challenge for teacher and students. Also conveyed is a clear message to young people that they have value—they can influence their environment.

As with athletics, service projects break students and teachers away from the confines of the classroom and the rigidity of the daily schedule. The opportunities for informal learning that can occur in a school van on the way to or from a service site should not be underestimated.

Students learn to seek out needed information as they become more engaged in the challenge confronting them. Teachers are available to help as guides to information and as interpreters of it. Because most problems are not confined to a particular academic discipline, students learn to think across categories and to use critical thinking skills. This also provides rich opportunities for teachers to collaborate.

The learning aspect of service is consolidated by requiring students to research broader issues related to whatever they are working on, to think critically about the problems that interest them, to document their activity through logs and to reflect on the meaning of what they are doing.

Working together, teachers and students can, for a time, create a small learning community that in significant ways mirrors the firms featured in the research. In turn, the skills developed in these activities are precisely the ones that will pay off in the future, when the student works in a teaching firm.

Conclusion

Educators are justifiably skeptical when business offers prescriptions for education reform. In the past, few of these blueprints have had a lasting impact or been accompanied by the resources necessary for full implementation. Telling schools to be more businesslike is often heard as "Raise your standards; be more punitive of poor performers; put the bottom line first." Educators respond that they are not businesses.

The research provides educators with a picture of how much informal learning is occurring in innovative firms. It posits the notion that teaching and learning for all employees can be embedded in the work of a firm in such a way that, whatever else is being produced, the firm might even be called a Teaching Firm.

Schools might wish to hold these findings up to their own workplace as a mirror. The comments in this paper point to disparities between teaching firms and schools as workplaces. Teachers might look in this mirror and ask policy makers, "Which of these learning practices would improve our workplace if we stressed them?"

Over time, a school that emphasizes informal learning practices might become a better place to work. At some point, teachers might find themselves working in a genuine learning community: a teaching firm.

In turn, they might find themselves providing their students with different learning activities. As students spent more of their time engaged in purposeful work connected to their real concerns, their alienation might be lowered. More classtime would be spent in group activity, meetings, projects, and critical thinking. And more of the informal time outside class might also become more constructive. Cumulatively, these changes might contribute to improved instructional results.

The school, as we know it and as most of us experienced it, was modeled on the workplace of the turn of the twentieth century. It will no more serve the needs of the next century than would the antiquated factories from that smokestack era.

Yet, if the firms studied in *The Teaching Firm Research* can be thought of as exemplifying the workplace of the twenty-first century, it has exciting implications for education reformers. In many ways, such places—places where everyone is a teacher and everyone is a learner—are a picture of what schools at their best can be.

IMPLICATIONS FOR COMMUNITY AND TECHNICAL COLLEGES

Background

The research data outlined in the Teaching Firm study has important implications for community and technical colleges as workplaces and as places of learning for the community and business sector. In many states and localities, the community or technical college is emerging (or already has emerged) as a major element of workforce development and economic development strategies. Community and technical colleges are often seen as the primary vehicle for providing lifelong learning in a community, as well as the spark behind much successful business development. The Teaching Firm research can help community colleges fulfill their critical role by demonstrating how to maximize learning opportunities both on and off campus for the wide range of individuals that they serve. It can also provide guidance to help colleges become more effective workplaces.

More specifically, our research will have implications for college faculty and administrators, as they move towards high performance work and increasing demands from the private sector; for students, both degree and non-degree candidates and those involved in business and industry training programs; for firms and organizations involved in workforce and economic development and technology transfer (such as manufacturing extension partnerships centers); and for the emerging lifelong learning delivery system, including connections between community colleges and the K-12 system and welfare to work.

Colleges will need to develop new relationships with employers to meet the rapidly changing demands of new high performance workplaces. They may also want to change their internal structure and management to more resemble a teaching firm. And, the study suggests a need for a fundamental reexamination of how education is delivered and student learning is enhanced by utilizing the informal learning processes.

