5. The Nondoctoral Technical Workforce: Shortage Of Skills Is Dampening Job Growth

"Science, math, engineering and technology workforce issues are not about the end of the pipeline but about the full spectrum of workers who use technology as well as create it, and upon whom we all depend for our health and our quality of life."

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During 1998-2008, U.S. employment in SMET fields is expected to increase at almost four times the rate for all occupations (Table 5-1) {49} {50}. While the economy as a whole is expected to provide approximately 14% more jobs over this decade, employment opportunities in SMET are expected to increase by about 51%, or about 1.9 million jobs. Substantial increases are expected in almost all industries over the next decade. For example, jobs for computer engineers and scientists are expected to increase from about 900,000 to over 1.8 million, while employment for computer systems analysts is expected to grow from a little over 600,000 to almost 1.2 million jobs.

Table 5-1: Projected Employment and Labor Force Growth, by Gender and Race/Ethnicity: 1998-2008

Total employment	14%
SMET employment	51%
Total civilian labor force	12%
Within civilian labor force:	
Men	10%
Women	15%
White, non-Hispanic	7%
Black	19%
Hispanic	37%
Asian & other	40%

Sources: Fullerton, H.N., Labor force projections to 2008: steady growth and changing composition, *Monthly Labor Review*, November 1999: pp 19-32; Braddock, D., Occupational employment projections to 2008, *Monthly Labor Review*, November 1999: pp 51-77 {49}{50}.

This job growth is being dampened by the shortage of skilled U.S. workers. Past studies and reports have amply described the depth of the problems resulting from the underutilization of women, most ethnic minorities, and persons with disabilities {2}. With the exception of Asian Americans, minorities continue to comprise a much smaller proportion of the SMET workforce than they do in the total U.S. population.

Given the projected growing demand for SMET professionals, several factors need to be considered in some depth:

- Rates of entry into the SMET workforce from current college graduates are not expected to satisfy the existing or future demand.
- There are not enough well-prepared students at the secondary school level (see Chapter 2).
- The achievement gap of underrepresented minority students is large and the closure rate of this gap too slow.
- High-quality science and mathematics teachers are not available in sufficient numbers to meet current and future demands (see Chapter 2).

These issues are interdependent and must be addressed as a high priority if significant inroads are to be made in this area.

5.1 A Higher Percentage of Women Employed Part-Time

As in science and engineering as a whole, women and men in the non-Ph.D. SMET workforce differ in their occupations. Women constitute the majority in some science and engineering occupations; for example, in 1996, more than two-thirds of all non-Ph.D. psychologists (69%) and more than half of non-Ph.D. sociologists (57%) were women. Men, on the other hand, constituted 91% of non-Ph.D. engineers, 75% of non-Ph.D. physical scientists, and 73% of non-Ph.D. computer scientists {29}.

Among those in the labor force (that is, those who were employed or seeking employment), the unemployment rates of female and male non-Ph.D. scientists and engineers differed: 2.3% of women and 1.6% of men were unemployed in 1996 {29}. This difference reflects variations in the age distributions of men and women as well as differing family responsibilities.

Similarly, a higher percentage of female than of male non-Ph.D. scientists and engineers are employed part-time. Of those who were employed, 17% of women and 8% of men worked part-time in 1996 {29}. As with unemployment, variations in age distribution of men and women, as well as varying family responsibilities, are factors in part-time employment choices.

Among non-Ph.D. scientists and engineers, 61% of women and 68% of men had a bachelor's degree as their highest degree in 1996. Employed women scientists and engineers with bachelor's or master's degrees were more likely than men to have their highest degrees in mathematics and computer sciences (21% vs. 15%), in life sciences (12% vs. 6%), and in social and related sciences (22% vs. 7%). Men, on the other hand, were more likely than women to have their highest degree in engineering (48% vs. 18%) {29}.

