

Job-related education and training: their impact on earnings

A worker's education and an appropriate job requiring education or training are significant determinants of earnings; qualifying training and training taken to improve skills play different roles in the workplace, but both contribute to greater earnings

Alan Eck

In the 1980's and early 1990's, a long-term decline in real average earnings of many U.S. workers, a trade deficit, and reductions in manufacturing employment growth became public concerns. The notion was bandied about that both education and job training would have to be strengthened in order for the United States to improve the economic status of its workers, as well as its competitive position in the global marketplace. The following excerpts from published sources are illustrative of official concern about the situation:

The quality of the U.S. workforce matters now more than ever. Well-trained, motivated workers who can produce high quality goods and services at low cost help enhance industrial productivity and competitiveness and keep American living standards high. In today's international economy, workers must be prepared to change the way they do their jobs in order to capture the benefits from rapidly evolving technology. Training goes hand-in-hand with productivity, quality, flexibility, and automation in the best performing firms.¹

Our nation is facing a major crisis in education, one larger and more significant than was realized even a few short years ago . . .

What is required are far more Americans who can understand mathematical and scientific principles and can apply them to everyday problems on the factory floor and in the executive suite. What is required are far more Americans who can

read and understand complex technical material—and use that knowledge to perform new tasks. What is required are more Americans who can work in teams to identify and solve problems without relying on direct supervision or rigid rules. What is required are far more Americans who can converse in foreign languages and be cognizant of events beyond our borders. What is required are for more Americans who can live and work effectively with people from diverse cultures and backgrounds.²

Although essentially policy statements, these excerpts reflect an uneasiness about the state of U.S. education and argue consistently for improving worker education and training. However, some general views expounded on the relationship of education to earnings and on how to improve our education and job training systems have raised anomalies. For example, if the Nation has lost ground to international competitors during the past decade, why have postsecondary institutional training in 2-year and bachelor's degree programs in the United States expanded significantly and educational attainment risen during that decade? In addition, will improving the reading, mathematics, and communication skills of our secondary school students ensure that they subsequently enjoy increased earnings? This article attempts to assess the data pertinent to these questions and other closely related subjects.

Alan Eck is an economist in the Office of Employment Projections, Bureau of Labor Statistics.

Education of U.S. workers

One statistic that is used to measure trends in education is the educational attainment of workers. Clearly, there was a pronounced increase in the educational attainment of U.S. workers during the 1970's and 1980's. As shown in table 1, the proportion of workers with 4 or more years of college—roughly, those with a bachelor's or higher degree—has increased significantly over the past two decades. In fact, the proportion of college graduates aged 25 to 64 years in the United States is twice that in Germany and Japan.³ Also, increases in the proportion of workers completing 1 to 3 years of college are similar to those for college graduates. By contrast, at the lower end of the educational scale, the proportion of workers aged 25 to 64 years with fewer than 4 years of high school decreased from 36 percent of the labor force in 1970 to less than 13 percent in 1991.⁴

The proportion of high school graduates who enroll in college directly after completing high school, another measure of educational attainment, has increased significantly over the past two decades. (See table 2.) In October 1973, 46.6 percent of high school graduates were enrolled in college following their graduation. The proportion increased to 60.1 percent in 1990. The increase was evenly distributed between 2- and 4-year college programs. Along with the increases in educational attainment, school dropout rates, as measured by the percent of persons 16 to 24 years of age who neither were enrolled in school nor had completed high school, fell

from 14.6 percent in 1972 to 12.5 percent in 1991.

Other data also suggest strengths in the U.S. education system. Increased expenditures (in constant dollars) indicate continued public support for the system. Expenditures per pupil in public elementary and secondary schools rose 43 percent from 1974 to 1990; in public institutions of higher education, the increase was 13 percent. (See table 3.) Compared with public per-pupil expenditures for elementary and secondary schools in Japan (\$2,200) and Germany (\$2,168), similar U.S. expenditures (\$3,846) were higher. Public per-pupil expenditures for higher education in the United States (\$5,643), however, were lower than in Japan (\$7,221), but higher than in Germany (\$4,255).⁵ In addition, the reading, mathematics, and science proficiency scores of 17-year-old students in the United States remained about the same during the 1970's and 1980's.⁶

Since the early 1970's, improvements in educational measures have not been accompanied by higher real income for many worker groups. For example, during the 1980's, the median real annual income of men increased only for those with 4 or more years of college, and even then, the 1990 figure of \$44,310 for this group was still below its 1972 median of \$48,299. (See table 4.) For women, real income increased during the 1980's for those with 1 to 3 years of college and those with 4 or more years of college. Between all other years and for all other education groups shown in the table, real income increased insignificantly or declined.

Table 1. **Percent distribution of the labor force 25 to 64 years of age, by educational attainment, selected years, 1970-91**

Year	Fewer than 4 years of high school	4 years of high school	1-3 years of college	4 or more years of college
1970	36.1	38.1	11.8	14.1
1975	27.5	39.7	14.4	18.3
1980	20.6	39.8	17.6	22.0
1985	15.9	40.2	19.0	24.9
1990	13.2	39.4	20.9	26.5
1991	12.8	39.1	21.3	26.8

Source: Current Population Survey.

Table 2. **Percent of high school graduates enrolling in college in October following graduation, by type of college, selected years, 1973-90**

Year	Total	2-year college	4-year college
1973	46.6	14.9	31.7
1975	50.7	18.2	32.6
1980	49.3	19.4	29.9
1985	57.7	19.6	38.1
1990	60.1	20.1	40.0

Source: Current Population Survey.

Postsecondary school training and labor market demand. A vast amount of postsecondary training is provided by public and private colleges and universities, junior and community colleges, and vocational schools. Nearly 2.9 million awards and degrees were received by individuals during the 1989-90 academic year, according to the National Center for Educational Statistics.⁷ These awards and degrees are classified by field of training in accordance with the Classification of Instructional Programs.⁸ In turn, the training categories can be matched with an occupation or with an occupation group comprised of a few to several detailed occupations in the employment data compiled by the Bureau of Labor Statistics. Some of these matches are very precise, such as that between the degrees awarded for completing medical school and the profession of physician and that between the completions of cosmetology vocational school programs and the profession of cosmetologist. Others are less precise. For example, the completion of one or more degrees in business administration provides training needed by workers in a wide variety of managerial occupations, and skills

Table 3. Expenditures per pupil in public schools, selected years, 1974-90

Year	Public elementary and secondary education ¹	Public institutions of higher education ²
1974	3,772	10,255
1976	3,860	9,847
1978	4,029	10,278
1980	4,188	10,734
1982	3,956	10,209
1984	4,213	10,374
1986	4,595	11,535
1988	4,873	11,719
1990	5,399	11,635

¹ In constant 1990-91 dollars.

² In constant 1989-90 dollars. Expenditures are per full-time equivalent student.

SOURCE: Elementary and secondary school expenditures—*The Condition of Education, 1992* (National Center for Education Statistics, 1992), p. 130. Higher education expenditures—*Digest of Education Statistics, 1992* (National Center for Education Statistics, 1992), table 321, p. 326.

learned in a secretarial or typing vocational program can be used in a variety of clerical occupations. A few fields of study cannot be matched with any related specific occupation. For example, completion of bachelor's degree programs in Russian or Japanese do not fit well with any particular profession, even though the education received can no doubt be applied in fields of work involved with foreign trade or teaching. (Of course, the latter would likely require an advanced degree, at least at the collegiate level.)⁹

After the training categories have been matched with occupations or groups of occupations, the awards and degrees can be compared with projections of job openings. Job openings result from employment growth and the need to replace individuals who leave an occupation. For the purposes of this article, the measure of replacement needs considers only persons who leave the occupation permanently, not those who leave on a temporary basis.¹⁰ However, during any given period, there is a great deal of movement into, out of, and between occupations. Moreover, the amount of movement varies considerably among occupations, and it is very difficult to measure with any degree of precision. For occupations in which there is much turnover, the *total* job openings may be many times higher than the number of *net* job openings. Thus, any comparisons between the estimates of net openings and training completions should be made with great caution.

Obviously, comparisons of job openings with degrees and awards are subject to many limitations, including the following: (1) Many of the matches between occupations and fields of study result from subjective decisions that may

be erroneous. (2) The number of openings projected in an occupation is dependent on the accuracy of estimates of projected employment growth and replacement needs in that occupation. (3) Data about degrees and awards provide information only about training obtained in schools or other formal educational programs and do not take into account, for example, training obtained in apprenticeship programs, in the Armed Forces, or from private employers. (4) Fields of study for about 310,000 degrees and awards could not be matched with any specific occupation. (5) Fields of study were considered appropriate training for 260 occupations or occupation groups—only about one-half of the occupations in the BLS projections model. Because there are no institutional training programs in many occupations, the exclusion from the analysis of a significant number of occupations is not unexpected.

