6. TOWARD A SOCIOLOGY OF EDUCATIONAL TECHNOLOGY

Stephen T. Kerr

UNIVERSITY OF WASHINGTON

6.1 INTRODUCTION

Common images of technology, including educational technology, highlight its rational, ordered, and controlled aspects. These are the qualities that many observers see as its advantages, the qualities that encouraged the United States to construct ingenious railway systems in the last century, to develop a national network of telegraph and telephone communication, and later to blanket the nation with television signals. In the American mind, technology seems to be linked with notions of efficiency and progress; it is a distinguishing and preeminent value, a characteristic of the way Americans perceive the world in general, and the possible avenues for resolving social problems in particular (Boorstin, 1973; Segal, 1985).

Education is one of those arenas in which Americans have long assumed that technological solutions might bring increased efficiency, order, and productivity. Our current interest in computers and multimedia was preceded by a century of experimentation with precisely articulated techniques for organizing school practice, carefully specific approaches to the design of school buildings (down to the furniture they would contain), and an abiding enthusiasm for systematic methods of presenting textual and visual materials (Saettler, 1968; Godfrey, 1965).

There was a kind of mechanistic enthusiasm about many of these efforts. If we could just find the right approach, the thinking seemed to go, we could address the problems of schooling and improve education immensely. The world of the student, the classroom, the school, was, in this interpretation, a machine (perhaps a computer) needing only the right program to run smoothly.

But technology frequently has effects in areas other than those intended by its creators. Railroads were not merely a better way to move goods across the country; they also brought standard time and a leveling of regional and cultural differences. Telephones allowed workers in different locations to speak with each other, but they also changed the ways workplaces were organized and the image of what office work was. Television altered the political culture of the country in ways we still struggle to comprehend. Those who predicted the social effects that might flow from these new technologies typically either missed entirely or foresaw inaccurately what their impact might be.

Similarly with schools and education, the focus of researchers interested in educational technology has usually been on what is perceived to be the outcome of these approaches on what is thought of as their principal target: learning by pupils. Occasionally, other topics related to the way technology is perceived and used have been studied. Attitudes and opinions by teachers and principals about the use of computers are an example. Generally, however, there have been few attempts to define a "sociology of educational technology" (exceptions: Kerr & Taylor, 1985; Hlynka & Belland, 1991). In their 1992 review, Scott, Cole, and Engel also went beyond traditional images to focus on what they called a "cultural constructivist perspective." The task here, then, has these parts: to say what ought to be included under such a rubric, to review the relatively small number of works from within the field that touch on these issues, and the larger number of works from related fields or on related topics that may be productive in helping us think about a sociology of educational technology; and, finally, to consider future directions for work in this field.

6.1.1 What to Include?

To decide what we should consider under the suggested heading of a "sociology of educational technology," we need to think about two sets of issues: those that are important to sociologists, and those that are important to educators and to educational technologists. Sociology is concerned with many things, but if there is a primary assertion, it is that we cannot adequately explain social phenomena if we look only at individuals. Rather, we must examine how people interact in group settings, and how those settings shape and constrain individual action.

Defining what is central to educators (including educational technologists) is also difficult, but central is probably (to borrow a sociological term) cultural reproduction: the passing on to the next generation of values, skills, and knowledge that are judged to be critical, and the improvement of the general condition of society. Three aspects of this vision of education are important here: (1) direct relationships among educators, students, administrators, parents, community members, and others who define what education is to be ("what happens in schools and classrooms"); (2) attempts to deal with perceived social problems and inequities, and thus provide a better life for the next generation ("what happens after they finish"); and (3) efforts to reshape the educational system itself, so that it carries out its work in new ways and thus contributes to social improvement.

The questions about educational technology's social effects that will be considered here, then, are principally those relating (or potentially relating) to what sociologists call *collectivities:* groups of individuals (teachers, students, administrators, parents), organizations, and social movements.

6.1.1.1. Sociology of Organizations. If our primary interest is in how educational technology affects the ways that people work together in schools, then what key topics ought we to consider? Certainly a prime focus must be organizations, the ways that schools are structured so as to carry out their work. It is important to note that we can use the term *organization* to refer to more than the administration of schools or universities. It can also refer to the organization of classrooms, of interactions among students or among teachers, of the ways individuals seek to shape their work environment to accomplish particular ends, and so forth.

Organizational sociology is a well-established field, and there have been some studies on educational organizations. Subparts of this field include the functioning of schools as bureaucracies; the ways in which new organizational forms are born, live, and die; the expectations of actors within the school setting of themselves and of each other (in sociological terms, the roles they play); and the sources of power and control that support various organizational forms.

6.1.1.2. Sociology of Groups and Classes. A second focus of our review here will regard the sociology of groups, including principally groups of ascription (that one is either born into or to which one is assumed to belong by virtue of one's position), but also those of affiliation (groups that one voluntarily joins, or comes to be connected with via one's efforts or work). Important here are the ways that education deals with such groups as those based on gender, class, and race, and how educational technology interacts with those groupings. While this topic has not been central in studies of educational technology, the review here will seek to suggest its importance and the value of further efforts to study it.

6.1.1.3. Sociology of Social Movements. Finally, we will need to consider the sociology of social movements and social change. Social institutions change under certain circumstances, and education is currently in a period where large changes are being suggested from a variety of quarters. Educational technology is often perceived as a harbinger or facilitator of educational change, and so it makes sense for us to examine the sociological literature on these questions and thus try to determine where and how such changes take place, what their relationships are to other shifts in the society, economy, or polity, etc.

Another aspect of education as a social movement, and of educational technology's place there, is what we might call the *role of ideology.* By ideology here is meant not an explicit, comprehensive, and enforced code of beliefs and practices to which all members of a group are held but rather a set of implicit, often vague, but widely shared set of ex-

pectations and assumptions about the social order. Essential here are such issues as the values that technology carries with it, its presumed contribution to the common good, and how it is perceived to interact with individuals' plans and goals.

6.1.1.4. Questions of Sociological Method. As a part of considering these questions, we will also examine briefly some questions of sociological method. Many sociological studies in education are conducted via surveys or questionnaires, instruments that were originally designed as sociological research tools. Inasmuch as sociologists have accumulated considerable experience in working with these methods, we need to note both the advantages and the problems of using such methods. Given especially the popularity of opinion surveys in education, it will be especially important to review the problem of attitudes vs. actions ("what people say vs. what they do").

A further question of interest for educational technologists has to do with the "stance" or position of the researcher. Most of the studies of attitudes and opinions that have been done in educational technology assume that the researcher stands in a neutral position, "outside the fray." Some examples from sociological research using the ethnomethodological paradigm are introduced, and their possible significance for further work on educational technology are considered.

The conclusion seeks to bring the discussion back specifically to the field of educational technology by asking how the effects surveyed in the preceding sections might play out in real school situations. How might educational technology affect the organization of classes, schools, and education as a social institution? How might the fates of particular groups (women, minorities) intersect with the ways educational technology is or is not used within schools? And finally, how might the prospects for long-term change in education as a social institution be altered by educational technology.

6.2 SOCIOLOGY AND ITS CONCERNS

6.2.1 A Concern for Collective Action

In the United States, most writing about education has had a distinctly psychological tone. This is in contrast with what is the case in certain other developed countries, especially England and western Europe, where there is a much stronger tradition of thinking about education, not merely as a matter of concern for the individual but also as a general *social* phenomenon, a matter of interest for the state and polity. Accordingly, it is appropriate that we review here briefly the principal focus of sociology as a field, and describe how it may be related to another field that in America has been studied almost exclusively through the disciplinary lenses of psychology.

Sociology as a discipline appeared during the 19th century in response to serious changes in the existing social structure. The industrial revolution had wrought large shifts in relationships among individuals, and especially in the relationships among different social groups. Marx's interest in class antagonisms, Weber's focus on social and political structure under conditions of change, Durkheim's investigations of the sense of "anomie" (alienation) seen as prevalent in the new social order—all these concerns were born of the shifts that were felt especially strongly as Western social life changed under the impact of the industrial revolution.

The questions of how individuals define their lives together, and how those definitions, once set in place and commonly accepted, constrain individuals' actions and life courses, formed the basis of early sociological inquiry. In many ways, these are the same questions that continue to interest sociologists today. What determines how and why humans organize themselves and their actions in particular ways? What effects do those organizations have on thought and action? And what limitations might those organizations impose on human action?

If psychology focuses on the individual, the internal processes of cognition and motives for action that individuals experience, then sociology focuses most of all on the ways people interact as members of organizations or groups, how they form new groups, and how their status as members of one or another group affects how they live and work. The "strong claim" of sociologists might be put simply as "settings have plans for us." That is, the social and organizational contexts of actions may be more important in explaining what people do than their individual motivations and internal states. How this general concern for collective action plays out is explored below in relation to each of three topics of general concern here: organizations, groups, and social change.

6.2.1.1. Sociology of Organizations. Schools and other educational enterprises are easily thought of as organizations, groups of people intentionally brought together to accomplish some specific purpose. Education as a social institution has existed in various forms over historical time, but only in the last 150 years or so has it come to have a distinctive and nearly universal organizational form. Earlier societies had ways to ensure that young people were provided with appropriate cultural values (enculturation), with specific forms of behavior and outlooks that would allow them to function successfully in a given society (socialization), and with training needed to earn a living (observation and participation, formal apprenticeship, or formal schooling). But only recently have we come to think of education as necessarily a social institution characterized by specific organizational forms (schools, teachers, curricula, standards, laws, procedures for moving from one part of the system to another, etc.).

The emphasis here on education as a social organization leads us to three related subquestions that we will consider in more detail later. These include: (1) How does the fact that the specific organizational structure of schools is usually bureaucratic in form affect what goes on (and can go on) there, and how does educational technology enter into these relationships? (2) How are social roles defined in schools, and how does educational technology affect the definition of those roles? (3) How does the organizational structure of schools change, and how does educational technology interact with those processes of organizational change? Each of these questions will be introduced briefly here and treated in more depth in following sections.

6.2.1.1.1. Organizations and Bureaucracy. The particulars of school organizational structure are a matter of interest, for schools and universities have most frequently been organized as bureaucracies. That is, they develop well-defined sets of procedures for processing students, for dealing with teachers and other staff, and for addressing the public. These procedures deal with who is to be allowed to participate (rules for qualification, admission, assignment, and so forth), what will happen to them while they are part of the system (curricular standards, textbook selection policies, rules for teacher certification, student conduct, etc.), how the system will define that its work has been completed (requirements for receiving credit, graduation requirements, tests, etc.), as well as with how the system itself is to be run (administrator credentialing, governance structures, procedures for financial transactions within schools, relations among various parts of the system—accreditation, state vs. local vs. federal responsibility, etc.). Additional procedures may deal with such issues as how the public may participate in the life of the institution, how disputes are to be resolved, and how rewards and punishments are to be decided on and distributed (Bidwell, 1965). Educational organizations are thus participating in the continuing transition from what German sociologists called *gemeinschaft* to *gesellschaft,* from an earlier economic and social milieu defined by close familial bonds, personal relationships, and a small and caring community, to a milieu defined by ties to impersonal groups and large, bureaucratic organizations.

While bureaucratic forms of organization are not necessarily bad (and indeed were seen in the past century as a desirable antidote to personalized, corrupt, arbitrary social forms), the current popular image of bureaucracy is exceedingly negative. The disciplined and impersonal qualities of the bureaucrat, admired in the last century, are now frequently seen as ossified, irrelevant, a barrier to needed change.

A significant question may therefore be: What are the conditions that encourage bureaucratic systems, especially in education, to become more flexible, more responsive? And since educational technology is often portrayed as a solution to the problems of bureaucracy, we need to ask about the evidence regarding technology and its impact on bureaucracies.

