Upgrading the U.S. workplace: do reorganization, education help?

Firms that establish workplace education programs and reorganize work report noticeable improvements in their workers' abilities and the quality of their products

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Pervasive foreign encroachment on markets that have historically been U.S. dominated, and falling real wages have led some workplace analysts to conclude that inadequacies in education have caused a decline in the quality of the U.S. work force.[1] As a result, public policy focuses increasingly on lifelong learning. However, other analysts suggest that little will be accomplished if workers learn new skills, and go back to the same jobs that they held before. They conclude that it is not only the *workers* who must change, but that the *jobs* must change also. According to this reasoning, the full benefits of skill upgrading will not be captured unless worker education is accompanied by the reorganization of work.[2]

There is no research that either confirms or refutes the hypothesis that skill upgrading correlates with worker education and reorganization of work. In fact, there is little research on either workplace education or the reorganization of work, and even less on how the two relate to one another. This article provides results from surveys conducted in 1992 on the incidence of workplace education programs and reorganization of work strategies implemented in manufacturing and nonmanufacturing firms. In particular, the research answers the following questions:

- What percentage of firms are engaged in workplace education and/or work reorganization?
- What is the nature of the reorganization of work and workplace education?
- What are the differences between those firms that have reorganized work and/or have workplace education programs and those that have not?
- Why do firms reorganize work and/or implement a workplace education program?
- What, if any, evidence can be found identifying the impact of workplace education programs and/or work reorganization on the worker?

For this research, workplace education includes any program that provides instruction for hourly workers — separate from regular job activities — in one or more of the following: reading, writing, mathematics, speaking and understanding English, preparation for the general equivalency degree (GED), problem solving, or development of interpersonal skills.

Reorganization of work includes changes in the nature of work or compensation for employees that are intended to boost productivity and profits. The specific changes could involve: implementing work teams or quality circles, imple-

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menting total quality management or maintenance, introducing profitsharing or gainsharing, reducing management layers or oversight, increasing responsibility for all workers (empowerment), integrating quality control into production, implementing just-in-time production[3] or computer integrated production, and increasing training.[4]

Research design

The first stage of the research consisted of case studies of 72 firms, conducted during the summer of 1991.[5] This crucial first stage was important in understanding the complexities involved in workplace education and reorganization programs. The second stage, which is the focus of this article, involved mail and telephone surveys that incorporated the information gathered from the case studies. The mail-telephone surveys were conducted during the January-March 1992 period.

The case studies clearly indicated that no single database would, at reasonable cost, provide all of the needed information. Essentially, there were three obstacles to devising a data collection strategy. First, relatively large samples of firms had to be surveyed to locate enough firms *with* education and workplace reorganization programs to derive meaningful conclusions. The case studies indicated that firms with education programs focusing on basic academic skills disproportionately appeared in the manufacturing sector. To provide a closer view of these firms, random samples of manufacturing firms were obtained from the membership of the National Association of Manufacturing,[6] and from a professional mail house.[7]

Second, the survey had to be fairly lengthy to obtain information on why firms decide to reorganize work and/or implement a workplace education program. This implies that the expected survey response rate could be fairly low, and in all likelihood, the response would be nonrandom. That is, those firms that were either considering, or engaged in, reorganization and/or workplace education would be more likely to respond than those that were not. To maximize the response rate, we needed a survey form for firms, asking basic background information; if, and why it was reorganizing; and whether it had a workplace education program. A telephone follow-up survey was conducted for firms that indicated they had a workplace education program, to find out more about the nature and effectiveness of the program and why it was implemented.

Third, the likely nonrandomness of the response to the mail survey implies that it cannot be used to estimate the incidence of workplace education and/or work reorganization. Consequently, a brief (approximately 3 minutes) telephone survey was made to a random sample of firms. The survey asked about the number of employees in the firm, the firm's reorganizing methods (through a checklist of items), whether the firm had a workplace education program (a checklist determined the nature of the program), and for those firms that did not have a program, their reasons for not having one.[8] The response rate for the short telephone survey was much higher than that for the mail survey.[9]

Research findings

Information relating to the incidence of workplace education and/or work reorganization is based on the telephone survey which, as stated earlier, had a high response rate; information about the process and impact of these programs is based on the mail survey, which had a low response rate, but provided much more detail.

Extent of involvement. Workplace education and the reorganization of work are not dichotomous phenomenon. Rather, they are best thought of as continua. Many firms do none of either or a little of one or both; relatively few firms do a substantial amount of either education or reorganization; and even fewer do a substantial amount of both. Further, the frequency of these phenomena varies with the type and size of the firm.

To characterize these continua, seven distinct levels of workplace education programs, which are cumulative in nature, were identified:

Level 1: the firm reports that it has a workplace education program

Level 2: level 1 plus two of the following three items — the education program is offered at the worksite, the firm provides employees with at least partial release time, the firm provides financial support for the program[10]

Level 3: level 2 plus the program teaches interpersonal skills or problemsolving skills

Level 4: level 2 or level 3 plus the program teaches any of the following: math, reading, writing, English as a second language, or general equivalency degree preparation

Level 5: level 4 plus the program is taught by a paid instructor (either from the firm or from outside the firm)

Level 6: level 5 plus classes meet at least once a week

Level 7: level 6 plus classes meet at least twice a week

Firms that have made a financial commitment to workplace education are those that are at level 2 or above. Firms with education programs that teach academic skills are at levels 4–7. At levels 5–7, the academic education is done by paid instructors, as opposed to volunteers; at levels 6 and 7 the classes meet regularly.