Despite these limitations, comparing the number of completions of education and training programs with the number of job openings due to employment growth and replacement needs in related occupations prepared as part of the BLS Occupational Outlook Program may provide some useful insights. Such an endeavor shows that, overall, there were nearly 2.9 million awards and degrees in 1989-90, compared with an estimated 4.4 million job openings, on average, for new entrants to the work force each year from 1990 to 2005. (See table 5.) That is, the number of individuals currently completing training programs is about 65 percent of the average annual number of job openings anticipated through the 1990's. Again, this proportion is not surprising, given that many jobs do not require post-secondary school training.

Some individual occupations appearing in table 5 show close matches between the projected needs of the workplace over the next decade and the current number of awards and degrees in related education and training programs. Among these are engineers, optometrists, dental hygienists and assistants, emergency medical technicians, landscape architects, and aircraft mechanics. In contrast, many occupations had substantially more individuals trained during 1989-90 than the projected annual average number of job openings from 1990 to 2005 due to employment growth and the need to replace workers who leave the occupation permanently. For example, the 23,949 bachelor degrees in economics awarded in 1989-90 greatly exceed the 2,000 job openings in the field that are projected to occur annually during the 1990-2005 period; however, collegiate training in economics may be useful indirectly for many entry-level professional positions.

On the other hand, there are many fields in which the output of institutional training programs is much less than the projected number of job openings. Of course, for some occupations—for example, cashiers—formal training may not be needed, and what training there is can be learned in a few hours or a few days on the job. For other occupations, however, training is important. In most construction crafts, and in many mechanic and repairer occupations, the number of job openings projected from 1990 to 2005 is much greater than the number of education and training awards received in 1989–90. For the construction crafts, this is understandable, as many workers are trained on the job, some in formal apprenticeship programs. However, additional vocational training for construction occupations may provide workers who lack the necessary skills with greater job potential than other types of vocational training. Additional training may also be appropriate for many other occupations where annual completions are far fewer than estimated job openings and for some occupations that have no associated training programs at all.

Utility of education and job training

The discussion in the preceding section afforded a broad view of the relationship of the output of our educational institutions, by field of training, to the projected outlook in the job market, by occupation. Another view of the relationship of education to the job market is provided in information about the extent and utility of training for individual workers. Such information was compiled from respondents' answers to the questions in the January 1991 Current Population Survey about whether they needed specific skills or

training to get their current jobs.¹¹ Respondents also were questioned on whether or not they took training to improve their skills in their current jobs. The responses provided information not only about an individual's view of the utility of school-based training, but also about the utility of formal and informal company training in the current job and about other types of training.¹² Data on earnings were analyzed to assess the impact of the various sources of training.

Several significant findings emerged from the analysis. First, the data may provide some support for the results of an earlier BLS study which found that many college graduates have acquired training that they are not using in their current jobs.¹³ They may have acquired general skills that make them more productive than workers with less education, but they are not using training specifically from their major field of study. Second, the results of the analysis show the extent to which training is used in the labor market in general, as approximately 2 out of 3 workers responded that specific skills or training was needed to obtain their current jobs or that they had taken training to improve their skills. (Conversely, 1 in 3 responded that qualifying training or training to improve skills was not required to obtain his or her current job.)¹⁴ Third, the data on earnings show clearly that the job itself counts: at each of the four levels of educational attainment examined—college graduate, some college, high school graduate, and fewer than 12 years of schooling—those who said that they required specific skills or training to get their jobs received higher earnings than those at the same education level who said that they did not require any such skills to get their jobs. Moreover, workers who required specific skills or training to get their jobs and who also took training to improve their skills through a formal company program had higher earnings than those with the same level of education who improved their skills through training at a school or informally while on the job. Finally, while data from this survey show—as do other data—that educational attainment is directly related to earnings, they also show that being in a job that requires skills is beneficial for many workers, irrespective of their education level.

Qualifying training. In January 1991, 57 percent of all workers reported that they needed specific skills or training to get their current jobs. As shown in table 6, informal on-the-job training, 4-year or longer college programs, formal company training, training through junior colleges or technical institutes, and training from friends or relatives or other nonwork-related training were the most frequently reported sources. Relatively few cited high school vocational training, post-high school

text continues on page 30

Table 4. Median annual income for full-time workers,¹ by education level and sex, selected years

[1991 dollars]

Gender and year	Fewer than 4 years of high school	4-years of high school	1–3 years of college	4 or more years of college
Men:				
1972	\$26,462	\$33,961	\$38,117	\$48,299
1975	25,630	32,812	36,318	44,704
1980	24,380	32,202	34,583	42,754
1985	22,657	30,174	34,104	45,454
1990	20,306	27,629	32,892	44,310
Women:				
1972	15,117	18,911	21,530	28,971
1975	14,548	18,844	22,112	27,523
1980	15,103	19,082	21,393	27,083
1985	14,443	19,583	22,756	29,246
1990	14,338	19,093	23,161	31,668

¹ Workers aged 25 years and older, working year round.

Source: Current Population Survey, as adjusted by the CPI-U-X1.

Table 5. Projected annual average job openings, 1990–2005, and awards and degrees from institutional education and training programs in related fields, 1989–90

Occupation	Annual average job openings, 1990–2005: growth plus net replacement needs	Total degrees and awards	Awards, curriculums of under 1 year	1- to 4-year awards	Associate degrees	Total bachelor's and higher degrees	Bachelor's degrees requiring 4 or 5 years	Master's degrees	Doctoral and first professional degrees
Total, all occupations ¹	4,384,000	2,887,465	531,443	375,452	473,645	1,506,925	1,066,511	328,260	112,154
Executive, administrative, and managerial	436,000	506,830	21,025	15,394	63,321	407,090	293,306	109,932	3,852
Managerial and administrative occupations	305,000	427,980	16,526	12,938	56,295	342,221	237,240	101,276	3,705
Communication, transportation, and utilities operations managers	5,000	2,720	180	62	583	1,895	1,207	667	21
Construction managers	7,000	825	57	100	358	310	310	0	0
Education administrators	14,000	12,163	0	0	26	12,137	27	10,091	2,019
Financial managers	24,000	32,836	154	69	493	32,120	26,484	5,588	48
Food service and lodging managers	23,000	14,837	3,751	1,871	4,932	4,283	4,125	157	1
Funeral directors and morticians	1,000	1,460	36	751	594	79	79	0	0
Government chief executives and legislators	2,000	35,801	236	314	2,707	32,544	14,449	17,598	497
Industrial production managers	6,000	6,449	203	216	1,342	4,688	4,488	196	4
Marketing, advertising, and public relations managers	23,000	66,416	1,144	588	2,611	62,073	57,706	4,126	241
All other managers and administrators	200,000	254,473	10,765	8,967	42,649	192,092	128,365	62,853	874
Management support occupations	131,000	78,850	4,499	2,456	7,026	64,869	56,066	8,656	147
Accountants and auditors	38,000	57,646	1,452	1,978	5,828	48,388	45,038	3,290	60
Construction and building inspectors	2,000	2,537	2,492	0	45	0	0	0	0
Management analysts	7,000	7,704	28	345	715	6,616	4,818	1,778	20
Personnel, training, and labor relations specialists	11,000	8,185	209	0	291	7,685	5,462	2,156	67
Purchasing agents, except wholesale, retail, and farm products	7,000	1,437	2	69	146	1,220	748	472	0
All other management support workers	66,000	1,341	316	64	1	960	0	960	0
Professional specialty occupations	623,000	1,120,063	47,768	43,591	101,273	927,431	618,835	205,295	103,301
Engineers	61,000	94,611	367	521	3,071	90,652	62,652	23,108	4,892
Architects and surveyors	7,000	12,192	104	311	1,981	9,796	7,424	2,341	31
Architects, except landscape and marine	4,000	10,480	81	232	1,776	8,391	6,366	1,997	28
Landscape architects	1,000	1,241	1	0	3	1,237	918	318	1
Surveyors	2,000	471	22	79	202	168	140	26	2
Life scientists	8,000	67,822	1,261	4,362	3,066	59,133	46,664	7,555	4,914
Computer, mathematical, and operations research analysts	32,000	86,592	14,895	3,470	6,072	62,155	44,698	15,749	1,708
Actuaries	(²)	275	0	0	0	275	229	46	0
Systems analysts and computer scientists	28,000	64,421	14,309	3,417	5,312	41,383	29,089	11,550	744
Statisticians	(²)	1,317	0	0	0	1,317	457	671	189
Mathematicians and all other mathematical scientists	(²)	19,080	586	53	760	17,681	13,988	2,967	726
Operations research analysts	4,000	1,499	0	0	0	1,499	935	515	49
Physical scientists	8,000	35,136	642	31	6,082	28,381	18,513	5,660	4,208
Chemists	3,000	12,417	57	5	166	12,189	8,289	1,711	2,189
Geologists, geophysicists, and oceanographers	2,000	4,977	582	16	33	4,346	2,416	1,398	532
Meteorologists	(²)	623	0	0	0	623	360	198	65
Physicists and astronomers	1,000	7,640	2	10	77	7,551	4,333	1,924	1,294
All other physical scientists	2,000	9,479	1	0	5,806	3,672	3,115	429	128
Social scientists	10,000	216,121	2,447	158	8,492	205,024	175,475	23,003	6,546
Economists	2,000	29,198	2,269	33	152	26,744	23,949	1,973	822
Psychologists	6,000	68,651	21	78	1,118	67,434	54,023	9,991	3,420
Urban and regional planners	1,000	3,348	5	0	49	3,294	1,689	1,502	103
All other social scientists	1,000	114,924	152	47	7,173	107,552	95,814	9,537	2,201
Social, recreational, and religious workers	34,000	61,634	1,117	4,120	3,829	52,568	26,958	17,346	8,264
Lawyers and judicial workers	28,000	44,314	556	1,195	871	41,692	1,581	2,686	37,425
Teachers, librarians, and counselors	208,000	225,298	6,913	4,533	9,431	204,421	115,966	81,346	7,109
Teachers, elementary	48,000	64,514	6	82	1,195	63,231	50,566	12,577	88

See footnotes at end of table.