6.2.1.1.2. Organizations and Social Roles. To understand how organizations work, we need to understand not only the formal structure of the organization, the "organization chart." We also need to see the independent "life" of the organization as expressed and felt through such mechanisms as social and organizational roles. Roles have long been a staple of sociological study, but they are often misunderstood. A role is not merely a set of responsibilities that one person (say, a manager or administrator) in a social setting defines for another person (e.g., a worker, perhaps a teacher). Rather, it is better thought of as a set of interconnected expectations that participants in a given social setting have for their own and others' behaviors. Teachers expect students to act in certain ways; principals expect teachers to do thus and so; and teachers have similar expectations of principals. Roles, then, are best conceived of as "emergent properties" of social systems: They appear not in isolation but rather when people gather together and try to accomplish something together. Entire systems of social analysis (such as that proposed by George Herbert Mead [1934] under the rubric "symbolic interactionism") have been built on this basic set of ideas.

Educational institutions are the site for an extensive set of social roles, including those of teacher, student/pupil, administrator, staff professional, parent, future or present employer, and community member. Especially significant are the ways in which the role of the teacher may be affected by the introduction of educational technology into a school, or the formal or informal redefinition of job responsibilities following such introduction. How educational roles are defined and redefined, how new roles come into existence, and how educational technology may affect those processes, then, are all legitimate subjects for our attention here.

6.2.1.1.3. Organizations and Organizational Change. A further question of interest to sociologists is how organizations change. New organizations are constantly coming into being, old ones disappear, and existing ones change their form and functions. How this happens, what models or metaphors best describe these processes, and how organizations seek to ensure their success through time have all been studied extensively in sociology. There have been numerous investigations of innovation in organizations, as well as of innovation strategies, bafflers to change, and so forth.

In education, these issues have been of special concern, for the persistent image of educational institutions has been one of unresponsive bureaucracies. Specific studies of educational innovation are therefore of interest to us here, with particular reference to how educational technology may interact with these processes.

6.2.1.2. Sociology of Groups. Our second major rubric involves groups, group membership, and the significance of group membership for an individual's life chances. Sociologists study all manner of groups: formal and informal. groups of affiliation (which one joins voluntarily) and ascription (which one is a member of by virtue of birth, position, class),

and so on. The latter kinds of groups, in which one's membership is not a matter of one's own choosing, have been of special interest to sociologists in this century. This interest has been especially strong since social bafflers of race, gender, and class are no longer seen as immutable but rather as legitimate topics for state concern. As the focus of sociologists on mechanisms of social change has grown over the past decades, so has their interest in defining how group membership affects the life chances of individuals, and in prescribing what steps institutions (government, schools, etc.) might take to lessen the negative impact of ascriptive membership on individuals' futures.

Current discussion of education has often focused on the success of the system in enabling individuals to transcend the boundaries imposed by race, gender, and class (see also 9.5). The pioneering work by James Coleman in the 1960s (Coleman, 1966) on race and educational outcomes was critical to changing how Americans thought about integration of schools. Work by Carol Gilligan (Gilligan, Lyons & Hanmer, 1990) and others starting in the 1 980s on the fate of women in education has led to a new awareness of the gender nonneutrality of many schooling practices (see 9.5.4, 10.4). The continuing importance of class is a topic of interest for a number of sociologists and social critics who frequently view the schooling system more as a mechanism for social reproduction than for social change (Apple, 1988; Giroux, 1981; Spring, 1989). These issues are of major importance to how we think about education in a changing democracy, and so we need to ask how educational technology may either contribute to the problems themselves or to their solution.

6.2.1.3. Sociology of Social Change and Social Movements. A third large concern of sociologists has been the issue of social stability and social change. The question has been addressed variously since the days of Karl Marx, whose vision posited the inevitability of a radical reconstruction of society based on scientific "laws" of historical and economic development, class identification, and class conflict via newly mobilized social movements. Social change is of no less importance to those who seek not to change but to preserve the social order. Talcott Parsons, an American sociologist of the middle of this century, is perhaps unjustly criticized for being a conservative, but he discussed in detail how particular social forms and institutions could be viewed as performing a function of "pattern maintenance" (Parsons, 1949, 1951).

Current concerns about social change are perhaps less apocalyptic today than they were for Marx, but in some quarters are viewed as no less critical. In particular, educational institutions are increasingly seen as one of the few places where society can exert leverage to bring about desired changes in the social and economic order. Present fears about "global economic competitiveness" are a good case in point. It is clear that for many policymakers, the primary task of schools in the current economic environment ought to be to

produce an educated citizenry capable of competing with other nations. But other voices in education stress the importance of the educational system in conserving social values, passing on traditions. A variety of social movements have emerged in support of both these positions. Both positions contain a kernel that is essentially ideological—a set of assumptions, values, and positions as regards the individual and society. These ideologies are typically implicit and thus rarely are articulated openly. Nonetheless, identifying them is especially important to a deeper understanding of the questions involved.

It is reasonable for us to ask how sociologists have viewed social change, what indicators are seen as being most reliable in predicting how social change may take place, and what role social movements (organized groups in support of particular changes) may have in bringing change about. If education is to be viewed as a primary engine for such change, and if educational technology is seen by some as a principal part of that engine, then we need to understand how and why such changes may take place, and what role technology may rightly be expected to play. This raises in turn the issue of educational technology as a social and political movement itself and of its place vis-à-vis other organizations in the general sphere of education. The ideological underpinnings of technology in education are also important to consider. The values and assumptions of both supporters and critics of technology's use in education bear careful inspection if we are to see clearly the possible place for educational technology.

The following section offers a detailed look at the sociology of organizations, the sociology of school organization and of organizational roles, and the influences of educational technology on that organization. Historical studies of the impact of technology on organizational structures are also considered to provide a different perspective on how organizations change.

6.3 SOCIOLOGICAL STUDIES OF EDUCATION AND TECHNOLOGY

6.3.1 THE SOCIOLOGY OF ORGANIZATIONS

Schools are many things, but (at least since the end of the 19th century) they have been organizations: intentionally created groups of people pursuing common purposes, and standing in particular relation to other groups and social institutions. Within the organization, there are consistent understandings of what the organization's purposes are, and participants stand in relatively well-defined positions vis-à-vis each other (e.g., the roles of teachers, student, parent, etc.). Additionally, the organization possesses a technical structure for carrying out its work (classes, textbooks, teacher certification), seeks to define job responsibilities so that tasks are accomplished, and has mechanisms for dealing with the outside world (PTA meetings, committees on textbook adoption, legislative lobbyists, school board meetings).

Sociology has approached the study of organizations in a number of ways. Earlier studies stressed the formal features of organizations and described their internal functioning and the relationships among participants within the bounds of the organization itself. Over the past 20 years or so, however, a new perspective has emerged, one that sees the organization in the context of its surrounding environment (Aldrich & Marsden, 1988). Major issues in the study of organizations using the environmental or organic approach include the factors that give rise to organizational diversity and those connected with change in the organization.

Perhaps it is obvious that questions of organizational change and organizational diversity are pertinent to the study of how educational technology has come to be used, or may be used, in educational environments, but let us use the sociological lens to examine why this is so. Schools as organizations are increasingly under pressure from outside social groups and from political and economic structures. Among the criticisms constantly leveled at the schools are that they are too hierarchical, too bureaucratized, and that current organizational patterns make changing the system almost impossible. (Whether these perceptions are in fact warranted is entirely another issue, one that we will not address here; see Carson, Huelskamp & Woodall, 1991.) We might reasonably ask whether we should be focusing attention on the organizational structure of schools as they are, rather than discussing desirable alternatives. Suffice it to say that massive change in an existing social institution, such as the schools, is difficult to undertake in a controlled, conscious way.

Those who suggest (e.g., Perelman, 1992) that schools as institutions will soon "wither away" are unaware of the historical flexibility of schools as organizations (Cuban, 1984; Tyack, 1974) and of the strong social pressures that militate for preservation of the existing institutional structure. The perspective here, then, is much more on how the existing structure of the social organizations we call *schools* can be affected in desirable ways, and so the issue of organizational change (rather than that of organizational generation) will be a major focus in what follows.

To make this review cohere, we will start by surveying what sociologists know about organizations generally, including specifically bureaucratic forms of organization. We will then consider the evidence regarding technology's impact on organizational structure in general, and on bureaucratic organization in particular. We will then proceed to a consideration of schools as a specific type of organization and concentrate on recent attempts to redefine patterns of school organization. Finally, we will consider how educational technology relates to school organization and to attempts to change that organization and the roles of those who work in schools.

6.3.1.1. Organizations: Two Sociological Perspectives. Much recent sociological work on the nature of organiza-

tions starts from the assumption that organizations are best studied and understood as parts of an environment. If organizations exist within a distinctive environment, then what aspects of that environment should be most closely examined? Sociologists have answered this question in two different ways: For some, the key features are the resources and information that may be used rationally within the organization or exchanged with other organizations within the environment; for others, the essential focus is on the cultural surround that determines and moderates the organization's possible courses of action in ways that are more subtle, less deterministic than the resources-information perspective suggests. While there are many exceptions, it is probably fair to say that the resources-information approach has been more often used in analyses of commercial organizations, and the latter, cultural approach used in studies of public and non-profit organizations.

The environmental view of organizations has been especially fruitful in studies of organizational change. The roles of outside normative groups such as professional associations or state legislatures, for example, were stressed by DiMaggio and Powell (1983; see also Meyer & Scott, 1983), who noted that the actions of such groups tend to reduce organizational heterogeneity in the environment and thus inhibit change. While visible alternative organizational patterns may provide models for organizational change, other organizations in the same general field exert a counter-influence by supporting commonly accepted practices and demanding that alternative organizations adhere to those models, even when the alternative organization might not be required to do so. For example, an innovative school may be forced to modify its record-keeping practices so as to match more closely "how others do it" (Rothschild-Whitt, 1979).

How organizations react to outside pressure for change has also been studied. There is considerable disagreement as to whether such pressures result in dynamic transformation via the work of attentive leaders, or whether organizational inertia is more generally characteristic of organizations' reaction to outside pressures (Astley & Van de Ven, 1983; Hrebiniak & Joyce, 1985; Romanelli, 1991). Mintzberg (1979) suggested that there might be a trade-off here: Large organizations have the potential to change rapidly to meet new pressures (but only if they use appropriately their large and differentiated staffs, better forecasting abilities, etc.); small organizations can respond to outside pressures if they capitalize on their more flexible structure and relative lack of established routines.

Organizations face a number of common problems, including how to assess their effectiveness. Traditional evaluation studies have assumed that organizational goals can be relatively precisely defined, outcomes can be measured, and standards for success agreed upon by the parties involved (McLaughlin, 1987). More recent approaches suggest that examination of the "street-level" evaluation methods used by those who work within an organization may provide an additional, useful perspective on organizational effectiveness (Anspach, 1991). For example, "dramatic incidents," even though they are singularities, may define effectiveness or its lack for some participants.

6.3.1.2. Bureaucracy as a Condition of Organizations. We need to pay special attention to the particular form of organization we call *bureaucracy,* since this is a central feature of school environments where educational technology is often used. The emergence of this pattern as a primary way for ensuring that policies are implemented and that some degree of accountability is guaranteed lies in the 19th century (Peabody & Rourke, 1965; Waldo, 1952). Max Weber described the conditions under which social organizations would move away from direct, personalized, or "charismatic" control, and toward bureaucratic and administrative control (Weber, 1978).

The problem with bureaucracy, as anyone who has ever stood in line at a state office can attest, is that the organization's workers soon seem to focus exclusively on the rules and procedures established to provide accountability and control, rather than on the people or problems the bureaucratic system ostensibly exists to address (Herzfeld, 1992). The tension for the organization and those who work therein is between commitment to a particular leader, who may want to focus on people or problems, and commitment to a self-sustaining system with established mechanisms for ensuring how decisions are made and how individuals work within the organization, and which will likely continue to exist after a particular leader is gone. In this sense, one might view many of the current problems in schools and concerns with organizational reform (especially from the viewpoint of teachers) as attempts to move toward a more collegial mode of control and governance (Waters, 1993). We will return later to this theme of reform and change in the context of school bureaucratic structures when we deal more explicitly with the concepts of social change and social movements.