Similarly, the reorganization of work can also be characterized as a continuum. In this case, however, the continuum is not cumulative. Rather, the measure of the extent to which

a firm is reorganizing work is simply the number of reported changes in the way work is done.[11] Firms responding to the telephone survey were asked about six specific methods by which work can be reorganized: using work teams or quality circles, implementing total quality management, introducing profitsharing or gainsharing, reducing management layers or oversight, increasing the responsibility of workers, and increasing training.[12]

The results from the telephone survey are summarized in table 1 and chart 1, both of which have been weighted[13] by firm size and by the Standard Industrial Classification (SIC) code. The estimates are lower bounds, because they are based on the assumption that all of the firms that refused to respond have not implemented reorganizational changes and do not have a workplace education program. This is probably a more realistic assumption about workplace education (which has a low incidence) than it is about work reorganization (which has a high incidence). Consequently, the lower bound estimate for work reorganization is probably quite conservative.

Table 1 indicates that 7.6 percent of manufacturing firms and 5.7 percent of nonmanufacturing firms report a workplace education program. Only 3.5 percent of the nonmanufacturing firms and 5.1 percent of the manufacturing firms have at least a level 4 education program (the minimum level at which academic skills are taught). Even fewer, 1.4 percent of manufacturing firms and 2.7 percent of nonmanufacturing firms have a level 7 program. Additional results indicate that larger firms are more likely to have a workplace education program, and the program is likely to be at a higher level along the continuum than is the case for smaller firms. For example, among firms with fewer than 20 employees, 3.2 percent of manufacturing firms and 3.1 percent of nonmanufacturing firms report that they have an education program, whereas comparable figures for firms with 200-499 employees are 15.3 percent in manufacturing and 23.6 percent in nonmanufacturing. Among the smallest firms, 1.8 percent of the manufacturing firms and 1.8 percent of the nonmanufacturing firms have programs that are at level 4–6, whereas the comparable figures for firms with 200–499 employees are 7.6 percent for manufacturing and 5.0 percent for nonmanufacturing.

Chart 1 indicates that slightly more than one-half (50.7 percent) of the manufacturing firms and little more than one-third (33.7 percent) of nonmanufacturing firms report at least one of the six changes for reorganizing work. Only 2.7 percent of manufacturing firms and 1.4 percent of nonmanufacturing firms have implemented all six of the reorganization mechanisms.

As is the case with workplace education programs, larger firms are more likely to implement methods of reorganizing work (and to do so more intensively) than are smaller firms.

Table 1. Percent of firms with workplace education programs, by level, 1992

Cumulative program levels	Manufacturing	Nonmanufacturing
Level 1: A workplace education program	7.6	5.7
Level 2: Level 1 plus two other items: Program is offered at the worksite. At least partial release time Financial support for the program[1]	7.0	5.5
Level 3: Level 2 plus the program teaches interpersonal or problemsolving skills	7.0	5.5
Level 4: Level 2 or level 3 plus the program teaches either: Math, reading, writing, English as a second language, or general equivalency degree preparation	5.1	3.5
Level 5: Level 4 plus program is taught by a paid instructor (either from the firm or outside the firm)	3.6	3.1
Level 6: Level 5 plus classes meet at least once a week	2.5	2.4
Level 7: Level 6 plus classes meet at least twice a week	1.4	2.1

[1] Essentially, level 2 eliminates firms that only have a tuition assistance program because tuition assistance provides financial support, but typically does not involve release time or classes taught at the worksite.

For example, among firms with fewer than 20 employees, 38.8 percent of manufacturing firms and 26.1 percent of nonmanufacturing firms have implemented at least one of the six reorganization mechanisms. The comparable figures for firms with 200–499 employees are 66 percent for manufacturing and 64.2 percent for nonmanufacturing. Among the smaller firms, 4.9 percent of manufacturing and 3.7 percent of the nonmanufacturing firms have implemented at least four of the mechanisms for reorganizing work, whereas the comparable figures for firms with 200–499 employees are 34.8 percent for manufacturing and 34.0 percent for nonmanufacturing. On average, manufacturing firms have implemented more mechanisms for reorganizing work than have nonmanufacturing firms.

Cross tabulations of the level of workplace education with the level of the reorganization of work indicate very few firms

are implementing substantial workplace education programs without also undergoing at least a moderate amount of reorganization of work. However, more firms are reorganizing work without implementing a workplace education program. A very small percentage of firms are engaged in substantial reorganization *and* substantial workplace education. This phenomenon is somewhat more pronounced among manufacturing firms (4.4 percent) than among nonmanufacturing firms (1.1 percent).[14]

Table 2. Attributes of firms with workplace education programs, 1992

[In percent]

Attribute	Manufacturing	Nonmanufacturing
Provide financial support	94.3	90.3
Voluntary participation	66.7	71.0
Provide time for workers to attend program	77.8	93.5
Frequency of class:		
Less than once a week	11.1	17.5
Once a week	20.4	17.4
Two times a week	[1]14.8	4.8
Three to four times a week	[1]8.5	4.8
Classes are not regularly scheduled	26.0	40.0
Class location:		
Worksite	77.8	76.2
Community colleges	7.4	6.3
Another company	5.6	14.3
Local high schools	5.6	0
Local technical or proprietary schools	1.9	0
Teaching arrangements:		
Teacher from in-house (paid by company)	27.8	39.7
Volunteer from within the company	11.1	17.5
Community college teacher	13.0	11.1
Teacher contracted (paid) by the company	[1]22.2	4.8
Skills most frequently taught:		
Identifying and solving problems	[1]68.0	83.3
Interpersonal (team building) skills	64.7	70.0
Mathematics	[1]65.4	37.9
Skills less frequently taught:		
Reading and writing	[1]48.0	25.9
English as a second language	10.2	20.0
Standard general equivalency curriculum	[1]30.0	5.3

[1] Statistically significant at the .05 level of difference between manufacturing and nonmanufacturing firms.