Table 5. Continued—Projected annual average job openings, 1990–2005, and awards and degrees from institutional education and training programs in related fields, 1989–90

Occupation	Annual average job openings, 1990–2005: growth plus net replacement needs	Total degrees and awards	Awards, curriculums of under 1 year	1- to 4-year awards	Associate degrees	Total bachelor's and higher degrees	Bachelor's degrees requiring 4 or 5 years	Master's degrees	Doctoral and first professional degrees
Teachers, preschool and kindergarten	14,000	7,569	79	241	736	6,513	4,880	1,616	17
Teachers, special education	12,000	16,667	183	88	164	16,232	6,966	9,053	213
Teachers, secondary school	58,000	81,513	653	2,455	4,823	73,582	42,544	28,874	2,164
College and university faculty	32,000	4,731	0	0	2	4,729	163	1,862	2,704
All other teachers and instructors	33,000	29,784	5,926	1,592	2,301	19,944	7,156	11,453	1,335
Librarians, archivists, curators, and related workers	5,000	4,744	35	75	112	4,522	84	4,397	41
Counselors	6,000	15,797	31	0	98	15,668	3,607	11,514	547
Health diagnosing occupations	37,000	31,277	797	2,254	568	27,658	1,494	834	25,330
Dentists	6,000	4,877	91	0	27	4,759	134	449	4,176
Optometrists	1,000	1,388	0	0	18	1,370	252	17	1,101
Physicians	27,000	21,557	706	2,254	402	18,195	855	208	17,132
Podiatrists	1,000	736	0	0	0	736	5	56	675
Veterinarians and veterinary inspectors	2,000	2,719	0	0	121	2,598	248	104	2,246
Health assessment and treating occupations	105,000	125,163	3,425	13,594	44,480	63,664	48,724	13,037	1,903
Dietitians and nutritionists	2,000	3,230	25	29	129	3,047	2,513	479	55
Pharmacists	6,000	7,768	16	0	7	7,745	6,100	287	1,358
Physician assistants	2,000	1,090	65	226	130	669	638	31	0
Registered nurses	78,000	90,580	1,847	11,024	40,911	36,798	29,668	6,797	333
Therapists	17,000	22,495	1,472	2,315	3,303	15,405	9,805	5,443	157
Occupational therapists	2,000	2,597	0	77	132	2,388	2,009	379	0
Physical therapists	6,000	4,832	0	110	269	4,453	3,532	919	2
Recreational therapists	2,000	2,191	170	632	1,008	381	363	18	0
Respiratory therapists	3,000	2,403	46	1,145	1,194	18	18	0	0
Speech-language pathologists and audiologists	3,000	5,873	0	0	22	5,851	2,839	2,920	92
All other therapists	1,000	4,599	1,256	351	678	2,314	1,044	1,207	63
Writers, artists, and entertainers	55,000	105,825	9,061	8,893	12,734	75,137	63,238	10,986	913
Artists and commercial artists	10,000	27,263	1,863	1,299	4,001	20,100	17,017	2,935	148
Athletes, coaches, umpires, and referees	1,000	2,288	2,288	0	0	0	0	0	0
Dancers and choreographers	(²)	1,067	85	110	39	833	638	187	8
Designers	11,000	21,685	1,828	5,149	4,344	10,364	9,880	462	22
Musicians	7,000	13,126	1,454	211	680	10,781	6,935	3,263	583
Photographers and camera operators	5,000	1,737	720	274	691	52	52	0	0
Producers, directors, actors, and entertainers	4,000	14,357	371	1,791	2,294	9,901	7,991	1,811	99
Public relations specialists and publicity writers	5,000	1,922	0	0	9	1,913	1,804	109	0
Radio and TV announcers and newscasters	2,000	7,721	442	0	339	6,940	6,634	294	12
Writers and editors, including technical writers	8,000	14,659	10	59	337	14,253	12,287	1,925	41
All other professional workers	32,000	14,078	6,183	149	596	7,150	5,448	1,644	58
Technicians and related support occupations	183,000	212,767	51,291	70,983	63,867	26,626	19,055	4,346	3,225
Health technicians and technologists	79,000	71,804	10,432	33,341	13,260	14,771	8,139	3,423	3,209
Clinical lab technologists and technicians	9,000	6,857	957	852	1,926	3,122	2,814	205	103
Dental hygienists	4,000	4,115	14	241	3,140	720	703	17	0
Emergency medical technicians	3,000	3,111	1,812	972	321	6	6	0	0
Licensed practical nurses	29,000	25,984	2,463	22,729	617	175	169	6	0
Medical records technicians	3,000	3,073	494	810	1,120	649	639	10	0
Nuclear medicine technologists	1,000	478	3	130	205	140	140	0	0
Opticians, dispensing and measuring	3,000	835	197	177	461	0	0	0	0
Radiologic technologists and technicians	9,000	5,844	81	1,884	3,492	387	374	13	0
Surgical technologists	2,000	2,506	442	1,854	210	0	0	0	0
All other health professionals, paraprofessionals, and technicians	16,000	19,001	3,969	3,692	1,768	9,572	3,294	3,172	3,106
Engineering and science technicians and technologists	52,000	85,611	18,088	20,429	38,087	9,007	8,637	354	16
Engineering technicians	28,000	65,881	11,847	14,109	31,380	8,545	8,250	288	7

See footnotes at end of table.

Table 5. Continued—Projected annual average job openings, 1990–2005, and awards and degrees from institutional education and training programs in related fields, 1989–90