6.3.1.3. Technology and Organizations. Our intent here is not merely to review what current thinking is regarding schools as organizations but also to say something about how the use of educational technology within schools might affect or be affected by those patterns of organization. Before we can address those issues, however, we must first consider how technology has been seen as affecting organizational structure generally. In other words, schools aside, is there any consensus on how technology affects the life of organizations, or the course of their development? While the issue would appear to be a significant one, and while there have been a good many general discussions of the potential impact of technology on organizations and the individuals who work there (e.g., Naisbitt & Aburdene, 1990; Toffler, 1990), there is remarkably little consensus about what precisely the nature of such impacts may be. Indeed, Americans seem to have a deep ambivalence about technology: Some

see it as villain and scapegoat; others stress its role in social progress (Florman, 1981; Pagels, 1988; Segal, 1985; Winner, 1986).

Some of these concerns stem from the difficulty of keeping technology under social control once it has been introduced (Glendenning, 1990; Steffen, 1993, especially Chapters 3 and 5). Perrow (1984) suggests that current technological systems are so complex and "interactive" (showing tight relationship among parts) that accidents and problems cannot be avoided. They are, in effect, no longer accidents but an inevitable consequence of our limited ability to predict what can go wrong. Others, however, stress that technology is an essential part of human culture and that our images of technology would be better if elaborated to include the notion of "extending our humanity" (Rothenberg, 1993).

6.3.1.3.1. Historical Studies of Technology As a framework for considering how technology affects or may affect organizational life, it may be useful to consider specific examples of earlier technological advances now seen to have altered social and organizational life in particular ways. A problem here is that initial prognoses for a technology's effects—indeed, the very reason a technology is developed in the first place—are often radically different from the ways in which a technology actually comes to be used. Few of those who witnessed the development of assembly-line manufacture, for example, had any idea of the import of the changes they were witnessing; although these shifts were perceived as miraculous and sometimes frightening, they were rarely seen as threatening the social status quo (Jennings, 1985; Marvin, 1988; see also 1.5).

Several specific technologies illustrate the ways initial intentions for a technology often translate over time into unexpected organizational and social consequences. The development of printing, for example, not only lowered the cost, increased the accuracy, and improved the efficiency of producing individual copies of written materials; it also had profound organizational impact on how governments were structured and did their work. Governments began to demand more types of information from local administrators and to circulate and use that information in pursuit of national goals (Boorstin, 1983; Darnton, 1984; Eisenstein, 1979; Febvre & Martin, 1958; Luke, 1989).

The telephone offers another example of a technology that significantly changed the organization of work in offices. Bell's original image of telephonic communication foresaw repetitive contacts among a few key points rather than the multipoint networked system we see today, and when Bell offered the telephone patents to William Orton, president of Western Union, Orton remarked, "What use could this company make of an electrical toy?" (Aronson, 1977). But the telephone brought a rapid reconceptualization of the workplace. After its development, the "information workers" of the day—newspaper reporters, financial managers,

and so forth—no longer needed to be clustered together so tightly. Talking on the telephone also established patterns of communication that were more personal, less dense, and formal (de Sola Pool, 1977).

Chester Carlson, an engineer then working for a small company called Haloid, developed in 1938 a process for transferring images from one sheet of paper to another based on principles of electrical charge. Carlson's process, and the company that would become Xerox, also altered the organization of office life, perhaps in more local ways than the telephone. Initial estimates forecast only the "primary" market for Xerox copies and ignored the large number of extra copies of reports that would be made and sent to a colleague in the next office, a friend, or someone in a government agency or university. This "secondary market" for copies turned out to be many times larger than the "primary market" for original copies, and the resulting dissemination of information has brought workers into closer contact with colleagues, given them easier access to information, and provided for more rapid circulation of information (Mort, 1989; Owen, 1986).

The impact of television on our forms of organizational life is difficult to document, though many have tried. Marshall McLuhan and his followers have suggested that television brought a view of the world that breaks down traditional social constructs. Among the effects noted by some analysts are the new position occupied by political figures (more readily accessible, less able to hide failures and problems from the electorate), changing relationships among parents and children (lack of former separation between adult and children's worlds), and shifts in relationships among the sexes (disappearance of formerly exclusively "male" and "female" domains of social action; Meyrowitz, 1985).

Process technologies may also have unforeseen organizational consequences, as seen in mass production via the assembly line. Production on the assembly line rationalized production of manufactured goods, improved their quality, and lowered prices. It also led to anguish in the form of worker alienation, and thus contributed to the development of socialism and Marxism, and to the birth of militant labor unions in the United States and abroad, altering forms of organization within factories and the nature of worker-management relationships (Boorstin, 1973; Hounshell, 1984; Smith, 1981. See also Bartky, 1990, on the introduction of standard time; and Norberg, 1990, on the advent of punch card technology).

6.3.1.3.2. Information Technology and Organizations. Many have argued that information technology will flatten organizational hierarchies and provide for more democratic forms of management. Shoshana Zuboff's study of how workers and managers in a number of corporate environments reacted to the introduction of computer-based manufacturing processes is one of the few empirically based studies to examine this issue (Zuboff, 1988). However, some have

argued from the opposite stance that computerization in fact strengthens existing hierarchies and encourages top-down control (Evans, 1991). Still others (Winston, 1986) have argued that information technology has had minimal impact on the structure of work and organizations. Kling (1991) found remarkably little evidence of radical change in social patterns from empirical studies, noting that while computerization had led to increased worker responsibility and satisfaction in some settings, in others it had resulted in decreased interaction. He also indicated that computer systems are often merely "instruments in power games played by local governments" (p. 35; see also Danziger et al., 1986).

One significant reason for the difficulty in defining technology's effects is that the variety of work and work environments across organizations is so great (Palmquist, 1992). It is difficult to compare, for example, the record-keeping operation of a large hospital, the manufacturing division of a major automobile producer, and the diverse types of activities that teachers and school principals typically undertake. And even between similar environments in the same industry, the way in which jobs are structured and carried out may be significantly different. Some sociologists have concluded that it may therefore only make sense to study organizational impacts of technology on the micro level, i.e., within the subunits of a particular environment (Comstock & Scott, 1977; Scott, 1975, 1987).

Defining and predicting the organizational context of a new technology on such a local level have also proved difficult. It is extraordinarily complex to define the web of social intents, perceptions, decisions, reactions, group relations, and organizational settings into which a new technology will be cast. Those who work using this framework (e.g., Bijker, Hughes & Pinch, 1987; Fulk, 1993; Joerges, 1990; Nartonis, 1993) often try to identify the relationships among the participants in a given setting, and then on that basis try to define the meaning that a technology has for them, rather than focus on the impact of a particular kind of hardware on individuals' work in isolation.

A further aspect of the social context of technology has to do with the relative power and position of the actors involved. Langdon Winner (1980) argues that technologies are in fact not merely tools; they have their political and social meanings "built in" by virtue of the ways we define, design, and use them. A classic example for Winner is the network of freeways designed by civil engineer Robert Moses for the New York City metropolitan region in the 1930s. The bridges that spanned the new arterials that led to public beaches were too low to allow passage by city buses, thus keeping hoi polloi away from the ocean front, while at the same time welcoming the more affluent, newly mobile (car-owning) middle class. The design itself, rather than the hardware of bridge decks, roads, and beach access points, defined what could later be done with the system once it had been built and put into use. Similar effects of predisposition-through-

design, Winner argues, are to be found in nuclear-power plants and nuclear-fuel reprocessing facilities (Winner, 1977, 1993).

An attempt to link the critical and positivist models of how technology interacts with social and political structures is provided by Street (1992). He proposes that subjecting to public scrutiny both the "hardware" side of technology and the fundamental assumptions that underlay its design and creation may lead to an improved way of handling the political decisions that necessarily now must be made with regard to implementation of particular technological systems.

6.3.1.3.3 Technology and Bureaucracy. One persistent view of technology's role within organizations is as a catalyst for overcoming centralized bureaucratic inertia (Rice, 1992; Sproull & Kiesler, 1991a). Electronic mail is widely reputed to provide a democratizing and leveling influence in large bureaucracies; wide access to electronic databases within organizations may provide opportunities for whistle-blowers to identify and expose problems; the rapid collection and dissemination of information on a variety of organizational activities may allow both workers and managers to see how productive they are and where changes might lead to improvement (Sproull & Kiesler, 1991b). While the critics are equally vocal in pointing out technology's potential organizational downside in such domains as electronic monitoring of employee productivity and "deskilling"— the increasing polarization of the work-force into a small cadre of highly skilled managers and technocrats, and a much larger group of lower-level workers whose room for individual initiative and creativity is radically constrained by technology (e.g., Carson, 1989)— the general consensus (especially following the intensified discussion of the advent of the "information superhighway" in the early 1 990s) seemed positive.

But ultimately the role of technology in an increasingly bureaucratized society may depend more on the internal assumptions we ourselves bring to thinking about its use. Rosenbrock (1990) suggests that we too easily confuse achievement of particular, economically desirable ends with the attainment of a more general personal, philosophical, or social good. This leads to the tension that we often feel when thinking about the possibility of replacement of humans by machines. Rosenbrock (1990) asserts that:

> Upon analysis it is easy to see that "assistance" will always become "replacement" if we accept [this] causal myth. The expert's skill is defined to be the application of a set of rules, which express the causal relations determining the expert's behavior. Assistance then can only mean the application of the same rules by a computer, in order to save the time and effort of the expert. When the rule set is made complete, the expert is no longer needed, because his skill contains nothing more than is embodied in the rules (p. 167).

But when we do this, he notes, we lose sight of basic human needs and succumb to a "manipulative view of human relations in technological systems" (p. 159).

6.3.1.4. Schools as Organizations. One problem that educational sociologists have faced for many years is how to describe schools as organizations. Early analyses focused on the role of school administrator as part of an industrial production engine: the school. Teachers were workers, students—products, and teaching materials and techniques—the means of production. The vision was persuasive in the early part of this century when schools, as other social organizations, were just developing into their current forms.

But the typical methods of analysis used in organizational sociology were designed to provide a clear view of how large industrial firms operated, and it early became clear that these enterprises were not identical to public schools. Their tasks were qualitatively different; their goals and outcomes were not equally definable or measurable; the techniques they used to pursue their aims were orders of magnitude apart in terms of specificity. Perhaps most importantly, schools operated in a messy, public environment where problems and demands came not from a single central location but seemingly from all sides; they had to cater to the needs of teachers, students, parents, employers, and politicians, all of whom might have different visions of what the schools were for.

It was in answer to this perceived gap between the conceptual models offered by classical organizational sociology and the realities of the school that led to the rise among school organization theorists of the "loose-coupling" model. According to this approach, schools were viewed as systems that were only loosely linked together with any given portion of their surroundings. It was the diversity of schools' environment that was important, argued these theorists. Their view was consistent with the stronger emphasis given to environmental variables in the field of organizational sociology in general starting with the 1970s.

The older, more mechanistic vision of schools as mechanisms did not die, however. Instead, it lived on and gained new adherents under a number of new banners. Two of these—the "Effective Schools" movement and "outcome-based education"—are especially significant for those working in the field of educational technology, because they are connected with essential aspects of our field. The effective-schools approach was born of the school reform efforts that started with the publication of the report on the state of America's schools, *A Nation at Risk* (National Commission, 1983). That report highlighted a number of problems with the nation's schools, including a perceived drop in standards for academic achievement (but note Carson et al., 1991). A number of states and school districts responded to this problem by attempting to define an "effective school." The definitions varied, but there were common elements: high expectations, concerned leadership, committed teaching, involved parents, and so forth. In a number of cases these elements were put together into a "package" that was intended to define and offer a prescription for good schooling (Mortimer, 1993; Fredericks & Brown, 1993; Purkey & Smith, 1983; Rosenholtz, 1985; Scheerens, 1991).