Community and technical colleges are uniquely positioned to provide workforce development and economic development services to employers, individuals, and communities. Their current focus and interest in these areas suggests that they are natural partners that can play a role in helping firms understand the concept of a teaching firm and move towards becoming one.

Finding 1: Most learning in organizations occurs informally.

The finding that most learning occurring in organizations is informal suggests that community colleges should recognize the powerful role that such learning plays in the education and training of *all* students. As stated in the introduction, we do not support replacing formal learning with informal learning, but rather looking for ways to use informal learning to enhance the learning process for all. For colleges

working with firms, this finding is particularly noteworthy, as colleges are often called upon to design customized training programs for small and medium sized firms in their community. But the finding also has implications for courses and curriculum offered to degree-seeking students and adults returning for specific courses or skill sets, including those recently transitioning from welfare to work.

Community and technical colleges should consider moving from traditional, classroom-based curriculum to models that use formal and informal learning opportunities for learning. Such new models could include classroom teaching in conjunction with worksite learning and experience; the use of educational and distance technology that links classrooms and worksites; and coursework that links theory and application. For degree programs, particularly, informal workbased learning opportunities may be very rich informal learning experiences for students. The finding also suggests that coursework include opportunities for interaction among students and faculty and that faculty look for ways to insert or increase mentoring, teaming, and exploration activities for all students. Using informal learning opportunities would also assist faculty in reaching students with various learning styles.

One step may be to create a model for education in community colleges that places greater emphasis on employing informal learning. An entire course could be designed to take place in a factory or on the shop floor or in a hospital, with the technical material being taught in an applied and contextualized manner and embedded in work activities. Students would have to meet certain standards for learning basic and required information. But they may find that learning the technical information through more informal, applied methods is very successful.

For adults returning to college or involved in welfare to work programs, having an increase in informal learning opportunities may make the reentry to education easier and less stressful. Informal learning opportunities, which are heavily weighted toward practice and applied knowledge, may provide fruitful learning situations for adults who were not successful in high school in earlier years.

As learning becomes asynchronous, and community and technical colleges move towards a student or learner centered education model, the connections and relationships between formal and informal learning will need to be distinguished in order to promote the most efficient way to learn. In their work with firms and businesses, community and technical college faculty can determine, with input from employers and learners, what material can best be learned through formal methods and what material can best be learned through informal methods, and then assist other faculty in developing programs to meet those needs.

Lastly, for faculty and administrators, there should be increased opportunity within the structure of their own workplace to allow for informal learning through teaming, exploration, cross-training, meetings, etc. Generally, faculty are not able to spend

time with colleagues or business representatives in such pursuits due to the structure of academic departments or class scheduling, but much could be gained by allowing a greater sharing of knowledge among faculty and administrators through informal learning. (Much of the material in the K-12 section related to professional development and structure of work is also true for community and technical colleges.)

Finding 2: Informal learning happens in the pursuit of larger organizational and individual goals and occurs best when goals are aligned.

The research identifies key organizational goals and individual goals, and it finds that alignment of these two types of goals is facilitated by an organization's showing genuine sensitivity to employee goals and providing employees with a deep enough understanding of organizational goals to integrate them as their own.

This finding has broad implications for aligning faculty and administration in community and technical colleges to respond to a rapidly changing and competitive environment. Many leaders of community and technical colleges struggle with how to create a climate of urgency in the face of widespread faculty's preference for business as usual. If faculty and administrators interacted in teams and had access to greater and new information, they might understand the larger goals of the college related to workforce development and how those goals may have changed over the years.

Numerous college presidents have questioned and recently shifted their role in the community, especially with regard to economic development, workforce development and welfare to work programs, but faculty and staff often continue to assume a more traditional goal for the college. Many of the faculty in the degree programs do not always support the shift from preparing students for transfer to a four-year institution of higher education to preparing students for the workforce. Having alignment between administrators and faculty and also between the academic and business/industry training sectors of a college would certainly reduce tension and resource battles.