Occupation	Annual average job openings, 1990–2005: growth plus net replacement needs	Total degrees and awards	Awards, curriculums of under 1 year	1- to 4-year awards	Associate degrees	Total bachelor's and higher degrees	Bachelor's degrees requiring 4 or 5 years	Master's degrees	Doctoral and first professional degrees
Drafters	14,000	14,725	4,707	4,047	5,713	258	258	0	0
Science and mathematics technicians ..	10,000	5,005	1,534	2,273	994	204	129	66	9
Technicians, except health, engineering, and science	52,000	55,352	22,771	17,213	12,520	2,848	2,279	569	0
Aircraft pilots and flight engineers	5,000	9,820	4,353	3,747	844	876	508	368	0
Air traffic controllers	1,000	127	12	0	92	23	23	0	0
Computer programmers	34,000	31,361	13,719	9,243	7,058	1,341	1,144	197	0
Paralegals	6,000	14,044	4,687	4,223	4,526	608	604	4	0
All other technicians	6,000	0	0	0	0	0	0	0	0
Marketing and sales occupations	584,000	154,118	106,967	24,879	15,297	6,975	6,521	452	2
Cashiers	129,000	389	0	0	244	145	144	1	0
Insurance sales workers	17,000	1,627	1,602	0	25	0	0	0	0
Real estate agents, brokers, and appraisers	11,000	82,484	67,221	13,527	622	1,114	824	290	0
Securities and financial services sales workers	7,000	3,205	759	712	1,304	430	428	2	0
Travel agents	9,000	24,317	16,119	5,483	2,393	322	293	29	0
All other sales and related workers	411,000	42,096	21,266	5,157	10,709	4,964	4,832	130	2
Administrative support occupations, including clerical	654,000	157,387	58,311	54,065	41,628	3,383	3,349	34	0
Adjusters, investigators, and collectors	29,000	14	4	0	10	0	0	0	0
Communications equipment operators	9,000	0	0	0	0	0	0	0	0
Computer operators and peripheral equipment operators	6,000	19,645	8,953	5,142	5,155	395	387	8	0
Financial records-processing occupations ..	67,000	26,692	7,775	7,933	10,621	363	345	18	0
Information clerks	62,000	1,103	302	794	7	0	0	0	0
Mail clerks and messengers	9,000	0	0	0	0	0	0	0	0
Postal clerks and mail carriers	14,000	0	0	0	0	0	0	0	0
Material-recording, scheduling, dispatching, and distributing operations ..	66,000	57	55	0	2	0	0	0	0
Records-processing occupations, except financial	34,000	0	0	0	0	0	0	0	0
Secretaries, stenographers, and typists	138,000	84,832	31,226	32,873	19,302	1,431	1,430	1	0
Secretaries	116,000	53,770	17,923	18,717	15,816	1,314	1,314	0	0
Legal secretaries	15,000	7,357	3,379	2,374	1,590	14	14	0	0
Medical secretaries	16,000	4,755	1,138	2,360	1,257	0	0	0	0
Secretaries, except legal and medical ..	85,000	41,658	13,406	13,983	12,969	1,300	1,300	0	0
Stenographers	3,000	2,952	503	1,710	713	26	26	0	0
Typists and word processors	19,000	28,110	12,800	12,446	2,773	91	90	1	0
Other clerical and administrative support workers	220,000	25,044	9,996	7,323	6,531	1,194	1,187	7	0
Bank tellers	19,000	2,074	639	797	616	22	22	0	0
Clerical supervisors and managers	47,000	4,210	538	781	1,763	1,128	1,121	7	0
Data entry keyers, except composing	11,000	4,783	3,521	1,018	244	0	0	0	0
General office clerks	85,000	3,473	2,512	791	170	0	0	0	0
Teacher aides and educational assistants ..	32,000	379	151	0	225	3	3	0	0
All other clerical and administrative support workers	26,000	10,125	2,635	3,936	3,513	41	41	0	0
Service occupations	882,000	237,062	117,984	77,056	23,401	18,621	16,821	1,736	64
Cleaning and building service occupations, except private household	108,000	382	380	0	2	0	0	0	0
Food preparation and service occupations ..	432,000	6,411	4,268	688	1,455	0	0	0	0
Cooks, except short order	52,000	3,297	1,179	688	1,430	0	0	0	0
Bartenders	14,000	3,114	3,089	0	25	0	0	0	0
All other food preparation and service workers	366,000	0	0	0	0	0	0	0	0
Health service occupations	84,000	72,216	46,896	17,933	5,641	1,746	1,190	532	24

See footnotes at end of table.

Table 5. Continued—Projected annual average job openings, 1990–2005, and awards and degrees from institutional education and training programs in related fields, 1989–90

Occupation	Annual average job openings, 1990–2005: growth plus net replacement needs	Total degrees and awards	Awards, curriculums of under 1 year	1- to 4-year awards	Associate degrees	Total bachelor's and higher degrees	Bachelor's degrees requiring 4 or 5 years	Master's degrees	Doctoral and first professional degrees
Ambulance drivers and attendants, except EMT's	(2)	9,044	8,224	769	22	29	25	4	0
Dental assistants	8,000	8,606	4,491	3,745	361	9	0	9	0
Medical assistants	10,000	23,796	13,376	8,557	1,843	20	0	20	0
Nursing aides and psychiatric aides	59,000	20,984	18,756	2,228	0	0	0	0	0
Occupational therapy assistants and aides	(2)	855	0	55	800	0	0	0	0
Pharmacy assistants	2,000	1,250	198	993	59	0	0	0	0
Physical and corrective therapy assistants and attendants	2,000	1,650	12	59	1,579	0	0	0	0
All other health service workers	3,000	6,031	1,839	1,527	977	1,688	1,165	499	24
Personal service occupations	95,000	99,219	43,827	51,864	3,364	164	118	43	3
Amusement and recreation attendants	8,000	598	598	0	0	0	0	0	0
Baggage porters and bellhops	1,000	0	0	0	0	0	0	0	0
Barbers	1,000	5,730	2,624	3,102	4	0	0	0	0
Child care workers	31,000	8,231	1,032	4,072	3,052	75	38	36	1
Cosmetologists and related workers	17,000	81,890	37,101	44,587	202	0	0	0	0
Flight attendants	6,000	103	62	0	41	0	0	0	0
Homemaker-home health aides	29,000	2,667	2,410	103	65	89	80	7	2
Ushers, lobby attendants, and ticket takers	2,000	0	0	0	0	0	0	0	0
Private household workers	17,000	0	0	0	0	0	0	0	0
Firefighting occupations	15,000	5,556	3,001	777	1,616	162	156	6	0
Police and correction officers	45,000	38,557	7,380	4,083	10,630	16,464	15,274	1,153	37
Correction officers	12,000	9,238	1,949	229	1,941	5,119	4,645	474	0
Police and detectives	33,000	29,319	5,431	3,854	8,689	11,345	10,629	679	37
Guards and other protective service workers	52,000	3,362	2,527	117	634	84	82	2	0
Guards	39,000	2,585	2,493	0	42	50	48	2	0
All other protective service workers	13,000	777	34	117	592	34	34	0	0
All other service workers	34,000	11,359	9,705	1,594	59	1	1	0	0
Agriculture, forestry, fishing, and related workers	90,000	14,547	4,356	1,946	2,956	5,289	4,366	713	210
Animal caretakers, except farm	5,000	892	643	28	158	63	63	0	0
Farm operators and managers	13,000	10,186	2,552	1,144	1,729	4,761	3,900	677	184
Gardeners and groundskeepers, except farm	33,000	3,468	1,161	774	1,068	465	403	36	26
All other agricultural, forestry, fishing and related workers	39,000	1	0	0	1	0	0	0	0
Precision production, craft, and repair occupations	455,000	133,057	58,954	53,553	18,700	1,850	1,726	122	2
Blue-collar worker supervisors	54,000	0	0	0	0	0	0	0	0
Construction trades	128,000	19,730	9,593	8,619	1,501	17	17	0	0
Bricklayers and stone masons	5,000	365	153	194	18	0	0	0	0
Carpenters	29,000	2,848	801	1,695	352	0	0	0	0
Carpet installers	3,000	0	0	0	0	0	0	0	0
Concrete and terrazzo finishers	5,000	0	0	0	0	0	0	0	0
Drywall installers and finishers	5,000	0	0	0	0	0	0	0	0
Electricians	23,000	5,773	1,434	4,014	325	0	0	0	0
Insulation workers	4,000	2	0	0	2	0	0	0	0
Painters and paperhangers, construction and maintenance	16,000	457	132	316	9	0	0	0	0
Pipelayers and pipelaying fitters	2,000	0	0	0	0	0	0	0	0
Plumbers, pipefitters, and steamfitters	14,000	4,857	4,048	733	76	0	0	0	0
Roofers	4,000	0	0	0	0	0	0	0	0
Structural and reinforcing metal workers	3,000	0	0	0	0	0	0	0	0
All other construction trades workers	15,000	5,428	3,025	1,667	719	17	17	0	0
Extractive and related workers, including blaster	5,000	0	0	0	0	0	0	0	0

See footnotes at end of table.

Table 5. Continued—Projected annual average job openings, 1990–2005, and awards and degrees from institutional education and training programs in related fields, 1989–90