A further relative of the earlier mechanistic visions of school improvement was seen during the late 1980s in the trend toward definition of local, state, and national standards in education (e.g., National Governors' Association, 1986, 1987) and in the new enthusiasm for "outcome-based" education. Aspects of this trend become closely linked with economic analyses of the schooling system, such as those offered by Chubb and Moe (1990).

There were a number of criticisms and critiques of the effective-schools approach. The most severe of these came from two quarters: those concerned about the fate of minority children in the schools, who felt that these children would be forgotten in the new drive to push for higher standards and "excellence" (e.g., Dantley, 1990; Boysen, 1992) and those concerned with the fate of teachers who worked directly in schools, who were seen to be "deskilled" and ignored by an increasingly top-down system of educational reform (e.g., Elmore, 1992). These factions, discontented by the focus on results and apparent lack of attention to individual needs and local control, have served as the focus for a "second wave" of school restructuring efforts that have generated such ideas as "building-based management," school site councils, teacher empowerment, and action research.

Some empirical evidence for the value of these approaches has begun to emerge recently, showing, for example, that teacher satisfaction and a sense of shared community among school staff are important predictors of efficacy (Lee, Dedrick & Smith, 1991). Indications from some earlier research, however, suggest that the school effectiveness and school restructuring approaches may in fact simply be two alternative conceptions of how schools might best be organized and managed. The school effectiveness model of centrally managed change may be more productive in settings where local forces are not sufficiently powerful, well organized, or clear on what needs to be done, whereas the locally determined course of school restructuring may be more useful when local forces can in fact come to a decision about what needs to happen (Firestone & Herriott, 1982).

How to make sense of these conflicting claims for what the optimal mode of school organization might be? The school effectiveness research urges us to see human organizations as rational, manageable creations, able to be shaped and changed by careful, conscious action of a few well-intentioned administrators. The school restructuring approach, on the other hand, suggests that organizations, and schools, are best thought of as collectivities, groups of individuals who, to do their work better, need both freedom and the incentive that comes from joining with peers in search of new approaches. The first puts the emphasis on structure, central control, and rational action; the latter on individuals, community values, and the development of shared meaning.

A potential linkage between these differing conceptions is offered by James Coleman, the well-known sociologist who studied the issue of integration and school achievement in the 1960s. Coleman (1993) paints a broad picture of the rise of corporate forms of organization (including notably schools) and concomitant decline of traditional sources of values and social control (family, church). He sees a potential solution in reinvesting parents (and perhaps by extension other community agents) with a significant economic stake in their children's future productivity to the state via a kind of modified and extended voucher system. The implications are intriguing, and we will return to them later in this chapter as we discuss the possibility of a sociology of educational technology.

6.3.1.5. Educational Technology and School Organization.

If we want to think about the sociological and organizational implications of educational technology as a field, we need something more than a "history of the creation of devices." Some histories of the field (e.g., Saettler, 1968) have provided just that. But while it is useful to know when certain devices first came on the scene, it would be more helpful in the larger scheme of things to know why school boards, principals, and teachers wanted to buy those devices, how educators thought about their use as they were introduced, what they were actually used for, and what real changes they brought about in how teachers and students worked in classrooms and how administrators and teachers worked together in schools and districts. It is through thousands of such decisions, reactions, perceptions, and intents that the field of educational technology has been defined.

As we consider schools as organizations, it is important to bear in mind that there are multiple levels of organization in any school: the organizational structure imposed by the state or district, the organization established for the particular school in question, and the varieties of organization present in both the classroom and among the teachers who work at the school. Certainly there are many ways of using technology that simply match (or even reinforce) existing bureaucratic patterns: districts that use e-mail only to send out directives from the central office, for example, or large-scale central computer labs equipped with integrated learning packages through which all children progress in defined fashion.

As we proceed to think about how technology may affect schools as organizations, there are three central questions we should consider. Two of these—the overall level of adoption and acceptance of technology into schools (i.e., the literature on educational innovation and change), and the impact of technology on specific patterns of organization and practice within individual classrooms and schools (i.e., the literature on roles and role change in education)— have been commonplaces in the research literature on educational technology for some years. The third—organizational analysis

of schools under conditions of technological change—is only now emerging.

6.3.1.5.1. The Problem of Innovation. We gain perspective on the slow spread of technology into schools from work on innovations as social and political processes. Early models of how new practices come to be accepted were based on the normal distribution; a few brave misfits would first try a new practice, followed by community opinion leaders, "the masses," and finally a few stubborn laggards. Later elaborations suggested additional factors at work: concerns about the effects of the new approach on established patterns of work, different levels of commitment to the innovation, and so on (Rogers, 1962; Hall & Hord, 1984; Hall & Loucks, 1978. See also 23.7.7, Chapter 37).

If we view technologies as innovations in teachers' ways of working, then there is evidence they will be accepted and used if they buttress a teacher's role and authority in the classroom (e.g., Godfrey, 1965, on overhead projectors), and disregarded if they are proposed as alternatives to the teacher's presence and worth (e.g., early televised instruction, programmed instruction in its original Skinnerian garb; Cuban, 1986). Computers and related devices seem to fall somewhere in the middle: They can be seen as threats to the teacher, but also as helpmates and liberators from drudgery (Kerr, 1991). Attitudes on the parts of teachers and principals toward the new technology have been well studied, both in the past and more recently regarding computers (e.g., Honey & Moeller, 1990; Pelgrum, 1993). But attitude studies, as noted earlier, rarely probe the significant issues of power, position, and changes in the organizational context of educators' work, and the discussion of acceptance of technology as a general stand-in for school change gradually has become less popular over the years. Scriven (1986), for example, suggested that it would be more productive to think of computers not simply as devices but rather as new sources of energy within the school, energy that might be applied in a variety of ways to alter teachers' roles.

Less attention has been paid to the diffusion of the "process technology" of the instructional development] instructional design process. There have been some attempts to chart the spread of notions of systematic thinking among teachers, and a number of popular classroom teaching models of the 1970s (e.g., the "Instructional Theory into Practice," or ITIP, approach of Madeline Hunter) seemed closely related to the notions of ID. While some critics saw ID as simply another plot to move control of the classroom away from the teacher and into the hands of "technicians (Nunan, 1983), others saw ID providing a stimulus for teachers to think in more logical, connected ways about their work, especially if technologists themselves recast ID approaches in a less formal way so as to allow teachers leeway to practice "high influence" teaching (Martin & Clemente, 1990; see also Shrock, 1985; Shrock & Higgins, 1990). More elaborated visions of this sort of application of both the hardware and

software of educational technology to the micro- and macro-organization of schools include Reigeluth and Garfinkle's (1992) depiction of how the education system as a whole might change under the impact of new approaches (see also Kerr, 1 989a, 1990a).

6.3.1.5.2. Studies of Technology and Educational Roles. What has happened in some situations with the advent of contemporary educational technology is a quite radical restructuring of classroom experience. This has not been simply a substitution of one model of classroom life for another but rather an extension and elaboration of what is possible in classroom practice. The specific elements involved are several: greater student involvement in project-oriented learning and increased learning in groups, a shift in the teacher's role and attitude from being a source of knowledge to being a coach and mentor, and a greater willingness on the parts of students to take responsibility for their own learning. Such changes do not come without costs; dealing with a group of self-directed learners who have significant resources to control and satisfy their own learning is not an easy job. But the social relationships within classrooms can be significantly altered by the addition of computers and a well-developed support structure. (For further examples of changes in teachers' roles away from traditional direct instruction and toward more diverse arrangements, see Davies, 1988; Hardy, 1992; Hooper, 1992; Hooper & Hannafin, 1991; Kerr, 1977, 1978; Laridon, 1990a, 1 990b; McIlhenny, 1991; also 35.1. For a discussion of changes in the principal's role, see Wolf, 1993.)

Indeed, the evolving discussion on the place of ID in classroom life seems to be drawing closer to more traditional sociological studies of classroom organization and the teacher's role. One such study suggests that a "more uncertain" technology (in the sense of general organization) of classroom control can lead to more delegation of authority, more 'lateral communication" among students, and increased effectiveness (Cohen, Lotan & Leechor, 1989). The value of intervening directly in administrators' and teachers' unexamined arrangements for classroom organization and classroom instruction was affirmed in a study by Dreeben and Barr (1988).

6.3.1.5.3. The Organizational Impact of Educational Technology. If the general conclusion of some sociologists (as noted above) that the organizational effects of technology are best observed on the microlevel of classrooms, offices, and interpersonal relations, rather than the macrolevel of district and state organization, then we would be well advised to focus our attention on what happens in specific spheres of school organizational life. It is not surprising that most studies of educational technology have focused on classroom applications, for that is the image that most educators have of its primary purpose. Discussions of the impact of technology on classroom organization, however, are rarer. Some empirical studies have found such effects, noting especially the change in the teacher's role and position from

being the center of classroom attention to being more of a mentor and guide for pupils. This shift, however, is seen as taking significantly longer than many administrators might like, typically taking from 3 to 5 years (Kerr, 1991; Hadley & Sheingold, 1993; see also 13.6.7, 14.8.2).

Some models of application of technology to overall school organization do suggest that it can loosen bureaucratic structures (Hutchin, 1992; Kerr, 1989b; McDaniel, McInerney & Armstrong, 1993). Examples include the use of technology to allow teachers and administrators to communicate more directly, thus weakening existing patterns of one-way, top-down communication; and networks linking teachers and students, either within a school or district, or across regional or national borders, thus breaking the old pattern of isolation and parochialism and leading to greater collegiality (Tobin & Dawson, 1992). Linkages between schools, parents, and the broader community have also been tried sporadically, and results so far appear promising

There have been some studies that have focused on administrators' changed patterns of work with the advent of computers. Kuralt (1987), for example, described a computerized system for gathering and analyzing information on teacher and student activity. Special educators have been eager to consider both instructional and administrative uses for technology, with some seeing the potential to facilitate the often-cumbersome processes of student identification and placement through better application of technology (Prater & Ferrara, 1990). Administrators concerned about facilitating contacts with parents have also found solutions using technology to describe assignments, provide supportive approaches, and allow parents to communicate with teachers using voice mail (Bauch, 1989). However, improved communication does not necessarily lead to greater involvement, knowledge, or feelings of "ownership" on the parts of educators. In a study of how schools used technology to implement a new budget planning process in school-based management schools, Brown (1994) found that many teachers simply did not have the time or the training needed to participate meaningfully in budget planning via computer.

6.3.1.5.4. Educational Technology and Assumptions about Schools as Organizations. There is clearly no final verdict on the impact educational technology may have on schools as organizations. In fact, we seem to be faced with competing models of both the overall situation in schools and the image of what role educational technology might play there. On the one hand, the advocates of a rational systems view of school organization and management— the effective-schools devotees—would stress technology's potential for improving the flow of information from administration to teachers, and from teachers to parents, for enabling management to collect more rapidly a wider variety of information about the successes and failures of parts of the system as they seek to achieve well-defined goals.

A very different image would come from those enticed by the vision of school restructuring. They would likely stress technology's role in allowing wide access to information, free exchange of ideas, and the democratizing potentials inherent in linking schools and communities more closely.

Is one of these images more accurate than the other? Hardly, for each depends on a different set of starting assumptions. The rational-systems adherents see society (and hence education) as a set of more or less mechanistic linkages, and efficiency as a general goal. Technology, in this vision, is a support for order, rationality, and enhanced control over processes that seem inordinately "messy." The proponents of the "teledemocracy" approach, on the other hand, are more taken by organic images, view schools as institutions where individuals can come together to create and recreate communities, and are more interested in technology's potential for making the organization of the educational system not necessarily more orderly, but perhaps more diverse.