Nature of the programs. Empowerment appears to be the most likely reorganization method used by the manufacturing firms and nonmanufacturing firms. The least likely method is reduced management layers or oversight for manufacturing firms and work teams or quality circles for nonmanufacturing firms. Chart 2 shows the frequency with which alternative types of work reorganization are implemented.[15] (All of the differences between manufacturing and nonmanufacturing firms are statistically significant.)

While it is not possible to check the validity of these estimates using alternative data, the figures for increased training are remarkably similar to those reported by a nationally representative sample from the Current Population Survey, and the overall magnitude of activity appears to be quite close to that in another recent survey.[16]

A comparison of the attributes of the workplace education programs within firms reveals that nonmanufacturing firms focus more on problemsolving skills, while manufacturing firms focus more on academic skills such as mathematics, reading and writing, and preparation for the general equivalency degree. (See table 2.)

Differences between firms with and without programs. The findings indicate that a substantial minority of nonmanufacturing firms, and a majority of manufacturing firms report that they have implemented at least one aspect of work reorganization.[17] As a result, it is more useful to compare the attributes of firms that have undergone a substantial amount of reorganization of work to those firms that have not, rather than to compare those that have undergone none to those that have undergone some.[18] The results from a comparison of attributes for manufacturing and nonmanufacturing firms with and without workplace reorganization programs, are reported in table 3. In this table, and in table 4, the tabulations are based entirely on those firms with 50 to 500 employees. This is done to ensure that the distinctions between firms with and without workplace education are not distorted by size of firm (that is, number of employees) because larger firms are more likely to have reorganized work and/or have workplace education programs.

Table 3 reveals few striking differences in the attributes of the work forces of firms that have undertaken a substantial amount of work reorganization and those that have not. Most of the differences that do appear are among manufacturing firms.[19] There are, however, substantial differences in the human resources policies between firms that have and have not reorganized.

In comparison with firms that have undergone either no reorganization or only a moderate amount of reorganization, manufacturing firms that have undertaken a substan-

Chart 1 **Percent of firms implementing work reorganization changes, by number of changes, 1992**

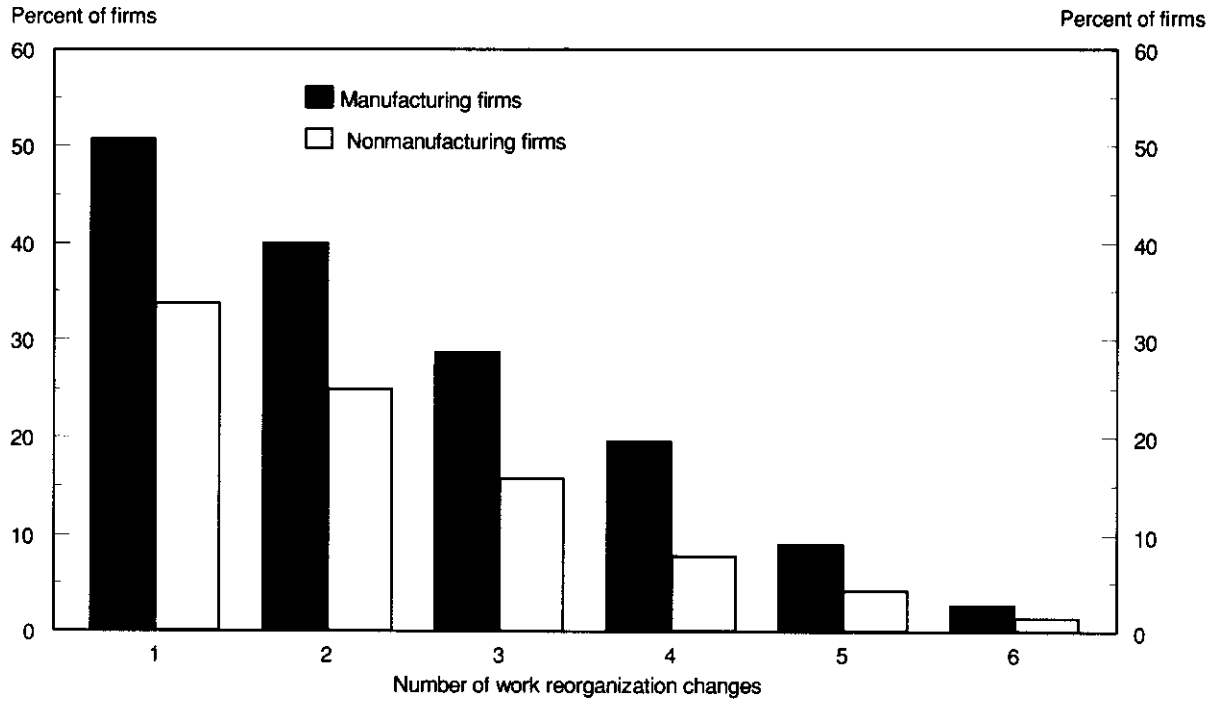


Chart 2 **Nature of the reorganization of work changes, by percent of firms, 1992**