Goals and objectives should also be clear between students and the college. Often students are interested in taking a few courses, not in attaining a degree, but the college has traditionally been measured on its graduation rate and therefore looks at completion of a program as a major goal. Colleges need to have a better understanding of the students' goals, especially when the students are older, non-traditional, from industry, or now coming off of welfare. The traditional college goal of having students obtain a 2-year certificate is not a goal, at least initially, for many, many students.

Community colleges and businesses also approach goal-oriented learning differently. In many degree programs, most goal-oriented learning occurs formally in abstract, broad conceptual subject areas. At work, most goal-oriented learning occurs informally, meaning that employees are learning certain skills on their own or with peers in order to meet certain goals. When students make the transition from school to the workplace, they move from a formal learning environment to one that relies heavily on informal learning, and employers often assume that employees will take the initiative to learn. Yet the students do not necessarily have the skills required to be successful informal learners, as they may not have been thoroughly exposed to these skills through informal learning opportunities during their school years. To help students make a smooth transition to and succeed at work, they must have skills that allow them to be successful informal learners, and these must be learned through practice in informal learning situations.

Finding 3: Informal learning occurs in everyday work activities.
The research scrutinized what employees are doing when informal learning occurs. During these activities, employees develop skills and construct information through participation and through actively testing ideas. For each key activity, the research identified specific, direct factors affecting the activity and therefore informal learning.

The activities outlined in this finding pose a challenge to community colleges as to how to incorporate appropriate opportunities for acquiring the skills mediated by informal learning into curricula. For example, colleges could create environments that encourage exploration, the experiences of supervising and being supervised, meeting to solve problems or resolve issues, or sharing knowledge through cross-training among students.

Community colleges can use the activities encompassed in this finding to examine how to incorporate informal learning into their programs, curricula, student support services, and various work-based learning programs. Doing so will enhance students' skills and abilities in using informal learning as part of their formal learning and as a method for growth in their future employment.

This finding also raises the question of how community colleges help incumbent workers better utilize informal learning at work and help companies enhance their work environments to make them more conducive to productive informal learning. Increasingly, community colleges are being contacted by companies that want to contract out the learning function of their organization to the college. This is due partly because of the high costs associated with libraries and other training materials. The report challenges the validity of moving learning out of the company and opens the door for ways in which community colleges might include informal learning in company-sponsored learning centers.

This finding that informal learning occurs in everyday work activities has strong implications for improving the quality of informal learning among faculty and staff at community colleges. It raises the question of what informal learning activities should be reinforced in the college to help the institution develop its own internal organization and culture. A matter for administrators would be to determine how to increase time for faculty and staff to interact in work activities that enhance formal and informal learning, and how to build greater opportunities for mentoring, teaming, customer interaction and feedback, and problem-solving meetings into the daily structure of work.

Finding 4: The amount and quality of learning within an organization are greatly impacted by the context or the environment in which the learning occurs.

The same activity occurring in different organizations will yield different learning results, because the context for an activity is different. Three categories of contextual factors emerged at the organizational level, and four at the individual level. This finding is the key to the usefulness of the previous finding about where informal learning occurs. Without attending to the context for informal learning, activities known to have vast learning potential may not yield informal learning.

A strong determinant of individuals' receptivity to learning is the degree to which the culture as experienced by employees matches the culture as presented by management: The better the match, the more receptive employees are to learning.

The issue of culture becomes very important when a college is serving many customers and is called upon to provide many services. Demands from local government officials, business, and the public require that many colleges change their traditional culture. There are vastly different cultures between the academic world and the business world, and as colleges work more closely with businesses, these cultures can collide if care is not taken to understand the goals and values of each.

Within the college itself, there are cultural differences between the degree programs and the non-degree programs and business/industry training (BIT) programs, which can cause a great deal of friction among faculty and staff. For instance, the rewards and recognition of degree and non-degree programs are very different, with faculty in degree programs still recognized for scholarly work or the number of students who attained degrees; while faculty in the BIT programs, who are often part-time consultants from industry, are recognized for their quick and efficient response to a pressing business need.

