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AUTHOR Rumberger, Russell W.; Levin, Henry M.
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ABSTRACT

U.S. competitiveness depends on higher worker productivity, greater technological investment, and streamlined organizational structure, which require a flexible, highly trained work force. The demand for educated workers continues to rise in industrialized societies, influenced by the demand for certain goods and services, decline in real labor costs, productivity as influenced by technology and workplace organization, and international competition, which is changing the skill requirements and composition of jobs. Research findings show that the average educational requirements of future jobs will not differ significantly from current jobs; technology has varying impacts on occupations; and a broad array of different types of skills may be necessary. Changes in the supply of educated labor are caused by increased numbers of women, minorities, and immigrants in the work force and the lack of educational preparation of many labor market entrants. There is a growing mismatch between the educational attainment of workers and job demands, resulting in both over- and undereducation. The nature of schools differs from the nature of the workplace, with a consequent imbalance between the types of skills taught and those needed by workers. Additional research is needed to provide adequate measures of skill needs and labor supply and demand. Policy makers should focus attention on achieving adequate education for disadvantaged groups, providing appropriate school experiences, determining appropriate roles for all types of educational providers, and effectively using educated workers. (81 references) (SK)

2. SCHOOLING FOR THE MODERN WORKPLACE

Russell W. Rumberger

University of California at Santa Barbara

and

Henry M. Levin

Stanford University

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Russell W. Rumberger
University of California at Santa Barbara

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Henry M. Levin
Stanford University

I. Introduction

The U.S. economy is undergoing fundamental changes. Foreign producers from both developed and developing economies are now competing with U.S. firms in domestic as well as international markets. U.S. firms are adopting new forms of production and employing new technologies more rapidly than in any recent period. Computers, robots, and other new technologies are now commonplace in American companies. The future promises even more changes.

Education is considered to be a key to maintaining economic progress and regaining competitiveness. The U.S. cannot compete with other countries on the basis of wages without creating drastic reductions in income and working conditions. Instead, it is argued, we must aim for much higher worker productivity that will merit higher wages while ensuring competitive prices and products. Such a strategy assumes a need for greater technological investment, streamlined organizational structures, and a focus on products which require a flexible and highly-trained workforce. A crucial part of this strategy is the formation of a supportive educational strategy both in the formal educational system and in job training by enterprises.

Of particular concern is the view that education must adapt to the use of new technologies. With the advent of technologies based upon micro-processors, new communications technologies, robotics, and bio-technology, it is argued that the labor force faces new workplace demands. All of these technologies make possible the emergence of new products and expansion of new occupations, while creating changes in work tasks in many of the more traditional occupations. Some features of the new technologies are so automated that it is possible to shift such production techniques easily to less-educated workforces in industrializing countries where lower wages and less demanding working conditions prevail. Indeed, the multinational enterprises are constantly choosing between industrialized and industrializing nations in terms of where to make productive investments. And, such enterprises continually weigh whether the education of their labor forces in the industrialized nations justifies the higher wages received by their workers.

The purpose of this paper is to identify the issues and assess the research literature about the role of schooling for the modern work-place. Most research literature focuses on past changes, whereas current policy is concerned about current and future changes and their implications for education. Therefore, we will review past research and attempt, where possible, to speculate where the future may depart from past trends.

As an organizing framework, we approach this topic through a labor market perspective. That is, we first examine the changing demand for educated labor in the current and future economy and then the changing

supply of educated labor that will be available to meet that demand. Following that discussion, we look at the interaction of supply and demand and two conditions that can result: undereducation and overeducation. Finally, in the last two sections we discuss implications for further research and data and implications for policy.

II. The Changing Demand for Educated Labor

It is widely viewed that the demand for more educated workers is rising and will continue to rise in all of the industrialized societies. This view is usually premised on the dramatic shift from manufacturing to services that has characterized the industrialized economies as well as the increasing reliance on new technologies. In this section, we will discuss the demand for educated workers by focussing on some of its major determinants.

Demand for Goods and Services

First, the demand for educated labor is influenced by the level and composition of the demand for goods and services. Since the production of some goods and services requires more educated labor than the production of others, shifts in the demand for goods and services shifts from one sector of the economy to another will alter the demand for educated as well.

Historically, the U.S. has moved from an agricultural economy to goods-producing economy and most recently to a services-producing economy. This trend will continue as virtually all new jobs projected for the future economy coming from the services sector (Table 1). Each transition has increased the demand for educated labor because, on

average, services-producing industries require higher education levels of their workers than goods-producing industries which, in turn, require more educated labor than agriculture. In 1980, for example, 30 percent of employees in goods-producing industries had less than 12 years of schooling, while only 11 percent had 4 or more years of college (Table 1). In contrast, only 20 percent of employees in service-producing industries had less than 12 years of schooling, while 24 percent had 4 or more years of college.

The sources of demand for goods and services influences the demand for educated labor as well. In recent periods, about one-third of the final demand for goods and services in the U.S. economy has been generated from direct and indirect (e.g., defense, social security) government spending. Yet because employment from government spending is more education-intensive than private spending, fully one-half of all employment for college graduates can be traced to government spending (Rumberger, 1983, Table 5). Thus some of the growth in the demand for educated labor can be traced to the growth of government spending over the last fifty years.

Costs of Educated Labor

A second influence on the demand for educated labor is its cost relative to that of other productive inputs such as other types of labor and capital. Labor costs are influenced by two factors: compensation (wages and benefits) and productivity. When real (inflation-adjusted) compensation rises faster than productivity, unit labor costs rise and employers may substitute to less expensive production inputs such as

capital; when real compensation increases slower than productivity, unit labor costs fall and employers may substitute labor for capital.

In the U.S. real wages (the principal component of compensation) have fallen over the last fifteen years, with greater declines among workers with less education than for those who were college or university graduates (Berlin and Sum, 1988, p. 9). There is no corresponding evidence of a decline in capital cost. Indeed, real wages have not kept pace with rises in labor productivity, and labor compensation has fallen as a proportion of national income. The relative and absolute decline in real labor costs has induced employers to substitute labor for capital in production, partially explaining the rapid rise in employment.

Productivity of Educated Labor

A third influence on the demand for educated labor is productivity which, in turn, is influenced by technology and workplace organization.

Technology. Technologies have long been incorporated into the production process as a means of boosting worker productivity. Older technologies largely performed physical tasks that greatly increased the productivity of workers on the farm and in the factory. Newer technologies, based on sharp advances in micro-electronics, can perform mental as well as physical tasks and are being used to bolster productivity throughout the economy.

One long-standing debate is whether technologies increase or decrease the skill and educational demands of jobs. Although most discussions of the new technologies presume that their sophistication requires a demand for more education, this is only true if such

technologies are embodied in forms of capital that are a complement to education. Surely, many applications of technology require workers who are better educated and trained. However, technology can also be used as a basis for capital investment that is a substitute for education. The sophistication of micro-processors can be used to reduce the educational requirements for jobs by substituting the measurement, manipulative, and analytical capacities of hardware and software for these qualities of humans. Evidence on this issue is reviewed below.

Workplace Organization. The organization of work also influences worker productivity. Historically, most firms were organized in a hierarchical fashion, with many lower-level workers at the bottom of the hierarchy and progressively fewer employers at higher levels of the hierarchy. Such an arrangement was thought to be the most efficient and kept control in the upper levels of the organization (Edwards, 1979).