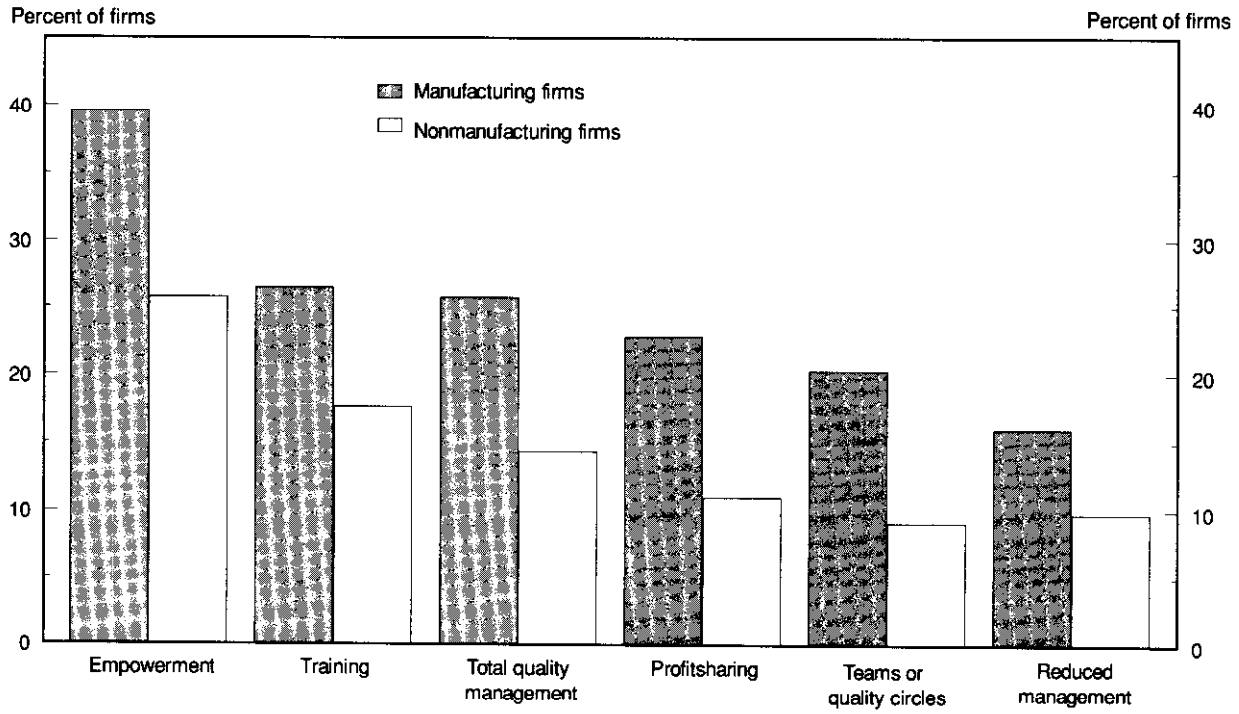


Table 3. Attributes of firms that have and have not implemented substantial workplace reorganization, 1992

Attribute	Nonmanufacturing		Manufacturing	
	Have not reorganized	Have reorganized	Have not reorganized	Have reorganized
Sample size	70	66	177	396
Total number of employees	168	142	135	[1]163
Hourly employees (in percent)	72.3	67.3	73.5	[1]69.9
Part-time employees (in percent)	24.7	21.1	6.9	5.3
Female employees (in percent)	44.7	44.6	31.6	31.4
Hourly employees with—				
Inadequate English language skills (in percent)	6.7	4.1	21.7	[1]14.8
Inadequate basic skills (in percent)	31.4	32.9	35.3	34.6
Importance of basic skills to[2]—				
Productivity	2.7	2.7	2.6	[1]2.7
Profits	—	—	2.5	[1]2.6
Domestic competitiveness	—	—	2.4	[1]2.6
International competitiveness	—	—	1.6	[1]2.0
Entry level wage	$6.55	$6.63	$6.38	$6.69
Average hourly employee wage	$9.14	$9.59	$9.12	$9.43
Top hourly wage	$13.53	$16.00	$13.46	$13.58
Benefits (in percent)[3]				
Health insurance	87.0	[1]98.3	97.7	98.4
Sick leave	66.7	[1]84.7	60.0	65.3
Paid vacations	94.2	98.3	97.7	[1]100.0
Pensions	77.9	88.1	73.1	[1]83.4
Training expenditures/payroll (in percent)	1.2	1.5	.6	[1]1.2
Promotions made internally (in percent)[4]	2.5	[1]2.9	2.6	[1]2.8
Turnover (in percent)[5]	1.2	1.0	.9	[1].8
Covered by collective bargaining (in percent)[6]	.12	[1].04	.16	.16
Profits (in percent)[7]	.47	.48	.42	.47

[1]Statistically significant at the .05 level of difference between firms that have reorganized and those that have not, within each industry classification.

[2]The importance of basic skills of hourly workers to each of the following items was based on a 4-point scale, where 1 represents "not at all important" and 4 represents "very important." Data on profits, domestic competitiveness, and international competitiveness reported only for the National Association of Manufacturing sample.

[3]Reported as the percentage of firms that offer each benefit.

[4]Based on a 4-point scale, in which 1 indicates that job openings during the past year were rarely filled by promotion from within, and 4 indicates that they were almost always filled from within.

[5]Based on a 4-point scale, in which 1 indicates that within the past 2 years turnover was not at all a serious problem, and 4 represents that the problem was very serious.

[6]Indicates the percentage of firms reporting that some or all of their employees are covered by collective bargaining.

[7]Based on a 3-point scale where 0 indicates that over the past 2 years profits have decreased, .5 indicates that profits have remained constant, and 1 indicates that they have increased.

NOTE: For the purpose of this table, substantial reorganization is defined as implementing at least four forms of reorganization.

Dashes indicate that questions relating to these attributes were not asked of nonmanufacturing firms.

tial amount of reorganization are somewhat larger; have a lower percentage of workers with inadequate English language skills; have a somewhat lower percentage of hourly workers; are more likely to report that the basic skills of their workers are very important to productivity, profits, domestic competitiveness, and especially to international competitiveness; pay a slightly higher entry level wage; are more likely to offer benefits, particularly pensions; be somewhat more likely to promote from within; and report that turnover is a somewhat less serious problem.