Occupation	Annual average job openings, 1990–2005: growth plus net replacement needs	Total degrees and awards	Awards, curriculums of under 1 year	1- to 4-year awards	Associate degrees	Total bachelor's and higher degrees	Bachelor's degrees requiring 4 or 5 years	Master's degrees	Doctoral and first professional degrees
Mechanics, installers, and repairers	160,000	91,758	39,033	38,193	13,667	865	848	15	2
Communications equipment mechanics, installers, and repairers	1,000	0	0	0	0	0	0	0	0
Electrical and electronic equipment mechanics, installers, and repairers	16,000	18,722	7,558	8,341	2,644	179	179	0	0
Data-processing equipment repairers	4,000	7,540	3,424	3,040	1,074	2	2	0	0
Electrical power line installers and repairers	4,000	4,058	2,721	1,098	237	2	2	0	0
All other electrical and electronic equipment mechanics and repairers	8,000	7,124	1,413	4,203	1,333	175	175	0	0
Machinery and related mechanics, installers, and repairers	49,000	4,426	824	948	2,244	410	408	2	0
Vehicle and mobile equipment mechanics and repairers	65,000	40,227	19,891	16,055	4,043	238	233	4	1
Aircraft mechanics and engine specialists	5,000	5,203	2,869	1,697	631	6	6	0	0
Automotive body and related repairers	9,000	3,806	1,256	2,308	242	0	0	0	0
Automotive mechanics	33,000	19,218	8,723	8,140	2,355	0	0	0	0
Bus and truck mechanics and diesel engine specialists	11,000	6,876	3,109	3,113	654	0	0	0	0
Farm equipment mechanics	2,000	753	165	209	147	232	227	4	1
Mobile heavy equipment mechanics	4,000	0	0	0	0	0	0	0	0
Motorcycle, boat, and small-engine mechanics	1,000	4,371	3,769	588	14	0	0	0	0
Other mechanics, installers, and repairers	29,000	28,383	10,760	12,849	4,736	38	28	9	1
Coin and vending machine servicers and repairers	(²)	59	23	36	0	0	0	0	0
Electromedical and biomedical equipment repairers	(²)	571	0	87	481	3	3	0	0
Heat, air conditioning, and refrigeration mechanics and installers	6,000	14,139	6,691	5,987	1,455	6	6	0	0
Home appliance and power tool repairers	2,000	1,387	255	1,116	16	0	0	0	0
Musical instrument repairers and tuners	(²)	142	0	138	4	0	0	0	0
Office machine and cash register servicers	2,000	280	54	202	24	0	0	0	0
Precision instrument repairers	1,000	527	9	178	326	14	4	9	1
Watchmakers	(²)	85	4	80	1	0	0	0	0
All other mechanics, installers, and repairers	18,000	11,193	3,724	5,025	2,429	15	15	0	0
Production occupations, precision	98,000	20,773	9,755	6,701	3,370	947	847	100	0
Assemblers, precision	8,000	0	0	0	0	0	0	0	0
Food workers, precision	8,000	298	156	137	5	0	0	0	0
Inspectors, testers, and graders, precision	16,000	0	0	0	0	0	0	0	0
Metal workers, precision	31,000	8,599	3,393	4,113	1,092	1	1	0	0
Jewelers and silversmiths	2,000	636	481	108	47	0	0	0	0
Sheet metal workers and duct installers	9,000	386	59	320	7	0	0	0	0
Tool and die makers	4,000	559	40	325	193	1	1	0	0
All other precision metal workers	16,000	7,018	2,813	3,360	845	0	0	0	0
Printing workers, precision	7,000	5,104	1,578	1,530	1,723	273	273	0	0
Textile, apparel, and furnishings workers, precision	9,000	1,255	563	394	166	132	132	0	0
Woodworkers, precision	9,000	478	112	319	44	3	0	3	0
Other precision workers	10,000	5,039	3,953	208	340	538	441	97	0
Dental lab technicians, precision	2,000	592	115	204	267	6	1	5	0
Optical goods workers, precision	1,000	64	3	0	61	0	0	0	0
All other precision workers	6,000	4,383	3,835	4	12	532	440	92	0
Plant and system occupations	10,000	796	573	40	162	21	14	7	0

See footnotes at end of table.

Table 5. Continued—Projected annual average job openings, 1990–2005, and awards and degrees from institutional education and training programs in related fields, 1989–90

Occupation	Annual average job openings, 1990–2005: growth plus net replacement needs	Total degrees and awards	Awards, curriculums of under 1 year	1- to 4-year awards	Associate degrees	Total bachelor's and higher degrees	Bachelor's degrees requiring 4 or 5 years	Master's degrees	Doctoral and first professional degrees
Operators, fabricators, and laborers	477,000	41,504	35,335	4,507	1,572	90	90	0	0
Machine setters, setup operators, operators, and tenders	129,000	1,161	810	81	184	86	86	0	0
Numerical control machine tool operators and tenders	3,000	0	0	0	0	0	0	0	0
Combination machine tool setters, setup operators, and tenders	4,000	0	0	0	0	0	0	0	0
Machine tool cut-and-form setters, operators, and tenders	18,000	0	0	0	0	0	0	0	0
Metal-fabricating machine setters, operators, and tenders	4,000	0	0	0	0	0	0	0	0
Metal- and plastic-processing machine setters, operators, and tenders	14,000	306	95	11	114	86	86	0	0
Printing, binding, and related workers	13,000	401	263	70	68	0	0	0	0
Printing press operators	7,000	400	262	70	68	0	0	0	0
Photoengraving and lithographing machine operators and photographers	4,000	1	1	0	0	0	0	0	0
All other printing, binding, and related workers	2,000	0	0	0	0	0	0	0	0
Textile and related setters, operators, and related workers	26,000	0	0	0	0	0	0	0	0
Woodworking machine setters, operators, and other related workers	5,000	0	0	0	0	0	0	0	0
Other machine setters, setup operators, operators, and tenders	42,000	454	452	0	2	0	0	0	0
Handworkers, including assemblers and fabricators	49,000	12,276	9,333	2,666	277	0	0	0	0
Welders and cutters	9,000	12,276	9,333	2,666	277	0	0	0	0
All other handworkers	40,000	0	0	0	0	0	0	0	0
Transportation and material-moving machine and vehicle operators	154,000	28,067	25,192	1,760	1,111	4	4	0	0
Motor vehicle operators	118,000	24,825	24,171	631	23	0	0	0	0
Rail transportation workers	4,000	0	0	0	0	0	0	0	0
Water transportation and related workers	4,000	2,963	838	1,066	1,055	4	4	0	0
Material-moving equipment operators	27,000	279	183	63	33	0	0	0	0
All other transportation and material-moving equipment and operators	1,000	0	0	0	0	0	0	0	0
Helpers, laborers, and material movers, hand	145,000	0	0	0	0	0	0	0	0
Nonmatches of awards and degrees with any occupation	310,130	29,452	29,478	141,630	109,570	102,442	5,630	1,498

¹ Totals include degrees and awards that could not be matched with any occupation. The last entry in the stub identifies categories of nonmatches.
² 500 or fewer.

SOURCE: *Occupational Projections and Training Data*, Bulletin 2401 (Bureau of Labor Statistics, 1992).

vocational training, training from the Armed Forces, or correspondence courses.¹⁵

The proportion of workers who reported needing training varied extensively by educational attainment. Only 28 percent of those with fewer than 12 years of education said that they needed training to get their current jobs. This contrasts with 84 percent for college graduates who said that they needed such training. At 18 percent, informal on-the-job training was the largest source of training for persons with fewer than 12 years of schooling who reported that they needed qualify-

ing training, but even that figure was significantly below the 26 to 32 percent with informal on-the-job training reported by the other education groups. These data indicate that workers who are not high school graduates are much less likely than others to obtain jobs that require training.

There was also great variation in the proportion of workers among the major occupation groups who reported needing qualifying training. Not surprisingly, professional specialty workers had the highest proportion needing special skills or training, 92 percent; handlers, equipment cleaners, and

laborers had the lowest proportion, 20 percent. College graduates who are in a job that requires training are more likely than college graduates who are in a job that does not require training to be a professional specialty worker. Their numbers underlie the high proportion of professional specialty workers who needed qualifying training. Similarly, those with the least education who did not need training are more likely to work as handlers, equipment cleaners, and laborers than to be in other occupation groups; thus, they are the reason for the low proportion of those requiring qualifying training for this occupation group.

To measure the utility of college training in the labor market, one can compare the proportion of employees who are college graduates with the proportion who are college graduates and who also reported that they needed training to qualify for their jobs.¹⁶ As shown in table 7, 25 percent of

employees were college graduates, but only 16 percent reported needing training obtained in a 4-year or longer college program. This indicates that about 1 in 3 college graduates may have acquired training that is not being used in his or her current job. Again, such a conclusion is consistent with the results of another BLS study.¹⁷ A more divergent pattern exists for workers with 1 to 3 years of college. This group constitutes 22 percent of all workers, but only about 1 in 5 of the group reported needing training from a junior college or technical institute, an indication that much of the training received was not appropriate for the jobs these workers obtained. Of course, the group also includes those who started in a 4-year bachelor's degree program, but who did not complete it.

Between January 1983—the only other date for which comparable data are available—and January 1991, the number of workers reporting

Table 6. **Workers who needed training to qualify for their current jobs and the source of training, by educational attainment and occupation, January 1991**

[Percent of category]