Recently, there has been a noticeable shift in many firms from traditional organizations with a detailed division of labor to one that has less hierarchy and more worker participation in decision-making in order to increase productivity. Instead of just following a repetitive routine, workers are expected to make decisions about product quality, scheduling of production, training, and job rotation and to address problems that arise in production. This type of shift tends to increase the skill and educational requirements of workers, even in the absence of technological change, but it has particularly important implications in conjunction with the application of new technologies that facilitate the use of information to address production needs (Levin, 1987a; Zuboff, 1988). The participative work organization is becoming more

prominent in all of the industrialized countries in automobile and electronics manufacturing and in other products and services.

Another change taking place in American firms that is both technical and organizational is the move toward customized production. It is widely agreed that most advanced industrialized countries will not have a competitive advantage in producing standardized products such as steel, chemicals, and many consumer goods that have very long production runs. The newly industrialized countries such as Brazil, Korea, Taiwan, and others have adequate labor forces and the technical capabilities to produce these goods cheaper than the more advanced industrialized countries.

The comparative advantage of the more advanced industrialized countries will be their highly educated workforces and quick adaptation of advanced technologies which will provide the potential flexibility to address the customers' needs for a large variety of customized products with shorter production runs and high adaptability to the requirements of different clientele (Piore and Sabel, 1984; Reich, 1985). The availability of such customized products and services will, in themselves, spur the productivity of other firms in the economies. The very high educational attainments of their labor forces will create the basis for adaptability to design and produce a range of customized products and services. Such an economic role will require a flexible work force with high levels of general skills rather than a repertoire of standardized capabilities that can be applied only to a fixed workplace regimen.

International Competition

The final influence on the demand for educated labor is international competition. International competition affects the demand for educated labor through its influence on the level and composition of demand for U.S. goods abroad and its influence on the level and composition of the supply of foreign goods into the U.S.

The question of the level and composition of imports and exports depends crucially on their prices relative to those of similar goods that are domestically produced. Since prices in international trade depend upon both labor costs and exchange rates, both can influence the patterns of trade with respect to overall levels and the education-intensiveness of their composition among different goods and services. It is generally perceived that U.S. exports tend to be more education-intensive than imports although no comprehensive study has ever been undertaken. But, as technology in micro-electronics and related industries make it easier to employ less-educated workers, technology transfer enables an increasing shift of formerly education-intensive production to the less-developed countries. Such shifts are presently taking place. In general, new technologies are creating new international structures of production whose implications for the employment of educated workers cannot be fully forecast in a rapidly evolving situation (O'Connor, 1987).

Impact on the Demand for Skills and Education

All of the factors discussed above influence the demand for schooling in the economy. While it is impossible to predict precisely the extent of these changes and their specific impact on education and

skill requirements of jobs, it is possible to examine past trends and current forecasts to get some idea of future demand.

For the aggregate economy, changes in the skill requirements of jobs stem from two factors: (1) changes in the composition of jobs in the economy, and (2) changes in the skill requirements of individual occupations. Changes in the composition of jobs in the economy--such as employment growth that favors high skilled jobs over low-skilled jobs--can increase aggregate skill requirements in the economy even if the skill requirements of individual occupations do not change. Similarly, changes in the skill requirements of individual occupations--such as increased skill requirements stemming from the increased use of new technologies--can raise aggregate skill levels even if there are no changes in the composition of jobs in the economy. The issue of whether skill requirements of jobs is increasing or decreasing has generated a great deal of debate and has been fueled by conflicting empirical evidence. What does the evidence say?

Changes in the Composition of Employment. Most of the evidence on changes in the composition of jobs in the United States comes from official employment forecasts of the U.S. Bureau of Labor Statistics (BLS). Every two years, the BLS develops detailed projections of future economy activity, industrial growth, and employment within industries and occupations based on an elaborate econometric model (U.S. Bureau of Labor Statistics, 1987). While such forecasts are always subject to some error, reviews of past forecasts show they are reasonably accurate in predicting overall trends and relative growth rates among major industries and job groups (Goldstein, 1983; U.S. Government Accounting

Office, 1985; Fullerton, 1988). The latest projections cover the period from 1986 to 2000. Thus they provide a glimpse of the future job market in the U.S. over the next decade or so.

The BLS projections have been used to estimate the educational requirements of future jobs based on the schooling level of current job holders (e.g., Levin and Rumberger, 1987; Johnston and Packer, 1987; Silvestri and Lukasiewicz, 1987). This can be done by first computing the distribution of schooling of the existing labor force for individual occupations and then using occupational forecasts to estimate required schooling levels for the future economy. This procedure assumes that the educational requirements of individual occupations will not change over time, an assumption supported by the literature reviewed below which suggests there is no particular trend in rising or declining skill requirements within occupations. The procedure also assumes that current job holders have the appropriate level of education that there jobs require which, according to the literature on overeducation reviewed below, may not be the case.

Two sources of confusion surround the use of occupational projections for estimating the educational requirements of future jobs. One comes from the practice of using figures on the fasting growing jobs in the economy as indicative of overall trends in educational requirements (e.g., Johnston and Packer, 1987, p. 97). The problem with such a practice is that it tends to overstate changes in educational requirements because the fastest growing jobs generally require above-average education levels, but will generate few new jobs.

To illustrate, recent BLS projections show that the 10 fastest growing jobs in the U.S. economy are concentrated in health and technical fields and require above-average education levels, as shown in the top half of Table 2. But these jobs are mostly in new fields that employ relatively few people so that these fast growth rates will actually produce few new jobs--less than 5 percent of all the new jobs projected between 1986 and 2000. In contrast, more traditional occupations that generally require lower education levels are expected to grow more modestly over this period on a percentage basis, but because they employ so many people, these modest growth rates will produce a substantial number of new jobs. The 10 occupations that will produce the greatest number of new jobs--shown in the bottom half of Table 2--will account for 30 percent of all new jobs expected between 1986 and 2000. In fact, 30 occupations, out of the 480 that the BLS forecasts, are expected to generate 50 percent of all new jobs in the U.S. economy between 1986 and 2000 (Silvestri and Lukasiewicz, 1987, Table 5). But all these sets of figures only provide a limited view of changes in the educational requirements of jobs for the overall economy.

A second source of confusion about the use of occupational projections concerns the practice of focusing on only on new job growth as indicative of overall educational requirements of future jobs. Although the focus on new jobs can reveal trends in the educational requirements, it is important to examine the educational requirements of both new jobs and existing jobs since the latter will provide more employment opportunities for future job seekers that the former.

To illustrate, estimates of the educational requirements for jobs in 1986 and 2000 are shown in Table 3. In 1986, about 58 percent of job holders had no more than a high school education, while 21 percent had 4 years of college or more. New jobs expected between 1986 and 2000 have higher educational requirements than existing jobs--48 percent at the high school level and 29 percent at the 4-year college level. But since only one out of every six jobs in the year 2000 will be a new job, the overall educational requirements of all jobs in the year 2000 are likely to be quite similar to those at present. These results are similar to those derived by the BLS (Silvestri and Lukasiewicz 1987, Table 8) and comports closely with the judgments of the Panel on Technology and Employment of the National Research Council (Cyert and Mowery, 1987, p. 103).