Collectively, these differences seem to indicate that firms that have undertaken a substantial amount of reorganization are somewhat more forward looking; they are substantially more likely to perceive the skills of their work force as critical to their competitiveness, especially in their ability to compete in international markets. This interpretation is reinforced by the finding that these firms offer somewhat more generous wage and benefits packages and that they are more likely to promote from within. Not surprisingly, they also report that turnover among employees is somewhat less problematic than do firms that have not undertaken a substantial amount of reorganization.

Although the differences are less statistically significant between nonmanufacturing firms that have and have not undertaken a substantial amount of reorganization, they more or less mirror the differences in manufacturing. One exception is that workers in nonmanufacturing firms that have undertaken a substantial amount of reorganization are less likely to be covered by a collective bargaining agreement than those in nonmanufacturing firms that have not undergone a substantial amount of reorganization.

Table 4 compares the attributes of firms with and without a workplace education program.[20] Here too, a comparison reveals few differences. The differences that do exist more or less parallel the differences between firms that have and have not undertaken a substantial amount of reorganization.[21]

In comparison with firms that do not have a workplace education program, those manufacturing firms that have a program: are somewhat larger; are more likely to report that the basic skills of their workers are very important to productivity, profits, and domestic and international competitiveness; report a slightly higher percentage of their workers have problems with basic skills;[22] pay somewhat higher wages; are somewhat more likely to offer benefits, particularly pensions; spend a greater amount on worker training; and report that turnover is a somewhat less serious problem.

As is the case with the reorganization of work, the differences between nonmanufacturing firms with, and without workplace education programs are less statistically significant. They more or less mirror the differences in manufacturing, with a few differences. Compared with nonmanufacturing firms without education programs, those with programs have a higher percentage of hourly workers; slightly lower benefits and entry level wages (although these differences are not statistically significant); workers who are less likely to be covered by a collective bargaining agreement; and experienced an increase in profits within the past 2 years.

Once again, the differences between firms with and without a workplace education program seem to indicate that firms with programs are more forward looking, in that they perceive the basic skills of their workers to be extremely important. Firms with education programs either have more or less comparable wage and benefits packages (in the case of nonmanufacturing firms) or better packages (in the case of manufacturing firms). Firms with education programs report that they are more likely to promote from within, and that turnover among employees is somewhat less problematic.

Reasons for programs. Table 5 summarizes the reasons that firms reorganize work and implement workplace education programs, as well as how these reasons

Table 4 Attributes of firms with and without workplace education programs, 1992

Attribute	Nonmanufacturing		Manufacturing	
	Without	With	Without	With
Sample size	94	38	345	225
Total number of employees	154	164	138	[1]180
Part-time employees (in percent)	24.3	20.8	5.4	5.9
Female employees (in percent)	44.2	45.6	31.9	30.4
Hourly employees (in percent)	68.2	[1]75.7	70.6	[1]71.4
Hourly employees with–				
Inadequate English language skills (in percent)	7.1	1.5	15.9	[1]18.6
Inadequate basic skills (in percent)	30.1	37.5	32.3	[1]38.6
Importance of basic skills to–[2]				
Productivity	2.7	2.8	2.6	[1]2.8
Profits	—	—	2.5	[1]2.7
Domestic competitiveness	—	—	2.4	[1]2.6
International competitiveness	—	—	1.7	[1]2.0
Entry level wage	$6.65	$6.45	$6.46	[1]$6.81
Average hourly employee wage	$9.14	$9.93	$9.17	[1]$9.60
Top hourly wage	$14.02	$16.46	$13.21	[1]$14.90
Benefits:[3]				
Health insurance	93.3	89.5	98.2	98.6
Sick leave	76.7	71.1	61.8	66.8
Paid vacations	96.7	94.7	99.1	[1]100.0
Pension	84.3	78.9	77.3	[1]84.8
Training expenditures/payroll (in percent)	1.1	1.5	.6	[1]1.6
Promotions made internally[4]	2.6	[1]2.9	2.6	[1]2.9
Turnover[5]	1.1	1.0	.9	[1].7
Covered by collective bargaining[6]	.10	[1].04	.16	.15
Profits[7]	.44	[1].59	.44	.48

[1]Statistically significant at the .05 level of difference between firms that have reorganized and those that have not, within each industry classification.

[2]The importance of basic skills of hourly workers to each of the following items was based on a 4-point scale, where 1 represents "not at all important" and 4 represents "very important." Data on profits, domestic competitiveness, and international competitiveness reported only for the National Association of Manufacturing sample.

[3]Reported as the percentage of firms that offer each benefit.

[4]Based on a 4-point scale, in which 1 indicates that job openings during the past year were rarely filled by promotion from within, and 4 indicates that they were almost always filled from within.

[5]Based on a 4- point scale, in which 1 indicates that within the past 2 years turnover was not at all a serious problem, and 4 represents that the problem was very serious.

[6]Indicates the percentage of firms reporting that some or all of their employees are covered by collective bargaining.

[7]Based on a 3-point scale where 0 indicates that over the past 2 years profits have decreased, .5 indicates that profits have remained constant, and 1 indicates that they have increased.

NOTE: Dashes indicate that questions relating to these attributes were not asked of nonmanufacturing firms.