Education level and occupational group	Total employed	Workers who needed training	School					Formal company training	Informal on-the-job training	Armed Forces	Correspondence course	Friends or relatives or other nonwork-related training
			Total with school training	High school vocational training	Post-high school vocational training	Junior college or technical institute	4-year or longer college program					
Total employed, aged 16 years and older . . .	100.0	56.7	32.1	3.9	2.7	7.7	18.8	12.1	27.2	2.1	1.1	7.4
Highest education level completed:												
Fewer than 12 years . . .	100.0	27.8	4.1	1.6	1.1	1.1	.2	4.6	18.1	.4	.4	5.9
High school graduate . . .	100.0	46.2	15.0	6.0	3.2	5.3	1.1	11.6	26.4	2.1	1.0	7.2
1-3 years of college . . .	100.0	63.1	35.7	4.5	4.1	19.5	10.8	15.9	32.1	3.1	1.5	8.0
College graduate	100.0	83.8	71.7	1.2	1.5	4.6	64.7	13.7	29.0	2.1	1.2	7.9
Occupational group:												
Executive, administrative, and managerial . . .	100.0	71.9	48.5	3.0	2.0	8.5	36.1	16.6	37.4	3.0	1.9	8.5
Professional specialty . . .	100.0	92.1	82.4	1.5	2.8	10.5	68.4	10.8	25.3	2.1	1.2	8.0
Technicians and related support	100.0	85.5	61.2	4.8	8.0	23.6	26.0	16.4	30.9	4.8	1.2	9.0
Sales occupations	100.0	43.8	17.9	1.5	1.5	4.1	11.0	13.2	25.5	1.0	1.3	7.0
Administrative support . . .	100.0	54.6	31.1	10.8	3.3	10.3	8.6	10.2	29.8	1.1	.9	4.3
Service, except protective service	100.0	33.8	12.1	1.8	3.7	5.2	1.7	5.8	17.0	.6	.3	6.1
Protective service occupations	100.0	61.1	24.5	1.8	3.1	12.6	7.9	31.1	23.1	9.2	1.4	9.5
Farming, forestry, and fishing	100.0	28.0	8.3	2.2	1.1	2.5	4.0	2.7	16.5	.6	.5	11.3
Precision production, craft, and repair	100.0	61.4	19.4	5.7	3.7	8.7	3.8	19.6	35.2	5.0	2.2	11.5
Machine operators, assemblers, and inspectors	100.0	37.7	7.6	2.8	1.5	2.9	1.0	9.0	25.0	.9	.2	5.0
Transportation and material-moving occupations	100.0	41.3	4.4	1.0	1.1	1.9	.5	11.1	22.9	1.7	.1	10.2
Handlers, equipment cleaners, and laborers	100.0	19.7	2.6	1.1	.3	.7	.5	3.2	14.0	.4	.1	3.4

NOTE: Because identification of more than one source was permitted, the total percent of sources of training exceeds the percent who reported needing training.

SOURCE: Current Population Survey.

Table 7. **Workers who needed training and those who obtained training in schools, by educational attainment, January 1991**

[Percent of total employed]

Education level	Total employed	Workers who needed training	School				
			Total with school training	High school vocational training	Post-high school vocational training	Junior college or technical institute	4-year or longer college program
Total employed, aged 16 and older	100.0	56.7	32.1	3.9	2.7	7.7	18.8
Highest education level completed:							
Fewer than 12 years	13.5	3.8	.6	.2	.1	.1	(¹)
High school graduate	39.5	18.3	5.9	2.4	1.3	2.1	.4
1-3 years of college	22.1	14.0	7.9	1.0	.9	4.3	2.4
College graduate	24.7	20.7	17.7	.3	.4	1.1	16.0

¹ Less than .05 percent.

NOTE: Because identification of more than one source was permitted, the total percent of sources of training from schools exceeds the percent who reported needing training. Also, because of rounding, total in each category may not equal sum of individual entries in that category.

SOURCE: Current Population Survey.

that they needed training to get their current job increased from 54 million to 65 million.¹⁸ This 20-percent increase was roughly equivalent to employment growth over the 1983-91 period. In contrast, significant changes occurred among the types of training reported on the two dates. Training reported by friends or relatives and other nonwork-related training increased by 165 percent during the period, more than 8 times the 19-percent increase in employment, although such training remained a relatively small portion of the total.¹⁹ Qualifying training obtained from junior colleges and technical institutes grew 79 percent, formal company training programs 48 percent, and 4-year or longer college programs 35 percent. Informal on-the-job training increased 16 percent, slightly less than the 19-percent increase in employment, while qualifying training obtained in high school and post-high school vocational education programs declined 4 and 14 percent, respectively. Thus, training obtained in educational institutions and formal company programs provided the bulk of the additional qualifying skills needed by the work force during the 1980's.

Training to improve skills. In addition to training needed to qualify for their jobs, many workers take training to improve their skills. In January 1991, 47 million workers, 41 percent of all employees, reported taking such training since obtaining their present job. (See table 8.)²⁰

Formal company training and informal on-the-job training shared the distinction of being the largest source of training to improve skills, with about 15 percent of all workers identifying each of

them. Other sources of training—from friends, relatives, and others—was the next largest category, but, at 7 percent, was less than half the size of either formal or informal company training. With just under 5 percent each, 4-year or longer college programs and junior colleges and technical institutes were less prominent as sources of training to improve skills than they were as sources of qualifying training. Relatively few persons identified post-high school or high school vocational training as a source of training to improve skills.

For the major occupation groups, data on training to improve skills reflect the fact that the incidence of such training increases with educational attainment. Professional specialty workers, who generally require a college degree, had the highest proportion who took this kind of training, 68 percent; the group accounted for 23 percent of all training to improve skills, but only 14 percent of employment. Most training to improve skills—58 percent of the total taken in 4-year or longer college programs—accrued to workers in professional specialty occupations.²¹

Unlike the situation with qualifying training, the proportion of workers reporting that they had taken training to improve their skills increased significantly—from 35 percent to 41 percent—between 1983 and 1991.²² The number of workers reporting such training rose from 34 million to 47 million, a 39-percent increase, compared with a 19-percent increase in employment over the period. Other types of training increased the fastest (85 percent), followed by formal company training (69 percent). The number of workers reporting that they had had formal company training grew

from 7 million to 18 million and was responsible for 40 percent of the increase in training taken to improve skills between 1983 and 1991.

Impact on earnings. While information about the number of workers who needed training to obtain their jobs or who took training to improve their skills measures the utility of education and training, data on earnings measure the benefit of the training to workers. Earnings data from the January 1991 cps display the same patterns as the 1991 cps annual average data: median earnings of full-time workers increase with increases in educational attainment—about \$80.00 weekly for each higher level of attainment. (See table 9.)²³ These data also show that, for all education groups, earnings are higher in jobs that generally require qualifying training or jobs in which training is taken to improve skills. For example, for each level of educational attainment examined, except for college graduates, the median weekly

earnings of those whose only type of training was qualifying training was approximately 15 percent higher than those in the same education group who did not report needing such training; for college graduates, the difference was an even greater 35 percent. Similarly, excluding those with fewer than 12 years of education, the median weekly earnings for workers whose only training was training to improve their skills were about 30 percent higher than those with neither type of training. Workers who took both qualifying training and training to improve their skills had the largest differential, about 30 percent to 50 percent higher than the earnings of those reporting that they had had neither type of training.

Note in table 9 that the earnings of individuals with fewer than 12 years of school who reported both qualifying training and training to improve their skills were higher than the earnings of persons with some college but neither of those forms of training. Similarly, high school graduates who

Table 8. **Workers who took training to improve their skills in their current jobs, by education and occupation, January 1991**

[Percent of category]

Education level and occupation group	Total employed	Workers who took skill improvement training	School					Formal company training	Informal company training	Other types of training
			Total with school training	High school vocational training	Post-high school vocational training	Junior college or technical institute	4-year or longer college program			
Total employed, aged 16 and older	100.0	41.2	13.2	.4	1.1	4.0	4.9	15.8	15.4	7.0
Highest education level completed:										
Fewer than 12 years	100.0	18.0	2.3	.6	.3	.8	.1	4.9	10.2	1.8
High school graduate	100.0	33.9	7.4	.5	1.3	3.4	.7	13.2	14.8	4.5
1-3 years of college	100.0	46.5	15.4	.5	1.3	7.5	3.6	19.3	18.0	6.9
College graduate	100.0	61.1	26.5	.2	.9	3.8	15.3	22.9	17.2	13.8
Occupational group:										
Executive, administrative, and managerial	100.0	54.0	18.1	.3	1.1	5.3	7.3	24.9	18.0	11.7
Professional specialty	100.0	67.5	34.3	.3	1.2	5.3	20.1	20.1	17.1	15.4
Technicians and related support	100.0	60.1	20.7	.6	1.7	8.2	5.7	26.2	21.9	9.6
Sales occupations	100.0	35.9	7.2	.3	.5	2.9	1.9	16.3	15.1	6.1
Administrative support	100.0	40.4	12.3	.7	1.4	5.4	2.2	16.2	16.5	4.0
Service, except protective service	100.0	23.3	4.8	.5	.6	1.9	.6	5.3	10.9	4.3
Protective service occupations	100.0	62.5	18.3	.4	3.0	8.6	4.4	34.7	25.0	7.3
Farming, forestry, and fishing	100.0	20.9	7.2	.7	1.2	2.8	1.9	3.2	7.0	6.9
Precision production, craft, and repair	100.0	38.3	8.9	.6	1.6	4.1	.9	16.8	16.0	4.6
Machine operators, assemblers, and inspectors	100.0	25.0	3.9	.4	.6	2.1	.3	7.6	15.0	1.6
Transportation and material-moving occupations	100.0	25.5	2.4	(¹)	.4	1.0	.2	10.4	11.5	3.2
Handlers, equipment cleaners, and laborers	100.0	15.4	1.4	.2	.1	.7	.2	4.8	9.4	1.0

¹ Less than 0.5 percent.