Changes in the Skill Requirements of Jobs. Perhaps the most controversial issue about skills concerns the question of whether technology tends to increase or decrease the skill requirements of jobs. This issues has been debated in earlier periods of technological change and is again being debated in both the research and policy arenas (Braverman, 1974; Spenner, 1985; Rumberger, 1987a).

The common perception is that the rising use of computers and other new technologies in many occupations must be raising the skill requirements of those occupations. But this assertion does not take account of the fact that most persons who use computers require no special computer skills. For example, warehouse clerks and supermarket checkout clerks typically use a computer readout device to read barcodes on products as they are purchased, sold, shipped, and received. But the

use of this device requires no knowledge of computers. Wordprocessing operators and office workers need only learn how to operate a new piece of office equipment, as they have done in the past, not how to program or understand computers. This training can be measured in hours or days, not weeks, months, or years.

A recent study of a national sample of almost 3000 small businesses in the U.S. found that the average duration of training for a wide range of computer applications in offices by those without computer skills was only about 30 hours (Levin and Rumberger, 1986). The same study found that interest and enthusiasm, followed by reading and comprehension skills were far more important for learning to use the computer than extensive technical training (Levin and Rumberger, 1986). In general, the many workers in the U.S. who use computers in their jobs utilize standard computer packages that require very little previous education or training (Goldstein and Fraser, 1985).

Reviews of past studies on the impact of technologies on skill requirements reach the conclusion that past technologies have tended to raise the skill requirements of some jobs, while lowering the skill requirements of others, with a net result that aggregate skill requirements have not changed much (Spenner, 1985, 1986; Rumberger, 1981a, 1987a; Flynn, 1988; Form, et al., 1988; Hodson and Parker, 1988). After reviewing the evidence on the impact of technology on skill requirements, the National Academy of Sciences concluded in a recent report:

> ...the empirical evidence of technology's effects on skills is too fragmentary and mixed to support confident predictions of aggregate skill impacts. Despite this uncertainty, however, the evidence suggests that the skill

> requirements for entry into future jobs will not be radically upgraded from those of current jobs (Cyert and Mowery, 1987, p. 103)

One reason the existing research literature presents a such mixed view is that technology and other workplace changes may affect work skills in different ways depending on conditions and characteristics of the firms where the changes are introduced. For example, a recent study of firms that use the same automated manufacturing technology found major differences in the amount and type of labor employed between Japanese and U.S. firms (Jaikumar, 1986). Such evidence supports a contingency perspective that changes in skills have no predetermined direction, but rather depend on a host of specific and perhaps conflicting influences that may result in either the upgrading or downgrading of work skills.

Of course, the future may not look like the past. One major difference concerns the type of technologies and their capabilities. Whereas many past technologies enabled machines to reduce the physical requirements of work, present and future machines are more capable of displacing the mental requirements of work (Rumberger, 1987a). As Nobel laureate Wassily Leontief (1983) has pointed out:

> Computers and robots replace humans in the exercise of mental functions in the same way as mechanical power replaced them in the performance of physical tasks. As time goes on, more and more complex mental functions will be performed by machines. Not unlike large bulldozers assigned to earthmoving jobs that could not possibly have been carried out by even the strongest laborers or draft animals, powerful computers are now performing mental operations that could not possibly be accomplished by human minds. Any worker who now performs his task by following specific instructions can, in principle, be replaced by a machine. This means that the role of humans as the most important factor of production is bound to diminish--in the same way that the role of horses in agricultural production was first

diminished and then eliminated by the introduction of tractors (pp. 3-4).

The problem with existing evidence. In general, existing evidence on the educational demands of work is not adequate for formulating policies on education and training. One serious deficiency is that most empirical studies rely on single, aggregate measure of skills, when current research in education and psychology suggests that there are many distinct dimensions of skills (Rumberger, 1988). These dimensions include the cognitive domain (e.g., verbal, reasoning skills), the physical domain (e.g., sensory, motor skills), and the social domain (e.g., interpersonal skills).

Of course some analysts have argued that knowledge of distinct skill requirements for different jobs is unnecessary because it is claimed that worker productivity can be improved significantly in all jobs by simply increasing the general aptitude of workers (e.g., Schmidt and Hunter, 1977). These claims have been challenged, however, in part because the ability tests used in the sampled occupations have largely been validated on correlates of work performance, such as job knowledge and supervisory ratings, rather than on actual measures of work performance (Levin, forthcoming). Moreover, to the extent that jobs differ in the abilities that they require, then the predictive validity of ability tests in one set of jobs would not readily apply to another set of jobs. At this point, the degree to which validity studies can be generalized across occupations remains an open question (Fleishman and Quaintance, 1984, pp. 434-436).

Another deficiency of existing research is that it is unable to reveal how the various forces shaping the educational requirements of jobs interact to influence the level and types of skills demanded in different jobs, firms, and industries. In particular, existing research has tended to focus more on the effects of changes in technology rather than on the effects of changes in organization, although the latter may be at least as important as the former in influencing skill requirements. Research reveals, for example, that even firms in the same industry using ostensibly the same technology can organize production quite differently, resulting in different types and skill demands of jobs (Baron and Bielby, 1980; Jaikumar, 1986). Until there is better information on the types of changes taking place in various firms and industries and their impact on the educational requirements of jobs, it is difficult to speculate with any confidence on aggregate trends in the overall demand for schooling.

New Competencies. While existing literature is incomplete, a growing number of policy reports have been issued over the last several years that suggest future workers will need a broad array of new competencies in the future workplace (e.g., National Academy of Sciences, 1984; U.S. Departments of Labor, Education, and Commerce, 1988; Reich, 1988; U.S. Congress, 1988; Carnevale, Gainer, and Meltzer, 1989). Virtually all of these reports set out a classification of skills that are necessary for productive, entry-level workers.

There are three tenets reflected in all of the reports, whether written by employer groups, training associations, social commentators, or government agencies. First, the U.S. labor force cannot compete with

labor forces in the newly industrializing countries unless it raises its productivity or reduces its cost and standard of living. In order to raise productivity the labor force will need improved skills and education. Second, it is far more important for schools to provide the fundamental knowledge and thinking skills that will enable workers to learn on the job and adapt to new technologies and other work demands than to teach narrow vocational skills. Third, the movement towards customized production and worker participation require workers with the ability to solve problems as they arise and to work creatively and productively with others.

These tenets and their implications for a new set of workplace competencies they may engender are the subject of an on-going research project, "Educational Requirements for New Technologies and Work Organization," being conducted at Stanford University (Levin and Rumberger, 1985). The purpose of the project is to identify the competencies required in work settings characterized by different types of technologies and different forms of workplace organization. The research design is based on intensive observation techniques of individual workers and the work process, supplemented by worker and supervisor interviews. On the basis of studies at several worksites, a tentative array of thirteen competencies that workers will need to function effectively in these newer work settings have been identified.

These competencies are described in Table 4. Most of these competencies are not the standard ones stressed by elementary and secondary schools in the U.S. For example, most schools teach traditional academic disciplines (e.g., math, science) through rote

learning and memorization in classroom settings that emphasis individualism and individual competition. In contrast, these competencies stress applications of broad knowledge to complex, real-life situations and learning strategies that involve group and cooperative learning. Yet most of these competencies can be taught in regular school settings (e.g., Hurd, 1986; Sternberg, 1985a).