These images and assumptions, in turn, play out in the tasks each group sets for technology: monitoring, evaluation, assurance of uniformity (in outcomes if not methods), and provision of data for management decisions on the one hand; communication among individuals, access to information, diversification of the educational experience, and provision of a basis on which group decisions may be made, on the other. We shall discuss the implications of these differences further in the concluding section.

6.4 THE SOCIOLOGY OF GROUPS

American sociologists have recently come to focus more and more on groups that are perceived to be in a position of social disadvantage. Racial minorities, women, and those from lower socioeconomic strata are the primary examples. The sociological questions raised in the study of disadvantaged groups include: How do such groups come to be identified as having special, unequal status? What forms of discrimination do they face? How are attitudes about their status formed, and how do these change among the population at large? And what social or organizational policies may unwittingly contribute to their disadvantaged status? Because these groupings of race, gender, and class are so central to discussions of education in American society, and because there are ways that each intersects with educational technology, they will serve as the framework for the discussion that follows.

For each of these groups, there is a set of related questions of concern to us here. First, assuming that we wish to sustain a democratic society that values equity, equal opportunity, and equal treatment under law, *are we currently providing equal access to educational technology in schools?* Second, when we do provide access, are we providing access to the *same kinds of experiences?* In other words, are the experiences of males and females in using technology in schools of roughly comparable quality? Does one group or

the other suffer from bias in content of the materials with which they are asked to work, or in the types of experiences to which they are exposed? Third, are there *differing perspectives on the use of the technology that are particular to one group or the other?* The genders, for example, may in fact experience the world differently, and therefore their experiences with educational technology may be quite different. And finally, so what? That is, *is it really important that we provide equality of access to educational technology,* bias-free content, etc. , or are these aspects of education ultimately neutral in their actual impact on an individual's life chances?

6.4.1 Minority Groups

The significance of thinking about the issue of access to education in terms of racial groupings was underlined in studies beginning with the 1960s. Coleman's (1966) landmark study on the educational fate of American school children from minority backgrounds led to a continuing struggle to desegregate and integrate American schools, a struggle that continues. Coleman's findings—that African-American children were harmed academically by being taught in predominantly minority schools, and that Caucasian children were not harmed by being in integrated schools—provided the basic empirical justification for a whole series of federal, state, and local policies encouraging racial integration and seeking to abolish de facto segregation. This struggle continues, though in a different vein. As laws and local policies abolished de facto forms of segregated education, and access was guaranteed, the need to provide fully valuable educational experiences became more obvious.

6.4.1.1. Minorities and Access to Educational Technology. The issue of minority access to educational technology was not a central issue before the advent of computers in the early 1 980s. While there were a few studies that explicitly sought to introduce minority kids to media production techniques (e.g., Culkin, 1965; Schwartz, 1987; Worth & Adair, 1972), the issue did not seem a critical one. The appearance of computers, however, brought a significant change. Not only did the machines represent a higher level of capitalization of the educational enterprise than had formerly been the case, they also carried a heavier symbolic load than had earlier technologies, being linked in the public mind with images of a better future, greater economic opportunity for children, and so forth. Each of these issues led to problems vis-à-vis minority access to computers.

Initial concerns about the access of minorities to new technologies in schools were raised in Becker's studies (1983), which seemed to show not only that children in poor schools (schools where a majority of the children were from low-socioeconomic-status family backgrounds) had fewer computers available to them but also that the activities they were typically assigned by teachers featured rote memorization via use of simple drill-and-practice programs, whereas children in schools with a wealthier student base were of-

fered opportunities to learn programming and to work with more flexible software.

This pattern was found to be less strong in a follow-up set of studies conducted a few years later (Becker, 1986), but it has continued to be a topic of considerable concern. Perhaps school administrators and teachers became concerned and changed their practices, or perhaps there were simply more computers in the schools a few years later, allowing broader access. Nonetheless, other evidence of racial disparities in access to computing resources in schools was collected by Doctor (1991), who noted continuing disparities. In 1992, the popular computer magazine *Macworld* (Borrell, 1992; Kondracke, 1992; Piller, 1992) devoted an issue (headlined "America's Shame") to these questions, noting critically that this topic seemed to have slipped out of the consciousness of many of those in the field of educational technology, and raising in a direct way the issue of the relationship (or lack of one) between government policy on school computer use and the continuing discrepancies in minority access (see also 9.5.5).

If the issue of minority access to computing resources was not a high priority in the scholarly journals, it did receive a good deal of attention at the level of federal agencies, foundations, state departments of education, and local school districts. States such as Kentucky (Pritchard, 1991), Minnesota (McInerney & Park, 1986), New York (Webb, 1986), and a group of southern states (David, 1987), all identified the question of minority access to computing resources as an important priority. Additionally, national reports and foundation conferences focused attention on the issue in the context of low minority representation in math and science fields generally (Cheek, 1991; Kober, 1991). Madaus (1991) made a particular plea regarding the increasing move towards high-stakes computerized testing and its possible negative consequences for minority students.

The issue for the longer term may well be how educational technology interacts with the fundamental problem of providing not merely access but also a lasting and valuable education, something many minority children are clearly not receiving at present. The actual outcomes from use of educational technology in education may be less critical here than the symbolic functions of involvement of minorities with the hardware and software of a new era, and the value for life and career chances of their learning the language associated with powerful new forms of "social capital." We shall have occasion to return to this idea again below as part of the discussion of social class.

6.4.1.2. Gender

6.4.1.2.1. Gender and Technology. With the rise of the women's movement, and in reaction to the perceived "male bias" of technology generally, technology's relationship to issues of gender is one that has been explored increasingly in recent years. One economic analysis describes the complex interrelationship among technology, gender, and social patterns in homes during this century. Technological changes coincided with a need to increase the productivity of household labor. As wages rose, it became more expensive for women to remain at home, out of the workforce, and labor-saving technology, even though expensive, became more attractive, at first to upper-middle-class women, then to all. The simple awareness of technology's effects was enough, in this case, to bring about significant social changes (Day, 1992). Changes in patterns of office work by women have also been intensively considered by sociologists (Kraft & Siegenthaler, 1989; see also 1.12, 10.4).

6.4.1.2.2. Gender and Education. Questions of how boys' and girls' experiences in school differ have come to be a topic of serious consideration. Earlier assertions that most differences were the result of social custom or lack of appropriate role models have been called into question by the work of Gilligan and her colleagues (Gilligan, 1982; Gilligan, Ward & Taylor, 1988) which finds distinctive differences in how the sexes approach the task of learning in general, and faults a number of instructional approaches in particular (see also 9.5.4).

6.4.1.2.3. Gender and Access to Technology in Schools. Several scholars have raised the question of how women are accommodated in a generally male-centric vision of how educational technology is to be used in schools (Becker, 1986; Damarin, 1991; Kerr, 1990b; Turkle, 1984). In particular, Becker's surveys (1983, 1986) found that girls tended to use computers differently, focusing more on such activities as word processing and collaborative work, while boys liked game playing and competitive work. Similar problems were noted by Durndell and Lightbody (1993), Kerr (1990b), Lage (1991), Nelson and Watson (1991), and Nye (1991). Specific strategies to reduce the effect of gender differences in classrooms have been proposed (Neuter, 1986). The issue has also been addressed through national and international surveys of computer education practices and policies (Reinen & Plomp, 1993; Kirk, 1992). There is much good evidence that males and females differ both in terms of amount of computer exposure in school and in terms of the types of technology-based activities they typically choose to undertake. Some studies (Ogletree & Williams, 1990) suggest that prior experience with computers may determine interest and depth of involvement with computing by the time a student gets to higher grade levels. In fact, we are likely too close to the issues to have an accurate reading at present; the roles and expectations of girls in schools are changing, and different approaches are being tried to deal with the problems that exist. There have been some questions raised about the adequacy of the research methods used to unpack these key questions. Kay (1992), for example, found that scales and construct definitions were frequently poorly handled. Ultimately, the more complex issue of innate differences in social experience and ways of perceiving and dealing with the world will be extraordinarily difficult to unknot empirically,

especially given the fundamental importance of initial definitions and the shifting social and political context in which these questions are being discussed.

Nonetheless, the question of how males and females define their experiences with technology will continue to be an important one. Ultimately, the most definitive factor here may turn out to be changes in the surrounding society and economy. As women increasingly move into management positions in business and industry, and as formerly "feminine" approaches to the organization of economic life (team management styles, collaborative decision making) are gradually reflected in technological approaches and products (computer-supported collaborative work, "groupware"), these perspectives and new approaches will gradually make their way into schools as well.

6.4.2 Social Class

Surprisingly little attention has been paid to the issue of social class differences in American education. Perhaps this is because Americans tend to think of their society as "classless," or that all are "members of the middle class." Despite some current thinking that suggests the continuing importance of class as a defining variable in American society, class and issues of access to education based on class considerations are little analyzed.

6.4.2.1. Class and Access to Educational Technology. Only one study identified for this review addressed directly the question of access to computer technology and social class. Persell and Cookson (1987) found that computer knowledge represents a "new form of cultural capital," and that faculty and administration at elite boarding schools, in adopting new technologies, tend to think less about instructional uses and more about the need to master new technologies as a general strategy for social reproduction and protection of their own class interests.

6.4.2.1.1. Access to Information Under New Social Conditions. If social class has been little studied, there have nonetheless been serious concerns raised about equity in access to information more generally under the new kinds of conditions that computerized information services make possible. For example, Kerr (1983) noted that certain kinds of information became less accessible when print-based information was transformed into electronic form, a concern also raised by Schiller (1976, 1981). While de Sola Pool (1983) saw the spread of new systems for information dissemination and retrieval as encouraging democracy, Doctor (1992) was concerned about existing and predicted problems in making such systems available to residents of rural areas, as well as the poor, minorities, the elderly, and the disabled.

Questions such as these are ultimately questions of policy and values. Will we be willing to pay more for services so that those less fortunate can have access at reduced or no cost? Will schools be given special access privileges if the information superhighway is eventually built? There are no answers at present, but these are significant issues that bear further examination.

6.5 EDUCATIONAL TECHNOLOGY AS SOCIAL MOVEMENT

An outside observer reading the educational technology literature over the past half century (perhaps longer) would be struck by the messianic tone in much of the writing. Edison's enthusiastic pronouncement about the value of film in education in 1918, that "soon all children will learn through the eye, not the ear" was only the first in a series of visions of technology-as-panacea. And, although their potential is now seen in a very different light, such breakthroughs as instructional radio, dial-access audio, and educational television once enjoyed enormous support as "solutions" to all manner of educational problems (Cuban, 1986; Kerr, 1982).

Why has this been, and how can we understand educational technology's role over time as catalyst for a "movement" toward educational change, for reform in the status quo? To develop a perspective on this question, it would be useful to think about how sociologists have studied social movements. What causes a social movement to emerge, coalesce, grow, and wither? What is the role of organized professionals vs. laypersons in developing such a movement? What kinds of changes in social institutions do social movements bring about, and which have typically been beyond their power? How do the ideological positions of a movement's supporters (educational technologists, for example) influence the movement's fate? All these are areas in which the sociology of social movements may shed some light on educational technology's role as catalyst for changes in the structure of education and teaching.

6.5.1 The Sociology of Social Movements

Sociologists have viewed social movements using a number of different perspectives: movements as a response to social strains, as a reflection of trends and directions throughout the society more generally, as a reflection of individual dissatisfaction and feelings of deprivation, and as a natural step in the generation and modification of social institutions (McAdam, McCarthy & Zald, 1988). Much traditional work on the sociology of mass movements concentrated on the processes by which such movements emerged, how they recruited new members, defined their goals, and gathered the initial resources that would allow them to survive.