Table 9. Median weekly earnings of full-time workers who needed training to qualify for their current jobs and who took training to improve their skills, January 1991

Education level and degree status	Total employed age 16 and older		No qualifying training needed and no training taken to improve skills		Qualifying training needed, no training taken to improve skills		Training taken to improve skills, no qualifying training needed		Qualifying training needed and training taken to improve skills	
	Median weekly earnings	Median weekly earnings as percent of median earnings of all full-time workers aged 16 and older	Median weekly earnings	Median weekly earnings as percent of median earnings of all full-time workers aged 16 and older	Median weekly earnings	Median weekly earnings as percent of median earnings of all full-time workers aged 16 and older	Median weekly earnings	Median weekly earnings as percent of median earnings of all full-time workers aged 16 and older	Median weekly earnings	Median weekly earnings as percent of median earnings of all full-time workers aged 16 and older
Total employed, aged 16 and older	\$439	100.0	\$314	71.4	\$436	99.2	\$420	95.5	\$566	128.9
Highest education level completed:										
Fewer than 12 years	287	65.3	263	59.8	319	72.7	333	75.7	405	92.1
High school graduate	374	85.2	314	71.5	380	86.5	396	90.0	465	105.9
1-3 years of college	459	104.6	353	80.4	422	96.0	471	107.3	515	117.3
College graduate	639	145.6	461	105.0	616	140.1	601	136.7	683	155.5
Occupations generally requiring a college degree: ¹										
All education levels	591	134.4	458	104.3	567	129.0	546	124.4	629	143.3
High school graduate or less	469	106.8	407	92.8	453	103.2	480	109.3	503	114.5
1-3 years of college	524	119.3	483	110.0	495	112.8	540	122.9	563	128.2
College graduate	676	153.8	604	137.5	654	149.0	669	152.4	694	158.0
Occupations not generally requiring a college degree:										
All education levels	348	79.1	297	67.7	358	81.5	388	88.4	464	105.7
High school graduate or less	333	75.8	289	65.9	349	79.5	363	82.5	433	98.5
1-3 years of college	395	89.9	325	74.0	383	87.1	442	100.5	474	107.9
College graduate	454	103.3	390	88.7	381	86.8	458	104.1	581	132.3

¹ Workers with college degrees in executive and managerial, professional specialty, or technician occupation groups, as well as sales representatives and sales supervisors, insurance adjusters and investigators, police officers, farm managers, and craftworker supervisors, are considered to be in jobs that generally require a college degree.

Source: Current Population Survey.

reported that they had had both kinds of training earned slightly more than college graduates with neither type of training.

No comparison by occupation and education group of the earnings of those with and those without the two types of training is possible, because the distribution of educational attainment by occupation is skewed and the sample is too small to obtain reliable data for all occupations.²⁴ To obtain some measure of the occupational impact on earnings, occupations were categorized by whether a college degree was or was not required, using BLS categorizations developed for an analysis previously completed.²⁵

The data presented in table 9 on earnings by whether a college degree is or is not generally required for a job prompt two observations. First, for all education groups, the earnings of workers in occupations that generally require a college de-

gree are higher than those of workers in jobs that do not require a college degree. This is so, irrespective of whether or not the workers needed training to get their job or took training to improve their skills. Even with less education, workers in occupations that generally require a college degree have higher earnings than their counterparts in occupations that do not generally require a college degree. Also, college graduates in occupations that generally require a college degree and who both required training to qualify for their jobs and took training to improve their skills receive the highest compensation, about \$130 a week more than those with some college who took the same training and about \$90 a week more than college graduates in occupations generally requiring a college degree and who did not take either form of training.

The second observation prompted by table 9 relates to the premium paid college graduates who

have taken both qualifying training and training to improve their skills in occupations not generally requiring a college degree. While earning about \$110 a week less than college graduates who have taken the same training in occupations generally requiring a college degree, this group earns about \$100 a week more than those with the same training in occupations not generally requiring a college degree and who have had only some college, and almost \$200 a week more than college graduates in occupations not generally requiring a college degree and who have taken neither form of training.

Examining 1991 earnings within each of the educational attainment groups for those needing training to qualify for their jobs and who also took training to improve their skills provides an insight into the impact of each source of the latter form of training on earnings. (See table 10.) For all four education levels, persons reporting formal company training as the source of training to improve their skills had the highest earnings.

Data on earnings for 1983 display patterns similar to those observed in 1991.²⁶ In 1983, earnings increased with education, and workers who needed qualifying training or who took training to improve their skills consistently earned more than workers who did not. Similar to the 1991 survey, those taking both types of training earned about 50 percent more than those who took neither. Consistent patterns between 1991 and 1983 also are observed regarding occupations that generally required a college degree and those that generally did not. Workers in all education categories in occupations that generally required a college degree earned more than those in occupations that generally did not require a degree, and workers needing qualifying training and who took training to improve their skills earned more than those who did not. Data for 1983 also show that workers who needed qualifying training and who obtained training to improve their skills in formal company programs earned more than those who obtained the latter training in schools or informal on-the-job programs.

Job market changes

Information provided by workers about whether they needed specific skills or training to qualify for their current job or whether they took training to improve their skills provides a richer measure of the relationship of education and training to earnings than do data about educational attainment alone. Workers in jobs that require qualifying skills and that encourage the development of skills through training have higher earnings at all levels of education. With the recent emergence of a global economy, however, increased competi-

tion from foreign firms is changing the distribution of goods and services produced by U.S. companies, the technology used in their production, the types of workers those companies need, and the availability of jobs traditionally held by workers with the least education. Data that show the impact of these changes on the job market point up the importance of jobs that require and encourage training.

Table 11 presents information about employment, educational attainment, the utilization of education and training, and earnings for full-time workers for 1983 and 1991. Managerial and professional specialty occupations experienced the highest growth rate and the greatest increase in employment share between the 2 years, while operators, fabricators, and laborers ranked lowest in each of these categories. Differences in worker characteristics among these groups are striking. In 1991, managerial and professional specialty occupations had the lowest proportion of full-time

Table 10. **Median weekly earnings of full-time workers aged 16 and older who needed training to qualify for their current jobs and who took training to improve their skills, January 1991**

Education level and source of training to improve skills	Total	Qualifying training needed
All education levels:		
All training taken to improve skills	\$524	\$566
School	560	582
Formal company	579	605
Informal on the job	495	542
Fewer than 12 years:		
All training taken to improve skills	363	405
School	351	405
Formal company	463	497
Informal on the job	346	385
High school graduate:		
All training taken to improve skills	434	465
School	421	442
Formal company	493	508
Informal on the job	415	459
1-3 years of college:		
All training taken to improve skills	504	515
School	499	504
Formal company	539	546
Informal on the job	494	507
College graduate:		
All training taken to improve skills	676	683
School	663	666
Formal company	721	734
Informal on the job	694	699

SOURCE: Current Population Survey.

Table 11. Selected information on employment, education, training, and earnings for full-time workers, by major occupation groups, 1983 and 1991

Occupation group	1991	Employment ¹			Percent high school graduates or less		Percent college graduates ²		Percent using training ²		1991 weekly earnings ¹ (1983 dollars)	1991 percent of total	Percent change in real earnings, 1983-91
		Percent change, 1981-83	Share, 1991	Percent change in share, 1983-91	1983	1991	1983	1991	1983	1991			
Total	83,525,000	17.7	100.0	0.0	57.2	52.2	24.1	26.4	70.3	70.9	\$316	100.0	0.9
Managerial and professional specialty occupations	23,109,000	32.4	25.6	12.5	20.5	19.3	62.2	61.4	91.8	90.6	460	145.8	5.3
Technical, sales, and administrative support occupations	25,141,000	16.2	19.5	-1.3	55.9	50.5	17.7	20.9	71.9	71.8	289	91.6	2.9
Service occupations	8,908,000	21.7	9.4	3.4	75.7	73.0	6.9	7.1	53.5	51.7	206	65.1	.3
Precision production, craft, and repair occupations	10,642,000	6.8	20.4	-9.2	77.0	72.5	5.6	6.4	76.4	74.4	355	112.3	-5.9
Operators, fabricators, and laborers	14,129,000	6.1	22.5	-9.9	86.8	82.7	2.9	3.8	46.0	45.0	258	81.6	-6.3
Farming, forestry, and fishing occupations	1,397,000	9.1	2.6	-7.3	78.2	75.6	9.2	9.1	29.1	34.9	193	61.2	-1.5

¹ 1983 and 1991 Current Population Survey annual averages.

² January 1983 and January 1991 Current Population Survey data.

workers who had a high school education or less, the highest proportion of college graduates, and the highest proportion that took training. None of the proportions had changed much from 1983. In 1991, managerial and professional specialty occupations enjoyed the highest absolute earnings and had the greatest increase in real earnings. Operators, fabricators, and laborers, on the other hand, had the highest proportion of workers who had a high school education or less, the lowest proportion of college graduates, and the second lowest proportion that took training. While not the lowest of all groups, the absolute earnings of operators, fabricators, and laborers in 1991 were 20 percent below those of all workers. With a 6.3-percent decline from the 1983 figure, real earnings for this group fell the most of all the groups.