Although students with university degrees are likely to have more educational experiences in these areas, even in these cases there is little guarantee that workers will be fully capable. And, we must keep in mind that all of these competencies are ones that may be required <u>in addition</u> to the standard cognitive and technical skills that we expect of our workers. That is, if firms continue to develop strategies based upon customized production and workplace participation, there will be an increased demand for these types of competencies. Such demands will also tend to more fully utilize the talents of educated workers, but in many cases they may exceed the capabilities of such workers. These requirements also seem to be ones that respond to the needs of small businesses for initiative, creativity, problem-solving, and so on, which is an important concern since small businesses have been extremely important sources of job growth in the U.S. (U.S. Small Business Administration, 1984).

At this point we must await the results of this and other research studies to find how to what extent these and perhaps other competencies will be needed in the future work force. Preliminary findings from our own study indicate that many of these competencies are indeed required

in contemporary workplaces that use new technologies and more participative work organization.

Summary of Major Findings

- The average educational requirements of future jobs will not be significantly different than current jobs, as both high-skilled and low-skilled jobs will continue to exist in the future economy.
- Existing research finds that past technologies did not uniformly increase or decrease the skill requirements of jobs; rather the impacts varied and depended on the particular jobs, firms, and technologies.
- Most existing studies have examined changes in the level of education and skills that jobs require and have paid little attention to the types of skills that jobs require; yet both employers and new developments in psychology suggest that a broad array of different types of skills may be necessary in the future workforce.

III. The Changing Supply of Educated Labor

In order to adequately formulate education and training policies, the demand for educated labor must be contrasted with supply. The supply of educated labor is influenced by two factors: the level and composition of the labor force and the educational preparation of the labor force. We will examine recent changes in the size and composition of the U.S. labor force over the last decade and a half, from 1972 to 1986, and future prospects based on government projections for the

period from 1986 to 2000. We will also examine trends in the educational preparation of workers.

Labor Force Changes

The U.S. labor force increased by over 30 million persons or 30 percent between 1972 and 1986 as shown in Table 5. This growth resulted from increases in the civilian population as well as an increase in the labor force participation rate of women. The population (16 years old and over) increased by 36.5 million persons or 25 percent, while the labor force participation rate of the population increased from 60 to 65 percent, with women increasing their participation from 44 to 55 percent and men decreasing their participation from 79 to 76 percent (Fullerton, 1987, p. 21).

According to recent government projections, the U.S. labor force will continue to grow in the future, but at a slower pace. The labor force is expected to grow by 21 million or 18 percent between 1986 and 2000 because of slower population growth and a slower growth in the labor force participation rate. The U.S. civilian, noninstitutional population (16 years old and over) is expected to increase by 24 million or 13 percent from 1986 to 2000 (Fullerton, 1987, p. 21). The labor force participation rate of the population is expected to increase over this period from 65 to 68 percent, with women's labor force participation increasing from 55 to 62 percent and men's labor force participation decreasing from 76 to 75 percent. The age composition of the labor force is also expected to change. The number of younger and older workers will continue to decline in the future as it has in the

recent past, with virtually all labor force growth coming from increases in the prime age population as shown in Table 5.

The most dramatic change in the U.S. labor force is reflected in its altering racial and ethnic composition. The racial and ethnic populations in the U.S. are increasing at a faster rate than the White population because of increased immigration of predominantly minority populations, and higher fertility rates of minority females, particularly Hispanics. Although immigration contributed only 17 percent of the population increase between 1972 and 1979, it contributed 25 percent for the 1979-86 period and is expected to contribute more than 30 percent over the 1986-2000 period (Fullerton, 1987, p. 21).

Between 1979 and 1986, Blacks, Asians, and Hispanics represented 45 percent of the net increase in the U.S. civilian labor force (Fullerton, 1987, Table 1). Between 1986 and 2000, this proportion is expected to increase to 57 percent as shown in Table 5. In other words, racial and ethnic minorities will constitute more than half of the expected growth in the U.S. labor force over the next decade and a half. Population projections beyond the year 2000 as well as the large concentration of minority students in schools suggest that the proportion of minorities in the labor force will continue to increase well into the next century.

Educational Preparation

The reason that these demographic changes in the labor force are so important is that they can be indicative of the educational preparation of future workers. Black and Hispanic workers generally have lower education levels than Whites, so an increase in the

proportion of Black and Hispanics workers will lower the overall education level of the labor force in the absence of significant changes in the educational preparation of these groups.

Various measures of educational achievement illustrate these differences. In 1985, for example, 40 percent of all Hispanics 25 to 29 years old were high school dropouts, compared to 20 percent for blacks and 13 percent for whites (Table 6). Conversely, 23 percent of young Whites have completed four or more years of college, compared to about 11 percent or less for Blacks and Hispanics.

Other measures of educational achievement also suggest that minorities may be inadequately prepared for future jobs. A recent survey of 21 to 25 year olds found that 47 percent of all blacks and 29 percent of all Hispanics read below the 8th grade level, compared to 15 percent of all young whites (Table 6). Similar disparities exist for high school age youth.

Since education levels of younger minority workers entering the labor market are generally much higher than older minority workers that are leaving, one might expect the educational preparation of minorities to improve overall in the future. For example, only 20 percent of Blacks, 25 to 29 years old, have dropped out of high school compared to 40 percent for all Black workers 25 years old and over (U.S. Bureau of the Census, 1987, Table 19). Similarly, younger Hispanic workers have completed higher levels of schooling than Hispanic workers overall.

Yet several demographic changes could actually lower the educational preparation of all future workers, minorities and majority alike. One is the increasing proportion of children living in poverty,

which rose from 15 percent in 1970 to 20 percent in 1985 (Table 7). Another is the increase in the number parents living in single parent households, which rose from 12 percent to 23 percent during this period. In addition, almost one in five children live in households where an language other than English is spoken. Each of these indicators are associated with higher dropout rates and lower levels of educational achievement. For example, dropout rates are higher for students from poor families and single-parent households and for students with poor grades (Table 8). Together, these indicators suggest that as many as one-third of American youth are "at-risk" of educational failure (Levin, 1986; Pallas, Natriello, and McDill, 1988).

At the same time that the number of at-risk students is rising in the U.S., government programs designed to serve these students have been cut. The major federal program for the economically disadvantaged, compensatory education, was only reaching only 30 to 45 percent of all eligible students in 1976 (Kennedy, Jung, and Orland, 1986, p. 84). Since that time, the number of poor students has risen about 20 percent, while real federal expenditures for the program have been cut by 17 percent (U.S. Department of Education, 1988, Tables 18, 29; U.S. Executive Office of the President, 1988, Table 12.3). Other programs designed to serve the educational disadvantaged are also inadequate. Currently, there are 41 million high school dropouts in the U.S., representing one-quarter of the population, yet only a small fraction of those are being served by any type of training or recovery program (Rumberger, forthcoming). Overall, expenditures for education have

declined from 5.8 percent of the federal budget in 1980 to 3.7 percent in 1984 (U.S. Bureau of the Census, 1985, Table 208).

Summary of Major Findings

- Minorities, who traditionally have much lower levels of educational preparation that other workers, will contribute more than half of the expected growth in the U.S. labor force between 1986 and 2000.
- The growth of poverty and single-parent households could significantly increase the number of educational deficient workers in future in the absence of increased effort to address the educational needs of this population.