More recent work has focused attention on the processes by which movements, once organized, contrive to ensure the continued existence of their group and the long-term furtherance of its aims. Increasingly, social problems that in earlier eras were the occasion for short-lived expressions of protest by groups that may have measured their life spans in months are now the foci for long-lived organizations, for the activity of "social movement professionals," and for the cre-

ation of new institutions (McCarthy & Zald, 1973). This process is especially typical of those "professional" social movements where a primary intent is to create, extend, and preserve markets for particular professional services.

But while professionally oriented social movements enjoy some advantages in terms of expertise, organization, and the like, they also are often relatively easy for the state to control. In totalitarian governments, social movements have been controlled simply by repressing them. But in democratic systems, state and federal agencies, and their attached superstructure of laws and regulations, may in fact serve much the same function, directing and controlling the spheres of activity in which a movement is allowed to operate, offering penalties or rewards for compliance (e.g., tax-exempt status).

6.5.1.1. Educational Examples of Social Movements.
While we want to focus here on educational technology as a social movement, it is useful to consider other aspects of education that have recently been mobilized in one way or another as social movements. Several examples are connected with the recent (1983 to date) efforts to reform and restructure schools. As noted above, there are differing sets of assumptions held by different sets of actors in this trend, and it is useful to think of several of them as professional social movements. One such grouping might include the Governors' Conference, Education Council of the States, and similar government-level official policy and advisory groups with a political stake in the success of the educational system. Another such movement might include the Holmes Group, NCREST (the National Center for the Reform of Education, Schools and Teaching), the National Network for Educational Renewal, and a few similar centers focused on changing the structure of teacher education. A further grouping would include conservative or liberal "think tanks" such as the Southern Poverty Law Center, People for the American Way, or the Eagle Forum, having a specific interest in the curriculum, the content of textbooks, and the teaching of particularly controversial subject matter (sex education, evolutionism vs. creationism, values education, conflict resolution, racial tolerance, etc.). We shall return later to this issue of the design of curriculum materials and the roles technologists play therein.

6.5.1.1.1. Educational Technology as Social Movement.
To conceive of educational technology itself as a social movement, we need to think about the professional interests and goals of those who work within the field, and those outside the field who have a stake in its success. There have been a few earlier attempts to engage in those kinds of analyses: Travers (1973) looked at the field in terms of its political successes and failures and concluded that most activities of educational technologists were characterized by an astonishing naiveté as regards the political and bureaucratic environments in which they had to try to exist. Hooper (1969), a BBC executive, also noted that the field had failed almost entirely to establish a continuing place for its own agenda. Of those working during the 1960s and 1970s, only Heinich (1971) seemed to take seriously the issue of how those in the field thought about their work vis-à-vis other professionals. Of the critics, Nunan (1983) was most assertive in identifying educational technologists as a professionally self-interested lobby.

The advent of microcomputers changed the equation considerably. Now, technology-based programs moved from being perceived by parents, teachers, and communities as expensive toys of doubtful usefulness to being seen increasingly as the keys to future academic, economic, and social success. One consequence of this new interest was an increase in the number of professional groups interested in educational technology. Interestingly, the advantages of this new status for educational technology did not so much accrue to existing groups such as the Association for Educational Communication and Technology (AECT) or the Association for the Development of Computer-Based Instructional Systems (ADCIS), but rather to new groups such as the Institute for the Transfer of Technology to Education of the American School Board Association, the National Education Association, groups affiliated with such noneducational organizations as the Association for Computing Machinery (ACM), groups based on the hardware or applications of particular computer and software manufacturers (particularly Apple and IBM), and numerous academics and researchers involved in the design, production, and evaluation of software programs. There is also a substantial set of cross-connections between educational technology and the defense industry, as outlined in detail by Noble (1989, 1991). The interests of those helping to shape the new computer technology in the schools became clearer following publication of a number of federal and foundation-sponsored reports in the 1980s and 1 990s (e.g., *Power On!,* 1988).

Teachers themselves also had a role in defining educational technology as a social movement. A number of studies of the early development of educational computing in schools (Hadley & Sheingold, 1993; Olson, 1988; Sandholtz, Ringstaff & Dwyer, 1991) noted that a small number of knowledgeable teachers in a given school typically assumed the role of "teacher-computer buffs," willingly becoming the source of information and inspiration for other teachers. It may be that some school principals and superintendents played a similar role among their peers, describing not specific ways of introducing and using computers in the classroom but general strategies for acquiring the technology, providing for teacher training, and securing funding from state and national sources. A further indication of the success of educational technology as a social movement is seen in the widespread acceptance of levies and special elections in support of technology-based projects, and in the increasing incidence of participation by citizen and corporate leaders in projects and campaigns to introduce technology into schools.

6.5.1.1.2. Educational Technology and the Construction of Curriculum Materials. Probably in no other area involving educational technologists has there been such rancorous debate over the past 20 years as in the definition and design of curricular materials. Textbook controversies have exploded in fields such as social studies (Ravitch & Finn, 1987) and natural sciences (e.g., Nelkin, 1977); the content of children's television has been endlessly examined (Mielke, 1990); and textbook publishers have been excoriated for the uniformity and conceptual vacuousness of their products (Honig, 1989).

Perhaps the strongest set of criticisms of the production of educational materials comes from those who view that process as intensely social and political, and who worry that others, especially professional educators, are sadly unaware of those considerations (e.g., Apple, 1988; Apple & Smith, 1991). Some saw "technical," nonpolitical curriculum specification and design as quintessentially American. In a criticism that might have been aimed at the supposedly bias-free, technically neutral instructional design community, Wong (1991) noted:

> Technical and pragmatic interests are also consistent with an instrumentalized curriculum that continues to influence how American education is defined and measured. Technical priorities are in keeping not only with professional interests and institutional objectives, but with historically rooted cultural expectations that emphasize utilitarian aims over intellectual pursuits (p. 17).

Technologists have begun to enter this arena with a more critical stance. Ellsworth and Whatley (1990) considered how educational films historically have reflected particular social and cultural values. Spring (1992) examined the particular ways that such materials have been consciously constructed and manipulated by various interest groups to yield a particular image of American life. The new study of Channel One by DeVaney and her colleagues (1994) indicates the ways in which the content selected for inclusion serves a number of different purposes and the interests of a number of groups, not always to educational ends.

All of these examples suggest that technologists may need to play a more active and more consciously committed role regarding the selection of content and design of materials. This process should not be regarded as merely a technical or instrumental part of the process of education but rather as part of its essence, with intense political and social overtones. This could come to be seen as an integral part of the field of educational technology, but doing so would require changes in curriculum for the preparation of educational technologists at the graduate level.

6.5.1.1.3. The Ideology of Educational Technology as a Social Movement. The examples above suggest that educational technology has had some success as a social movement, and that some of the claims made by the field (improved student learning, more efficient organization of schools, more rational deployment of limited resources, etc.) are attractive not only to educators but also to the public at large. Nonetheless, it is also worth considering the ideological underpinnings of the movement, the sets of fundamental assumptions and value positions that motivate and direct the work of educational technologists (see also 2.2, 3, 9.7.2, 10.2.3).

There is a common assumption among educational technologists that their view of the world is scientific, value neutral, and therefore easily applicable to the full array of possible educational problems. The technical and analytic procedures of instructional design ought to be useful in any setting, if correctly interpreted and applied. The iterative and formative processes of instructional development should be similarly applicable with only incidental regard to the particulars of the situation. The principles of design of CAI, multimedia, and other materials are best thought of as having universal potential. Gagne (1987) wrote about educational technology generally, for example that:

> . . . fundamental systematic knowledge derives from the research of cognitive psychologists who apply the methods of science to the investigation of human learning and the conditions of instruction (p. 7).

Rita Richey (1986), in one of the few attempts to integrate the diverse conceptual strands that feed into the field of instructional design, noted that:

> Instructional design can be defined as the science of creating detailed specifications for the development, evaluation, and maintenance of both large and small units of subject matter (p. 9).

The focus on science and scientific method is marked in other definitions of educational technology and instructional design as well. The best known text in the field (Gagne, Briggs & Wager, 1992) discusses the systems approach to instructional design as involving:

> . . . carrying out of a number of steps beginning with an analysis of needs and goals and ending with an evaluated system of instruction that demonstrably succeeds in meeting accepted goals. Decisions in each of the individual steps are based on empirical evidence, to the extent that such evidence allows. Each step leads to decisions that become "inputs" to the next step so that the whole process is as solidly based as is possible within the limits of human reason (p. 5).

Gilbert (1978, p. 81), a pioneer in the field of educational technology in the 1960s, supported his model for "behavioral engineering" with formulas:

We can therefore define behavior *(B),* in shorthand, as a product of both the repertory [of skills] *and* environment:

$B = E * P$

The assumption undergirding these (and many other) definitions and models of educational technology and its com-

ponent parts, instructional design and instructional development, is that the procedures the field uses are scientific, value neutral, and precise. There are likely several sources for these assumptions: the behaviorist heritage of the field and the seeming control provided by such approaches as programmed instruction and CAI; the newer turn to systems theory (an approach itself rooted in the development of military systems in World War II) to provide an overall rationale for the specification of instructional environments; and the use of the field's approaches in settings ranging from schools and universities to the military, corporate and industrial training, and organizational development for large public-sector organizations.

In fact, there is considerable disagreement as to the extent to which these seemingly self-evident propositions of educational technology as movement are in fact value-free and universally applicable (or even desirable). Some of the most critical analysis of these ways of thinking about problems and their solution are in fact quite old.

Lewis Mumford, writing in 1930 about the impact of technology on society and culture, praised the "matter of fact" and "reasonable" personality that he saw arising in the age of the machine. These qualities, he asserted, were necessary if human culture was not only to assimilate the machine but also to go beyond it:

> Until we have absorbed the lessons of objectivity, impersonality, neutrality, the lessons of the mechanical realm, we cannot go further in our development toward the more richly organic, the more profoundly human (1962, p. 363).

For Mumford, the qualities of scientific thought, rational solution to social problems, and objective decision making were important, but only preliminary to a deeper engagement with more distinctively human (moral, ethical, spiritual) questions.

Jacques Ellul, a French sociologist writing in 1954, also considered the relationship between technology and society. For Ellul, the essence of "technical action" in any given field was "the search for greater efficiency" (1964, p. 20). In a description of how more efficient procedures might be identified and chosen, Ellul notes that the question is one

> . . . of finding the best means in the absolute sense, on the basis of numerical calculation. It is then the specialist who chooses the means; he is able to carry out the calculations that demonstrate the superiority of the means chosen over all the others. Thus a science of means comes into being—a science of techniques, progressively elaborated (p. 21).

"Pedagogical techniques," Ellul suggests, make up one aspect of the larger category of "human techniques," and the uses by "psychotechnicians" of such techniques on the formation of human beings will come more and more to focus on the attempt to

> . . . restore man's lost unity, and patch together that which technological advances have separated [in work, leisure, etc.]. But only one way to accomplish this ever occurs to [psychotechnicians], and that is to use technical means. . . . There is no other way to regroup the elements of the human personality; the human being must be completely subjected to an omnicompetent technique, and all his acts and thoughts must be the objects of the human techniques (p. 411).

For Ellul, writing in what was still largely a precomputer era, the techniques in question were self-standing procedures monitored principally by other human beings. The possibility that computers might come to play a role in that process was one that Ellul hinted at, but could not fully foresee. In more recent scholarship, observers from varied disciplinary backgrounds have noted the tendency of computers (and those who develop and use them) to influence social systems of administration and control in directions that are rarely predicted and are probably deleterious to feelings of human self-determination, trust, and mutual respect. The anthropologist Shoshana Zuboff (1988), for example, found that the installation of an electronic mail system may lead not only to more rapid sharing of information but also to management reactions that generate on the part of workers the sense of working within a "panopticon of power," a work environment in which all decisions and discussion are monitored and controlled, a condition of transparent observability at all times.