This finding also has implications for colleges that provide management consulting, quality intervention, or technology transfer services to firms. As community and technical colleges and their partners (such as manufacturing extension partnership centers) work with businesses on issues related to quality, management, technology,

etc., they will need to be aware of the culture of the firm. The culture is critical to understanding how to encourage and create a climate of learning or change. For example, many people fear new technology and its introduction in the workplace. If the culture of an organization is such that it encourages creativity, then college consultants can build on that cultural aspect in thinking how technology can best be introduced to increase creativity. In contrast, if the culture of an organization supports status quo behavior, college consultants would have to work through that cultural attitude in getting employees to use the new technology.

The finding also has implications for labor relations. Many colleges work with labor unions, and some have labor studies programs. Community colleges might develop a curriculum to help unions better understand the high-performance environment and the value of informal learning processes for the benefit of the members and the company, as well as leading to more labor-management training and education initiatives.

Finding 5: Informal and formal learning augment each other and interact synergistically.

Formal learning and informal learning occur simultaneously and exist along a continuum. Factors that influence the effectiveness of a learning event are the relevance of what is learned to the employee's responsibilities, the gap between current and target knowledge, and the timing of learning in relation to the task needed.

This finding indicates a synergy and suggests that formal learning and informal learning need to be related to each other in dynamic ways. The relationship of formal and informal learning can impact on curriculum, pedagogy, and programs, as faculty seek ways to reinforce formal learning with informal learning activities following the presentation of new information. Faculty need to understand that a great deal of learning occurs outside the classroom or in non-formal settings within a classroom.

This relationship can also impact distance learning and educational technology, by informing faculty about how information is learned through informal methods and how formal classroom teaching and informal learning can best work together. For example, this finding would support the notion that students who are learning through distance technology would benefit by some regular interaction with their peers to allow for cross-training, mentoring, or discussion in meetings.

The finding also argues for opportunities for learners to test and try out their knowledge in informal settings and ways: through interaction with peers, reflection or exploration. Understanding informal learning will also assist faculty as they work with students with multiple learning styles and will provide a greater arsenal of pedagogies and strategies to reach all students.

Finding 6: Workers develop skills when performing daily activities, and the skills are clustered in four dimensions: pragmatic, intrapersonal, interpersonal, and cultural.

The course of skills development is across a spectrum, from inexperience to maturity and from competence to expertise. Learning and development in one dimension do not necessarily yield learning in other dimensions. Learning at the broad level transfers more readily to the specific level than vice versa.

This finding reinforces the belief that the jobs of the twenty-first century will require people with a broader range of skills and capabilities. A number of studies, including the Secretary's Commission on Achieving Necessary Skills (SCANS), suggest that people need global mindsets, together with the ability to manage stress, exercise self-discipline, recognize patterns, and get along in a diverse workforce. This finding implies that the learning process might be reversed from its usual focus on pragmatic or job-specific skills, and that it might be wiser to embed the pragmatic skills in the other three domains. Certain other cultures do this more effectively as, for example, in the German Dual System, which has a heavy emphasis on teaching employability skills.

Faculty should consider ways to create opportunities for students to engage in ongoing evaluations or structured feedback sessions, in order for students to learn certain critical skills while in school. Faculty should also be aware of the need to present students with a larger picture or systems view, of a particular industry. And students should have many opportunities to develop inter- and intrapersonal skills through activities such as clubs, student organizations, service learning, school to career, and workbased learning.

For the development of faculty and administrators, this finding should raise awareness about the importance of these other skills, and move the focus away from pure academic (pragmatic) competence. Faculty and staff also need to develop competence in the other three areas and inservice (as well as preservice) should take these skills into account. Faculty should be given opportunities to see a larger picture and understand their larger role in workforce and economic development (they do more than just teach a course, they are part of a continuum of learning). By having exposure to customers and businesses and gaining a better understanding of their needs, faculty can begin to understand the supply-demand system that exists between the public education system and private employers. Internships in firms may be a very effective way for faculty to learn about what pragmatic skills, as well as what interpersonal skills, are desired by employers.