IV. The Market for Educated Labor

In the last two sections we have tried to capture some of the dynamics of both the demand for and supply of educated labor. There are a number of overall conclusions that one could draw from that analysis. First, the movement towards the application of new technologies is not necessarily associated with rapid educational upgrading of jobs. Such upgrading depends upon whether the technologies are used as a substitute for or a complement to higher level skills, and concomitant changes in the organization of the workplace, particularly the move from traditional work hierarchies to worker participation in decisions. Moreover, the supply of educated labor depends not only upon expansion of educational opportunities, but the incentives and other conditions that induce different groups in the population to increase their educational attainments.

One of the major problems in conceptualizing the educational requirements for the future workplace is the emphasis on comparing the average education associated with occupational needs and the average educational level of the workforce. For example, the most typical statistic that is used to argue for more education is that the average level of education required for future jobs will be somewhat higher than that required for present jobs. But, this concern for the "average" obscures the fact that there are two major forms of mismatch concealed by the average level of education of workers and needs of the workforce. Some workers may be vastly undereducated for the jobs that are available, and others may be substantially overeducated. The point is that average educational levels can comport with average educational requirements for jobs, while serious mismatches exist in the underlying situation between workers' educational qualifications and job requirements. Thus, the focus on whether rising average levels of education are keeping pace with rising educational needs of occupations may ignore important policy issues.

This problem is further compounded by the fact that workers with the appropriate level of education may have the wrong type of education in the sense of not possessing some of the newer skills that are required for participation and customized production. That is, there has been too much of a preoccupation with the amount of education possessed by workers rather than the suitability of that education for changing work conditions.

Undereducation

Undereducation refers to the situation in which members of the labor force do not have the educational experience and skills to qualify even for entry level jobs or to benefit from training that will provide upward mobility. The U.S. is now facing a rising demography of students who are considered to be educationally at-risk. This term is used to refer to students who by virtue of a lack of resources in their home or community are unlikely to succeed in schools as schools are presently constituted.

Such students are heavily concentrated among immigrants, racial minorities, poverty families, single-parent families, and those with low education. It has been estimated that at the present time about one-third of all students in elementary and secondary school are at-risk, and the number is rising because of the high levels of immigration and high birth rates of at-risk populations as reflected in the previous section of this paper (Levin, 1986). A large proportion of students from these populations do not complete secondary school (Rumberger, 1987c), a proportion that may be as high as half. Even those that do complete secondary school show very low achievement scores, equal--on average--to students with four years less formal schooling. This suggests that even the amount of education completed in these populations will be misleadingly high.

As jobs have shifted from menial and physical tasks to those in the services, the appropriateness of skills that are learned in schools have become a concern, even for lower-level service jobs such as salesclerks, waiters, cashiers, office clerks, and so on. These jobs

require good communication skills, reasoning, numeracy, and other qualifications that have been set out by employers as well as proper work values and attitudes which have not always been inculcated by the schools and family (National Academy of Sciences, 1984). In addition, upward mobility depends crucially on the ability to learn new skills which depends, in turn, on the educational foundation at labor market entry. Without these threshold skills, workers from these backgrounds are unlikely to experience success in the labor market (Murnane, 1988). And given the dramatic rises, both proportionately and absolutely, in the size of at-risk populations, employers may face a serious and increasing challenge in attracting an appropriate labor force.

This prospect has already alarmed the business community in the U.S. as well as government agencies (Committee for Economic Development, 1987; U.S. Department of Labor, Department of Education, and Department of Commerce, 1988). Although the U.S. schools have tried to address the needs of at-risk populations for at least two decades, the efforts have met with only meager success (Levin, 1986). The seriousness of the problem is increasing because of the massive rise in the numbers of students who are at risk in the schools and who will ultimately join the labor force. In our view, the response must be substantial and fundamental, moving away from remediation as a strategy and in the direction of acceleration of learning (Levin, 1987b, 1988). This will not only require a far greater national investment in the education of at-risk students, but it will require a fundamental restructuring of schools and educational activities.

Overeducation

At the same time that the supply of lesser-educated workers and especially those from at-risk backgrounds may be inadequate to meet the skill requirements of even the least skilled jobs, there may also be an excess supply of the most educated workers, particularly college graduates. This phenomenon has been referred to as overeducation, underemployment, or surplus schooling and has been the subject of considerable research in both the U.S. and in other industrialized countries (e.g., Freeman, 1976; Clogg, 1979; Rumberger, 1981b; Hartog and Oosterbeek, 1988).

A number of studies have argued that the educational attainments of the labor force have increased much faster than the educational requirements of jobs, resulting in a condition of overeducation (e.g., Berg, 1970; Freeman, 1976; Rumberger, 1981b). For instance, enrollments in higher education increased by threefold between 1960 and 1980, producing a similar increase in the number of workers with a college education (Rumberger, 1984, Table 1). During the same period, the number of jobs requiring a college education, particularly professional and technical jobs, only increased twofold (Rumberger, 1984, Table 2). As a result, an increasing number of college graduates--primarily during the 1970s--were forced to take jobs where a college education was not required. Especially hurt were female college graduates. For example, a greater proportion of young, female college graduates were employed in lower-skilled clerical jobs in 1980 than in 1960 (Rumberger, 1984, Table 5).

Although the size of the traditional college-age population is expected to decrease over the next decade or so in the U.S., government forecasts indicate the number of college graduates will remain fairly constant as more and more older persons return to college to pursue their degrees. In addition, the economic incentives for individuals to go to college are higher now than any period in the last two decades, which could further increase the number of college graduates (Murphy and Welch, 1989). Official government forecasts indicate that the supply of college graduates available will exceed the number of jobs requiring a college education by about 100,000 per year, or by 1.5 million over the next decade and a half (Sargent, 1988, Chart 2). Such figures could understate the extent of the problem since almost half of all recent college graduates report that the jobs they obtained after completing college did not require a college degree (Braddock and Hecker, 1988, Table 4).

Overeducation is considered a problem, in part, because it suggests that scarce government resources are allotted toward a system of higher education that is producing graduates in excess of labor market needs. While such an argument may imply that overeducation, at worst, generates opportunity costs, the evidence suggests more serious consequences. A growing body of literature suggests that overeducated workers are less satisfied in their jobs, exert less effort, and therefore have lower productivity and earnings than workers in jobs more commensurate with their education and training (Duncan and Hoffman, 1981; Rumberger, 1981b, 1987b; Tsang and Levin, 1985; Hartog and Oosterbeek, 1988). A recent study estimated that each year of

overeducation among the workforce of U.S. telephone companies was associated with a net loss in output of about $3.8 billion in 1982 (Tsang, 1987, p. 248). In this case, the negative effect on productivity of overeducation relative to the existing needs of the telecommunications industry was shown to outweigh the positive effect of the additional human capital that was employed. This example suggests that the individual and social costs of overeducation can be substantial.

Schools versus Workplaces

Perhaps one of the most important sets of issues that have arisen in recent years address the problem of preparing students for work in schools that are not similar to workplace institutions in a number of important ways (Berryman, 1988; Resnick, 1977). First, schools tend to evaluate students on a relatively small number of competencies. These tend to focus on a limited set of dimensions and on abstract knowledge rather than the applied knowledge which is used in practical situations. Recent work on abilities suggests that the number of distinct abilities is larger and somewhat different in composition than those that schools recognize and test for (Sternberg, 1985b; Gardner, 1983). Second, schools focus on individual work tasks and knowledge rather than shared work tasks and shared knowledge. As we have noted above, there is increasing evidence that working in groups is becoming a common feature of workplaces. Third, schools seem to measure academic success in ways that do not necessary reflect competencies of persons in actual work situations (Wagner and Sternberg, 1986; Rogoff and Lave, 1984).