Joseph Weizenbaum, computer scientist at MIT and pioneer in the field of artificial intelligence, wrote passionately about what he saw as the difficulty many of his colleagues had in separating the scientifically feasible from the ethically desirable. Weizenbaum (1976) was especially dubious of teaching university students to program computers as an end in itself:

> When such students have completed their studies, they are rather like people who have somehow become eloquent in some foreign language, but who, when they attempt to write something in that language, find they have literally nothing to say (p. 278).

Weizenbaum is especially skeptical of a technical attitude toward the preparation of new computer scientists. He worries that if those who teach such students, and see their role as that of

> . . . a mere trainer, a mere applier of "methods" for achieving ends determined by others, then he does his students two disservices. First, he invites them to become less than fully autonomous persons. He invites them to become mere followers of other people's orders, and finally no better than the machines that might someday replace them in that function. Second, he robs them of the glimpse of the ideas that alone purchase for computer science a place in the university's curriculum at all (p. 279).

Similar comments might be directed at those who would train educational technologists to work as "value-free" creators of purely efficient training.

Another critic of the "value-free" nature of technology is Neil Postman, who created a new term — Technopoly — to describe the dominance of technological thought in American society. This new world view, Postman (1992) observed.

> . . . consists of the deification of technology, which means that the culture seeks its authorization in technology and finds its satisfactions in technology, and takes its orders from technology. This requires the development of a new kind of social order. . . . Those who feel most comfortable in Technopoly are those who are convinced that technical progress is humanity's supreme achievement and the instrument by which our most profound dilemmas may be solved. They also believe that information is an unmixed blessing, which through its continued and uncontrolled production and dissemination offers increased freedom, creativity, and peace of mind. The fact that information does none of these things—but quite the opposite—seems to change few opinions, for such unwavering beliefs are an inevitable product of the structure of Technopoly (p. 71).

Other critics also take educational technology to task for what they view as its simplistic claim to scientific neutrality. Richard Hooper, a pioneer in the field and longtime gadfly, commented that:

> Much of the problem with educational technology lies in its attempt to ape science and scientific method. . . . An arts perspective may have some things to offer educational technology at the present time. An arts perspective focuses attention on values, where science's attention is on proof (p. 11).

Michael Apple (1991), another critic who has considered how values, educational programs, and teaching practices interact, noted that:

> The more the new technology transforms the classroom into its own image, the more a technical logic will replace critical political and ethical understanding (p. 75).

Similar points have been made by Sloan (1985) and by Preston (1992). Postman's assertion that we must

> . . . refuse to accept efficiency as the pre-eminent goal of human relations . . . not believe that science is the only system of thought capable of producing truth . . . [and] admire technological ingenuity but do not think it represents the highest possible form of human achievement (p. 184).

necessarily sounds unusual in the present context. Educational technologists are encouraged to see the processes they employ as beneficent, as value-free, as contributing to improved efficiency and effectiveness. The suggestions noted above that there may be different value positions, different stances toward the work of education, are a challenge, but one that the field needs to entertain seriously if it is to develop further as a social movement.

6.5.1.1.4. Success of Educational Technology as a Social Movement. If we look at the field of educational technology today, it has enjoyed remarkable success: Legislation at both state and federal levels includes educational technology as a focus for funded research and development; the topics the field addresses are regularly featured in the public media in a generally positive light; teachers, principals, and administrators actively work to incorporate educational technology into their daily routines; and citizens pass large bond issues to fund the acquisition of hardware and software for schools.

What explains the relative success of educational technology at this moment as compared with 2 decades ago? Several factors are likely involved. Certainly the greater capabilities of the hardware and software in providing for diverse, powerful instruction are not to be discounted, and the participation of technologists in defining the content of educational materials may be important for the future. But there are other features of the movement as well. Gamson (1975) discusses features of successful social movements and notes two that are especially relevant here.

As educational technologists began to urge administrators to take their approaches seriously in the 1960s and 1970s, there was often at least an implied claim that educational technology could not merely supplement but actually supplant classroom teachers. In the 1980s, this claim seems to have disappeared, and many key players (e.g., Apple Computer's Apple Classroom of Tomorrow [ACOT] project, GTE's Classroom of the Future, and others) sought to convince teachers that they were there not to replace them but to enhance their work and support them. This is in accordance with Gamson's finding that groups willing to coexist with the status quo had greater success than those seeking to replace their antagonists.

A further factor contributing to the success of the current educational technology movement may be the restricted, yet comprehensible and promising, claims it has made. The claims of earlier decades had stressed either the miraculous power of particular pieces of hardware (that were in fact quite restricted in capabilities) or the value of a generalized approach (instructional development/design) that seemed both too vague and too like what good teachers did anyway to be trustworthy as an alternative vision. In contrast, the movement to introduce computers to schools in the 1 980s, while long on general rhetoric, in fact did not start with large promises but rather with an open commitment to experimentation and some limited claims (enhanced remediation for poor achievers, greater flexibility in classroom organization, and so on). This too is in keeping with Gamson's findings that social movements with single or limited issues have been more successful than those pushing for generalized goals or those with many subparts.

It is likely too early to say whether educational technology will ultimately be successful as a social movement, but

the developments of the past dozen or so years are promising for the field. There are stronger indications of solidity and institutionalization now than previously, and the fact the technology is increasingly seen as part of the national educational, economic, and social discussion bodes well for the field. The increasing number of professionally related organizations, and their contacts with other parts of the educational, public policy, and legislative establishment are also encouraging signs. Whether institutionalization of the movement equates easily to success of its aims, however, is another question. Gamson notes that it has traditionally been easier for movements to gain acceptance from authorities and other sources of established power than actually to achieve their stated goals. Educational technologists must be careful not to confuse recognition and achievement of status for their work and their field with fulfillment of the mission they have claimed. The concerns noted above about the underlying ideology that educational technology asserts—value neutrality, use of a scientific approach, pursuit of efficiency—are also problematic, for they suggest that educational technologists may need to think still more deeply about fundamental aspects of their work than has been the case to date.

6.6 A NOTE ON SOCIOLOGICAL METHOD

The methods typically used in sociological research differ considerably from those usually employed in educational studies, and particularly from those used in the field of educational technology. Specifically, the use of two approaches in sociology—surveys and participant observation—differs sufficiently from common practice in educational research that it makes sense for us to consider them briefly here. In the first case, survey research, there are problems in making the inference from attitudes to probable actions that are infrequently recognized by practitioners in education. In the second case, participant observation and immersion in a cultural surround, the approach has particular relevance to the sorts of issues reviewed here, yet is not often employed by researchers in educational technology.

6.6.1 Surveys: from Attitudes to Actions

Survey research is hardly a novelty for educators; it is one of the most commonly taught methods in introductory research methods courses in education. Sociologists, who developed the method in the last century, have refined the approach considerably, and there exist good discussions of the process of survey construction that are likely more sophisticated than those encountered in introductory texts in educational research. These address nuances of such questions as sampling technique, eliciting high response rates, and so forth (e.g., Hyman, 1955, 1991). For our purposes here, we include all forms of surveys; mailed questionnaires, administered questionnaires, and in-person or telephone interviews (see also 41.2).

An issue often left unaddressed in discussions of the use of survey research in education, however, is the difficulty of making the inference that if a person holds an attitude on a particular question, that the attitude translates into a likelihood of engaging in related kinds of action. For example, it frequently seems to be taken for granted that if a teacher believes that all children have a right to an equal education, then that teacher will work to include children with disabilities in the class, will avoid discriminating against children from different ethnic backgrounds, and so forth.

Unfortunately, the evidence is not particularly hopeful that people do behave in accord with the beliefs that they articulate in response to surveys. This finding has been borne out in a number of different fields, from environmental protection (Scott & Willits, 1994), to smoking and health (van Assema, Pieterse & Kok, 1993), to sexual behavior (Norris & Ford, 1994), to racial prejudice (Duckitt, 1992—93). In all these cases, there exists a generally accepted social stereotype of what "correct" or "acceptable" attitudes are: One is supposed to care for the environment, refrain from smoking, use condoms during casual sex, and respect persons of different racial and ethnic backgrounds. Many people are aware of these stereotypes and will frame their answers on surveys in terms of them even when their actions do not reflect those beliefs. There is, in other words, a powerful inclination on the part of many people to answer in terms that the respondent thinks the interviewer or survey designer wants to hear.

This issue has been one of constant concern to methodologists. Investigators have attempted to use the observed discrepancies between attitude and action as a basis for challenging people about their actions and urging them to reflect on the differences between what they have said and what they have done. But some studies have suggested that bringing these discrepancies to people's attention may have effects opposite to what is intended; that is, consistency between attitudes and behavior is reduced still further (Holt, 1993).

6.6.1.1. Educational Attitudes and Actions. The problem of discrepancies between attitudes and actions is especially pronounced for fields such as those noted above, where powerful agencies have made large efforts to shape public perceptions and, hopefully, behaviors. To what extent is it also true in education, and how might those tendencies shape research on educational technology? Differences between attitudes and actions among teachers have been especially problematic in such fields as special education (Bay & Bryan, 1991) and multicultural education (Abt-Perkins & Gomez, 1993), where changes in public values, combined with recent legal prescriptions, have generated powerful expectations among teachers, parents, and the public in general. Teachers frequently feel compelled to express beliefs in conformity to those new norms, whereas their actual behavior

may still reflect unconscious biases or unacknowledged assumptions.

Is technology included among those fields where gaps exist between expressed attitudes and typical actions? There are occasions when teachers do express one thing and do another as regards the use of technology in their classrooms (McArthur & Malouf, 1991). Generally teachers have felt able to express ignorance and concerns about technology: Numerous surveys have supported this (e.g., Dupagne & Krendl, 1992; Savenye, 1992). Most studies of teacher attitudes regarding technology, however, have asked about general attitudes toward computers, their use in classrooms, and so on. But there have been few studies where attitudes toward technology are correlated to actual use.

As schools and districts spend large sums on hardware, software, and in-service training programs for teachers, the problem of attitudes and actions may become more serious. The amounts of money involved, combined with parental expectations, may lead to development of the kinds of strong social norms in support of educational technology that some other fields have already witnessed. If expectations grow for changes in patterns of classroom and school organization, such effects might be seen on several different levels. Monitoring these processes could be important for educational technologists.

6.6.2 Participant Observation

The research approach known as *participant observation* was pioneered not so much in sociology as in cultural anthropology, where its use became one of the principal tools for helping to understand diverse cultures (see also 40.2.2). Many of the pioneering anthropological studies of the early years of this century by such anthropologists as Franz Boas, Clyde Kluckhohn, and Margaret Mead used this approach, and it allowed them to demonstrate that cultures until then viewed as "primitive" in fact had very sophisticated world views, but ones based on radically different assumptions about the world, causality, evidence, and so on (Berger & Luckmann, 1966). The approach, and the studies that it permitted anthropologists to conduct, led to more complex understandings about cultures that were until that time mysteries to those who came into contact with them.

The attempts of the participant observer to both join in the activities of the group being studied and to remain in some sense "neutral" at the same time were, of course, critical to the success of the method. The problem remains a difficult one for those espousing this method, but has not blocked its continued use in certain disciplines. In sociology, an interesting outgrowth of this approach in the 1960s was the development of ethnomethodology, a perspective that focused on understanding the practices and world views of a group under study with the intent to use these very methods in studying the group (Garfinkel, 1967; Boden, 1990). Ethnomethodology borrowed significant ideas from the symbolic interactionism of G. H. Mead and also from the phenomenological work of the Frankfurt School of sociologists and philosophers. Among its propositions were a rejection of the importance of theoretical frameworks imposed from the outside and an affirmation of the sense-making activities of actors in particular settings. The approach was always perceived as controversial, and its use resulted in a good-many heated arguments in academic journals. Nonetheless, it was an important precursor to many of the ethnological approaches now being seriously used in the study of educational institutions and groups.

