Educational Considerations

Volume 13 | Number 3 Article 6

9-1-1986

Educational Computing: Some Policy Implications for Administrators

William D. McInerney
Purdue University

Recommended Citation
McInerney, William D. (1986) "Educational Computing: Some Policy Implications for Administrators," *Educational Considerations*: Vol. 13: No. 3. https://doi.org/10.4148/0146-9282.1698

Administrators must also be sensitive to the potential dangers inherent in a thoughtless rush to incorporate computing in schools.

Educational Computing: Some Policy Implications for Administrators

by Dr. William D. McInerney

Few technological innovations have entered schools with the speed and inevitability of computers. Driven by public demand for a skill that is seen as critical for success in professional life, and by osmosis from a computer-impregnated society, educational computing is increasingly a fact of school life. The power of the computer to alter the ways in which the traditional tasks of education are performed, and the intense pressure to adopt computing in schools, make it imperative that we understand the unintended as well as the intended effects of our practices and policies. The uses of computing to teach various types of subject matter have received considerable treatment in the literature. Less well studied, but no less important, are the social and structural impacts of computing on the dynamics of the organization itself.

Instructional and curricular impacts

The impact of academic computing on teachers has been widely thought to be salutary, freeing the teacher from the drudgery of teaching, facilitating individualized attention to students, and allowing the teacher to concentrate on the creative aspects of teaching (Lindelow, 1983). There has, however, been some suggestion that the nature of the teaching role may change from a focus on content where instruction is delivered in a group setting to an emphasis on diagnosing student instructional needs, monitoring student progress, and designing appropriate enrichment or remediation (Duttweiler, 1983; Podemski, 1984).

Administrators will find that computing has greatly complicated the tasks of managing instruction and curriculum. Staff may resist computing, particularly if it is forced, and thus integration of computing into the curriculum is a key task, although it is not yet clear where computing can supplement instruction and where it may supplant it (Podemski, 1984; Rockman, White, and Rampy, 1983). Software is improving in quality, but the high cost of quality software means that schools will have only one or two packages for any given instructional application, potentially leading to a standardization and uniformity of curricula (Dede, 1985). There is also fear that computing may force teaching, testing, and curricula into modes that are amenable to computerized monitoring, but not amenable to good teaching and learning. Studies in other organizations suggest, however, that the impacts of computing on organizational processes tend to be less dramatic than predicted, as computing is generally made to adapt to existing behavior and practice (Bank and Williams, 1986; Danziger, 1985), which appears frequently to be the case with education as well.

As computing becomes more significant in instruction, the intellectual skills most important to possess will center on those which promote abstract thought, particularly analysis, synthesis, and evaluation. The life-long learning required by the information age will demand independent, critical thinkers who can apply and develop their learning and thinking skills to both pose and solve problems (Dede, 1985; Lowi, 1981; Pea, 1985). Unfortunately, the major application of computing in instruction is currently drill-and-practice (Becker, 1986; Protheroe, Carroll, and Zoetis, 1982), which has not been found to convey any sense of control over the uses to which the machine can by put (Trumbull, 1986).

Administrators must also be sensitive to potential dangers inherent in a thoughtless rush to incorporate computing into schools. Computing has been found to isolate individuals, reducing their interaction with others (Danziger, 1985). The computer models the notion of pure rationality, which becomes man's ideal model of his own intelligence. Cognition, however, involves a rationality much deeper and capacious than simple technical rationality, and the humanistic aspects of the curriculum must not be sacrificed to a misplaced emphasis on instrumental rationality (Shallis, 1984; Sloan, 1984).

Educational computing may offer significant improvement in the efficiency with which school tasks are carried out. Protheroe, et al. (1982) maintained that educational computing would allow time and resources previously spent on administrative and recordkeeping functions to be allocated to the needs of individual students. Other studies (Danziger, 1985) have shown, however, that while computing has been a major source of productivity gains for individuals and organizations, the greatest benefits have been realized on more structured, repetitive tasks. Still, the idea that machines train and people educate is attractive from a cost-benefit perspective, as presumably machine-based training would be more efficient by avoiding some of the constraints of the cost of information. The one-time cost outlay for the development of a piece of quality instructional courseware, which could be used throughout the country, would be much more cost-efficient than the labor-intensive instructional technology which we employ now (Dede, 1983; Podemski, 1984). Lessinger (1985) has warned that technology must support tasks currently important within the school. If technology creates new jobs to be done, it will be resisted by the people managing the school. While it might be argued that this severely limits the prospect of technology creating desirable options that do not currently exist, certainly people will resist unnecessary jobs done simply because the machine is available. A more pressing danger to efficiency is the solitary, isolated nature of much work done with computers, which could injure morale and working relationships in an enterprise as much concerned with the human factor as is education (Brod, 1984). Another possible danger is the marked standardization caused by the nature of computing processes and the sorts of tasks given over to computers to do (Sherman, 1985). Finally, much hardware has been purchased prior to

Dr. William D. McInerney is an assistant professor of educational administration at Purdue University.

effective planning, creating a mishmash of incompatible machines and software. In order for major gains in efficiency to occur, serious participatory planning is essential (King, 1986).