For example, Lave, Murtaugh, and de la Rocha (1984) found that persons who failed academic tests on fractions and decimals were able to perform almost error-free when confronted with similar calculations in the supermarket. Other researchers have found that individuals without the ostensible academic knowledge are able to learn how to perform satisfactorily in the workplace or in the military (Sticht, et al., 1987; Saxe, 1988). In fact, individuals often find methods of work performance that meet their unique needs and abilities in contrast to the single approach that is stressed in school tasks (Scribner, 1986).

These findings suggest that the knowledge that is learned in the school context does not necessarily predict performance in the work context. School measures of abilities are too limited and too removed from the actual use of that knowledge. Moreover, present school organization tends to emphasize individual learning rather than group learning and collaboration, even though the workplace is increasingly characterized by the latter. These phenomena imply the need to make at least some changes in schools to accommodate the needs of the workplace or to rely more heavily on other institutions including the workplace for some dimensions of work preparation.

Summary of Major Findings

- There is an growing mismatch between the educational attainment of workers and the educational demands of jobs at both ends of the spectrum, with some workers undereducated for their jobs and others overeducated for their jobs.
- An additional imbalance exists between the types of knowledge and skills being taught and those being demanded in the workplace.

Schools, in general, emphasize rote learning of traditional academic subjects in a classroom setting stressing individual work, while workplaces increasingly require broad-based knowledge applied to complex problems in a cooperative setting.

V. Implications for Research and Data

Although current research and data are adequate to address many of the questions that arose in the earlier discussion, there are several areas where additional research and data are needed.

One of the major deficiencies of existing research concerns adequate measures of the various types of competencies that are demanded the workplace. Both employers and new developments in psychology have identified a wide range of skills and competencies that are needed in the modern workplace. Yet most research studies and existing data only provide information on a very limited number of such competencies. For example, the Dictionary of Occupational Titles (DOT), probably the most widely used source of information on skill requirements and other attributes of jobs in the U.S. economy, has been criticized for providing duplicate measures of some attributes while ignoring other important attributes (Miller, et al., 1980; Rumberger, 1988). What is needed is a comprehensive taxonomy of the full range of skills and competencies workers need to be productive in modern work settings. Once such a taxonomy is developed, it could be incorporated in the future editions of the DOT and other labor market studies.

A similar deficiency exists in data and studies of labor supply. The most common measure of educational preparation for jobs found in

existing surveys and studies, such as those produced by the U.S. Bureau of the Census, is years of schooling completed. While such a measure provides a general indication of the level of schooling workers have, it provides little information about the types of schooling they have received and the types of skills and competencies they possess. Newer national surveys being conducted by the U.S. Department of Education, such as High School and Beyond, contain additional information on cognitive test scores and courses completed in high school and college, but still do not provide a more comprehensive assessment of the cognitive, physical, and social competencies of individuals that may be important in effective job performance.

Another area where additional research and data are needed concerns the determinants of the educational demands of work. Existing research takes the form of either aggregate, national studies, such as those produced by the U.S. Bureau of Labor Statistics, or case studies of particular jobs, firms, and industries. The former are valuable to get a general view of near-term trends in the composition of jobs in the educational attainments of workers in those jobs, while the latter are valuable to better understand the process of workplace changes. Both are deficient, in part, because they often do not provide information on the full range of skills required in the workplace, as the above discussion pointed out, but also because they do not provide an indication of how widespread differences in skills and competencies are across jobs, firms, and industries and the factors that account for those differences. Yet research has shown that individual firms can employ different technologies and organize work quite differently even

in the same industry, with very different impacts on skills and education (e.g., Baron and Bielby, 1980; Jaikumar, 1986). Additional research is needed on exactly how technology, workplace organization, and other factors influence the educational and skill demands of work, as well as how extensive these influences are in U.S. firms. The former information could be obtained from comparative case studies, while the latter could be obtained through organizational surveys.

Finally, additional research is needed on effective practices and policies for education and training that can successfully develop the skills and competencies needed in the modern workplace.

VI. Implications for Policy

Much of the public policy attention that has been devoted to the relation of education to the workplace has focussed on whether the workforce will have an adequate level of education for future jobs (e.g., Johnston and Packer, 1987). Clearly, this must be a concern as a larger and larger portion of the workforce is drawn from populations who have traditionally obtained low educational attainments. But, an obsession with only the average level of education tends to ignore what may be a much larger disjuncture, the fact that the schools may be providing the wrong type of education for workplace needs. The foregoing analysis suggested that much of the public policy attention has been devoted to whether the level of education of the workforce will be adequate to the needs of the economy. We believe that policy should also address whether the types of experiences that schools provide are appropriate for preparing effective workers; the desirable roles of

schools, universities, training institutions, and workplaces in preparing workers, and the efficiency of firms in utilizing educated labor. Four policy areas warrant attention.

Achieving Adequate Educational Levels for the Disadvantaged

The most important threat to obtaining adequate numbers of persons with education suitable to the future economy is the growing population of disadvantaged and at-risk students. During the remainder of this century, the majority of new workers will be drawn from racial minority groups. As we noted above, these groups have the highest dropout rates, and their achievement scores are considerably below those associated with the number of school grades they complete. Many of them may not reach the threshold of literacy, numeracy, and communication that is necessary to gain steady employment and benefit from training. Further, the fact that at-risk populations are more likely to get involved in the criminal justice system, drugs, and other negative social experiences will work against their integration into the workplace.

What is clear is that new and radically different approaches to schooling and social services will be needed to stem the traditional academic failure of these groups and bring them into the educational mainstream. Particular directions that have promise are:

- the expansion of Head Start to cover all disadvantaged youngsters rather than the 17 percent or so of eligible youngsters who are presently enrolled;
- the radical revamping of schools attended by at-risk students to promote success rather than remediation. Promising models are

found in the works of Slavin and Madden (1989), Comer (1980, 1988), and Levin (1987b);

- heavier emphasis on parental involvement and parental education programs on the basis that parents represent important influences and examples for the educational success of their children;
- more coordination of social services that serve disadvantaged populations in order to improve the educational attainments of their children;
- increased commitment of businesses, colleges and universities, volunteers, and other institutions in the community to providing programs and assistance for raising the educational performance of at-risk students, such as grants to schools for special programs, part-time and summer jobs for students, awards for academic achievement, and the use of volunteers and mentors and tutors;
- greater social investments in the education of disadvantaged through increasing the financing of schools attended by such students;
- more attention to adult literacy programs, dropout recovery programs and other efforts that can improve the basic skills of disadvantaged adults.