6.6.2.1. Participant Observation Studies and Educational Technology. The literature of educational technology is replete with studies that are based on surveys and questionnaires, and on a smaller number of recent works that take a more anthropological approach. Olsen's (1988) and Cuban's (1986) work are among the few that really seek to study teachers, for example, from the teacher's own perspective. Shrock's (1985) study with faculty members in higher education around the use of instructional design offers a further example. But there could easily be more of this work, studies that might probe teachers' thought practices as they were actually working in classrooms, or as they were trying to interact with peers in resolving some educational or school decision involving technology. Similar work with principals and administrators could illuminate how their work is structured and how technology affects their activities. Also, studies from the inside of how schools and colleges cope with major educational technology-based restructuring efforts could be enormously valuable. What the field is missing, and could profit from, are studies that would point out for us how and where technology is and is not embedded into the daily routines of teachers, and into the patterns of social interaction that characterize the school and the community.

6.7 TOWARD A SOCIOLOGY OF EDUCATIONAL TECHNOLOGY

6.7.1 Organizations and Educational Technology

The foregoing analysis suggests that there is sociological dimension to the application of educational technology that may be as significant as its impacts in the psychological realm. But if this is true, as an increasing number of scholars seem to feel (see, e.g., Cuban, 1993), then we are perilously thin on knowledge of how technology and the existing organizational structure of schools interact. And this ignorance, in turn, makes it difficult for us either to devise adequate research strategies to test hypotheses or to predict in which domains the organizational impact of technology may be most pronounced. Nonetheless, there are enough pieces of the puzzle in place for us to hazard some guesses.

6.7.1.1. The Micro-Organization of School Practice. Can educational technology serve as a catalyst for the general improvement of students' experience in classrooms? Improve student learning, ensure teacher accountability, pro-

vide accurate assessments of how students are faring vis-à-vis their peers? For many in the movement to improve school efficiency, these are key aspects of educational technology, and a large part of the rationale for its extended use in schools. For example, Perelman (1987, 1992) makes the vision of improved efficiency through technology a major theme of his work. This also is a principal feature of Chris Whittle's arguments for privatized, more efficient schools in the Edison Project. On the other hand, enthusiasts for school restructuring through teacher empowerment and site-based management see technology as a tool for enhancing community and building new kinds of social relationships among students, between students and teachers, and among teachers, administrators, and parents (see also 35.1, 35.5).

6.7.1.1.1. Technologies and the Restructuring of Classroom Life. The possibilities here are several, and the approaches that might be taken are therefore likely orthogonal. We have evidence that technology can indeed improve efficiency in some cases, but we must not forget the problems that earlier educational technologists encountered when they sought to make technology, rather than teachers, the center of reform efforts (Kerr, 1989b). On the other hand, the enthusiasts for teacher-based reform strategies must recognize the complexities and time-consuming difficulties of these approaches, as well as the increasing political activism by the new technology lobbies of hardware and software producers, business interests, and parent groups concerned about perceived problems with the school system generally and teacher recalcitrance in particular.

Computers already have had a significant impact on the ways in which classroom life can be organized and conducted. Before the advent of computers, even the teacher most dedicated to trying to provide a variety of instructional approaches and materials was hard-pressed to make the reality match the desire. There were simply no easy solutions to the problem of how to organize and manage activities for 25 or 30 students. Trying to get teachers in training to think in more diverse and varied ways about their classroom work was a perennial problem for schools and colleges of education (see, e.g., Joyce & Weil, 1986).

Some applications of computers—use of large-scale Integrated Learning Systems (ILSs), for instance—support a changed classroom organization, but only within relatively narrow confines (and ones linked with the status quo). Other researchers have cast their studies in such a way that classroom management became an outcome variable. McLellan (1991), for example, discovered that dispersed groups of students working on computers could ease, rather than exacerbate, teachers' tasks of classroom management in relatively traditional settings.

Other studies have focused on the placement of computers in individual classrooms vs. self-contained laboratories or networks of linked computers. The latter arrangements, noted Watson (1990), are "in danger of inhibiting rather than

encouraging a diversity of use and confidence in the power of the resource" (p. 36). Others who have studied this issue seem to agree that dispersion is more desirable than concentration in fostering diverse use.

On a wider scale, it has become clear that using computers can free teachers' time in ways unimaginable only a few years ago. Several necessary conditions must be met: Teachers must have considerable training in the use of educational technology; they must have a view of their own professional development that extends several years into the future; there must be support from the school or district; there must be sufficient hardware and software; and there should be a flexible district policy that gives teachers the chance to develop a personal style and a feeling of individual ownership and creativity in the crafting of personally significant individual models of what teaching with technology looks like (see, for examples, Lewis, 1990; Newman, 1990a, 1990b, 1991; Olson, 1988; Ringstaff, Sandholtz & Dwyer, 1991; Sheingold & Hadley, 1990; Wiske, 1988).

6.7.1.1.2. Educational Organization at the Middle Range. Teachers Working with Teachers. A further significant result of the wider application of technology in education is a shift in the way educators (teachers, administrators, specialists) collect and use data in support of their work. Education has long been criticized for being a "soft" discipline, and that has in many eases been true. But there have been reasons: Statistical descriptions of academic achievement are not intrinsically easy to understand, and simply educating teachers in their use has never been easy; educational data have been seen as being more generalizable than they likely are, but incompatible formats and dissimilar measures have limited possibilities for sharing even those bits of information that might be useful across locations; and educators have not been well trained in how to generate useful data of their own and use it on a daily basis in their work (see also 35.8).

In each of these areas, the wider availability of computers and their linkage through networks can make a significant difference in educational practice. Teachers learn about statistical and research procedures more rapidly with software tools that allow data to be presented and visualized more readily. Networks allow sharing of information among teachers in different schools, districts, states, or even countries. Combined with the increased focus today on collaborative research projects that involve teachers in the definition and direction of the project, this move appears to allow educational information to be more readily shared. And the combination of easier training and easier sharing, together with a reemphasis on teacher education and the development of "reflective practitioners," indicates how teachers can become true producers and consumers" of educational data. There is evidence that such changes do in fact occur, and that a more structured approach to information sharing among teachers can develop, but only over time and with much sup-

port (Sandholtz, Ringstaff **&** Dwyer, 1991). Budin (1991) notes that much of the problem in working with teachers is that computer enthusiasts have insisted on casting the issue as one of training, whereas it might more productively "emphasize *teaching* as much as computing" (p. 24).

What remains to be seen here is the extent to which the spread of such technologies as electronic mail and wide access to networked information will change school organization. The evidence from fields outside of education has so far not been terribly persuasive that improved communication is necessarily equivalent to better management, improved efficiency, or flatter organizational structures. Rather, the technology in many cases merely seems to amplify processes and organizational cultures that already exist. It seems most likely that the strong organizational and cultural expectations that bind schools into certain forms will not be easily broken through the application of technology. Cuban (1993), Sheingold and Tucker (1990), and Cohen (1987) all suggest that these forms are immensely strong and supported by tight webs of cultural and social norms that are not shifted easily or quickly. Thus, we may be somewhat skeptical about the claims by enthusiasts that technology will by itself bring about a revolution in structure or intraschool effectiveness overnight. Its effects are likely to be slower and to depend on a complex of other decisions regarding organization taken within schools and districts.

6.7.1.1.3. The Macro-Organization of Schools and Communities. A particularly salient aspect of education in America and other developed nations is the linkage presumed to exist between schools and the surrounding community. Many forms of school organization and school life more generally are built around such linkages: relationships between parents and the school, between the schools and the workplaces of the community, between the school and various social organizations. These links are powerful determinants of what happens, and what may happen in schools, not so much because they influence specific curricular decisions, or because they determine administrative actions, but rather because they serve as conduits for a community's more basic expectations regarding the school, the students and their academic successes or failures, and the import of all of these for the future life of the community.

This is another domain in which technology may serve to alter traditional patterns of school organization. A particular example may be found in the relationships between schools and the businesses that employ their graduates. It is not surprising that businesses have for years seen schools in a negative light; the cultures and goals of the two types of institutions are significantly different. What is interesting is what technology does to the equation. Schools are, in industry's view, woefully undercapitalized. It is hard for businesses to see how schools can be so "wastefully" labor-intensive in dealing with their charges. Thus, much initial enthusiasm for joint ventures with schools and for educational reform efforts that involve technology appears, from the side of business, to be simply wise business practice: Replace old technology (teachers) with new (computers). This is the initial response when business begins to work with schools.

As industry-school partnerships grow, businesses often develop a greater appreciation of the problems and limitations schools have to face. (The pressure for such collaboration comes from the need on the part of industry to survive in a society that is increasingly dominated by "majority minorities," and whose needs for trained personnel are not adequately met by the public schools.) Classrooms, equipped with technology and with teachers who know how to use it, appear more as "real" workplaces. Technology provides ways of providing better preparation for students from disadvantaged backgrounds, and thus is a powerful support for new ways for schools and businesses to work together.

The business community is not a unified force by any means, but the competitiveness of American students and American industry in world markets is an increasing concern. As technology improves the relationship between schools and the economy, the place of the schools in the community becomes correspondingly strengthened.

Relationships between schools and businesses are not the only sphere in which technology may affect school-community relations. There are obvious possibilities in allowing closer contacts between teachers and parents, and among the various social service agencies that work in support of schools. While such communication would, in an ideal world, result in improvements to student achievement and motivation, recent experience suggests that many parents will not have the time or inclination to use these systems, even if they are available. Ultimately, again, the issues are social and political, rather than technical, in nature.

6.8 CONCLUSION: EDUCATIONAL TECHNOLOGY IS ABOUT WORK IN SCHOOLS

Contrary to the images and assumptions in most of the educational technology literature, educational technology's primary impact on schools may not be about improvements in learning or more efficient processing of students. What educational technology may be about is the work done in schools: how it is defined, who does it, to what purpose, and how that work connects with the surrounding community. Educational technology's direct effects on instruction, while important, are probably less significant in the long run than the ways in which teachers change their assumptions about what a classroom looks like, feels like, and how students in it interact when technology is added to the mix. Students' learning of thinking skills or of factual material through multimedia programs may ultimately be less significant than whether the new technologies encourage them to be active or passive participants in the civic life of a democratic soci-

ety. If technology changes the ways in which information is shared within a school, it may thus change the distribution of power in that school and thereby alter fundamentally how the school does its work. And finally, technology may change the relationships between schools and communities, bringing them closer together.

These processes have already started. Their outcome is not certain, and other developments may eventually come to be seen as more significant than some of those discussed here. Nonetheless, it seems clear that the social impacts of both device and process technologies are in many cases more important than the purely technical problems that technologies are ostensibly developed to solve. As many critics note, these developments are not always benign and may have profound moral and ethical consequences that are rarely examined. What we need is a new, critical sociology of educational technology (see 9.6), one that considers how technology affects the organization of schools, classrooms, and districts; how it provides opportunities for social groups to change their status; and how it interacts with other social and political movements that also focus on the schools. There are a few indications that such a perspective is emerging. Boyd (1991) and Webb (1991) offered a picture of educational technology as embedded in a cultural surround. And Hlynka and Belland (1991) provided a collection rich in new, critical approaches.

Much more is needed. Our view of how to use technologies is often too narrow. We tend to see the future, as Marshall McLuhan noted, through the rear-view mirror of familiar approaches and ideas from the past. In order to allow the potential inherent in educational technology to flourish, we need to shift our gaze and try to discern what lies ahead, as well as behind. As we do so, however, we must not underestimate the strength of the social milieu within which educational technology exists, or the plans that it has for how we may bring it to bear on the problems of education. A better-developed sociology of educational technology may help us refine that vision.

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