Table 5. Reasons for workplace reorganization and implementing education programs, 1992

Reason	Nonmanufacturing	Manufacturing
Workplace reorganization		
Sample size	211	831
Employee job satisfaction	28.9	[1]20.9
Low productivity	48.8	54.8
Low profits	41.2	46.7
Increased emphasis on quality	81.0	[1]95.3
Increased competition	63.5	[1]76.2
Pressure from customers	35.1	[1]52.6
Introduction of new technology	53.6	52.9
Workplace education		
Sample size	10	129
Retain workers	70.0	61.7
Decrease in work force	40.0	60.9
Problems with absenteeism	30.0	16.3
Agreement with labor	0.0	3.1
Needed before employees could pursue other education	40.0	[1]70.3
Needed before other job-specific training could occur	40.0	[1]76.0
Benefit to employer's well-being	100.0	[1]86.8
Increase in competition	50.0	[1]66.4
Waste, error, or rework too high	60.0	69.8
New safety or health requirements or practices	40.0	31.0
Meet customer requirements	60.0	67.4
Improve customer relations	70.0	61.2
Prevent loss of contracts	20.0	40.6
Training assistance or subsidy became available	0.0	[1]20.2

[1] Statistically significant at the .05 level of difference between manufacturing and nonmanufacturing firms.

NOTE: The data reported are the percentage of firms that answered in the affirmative for each item.

vary between manufacturing and nonmanufacturing firms. Because these questions were asked in checklist form, firms cited multiple reasons for implementing a workplace education program.

The most frequently cited reasons for reorganizing work are to increase the emphasis on the quality of the firm's product and to respond to increased competition. Somewhat less frequently cited reasons include introduction of new technology, low productivity, low profits, pressure from customers, and improving employee job satisfaction. The statistically significant differences between manufacturing and nonmanufacturing firms are that manufacturing firms are substantially more likely to cite that an increased emphasis on quality, increased competition, and pressure from customers were important to their decision to reorganize work. Nonmanufacturing firms are significantly more likely to cite that improving employee job satisfaction was important to their decision to reorganize work.

The most frequently cited reasons for providing a workplace education program among nonmanufacturing firms are that such programs are a benefit to workers' well-being; needed to improve customer relations; help retain workers; needed to meet customer requirements; needed because of high waste, error, or rework rates; and needed because of increased competition. Among manufacturing firms, the most frequently reported reasons are that the program is a benefit to workers' well-being; needed before job-specific training or further education could occur; needed because of high waste, error, or rework rates; needed to meet customer requirements; needed to help meet increased competition; to retain workers; to improve customer relations; needed because of a decrease in work force skills.

The statistically significant differences in the reasons that manufacturing firms cite for implementing a workplace education program are that it is needed as a prerequisite for employees who needed to pursue other job-specific training, or that a training subsidy or assistance became available (from a government source). Nonmanufacturing firms are more likely to report that it is a benefit to workers.

Impact of the programs. A substantial proportion of firms reported important effects from work reorganization. Firms were asked whether or not the changes made in the organization of work have caused any improvements. Chart 3 shows the categories of improvement and the level of work reorganization. The most frequently cited improvements are in productivity, worker morale, and customer satisfaction. However, improvements in delivery time, scrap/error rates, and profits are also reported by a majority (or near majority) of firms. The probability of reporting positive outcomes increases steadily with the number of reorganizational changes that have been made.

Both manufacturing and nonmanufacturing firms with education programs are significantly more likely to report that reorganization of work has resulted in increases in productivity and improvements in worker morale, than are firms that have reorganized work without implementing a workplace education program. The probability of reporting positive effects of reorganization is larger still for firms that have education programs that involve an academic component. These firms are significantly more likely to report positive effects from reorganization than are firms without education programs, as well as significantly more likely to report positive effects than are firms with education programs that do

not have an academic component. These differences are statistically significant for all six categories of improvement: productivity, worker morale, customer satisfaction, profits, delivery time, and scrap and error rates.

In addition to the six outcome measures, firms were asked to assess the direct effects of workplace education on a wide variety of outcomes. These assessments are summarized in table 6. Nonmanufacturing firms, on average, perceive workplace education as having a moderate to substantial impact on workers' communication on the job, morale, self-confidence and on customer satisfaction. By comparison, manufacturing firms perceive workplace education as having a moderate to substantial impact on workers' self-confidence, mathematics skills, morale, communication on the job, and ability to solve problems. Firms also report a wide variety of more modest (but still important) benefits, ranging from ability to work in teams to quality of output.

Another assessment of workplace education compares workplace education programs by the amount of time they have been in place at the firm. Programs are differentiated by those that were more than 2 years old in 1992 and those that were less than 2 years old in the same year. Not surprisingly, in most cases, data indicate that the effects of workplace education programs are more substantial when the programs have been in place over the longer period.[23] Compared with firms having newer workplace education programs, those with older programs are significantly more likely to report improvements in workers' ability to solve problems, advancement in the company, retention with the firm, and productivity, as well as improvements in customer satisfaction.[24]

Perhaps the most interesting aspects of these findings are the results on worker retention and advancement in the firm. Firms that have had an education program in place for more than 2 years are significantly more likely to report improvements in worker retention and advancement than are firms that have had a program in place for 2 years or less. Firms with newer programs do, however, report small improvements in worker retention and advancement. Taken together, these results indicate that workplace education programs do not cause an increase in turnover. In fact, just the opposite appears to be the case; firms report that workplace education causes a decrease in turnover and an increase in advancement within the firm.

Finally, additional tabulations that distinguish between firms that have undergone a substantial amount of reorganization of work and those that have not indicate that the positive effects of having a workplace education program are significantly more substantial when it is accompanied by reorganization. In particular, firms that have undergone a substantial amount of reorganization along with workplace education are significantly more likely to report improvements in workers' ability to solve problems, work independently and as a team, use new technology, and solve mathematical problems. In addition, these firms are significantly more likely to report improvements in the quality of their product and in scrap, error, or rework rates.