Appropriate School Experiences

We believe that there is sufficient evidence that schools are not providing many of the experiences that are needed in the workplace. Of particular concern is the emphasis on individual knowledge and abstract learning in the school in contrast to the need for shared knowledge and concrete learning in the workplace. But, beyond this there is the

question of a poor fit between the knowledge that workers need and that which the schooling experience imparts. For example, schools place much less emphasis on initiative, problem-solving and working in groups than does the workplace. Technological literacy of students is not adequate for understanding the world around them. The structure of traditional classroom instruction does not align well with the structure for learning in the workplace. The former tends to be based heavily on individual learning within a formal and structured situation whereas much learning in the workplace is group-oriented and informal. Finally, the workplace tends to be multidisciplinary and applied in contrast to the emphasis on individual subjects and abstract learning in schools. The following policy implications are suggested:

- schools should structure much more of their activity in groups to give students the experience of working productively with others and mastering the communications skills that are necessary to do so.
- schools should devote more attention to problem solving and activities in which students must take initiative to define and address their learning needs in order to prepare workers for similar tasks in the workplace.
- schools should emphasize more cooperative learning and peer tutoring to prepare students for workplaces in which groups work cooperatively and in which peers are an important part of the training process.
- schools should focus on developing evaluation skills among students to prepare them for evaluation of alternatives as well as

for evaluating the quality of their own work in correspondence with similar requirements in participative workplaces.

- o schools should give students more "hands-on" experiences to apply the abstract principles that are normally taught in school. These can encompass practical applications of learning experiences such as everyday uses of technology or forms of communication. They also suggest greater use of manipulable materials in learning at the lower levels.
- o student testing of competencies should coverage a wider range of abilities as well as the ability to apply knowledge in practical forms.

Appropriate Roles of Institutions for Workplace Preparation

Much of the traditional literature on the preparation of students for the workplace has focussed on vocational training for particular types of jobs. More recently there is a recognition that much preparation for the workplace is not narrowly vocational, but derives from the schooling process itself at all levels. Out of this recognition has come a concern that schools prepare workers with the general skills, enthusiasm, commitment, and capabilities to learn what they need to learn in the workplace. That is, the school is viewed as less of a agency for preparing workers with specific work skills and more as a place for preparing workers who are capable of learning those skills on the job.

A major policy area that must be addressed are the roles of elementary and secondary schools, community colleges, training institutes, universities, and workplaces. All students go through one

or more of these institutions, so there are questions of articulation among them. Further, these suggest questions of cost-effectiveness in where education and training take place as well as how earlier schooling affects the efficiency of later schooling and training at different post-secondary sites. Above all we need to work out some agreement on what is expected from each type of institution in terms of comprising a total educational and training system for the workplace. We are far from fully understanding institutional roles and even farther from setting out useful policies that can build upon a useful articulation.

Effective Utilization of Educated Labor

A final set of policy implications derives from the underutilization of educated labor. As we suggested above, educated persons have both a greater need to make decisions affecting their activities as well as greater capabilities to do so. Increasingly, these needs and capabilities are being reflected in workplaces that encourage participation and shared decisions as well as broader job designs, work groups, and worker rotation. These new forms of work organization are being adopted largely because they increase productivity, but they do have the effect of more fully utilizing the educated workers.

Both as a solution to lagging productivity and as a way to build in greater incentives for acquiring and using their education, public policy ought to promote new ways to utilize educated labor. Based upon the record of firms that have created semi-autonomous teams, shared decisions, flatter hierarchies, and other forms of worker participation, this is certainly one direction that might be promoted. But, more than

this, firms should be encouraged to recognize and build-on more fully the capabilities of their workers. Students should be able to see that many of the skills that they are developing in schools will be related to ones that they use in the workplace.

Table 1
Employment, Employment Growth, and Educational Attainments of Workers by Industrial Sector, 1980 and 2000

(percent distribution)

Sector Industry group	Employment, 1986	Employment Growth, 1986-2000	Educational Attainment (years), 1980			
			0-11	12	13-15	16+
Total	100.0	100.0	24	37	20	19
Goods-producing	24.9	0.0	30	42	17	11
Mining	0.8	-0.2	31	37	18	14
Construction	5.0	4.4	33	40	18	9
Manufacturing	19.2	4.2	31	42	16	11
Service-producing	75.1	100.0	20	35	21	24
Transportation, communications, and public utilities	5.3	2.4	20	46	23	11
Wholesale and retail trade	23.8	31.8	31	40	19	10
Finance, insurance, and real estate	6.4	8.1	8	39	26	27
Services	22.7	49.8	19	31	23	27
Government	16.9	8.0	14	31	18	37

Note: Employment data for wage and salary workers only. Educational attainment were based on data from the 1980 Decennial Census.

Source: Valerie A. Pesonick, "Industry Output and Employment Through the End of the Century," Monthly Labor Review, 110 (September 1987), Table 1; Russell W. Rumberger, The Changing Industrial Structure of the U.S. Economy, Report 86-SEPI-86 (Stanford: Stanford Education Policy Institute, July 1986), Table 3.

Table 2
Employment, Employment Growth, and Required Education
for the Fastest Growing Occupations in the United States:
1986 to 2000

(numbers in thousands)

	Employment 1986	Employment 2000	Job Growth, 1986-2000 Number	Job Growth, 1986-2000 Per.	Per. of Tot.	Req'd Ed. (yr.)*
Jobs with greatest growth (%)						
Paralegal personnel	61	125	64	103.7	0.3	13-15
Medical assistants	132	251	119	90.4	0.6	13-15
Physical therapists	61	115	53	87.5	0.2	16
Physical & corrective therapy assistants	36	65	29	81.6	0.1	12
Data processing equipment repairers	69	125	56	80.4	0.3	13-15
Home health aides	138	249	111	80.1	0.5	12
Podiatrists	13	23	10	77.2	0.0	17+
Comp. systems analysts	331	582	251	75.6	1.2	16
Medical records technicians	40	70	30	75.0	0.1	13-15
Employment interviewers, employment service	75	129	54	71.2	0.3	13-15
Total	956	1734	778	81.4	3.6	
Jobs with greatest growth (number)						
Salespersons, retail	3,579	4,780	1,201	33.5	5.6	12
Waiters and waitresses	1,702	2,454	752	44.2	3.5	12
Registered nurses	1,406	2,018	612	43.6	2.9	13-15
Janitors and cleaners	2,676	3,280	604	22.6	2.8	12
General managers and top executives	2,383	2,965	582	24.4	2.7	13-15
Cashiers	2,165	2,740	575	26.5	2.7	12
Truck drivers	2,211	2,736	525	23.8	2.5	12
General office clerks	2,361	2,824	462	19.6	2.2	12
Food counter workers	1,500	1,949	449	29.9	2.1	<12
Nursing aides and orderlies	1,224	1,658	433	35.4	2.0	12
Total	21,202	27,404	6,202	29.2	29.0	
Total employment	111,623	133,030	21,407	19.2	100.0	12

*Highest level of schooling completed by the majority of employed workers in that occupation as of March 1986.

Sources: George T. Silvestri and John M. Lukasiewicz, "A Look at Occupational Employment Trends to the Year 2000," Monthly Labor Review, vol. 110, no. 9 (September 1987), Table 3; Tabulations based on the March 1986 Current Population Survey, U.S. Bureau of the Census.