This finding should also provide a significant incentive to businesses to become more involved with the public education and training system. Because students need not only technical or pragmatic skills but also cultural, interpersonal, and intrapersonal skills to perform effectively, employers should help schools and colleges provide realistic work settings that promote informal learning. If employers

do not get involved in workforce preparation and development, their future workers may lack not only technical skills needed to complete the job but also the workplace or employability skills that are so important to success for both the individual and the firm.

Finding 7: Through the formal-informal learning dynamics of school-to-career programs, students learn how to apply academic knowledge to workplace settings and gain greater respect for and facility in the types of learning required by the workplace.

A great deal of what has been discussed relates to school-to-career programs or education-business partnerships. School to career programs, as studied as part of this project, have many benefits for students, faculty, and firms.

First, for faculty, our findings show that informal learning opportunities with businesses permit faculty to learn about business needs, the skills that employers want students to have in order to succeed, new technology and processes, and new business initiatives. Faculty also should have opportunities for application of theory in real work situations and be able to blend theory and practice through formal and informal teaching and learning. Faculty should also participate in teams with other teachers and with employers to develop integrated programs, thus broadening their knowledge into other academic subjects as well as the application of that knowledge.

For students, school to career programs help then learn about the importance of goals and that specific goals can drive learning. They also experience the importance of quality in a business setting and the consequences of low quality. Students have the chance to learn theory and abstract thinking, followed by application of that knowledge, which helps to reinforce the learning process. And perhaps, most importantly, when students are in workbased learning settings, they have the opportunity to learn how to learn informally and develop those skills which will help them succeed in a career.

The school to career programs allow firms to share their knowledge, informally, with colleges and to help colleges understand the skill sets needed and desired by business. Firms, working with colleges, gain a better understanding of how colleges operate and become supporters of the public education system. Employers see that their future workers are gaining skills that they value, and that they will be ready learners when they come to work.

Conclusion

As we see more interest in the teaching firm concept, community and technical colleges may be very well positioned to provide help and services in the development of the workforce and in promoting high performance workplaces. Understanding the value of informal learning both at work and in class can benefit colleges in their work and add value to their services, for firms, for communities, and for individuals.

IMPLICATIONS FOR ECONOMIC DEVELOPMENT

The Teaching Firm research can help states and communities develop innovative strategies to promote full employment, economic development, retain and attract business. The concept of a teaching firm is based on the notion that increasing learning in a firm, through formal or informal methods, and creating a culture of continuous learning will result in greater productivity and efficiencies, and therefore benefit both the firm and its employees.

While economic development has traditionally focused on attracting new business to an area or increasing the use of new technologies, these efforts are increasingly focused on transforming current businesses and growing new businesses into high performance workplaces and developing a skilled workforce. As this shift in economic development has taken place, more and more emphasis has been placed on workforce preparation and development as a key piece of any systemic economic development strategy. The teaching firm concept supports this economic development strategy by supporting collaboration between firms and providers of education and training to ensure a pool of skilled and available current and future workers.

The teaching firm research adds a significant new dimension to economic development by focusing on the importance of increasing learning which benefits the firm, as well as the individual. In addition, the research supports the creation of an environment that allows continuous learning. These findings point out the importance both of individuals and of the cultural environment in growing and developing jobs. This highlights the need for economic development efforts to expand beyond their conventional focus on tools, technology, and taxes in order to sustain and create jobs.

State and community economic development agencies can help firms understand that significant benefits to productivity can be achieved through increasing informal teaching and learning, without having to develop costly formal training programs. By demonstrating the value of informal teaching and learning and helping firms understand how to create an environment supportive of informal teaching and learning, economic development agencies can help businesses learn how to upgrade their workers' skills, often without major investments in formal programs by either the state or the firm.