As described elsewhere, the restructuring of U.S. industry in response to foreign competition has had a major impact on earnings.²⁷ As firms adjusted by moving assembly operations overseas or by introducing more productive equipment, many workers who received high wages to repeat simple tasks required by the mass production techniques employed throughout the U.S. economy lost their jobs or moved to other, less well-paying jobs.²⁸ In some cases, their jobs were reorganized to require an ability to monitor a machine or to work as part of a team; either responsibility makes demands on reading, mathematical, communication, and other skills that operator, fabricator, and laborer jobs typically do not require. The increase in the number of college graduates within this group may have resulted from employers being

able to obtain greater productivity from workers with better basic academic skills.

It is instructive to contrast the data on precision production, craft, and repair occupations with those on operators, fabricators, and laborers. Because of reduced demand due to industry restructuring, employment increased less than average in both occupation groups over the 1983-91 period. Both retained large proportions of workers with a high school education or less, had low proportions of college graduates, and experienced real earnings declines of about 6 percent over the period. Real earnings of precision production, craft, and repair occupations in 1991, however, were 12 percent above those of all workers and 33 percent above operators, fabricators, and laborers.

Earnings of precision production, craft, and repair workers are higher probably because these workers are more productive, the result of being in jobs that are more likely to use their skills. The proportion of precision production, craft, and repair workers using training (74 percent) and their earnings are exceeded only by those of managerial and professional specialty occupations.

Summary

Despite the widely held view that the quality of U.S. education and training is poor, the Nation is increasingly committed to education. Educational attainment has increased significantly in the past two decades, as the proportion of students attending and completing college has increased. Fewer students are now dropping out of

school before completing high school than in the past. While many high school graduates are cited as having inadequate reading, mathematics, and science skills, and high school students are identified as having skills inferior to those of their counterparts in many other countries, standardized tests of reading, mathematics, and science skills show that these have remained the same or increased slightly over the past decade. The basic skills of new high school graduates do not appear to have changed, and those of some graduates in the past, just as in the present, probably were poor. What have changed are the demands of the job market. Large numbers of high-paying production jobs that required unskilled workers to repeat simple tasks have been greatly reduced. The workplace has been reorganized, and more jobs now require reading, mathematics, and communication skills.

There may be a need for a better match between educational programs and the requirements of the workplace. Clearly, educational attainment, as measured by years of school completed, is related positively to earnings: workers having higher educational attainment have higher average earnings. However, education by itself does not guarantee high income. For example, many work-

ers with college degrees indicate that they are employed in jobs that do not require special skills or education and that their earnings are lower than the earnings of college graduates in jobs that require specialized education or skills. And workers with less education, but who are employed in jobs that require special skills or training, earn as much as college graduates who do not require training to get their job. Consequently, the skill and educational requirements of a job have a major impact on earnings. Thus, it is apparent that, to have a great effect on earnings, the educational and skill requirements of jobs, as well as the education and skills of workers, must be increased.

A final observation relates to the critical role of employers, both in providing training and in using it. Evidence suggests that, except for 4-year or longer college programs, formal and informal company training provides more workers with their required job skills than any other source of training. Employers also are the primary source of training for workers who wish to improve their skills in their current job. Combined with the training required to obtain a job, formal company training programs to improve the skills of workers have more of an impact on increasing those workers' earnings than does any other source of training. □

Footnotes

¹ *Worker Training: Competing in the New International Economy*, Report No. OTA-ITE-457 (Office of Technology Assessment, September 1990), p. 3.

² Report of the Task Force on Education, *Educating America, State Strategies for Achieving the National Education Goals* (Washington, National Governors' Association, 1990), p. 7.

³ *The Condition of Education, 1992* (National Center for Education Statistics, 1992), p. 64.

⁴ Data for 1992 indicate that 12.4 percent of the labor force 25 years and older had less than a high school diploma. However, this figure does not appear in the table, because 1992 was the first year for a new definition describing educational attainment in terms of the highest degree earned, as opposed to the number of years of school completed.

⁵ *The Condition of Education, 1992*, p. 132. Data are current per-pupil expenditures for education, in fiscal-year 1989 U.S. dollars. These data are for public expenditures only and are not comparable to the data on public and private expenditures presented in table 3.

⁶ *The Condition of Education, 1992*, pp. 42, 46, 48.

⁷ See *Occupational Projections and Training Data*, Bulletin 2401 (Bureau of Labor Statistics, 1992), table 8, pp. 54-70.

⁸ The Classification of Instructional Programs is the Department of Education's taxonomic standard for Federal surveys and State reporting of institutional data, as well as the accepted guide for data reported to the Federal Government by individual institutions and other educational providers. Data in this article reflect the 1985 revision.

⁹ Fields of study for about 310,000 degrees and awards could not be matched with any occupation. See table 5 for

information about the types of degrees and awards that were matched with various occupations, as well as those that could not be matched.

¹⁰ See *Occupational Projections and Training Data*, table 6 for data on job openings and chapter 5 for information on how data on replacement needs were prepared.

¹¹ The Current Population Survey is a monthly survey of approximately 60,000 households conducted by the Bureau of the Census for the Bureau of Labor Statistics.

¹² *How Workers Get Their Training: A 1991 Update*, Bulletin 2407 (Bureau of Labor Statistics, August 1992), provides an extensive analysis of the data on training that were collected in the January 1991 Current Population Survey.

¹³ See the following articles in the July 1992 *Monthly Labor Review*: Daniel E. Hecker, "Reconciling conflicting data on jobs for college graduates," pp. 3-12; and Kristina J. Shelley, "The future of jobs for college graduates," pp. 13-21.

¹⁴ Because the survey asked, "Did you need specific skills or training to get your current (last) job," some individuals may have reported only training obtained formally or informally in a structured setting and may not have reported informal training obtained while "learning by doing" in a previous job. Others may not have regarded their college preparation as training; there were, for example, doctors, teachers, dentists, and scientists who responded that they were not using their school training in their jobs. The extent to which training may have been understated in these two ways could not be determined.

¹⁵ Because each respondent was permitted to identify more than one source of training, the total sources of training identified exceeds the number of those who reported needing

Job-related Education and Training

training. In all, almost 95 million sources of qualifying training were identified by 65 million workers.

¹⁶ Information about training obtained in schools can be compared because the educational attainment of workers is known. The proportion of company and other types of training actually used cannot be determined because the total training these sources provide is unknown.

¹⁷ Shelley, "The future of jobs for college graduates."

¹⁸ *How Workers Get Their Training*, Bulletin 2226 (Bureau of Labor Statistics, February 1985), reports on data collected in the January 1983 Current Population Survey. The questions used to collect information on training in the January 1983 and January 1991 Current Population Surveys were virtually identical.

¹⁹ Much of the increase in training received from friends or relatives and in other nonwork-related training is probably attributable to a change in the January 1991 questionnaire, in which the data from two sources are combined: (1) friends or relatives or other nonwork-related training and (2) other. In January 1983, only the former category was cited. The availability of the additional, specific category, "other," may have increased the number of responses for what had previously been one source.

²⁰ Because individuals could have taken more than one type of training, 58 million sources of training to improve skills were identified by 47 million workers. See *How Workers Get Their Training: A 1991 Update*, table 46, p. 36.

²¹ Elementary and secondary school teachers alone accounted for 24 percent of all training to improve skills that was obtained in 4-year college or longer programs; by con-

trast, they accounted for only 3 percent of employment.

²² *How Workers Get Their Training*, table 45, pp. 51-56.

²³ To the extent that individuals with greater ability acquire more education and receive more training, the data may overstate the impact of education and training.

²⁴ For example, regarding skew, college graduates are concentrated in the professional specialty; executive, administrative, and managerial; and technician and related support occupations, and conversely, few persons with the least education were employed in the occupation groups in which college graduates were concentrated. Regarding sample size, no reliable data on the earnings of those with and those without both kinds of training were available for groups other than college graduates.

²⁵ Workers with college degrees who are in the executive and managerial, professional specialty, or technician occupation groups, as well as sales representatives and sales supervisors, insurance adjusters and investigators, police officers, farm managers, and craftworker supervisors, are considered to be in jobs that generally require a college degree. See Hecker, "Reconciling conflicting data," p. 4.

²⁶ The 1983 data on earnings are based on unpublished tabulations of data from the January 1983 Current Population Survey.

²⁷ See, for example, Anthony P. Carnevale, *America and the New Economy* (Washington, American Society for Training and Development, 1991).

²⁸ Jennifer M. Gardner, "Recession swells count of displaced workers," *Monthly Labor Review*, June 1993, pp. 14-23.