Table 3
Educational Requirements of Jobs:
1986 and Projected 2000

(percent distribution)

Educational Requirements (years)	Existing Jobs, 1986	New Jobs, 1986-2000	Projected Jobs, 2000
Some high school (0-11)	18	14	17
High school graduate (12)	40	34	39
Some college (13-15)	21	23	21
College graduate (16+)	21	29	23
Total percent	100	100	100
Number of jobs (thousands)	111,623	21,407	133,030

Note: Estimates of educational requirements were first derived for 284 occupations that the BLS uses to project future employment using schooling levels of the employed labor force in March 1986 and then aggregated to produce estimates for the entire economy. Projected employment in 2000 based on moderate growth projections.

Sources: George T. Silvestri and John M. Lukasiewicz, "A Look at Occupational Employment Trends to the Year 2000," Monthly Labor Review, vol. 110, no. 9 (September 1987), Table 3; Tabulations based on the March 1986 Current Population Survey, U.S. Bureau of the Census.

Table 4
Competencies for the Modern Workplace

1. Initiative	The drive and creative ability to think and perform independently
2. Cooperation	Constructive, goal-directed interaction with others
3. Working in groups	Interaction in work groups that is directed toward both short-term goals of efficient task or activity accomplishment and the long-term goal of group maintenance.
4. Peer training	Informal and formal coaching, advisement and training of peers
5. Evaluation	Appraisal, assessment, and certification of the quality of a work product or service
6. Communication	Appropriate uses of spoken, written, and kinesic communication as well as good listening, reading comprehension, and interpretive skills for receiving messages.
7. Reasoning	Evaluation and generation of logical arguments including both inductive and deductive approaches
8. Problem solving	Identification of problems, generation of alternative solutions and their consequences, selection of an alternative, and implementation of a solution.
9. Decision-making	Employing the elements of problem solving on an on-going basis in the workplace
10. Obtaining and using information	Deciding which information is relevant, knowing where to obtain it, obtaining it, and putting it to use
11. Planning	Establishing goals as well as scheduling and prioritizing work activities
12. Learning skills	Cognitive and affective skills that facilitate the acquisition of new knowledge, as needed
13. Multicultural skills	Understanding how to work with persons from other cultures in terms of language, communication styles, and different values

Table 5
U.S. Civilian Labor Force by Age, Sex, Race, and Ethnicity:
1986 and Projected 2000.

(numbers in thousands)

	1972	1986	2000	1972-1986 Number	1972-1986 Per.	1986-2000 Number	1986-2000 Per.
Total	87,037	117,837	138,775	30,800	100.0	20,938	100.0
Age							
16 to 24	20,186	23,368	22,631	3,182	10.3	-737	-3.5
25 to 54	52,325	79,565	100,780	27,240	88.4	21,215	101.3
55 and over	14,526	14,904	15,364	378	1.2	460	2.2
Gender							
Men	53,556	65,423	73,136	11,867	38.5	7,713	36.8
Women	33,481	52,414	65,639	18,933	61.5	13,225	63.2
Race/ethnicity							
White	77,275	101,801	116,701	24,526	79.6	14,900	71.2
Non-Hispanic*	---	93,725	102,615	---	---	8,890	42.5
Hispanic*	---	8,076	14,086	---	---	6,010	28.7
Black	8,748	12,684	16,334	3,936	12.8	3,650	17.4
Asian	---	3,352	5,740	---	---	2,388	11.4

*Persons of Hispanic origin may be of any race, but here are assumed to be White.

Source: Howard N. Fullerton, Jr., "Labor Force Projections: 1986 to 2000," Monthly Labor Review, Vol. 110, No. 9 (September 1982), Table 5.

Table 6
Indicators of Educational Achievement
by Race/Ethnicity

	Total	White	Black	Hispanic
Educational attainment, 25-29 year olds, 1985 (% completing)				
High School dropout (0-11 years)	13.9	13.2	19.4	39.1
High School graduate/ some college (12-15 years)	63.9	63.6	69.1	49.8
College graduate (16 years +)	22.2	23.2	11.5	11.1
Reading literacy, 21-25 year olds, 1985 (% reading below 8th grade level)				
Total	21.2	15.0	47.0	29.1
High School dropout	46.4			
High School graduate	22.1			
Reading proficiency, 17 year olds, 1984 (% reading at intermediate level)	83.6	88.9	65.8	69.1
Math achievement, 17 year olds, 1982 (average % correct)	60.2	63.1	45.0	49.4

Sources: U.S. Bureau of the Census, Educational Attainment in the United States: March 1982 to 1985. Current Population Reports, Series P-20, No. 415 (Washington, D.C.: (Washington, D.C.: U.S. Government Printing Office, November 1987), Table 1; Irwin S. Kirsh and Ann Jungeblut, Literacy: Profiles of America's Young Adults (Princeton, N.J.: Educational Testing Service, 1986, Table 6; U.S. Department of Education, Office of Educational Research and Improvement, Youth Indicators 1988 (Washington, D.C.: U.S. Government Printing Office, 1988), Tables 25, 27.

Table 7
Indicators of Student Diversity:
Characteristics of Children Under 18 Years Old

	Actual		Projected
	1970	1985	2000
Ethnicity (% distribution)			
White, non-Hispanic		72.0	67.3
Black		15.4	16.9
Spanish origin		10.0	12.9
Other races		2.6	2.9
Poverty Status (% below poverty)			
White	10.5	16.2	
Black	41.5	43.6	
Spanish origin	-	40.3	
Total	14.9	20.7	24.2*
Living with one parent (%)			
White	8.7	18.0	
Black	31.8	53.9	
Spanish origin	-	28.8	
Total	11.9	23.4	25.8*
Language minority status, 1980			
Total		16.9%	

*Estimated based on population projections by ethnicity for 2000 and indicators by ethnicity for 1985.

Sources: U.S. Bureau of the Census, Projections of Hispanic Population: 1983 to 2080, Current Population Reports, Series P-25, No. 995 (Washington, D.C.: U.S. Government Printing Office, November 1986), Table T; U.S. Department of Education, Educational Digest 1988 (Washington, D.C.: U.S. Government Printing Office, 1988), Table 18; U.S. Bureau of the Census, Marital Status and Living Arrangements: March 1985 (Washington, D.C.: U.S. Government Printing Office, 1986), Table A-8; U.S. Bureau of the Census, 1980 Census of the Population, Volume I, Characteristics of the Population, Chapter D, Detailed Population Characteristics, Part 1, U.S. Summary (Washington, D.C.: U.S. Government Printing Office, 1983), Table 1.

Table 8
Dropout Rates for 1980 High School Sophomores,
by Income, Family Composition, Grades and Race/Ethnicity

	Total	White	Black	Hispanic
Overall	14.4	13.0	17.2	19.1
Income levels (thirds)				
Top third	13.1	11.6	19.0	17.5
Middle third	12.4	11.4	14.4	17.0
Low third	21.7	22.6	17.8	24.0
Family Composition				
Both parents	12.2	11.3	14.5	16.1
Mother only	20.2	19.9	18.6	25.2
Father only	21.7	21.3	15.6	26.5
Neither	31.7	33.2	29.1	30.6
Self-reported grades				
A	1.4	1.2	3.5	2.3
A/B	6.7	5.7	10.9	11.2
B/C	14.3	13.8	15.0	15.7
C/D	35.4	36.2	31.2	35.9
D/F	82.9	85.5	73.8	81.4

Source: Stephen M. Barro and Andrew Kolstad, Who Drops Out of High School: Findings from High School and Beyond (Washington, D.C.: U.S. Government Printing Office, 1987), Tables 4.7, 4.9, 4.23.

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