Educational computing is expected to have deep and profound impacts on the role and nature of administration. A recent survey (Protheroe, et al., 1982) found the major benefits of computing to administration to be a decrease in time spent on routine matters, an increase in the amount and quality of information available for planning, and new functions being performed that previously were not possible within budgetary constraints. Time for adequate planning in the face of community pressures to take action was however found to be a major problem for administrators (Moskowitz and Birman, 1985). Podemski (1984) has identified issues which the full incorporation of computer technology would impact to include the governance structure of education, the role of the teacher, the nature of parental involvement in their children's education, and the financing of education. Podemski suggested that the ultimate role of administrators could become that of instructional support and systems design, since such organizational artifacts as scheduling, budgeting, course selection, advisement, and student evaluation systems will need to be reworked in order to take advantage of the flexibility made possible by the new technology. Also affected will be such administrative prerogatives as staff selection, development, and evaluation. Other issues of concern to administrators include how resources can be allocated to ensure equal access to computing on the part of all students, how the technology can most effectively be acquired, introduced, and managed, and how computing can most effectively be utilized in classrooms (Rampy, White, and Rockman, 1983).

Railsback (1983), looking at the implementation of education computing, has cited as common administrative mistakes overselling the idea, rushing to gain publicity, changing by administrative fiat, and purchasing equipment without knowing how it is going to be used. His keys to success include creating a board policy, developing administrative procedures, and establishing a plan to evaluate the computer program. Moskowitz and Birman (1985) cited a lack of clearly presented goals for computer activities, a lack of implementation plans, and the problem of assuring access for all students as the most common problems in the ten districts they studied. It is incumbent on the administrator, therefore, to become sufficiently computer literate to be able to ask the correct questions, and to plan for computer use. Clearly, the most important administrative skill in an era of computer technology may well be the ability to manage change (Estes and Watkins, 1983; Sturdivant, 1986). It is nonetheless true that the danger of depersonalization is always present. As computers enter into our way of thinking about the jobs we do, they similarly enter into our way of thinking about ourselves (Turkle, 1984). Already we are prone to think of the administrator less as the intellectual leader of a school and more as the manager of a system (Sardello, 1984). The uses a principal puts technology to will depend on his vision of what is possible both for technology and for education. What is required is not automation but renovation, not so much computerization as revitalization (Mojkowski, 1986). Indeed, King (1986) found leadership in all levels more important than either demographic or financial characteristics of districts in providing computing for students.

The computer is not, however, a magical panacea. Neibauer (1985) has characterized the machine as a new toy for teachers seeking new experiences in the classroom and as a public relations gimmick for administrators. Today's microcomputers are severely limited for use in education. They are hard to use, and few teachers are expert in their use. Long-term planning is nearly impossible since there is so little standardization of hardware and software. We are only beginning to learn to use microcomputers in education, so many mistakes are being made. Educational outcomes that involve judgment and intuition are difficult to teach through computers. Finally, microcomputers only aggravate such serious educational problems as equity, school finance, and divergent public expectations (Walker, 1983).

The issues are serious, since the movement of society into the information age holds the potential for a stratification of people related to intellectual preparation and functional responsibility. However, policy decisions regarding educational technology are frequently being made by default and inaction, without a policy planning process suitable for decisions of such importance (Lowi, 1981; Rampy, White, and Rockman, 1983). Much will be lost if we allow machine-mediated learning to replace egalitarian policies. If human interaction and interpersonal skills are not stressed in the curriculum, students' affective growth may be stunted by spending so much time with machines (Dede, 1983). Sloan (1984, p. 545) has noted that "It is in the imaging capacity of the mind that we find the moral element at the heart of all thinking." By letting the computer create images for children, the imagination is stilled, the senses blunted. The risk is that the child may form a relationship with the computer that closes off opportunities for personal development. We prize the computer's qualities of speed and accuracy, but there is a danger that we may come to expect similar qualities of speed and perfection from people. We have worried that the computer may replace the teacher; a more profound worry may be that the computer could replace the growing child (Brod, 1984; Turkle, 1984; Zajonc, 1984).