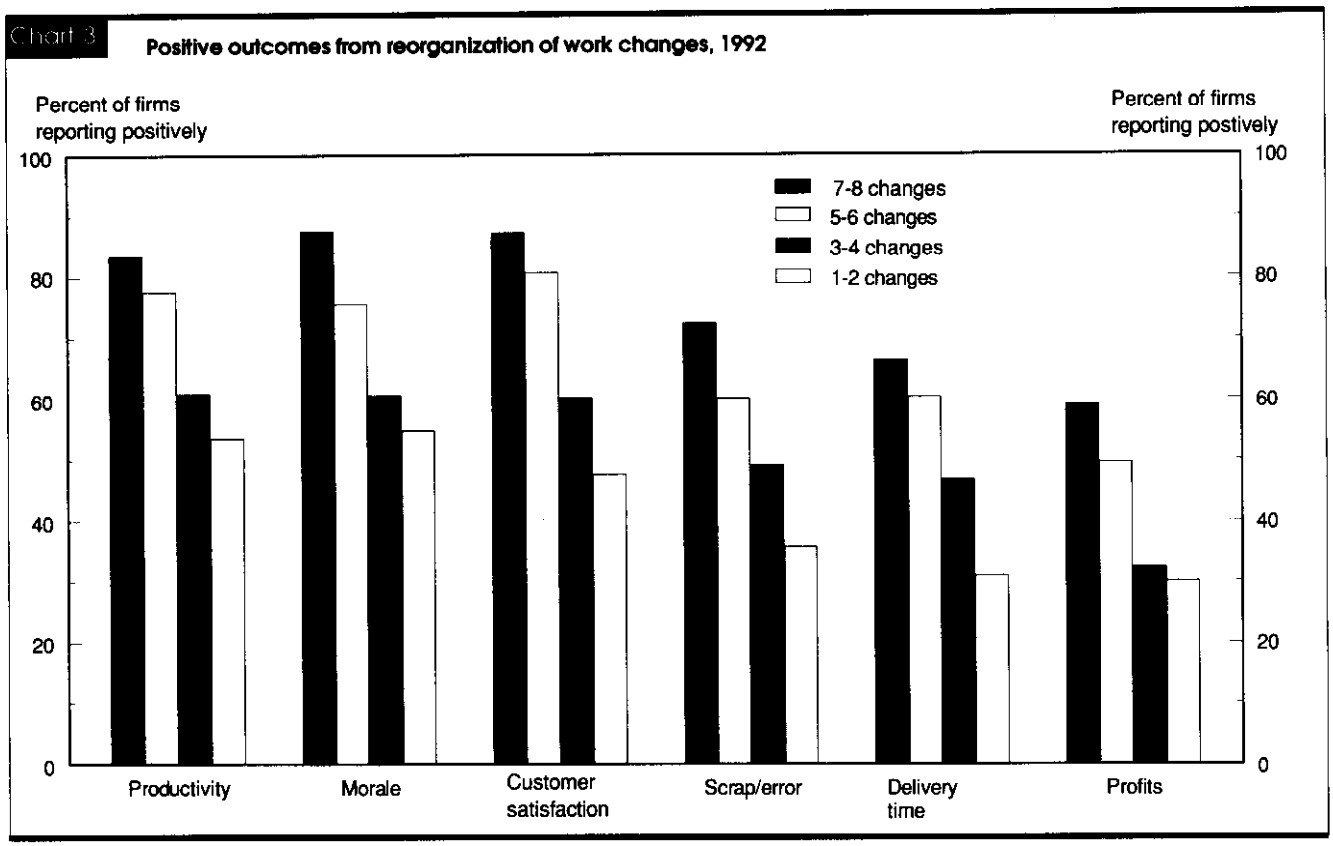
Table 6. Reported effects of workplace education, 1992

Item	Nonmanufacturing	Manufacturing
Sample size	9	112
Reading skills	1.50	1.61
Writing skills	1.75	1.37
Mathematics skills	1.50	2.08
Ability to speak and understand English	1.50	1.32
Ability to solve problems	1.75	2.03
Communication on the job	2.44	[1]2.02
Work effort	1.56	1.69
Retention of employees	1.38	1.27
Absenteeism and lateness	.67	.71
Advancement in the company	1.33	1.43
Company loyalty	1.89	1.72
Employee morale	2.22	2.06
Ability to work independently	1.78	1.78
Ability to work in a team	1.78	1.98
Worker safety	1.22	1.27
Quality of output	1.67	1.96
Customer satisfaction	2.11	[1]1.69
Ability to use new technology	1.56	1.73
Scrap, error, and rework rates	1.33	1.71
Productivity	1.56	1.55
Workers' self-confidence	2.00	2.22

[1]Statistically significant at the .05 level of difference between manufacturing and nonmanufacturing.

NOTE: Data are based on a 4-point scale, with 0 representing "no improvement" and 3 representing "very much improvement."

RESEARCH INDICATES that a substantial amount of work reorganization is underway. Increased demand for quality and increased competition appear to be the most important reasons for firms to reorganize. While small firms and nonmanufacturing firms are less likely to make the changes, than are large firms and/or manufacturing firms, there is still a significant amount of activity in these sectors. Work-



place education programs for hourly workers, while much less common than work reorganization, nonetheless, are implemented by a noteworthy percentage of firms. Furthermore, the two strategies—work reorganization and workplace education—are typically pursued simultaneously. Firms that have implemented both a workplace education program and work reorganization are significantly more likely to report positive outcomes than are firms that have done one without the other. □

Footnotes

ACKNOWLEDGMENT: This article is based in part on research and data bases developed by Southport Institute for Policy Analysis, Washington, D.C., in its project on basic skills training. The author thanks Southport Institute for its support and Ann Dilcher for superb research assistance throughout the course of the project.

[1] John H. Bishop, "Is the Test Score Decline Responsible for the Productivity Growth Decline?" *American Economic Review*, March 1989, pp. 178–97.