This strategy is particularly advantageous for small firms, which generally have few resources and little time to develop formal training programs. Community colleges, manufacturing extension centers, and state or local economic development agencies can use information about informal learning to assist small firms to integrate new technology, processes, and employees. The finding which states that informal learning occurs in everyday work activities also supports the notion that much of the training and learning can take place on the job, on the shop floor, as opposed to

formal classroom programs. By using informal learning opportunities more effectively, firms can reduce the amount of time spent formally training workers and therefore improve training efficiencies.

With the development of an assessment tool that will determine the extent to which informal learning occurs in a workplace, economic development agencies can ensure that they support firms that promote informal learning approaches, as well as firms that need assistance in promoting informal learning. Such an assessment will allow agencies to measure the amount of informal learning and to evaluate efforts to increase informal learning.

Research findings also provide guidance to economic development professionals about the types of training and development needed by firms, especially for firms interested in expanding. Many of the skills needed by employers are in the dimensions other than the technical or pragmatic, yet most economic development efforts focus on the pragmatics of new technology or new processes. The skills in the interpersonal, intrapersonal, and cultural dimensions that are critical to job success and career advancement are generally learned informally, and often are given little attention. Increasingly, firms want employees who understand systems and the larger world view, and who can deal with rapid change, increased job demands, and diverse populations. To develop such a workforce, economic and workforce professionals need to focus on creating opportunities for employees to learn those skills informally.

State and community economic development agencies can also use the Teaching Firm research to devise consistent policies that support and encourage firms, schools, colleges, and training programs to use informal learning in the development of the workforce. The ability to learn informally in the workplace is a skill which will become increasingly relevant as firms focus on just-in-time, work-based learning. Already a number of global firms have indicated that they want workers who can learn on the job and learn continuously. This type of continuous learning and skills upgrading can help employees be prepared for unforeseen circumstances in which a broader perspective and wider base of knowledge will be needed. The informal learning that employees undertake on their own, through exploration and expanding their own knowledge and personal development, may be the kind of learning needed by firms "just-in-case" something new or unexpected happens.

A workforce that has solid informal learning skills will attract strong businesses offering employment opportunities, which are attractive to current and potential workers. In the future, states could even develop indexes to measure the informal learning skills of their workforce as one measure of attracting and keeping employers in a state.

The Teaching Firm research can also aid in economic development efforts by influencing the education system in a way that ensures a broad pool of skilled workers. Economic development professionals are interested not only in developing the incumbent workforce as a strategy to retain businesses but also in preparing and developing a skilled workforce that will help attract new businesses to an area. The public education and training system has a serious role to play by maximizing its efforts to ensure that graduates not only possess academic and pragmatic skills but also have learned how to learn, already have informal learning skills, and therefore are able to take advantage of workplace learning. The public education and training system has much to contribute to economic development by ensuring a workforce with the skills needed by business. Focusing on developing students with informal learning skills would result in job candidates who are more attractive and valuable to firms. Communities with populations that have the skills desired by the private sector will be more attractive to firms making location choices.

Additionally, if schools and colleges were preparing students for placement in careers and students were successful in those jobs immediately after graduating, as opposed to spending several years seeking the right job, that outcome would be positive for the students and parents, the educational system, and the community. A strong educational system is a known, key variable as firms and families look to relocate.

In closing, the Teaching Firm research provides a conceptual framework for economic development activities in a community. It seeks to link firms with education and training providers in the development of a strong workforce, and at the same time encourages firms to create environments in which learning is second nature, like breathing. We believe that firms that operate this way will have satisfied and capable employees who want to stay at the firm and a workforce that has the skills to keep local firms competitive.

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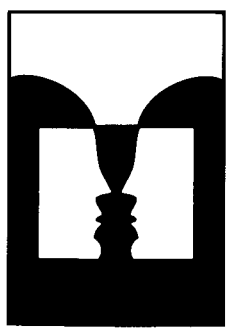

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