Among all employed non-Ph.D. scientists and engineers, women were less likely than men to be employed in business or industry—54% and 73%, respectively—and more likely to be employed in educational institutions—22% vs. 9% of men. However, these variations by sector primarily stem from differences in occupation. Women are less likely than men to be engineers or physical scientists, who tend to work in business or industry. Within occupations, the percentages of men and women employed in industry were similar. For example, among physical scientists, 65% of women and 67% of men were employed in private for-profit business or industry in 1996.

Among non-Ph.D. scientists and engineers, women generally earn less than men do, but these salary gaps are due primarily to differences in length of experience (as measured by years since highest degree), occupation, and highest degree attained. Female scientists and engineers have less experience, on average, than men and are less likely than men to be in computer science or in engineering—occupations that command higher salaries. The 1997 median salary for female scientists and engineers with a bachelor's degree was $45,000; for men it was $55,000. Within occupations and within experience categories, the median salaries of men and women were more alike. For example, in 1997, among physical scientists with a bachelor's degree and less than 5 years of experience, the median salary for women was $26,000; for men it was $27,800. (In addition to experience, occupation, and highest degree obtained, there are additional factors that influence the differences between the salaries of men and women in SMET professions. {51})

5.2 Many Minorities New to SMET Field

In 1997, African Americans (14%), Hispanic Americans (14%), and Native Americans (0.8%) together formed about 29% of the U.S. population, and 7% of the total SMET workforce. African Americans and Hispanic Americans each comprised about 3%, and Native Americans less than 0.5% {40}.

These population groups also differed in terms of educational background and work experience. For example, African American scientists and engineers have on average a lower level of education than do scientists and engineers of other racial or ethnic groups. African American scientists and engineers are more likely than their white, Hispanic American, or Asian counterparts to have a bachelor's as the terminal degree. Furthermore, about 36% of white scientists and engineers employed in 1997 had received their degrees within the previous 10 years, compared with between 47–52% of Asian American, African American, and Hispanic American scientists and engineers {40}.

The overwhelming percentage of the nondoctoral workforce (i.e., those who have received bachelor’s and master’s degrees) is employed in the private for-profit sector {40}. Thus, it is not surprising that there are growing concerns among U.S. business leaders about the disproportionately small numbers of underrepresented minorities in the SMET pipeline.

5.3 Incidence of Persons with Disabilities Rises with Age

The underrepresentation of persons with disabilities also extends beyond academic programs and into the workforce. Indeed, while individuals with disabilities constitute 20% of the U.S. population, they made up only 6% of the SMET workforce in 1997, representing little change since 1993 {53}. Individuals with disabilities in the SMET workforce are, on average, older than those without disabilities. This is due in large part to the fact that the incidence of disability rises with age. More than half of the scientists and engineers with disabilities acquired a disability at age 30 or older, while only 8% of scientists and engineers with disabilities had them since birth, and one-third had them since the age of 20 {53}.

In contrast, the occupations of individuals with and without disabilities do not differ greatly. In 1997, 10% of both populations worked in life sciences while 8% worked in the physical sciences. Similar participation results hold for those with and without disabilities in the engineering (42% vs. 41%), social science (11% vs. 10%), and computer science (25% vs. 28%) professions.

The labor force participation rates, however, are quite different for scientists and engineers with and without disabilities. In 1997, nearly one-third of scientists and engineers with disabilities were out of the labor force, compared with 11% of those without disabilities. Although the older mean age of individuals with disabilities accounts for some of this difference, not all of the large disparity can be attributed to age difference alone. Within age categories, for example, individuals with disabilities were still more likely than those without disabilities to be out of the labor force. Among those ages 35 to 44, 8% of those with disabilities were out of the labor force, compared with 4% of those without disabilities. Among employed scientists and engineers, individuals with disabilities were also more likely to be working part-time: 11% vs. 8% in 1997 {40}.

While individuals with disabilities are less likely than those without disabilities to be employed in for-profit businesses (53% vs. 60%), the type of work performed within the business setting varies little with disability status. For instance, 44% of scientists and engineers with disabilities, and 46% of those without disabilities, were engaged primarily or secondarily in management. Median salaries of scientists and engineers with disabilities also varied little from their counterparts without disabilities, $56,000 and $55,000, respectively, and this similarity held across age groups {40}.