[2] Adam Seitchik, *Employer Strategies for a Changing Labor Force: A Primer on Innovative Programs and Policies* (Washington, DC, National Commission for Employment Policy, 1990) and Anthony Carnavale, *America in the New Economy* (San Francisco, Jossy-Bass Publishers, 1991).

[3] "Just-in-time production" refers to production techniques that reduce inventory costs by relying on minimal inventory; parts arrive as they are needed.

[4] Training refers to job-specific skills, whereas workplace education refers to more general skills. The training could either be on-the-job or classroom training.

[5] For a summary of this stage of the research, see Laurie J. Bassi, "Workplace Education for Hourly Workers," *Journal of Policy Analysis and Management*, Vol. 13, No. 1, 1994, pp. 178–97.

[6] That is not to say, however, that this is necessarily a random sample of manufacturing firms. This strategy was pursued because the National Association of Manufacturing has a high-quality mailing list of its members, is able to elicit a reasonably high response rate from them, and was interested in the issues and willing to cooperate. The survey was mailed to 4,317 firms (50 percent of the association's small and medium size members). Of these firms, 762 responded, yielding a response rate of 18 percent.

[7] This effort turned out to be less successful than had been hoped. Despite the fact that one of the leading mail houses was used, it turned out that the quality of information contained in the mail list was quite low. Nine percent of the enterprises were schools, and 6 percent of the surveys were returned because the address was incorrect. In addition, random telephone follow-up calls revealed that in 34 percent of the cases, the telephone number was incorrect or disconnected, or the individual to whom the survey was addressed had either left the firm or died. Consequently, of the original 11,000 surveys that were sent, it appears that approximately 5,610 actually were received by a valid recipient. Of these, 465 responded, yielding a response rate of a little more than 8 percent among the surveys that reached a valid recipient.

[8] In addition, the State in which the firm is located is known, as well as the firm's Standard Industrial Classification (SIC), according to the *Standard Industrial Classification Manual, 1987* (Office of Management and Budget).

[9] The response rate in the telephone survey was 66 percent. Of the 714 firms that responded, 341 were manufacturing firms and 373 were nonmanufacturing firms.

[10] Essentially, level 2 eliminates firms that only have a tuition assistance program because tuition assistance provides financial support, but typically does not involve release time or classes taught at the worksite.

[11] In another recent survey, Paul Osterman also used the concept of reorganization as a continuum to characterize its scope. Osterman, however, characterized it according to the percentage of workers within a worksite that

were affected by the reorganization. These two alternative approaches, which are complementary to one another, produce very similar insights into the scope of the phenomenon. See Paul Osterman, "How Common is workplace Transformation and How Can We Explain Who Adopts It?" mimeograph (Massachusetts, Sloan School, Massachusetts Institute of Technology, January 1993).

[12] In the mail survey, firms were asked about these six methods plus two others: whether or not they have integrated quality control into production, and whether or not they have implemented just-in-time or computer integrated production.

[13] The weights are for 1990 and are based on unpublished tabulations from the Small Business Administration. The results should be representative of the distribution of firms in the U.S. economy. See Small Business Data Base, USEEM File, Version 8 (U.S. Small Business Administration, Office of Advocacy, 1991).

[14] Once again, these are lower bound estimates.

[15] Additional results from the mail survey indicate that 64.4 percent of the manufacturing firms and 38.6 percent of the nonmanufacturing firms report that they have integrated quality control into production, and 37.5 percent of manufacturing firms report that they have implemented just-in-time or computer integrated production. However, because the response rate in the mail survey was much lower than in the telephone survey, these figures are not comparable with those reported in the tabulation.

[16] See Paul Swaim, "Are American Workers Undertrained?" paper presented at the Eastern Economic Association Meetings, Washington, DC, March 1993. Swain reports that between 1983 and 1991, the percentage of workers who indicated that they had received skill-training at their current job increased from 36 to 42 (a 17-percent increase).

See also Paul Osterman, "Workplace Transformation," 1993, which reports that 35 percent of establishments with 50 or more employees have achieved "substantial use of flexible work organization," which he defines as the work organization affecting at least half of the employees. Using the number of reorganizational changes (as opposed to the percentage of employees affected by them), the results reported here indicate that 40 percent of firms with 100-499 employees have implemented at least three forms of work reorganization.

[17] The remainder of this section is based on the mail survey of firms and the telephone follow-up calls of firms that identified themselves as having a workplace education program.

[18] A substantial amount of reorganization is defined to have occurred if at least four forms of reorganization have been implemented.

[19] The fact that more statistically significant differences emerge within the manufacturing sample, than within the nonmanufacturing sample may, in part, be the result of the smaller sample of nonmanufacturing firms.

[20] Unlike the reorganization of work strategies, which many firms report that they have undertaken some, only a small fraction of firms indicate that they have a workplace education program. Consequently, the comparisons reported in table 4 are simply based on the attributes of firms with a workplace education program and the qualities of those without a program.

[21] This is to be expected because the results from cross-tabulations indicate that those firms that undertake a substantial amount of reorganization of work are also more likely to have a workplace education program.

[22] This difference, which is relatively small (38.6 percent, versus 32.3 percent), may simply result from a greater level of awareness of skill deficiencies among firms that have implemented an education program.

[23] These tabulations are not shown in this article, but can be found in Laurie J. Bassi, "Smart Workers, Smart Work," (Washington, DC, The Southport Institute for Policy Analysis, 1992), p. 39.

[24] Of the 17 firms in the sample that had terminated a workplace education program within the last 2 years, only 1 reported turnover as one reason (among others) for doing so. The most frequently cited reasons for terminating a program were that the program had achieved its purpose and that there was inadequate interest among workers.