Organizational and structural implications

Research indicates that aspects of organizational structure, such as control relationships, patterns of authority, and hierarchy, tend to be contingent of the organization's technology (Danziger, 1985). Computer systems affect organization in at least three areas: content of jobs, patterns of communication, and skill requirements for individuals in the organization. We can expect that as computing becomes increasingly important in schools, the traditional distinction between line and staff will blur, since in many schools teachers will be far more computer adept than the administrators who ostensively manage them. The manager's job will place greater emphasis on environmental scanning, goal setting, and motivation of employees, and less on recordkeeping, evaluation, and task-associated communication (Whisler, 1970). Studies in the insurance industry indicate that when computer-based decision systems are implemented, choice making and goal setting are pushed to higher organizational levels (Whisler, 1970). The shift in decision making tends to affect middle managers in departments first, then interdepartmental consolidation of decision making takes the locus of decisions higher in the organization. If this same pattern holds for school systems, we may expect computer-based management information systems to augment the principal's decision making in the short run, but to shift to an emphasis on central office decision making in the long run.

The successful implementation of technology may well be dependent on the support, motivation, and skill of

https://newprairiepress.org/edconsiderations/vol13/iss3/6
DOI: 10.4148/0146-9282.1698

staff to utilize the technology, implying that training or otherwise changing the way users relate to the technology is the best way to address computing problems (Kraemer, Dutton, and Northrop, 1981). King (1986) found the computer coördinator to be the key to effecting the transition from initial applications of computing to a full implementation. Clearly the disjointed nature of many (if not most) school district implementations of educational computing indicates a strong need for district level coordination by individuals who understand both technology and curriculum. It is equally clear that such coordinators must not be isolated from such policy issues as the definition of district priorities and decisions about equipment and applications. If funding is not available for a full-time position, it is likely that a school district already employs people who could be given some release time from teaching or other duties to serve a coordinating role.

Computing does not of course enter schools in a vacuum, but in the context of ongoing activities and processes. The key questions for educators are to attempt to determine for whom, where, and how computing can be most helpful (Sloan, 1984). In the typical school, the principal computer-using teacher is a classroom teacher, and the major application, particularly in elementary school, is CAI (Becker, 1986; Protheroe, et al., 1982). For meaningful integration of technology into curriculum, the teacher must be modeled as a facilitator of instruction rather than as a lecturer. This is difficult to do when such traditional organizational artifacts as curricula, schedules, and classroom organization have remained largely intact for several generations. Thus the successful integration of technology will call for a revitalization of roles and activities, not more of the same. Successful management in the computing era will be effected by technologically sophisticated administrators, adept at the self-conscious manipulation of the information environment (Duttweiler, 1983; Lowi, 1981; Mojkowski, 1986; Sturdivant, 1986).

There is reason to believe that administrative decisions could improve in a computer-based decision system, from the availability of comparative, trend, and outlier information (Klein, 1986). It is also true that computers, relying on explicit sets of rules, tend to rationalize and quantify decision making, reducing the importance of the judgmental and intuitive elements in decisions (Whisler, 1970). Danziger (1985, p. 14) has found a tendency toward overestimation of the reliability, validity, and significance of quantifiable data: "From this perspective, narrow, technical considerations tend to override a ricer assessment of crucial goals and the most appropriate means for achieving them." Computers magnify errors in two ways: first, the fact that a datum has emerged from a computer gives it an aura of accuracy that may be quite misleading; second, data are often swapped back and forth from one decision system to another, compounding the error each time they undergo analysis. Thus the qualitative factors are squeezed out by the false sense of objectivity engendered by computer analysis. Finally, it is important to remember that a decision system defines the boundaries of authority and responsibility of a decision maker, and thus sets limits to the search for information, and the range of decision variables and factors that will be considered (Shallis, 1984; Sherman, 1985; Whisler, 1970).

The question of performance documentation regarding educational computing is of particular interest to administrators. Lessinger (1985) has noted the need to set standards and measure performance objectively even as we attempt to understand the place of technology in our humanistic school systems. The capability currently exists to place all of the various parameters of teacher or administrator evaluation, based on district, school-level, or classroom objectives, in a computerized data base. Such information as grades, test scores, IQ scores, demographic information, teacher sick days, and referrals to the office are readily subject to computer analysis, and would permit comparisons both between different personnel and between expected and observed performance on a variety of measures. Once comprehensive data bases are built, the data may be easily analyzed in a variety of ways. These matters are of course hardly value-neutral. The mechanisms of information gathering, processing, and disseminating reveal the functional value orientation of the school system. How various organizational stakeholders receive and reveal information from and about each other says a good deal about the assumptions and power relationships that shape the school system (Molnar, 1986).

It is important to realize that a technology is not centralized or decentralized simply because it has a computer attached; It must be designed to be so. Current information from other industries suggests that computing tends to reinforce existing power distributions, providing a relative increase in influence for those higher in the hierarchy who perform more discretionary information processing tasks, as computing increases their capabilities for accessing, analyzing, and utilizing data relevant to organizational decision making. The current interest in cross-state comparisons of educational achievement was to some degree occasioned by the increased availability of data in computer-based information systems. Such systems are already making possible cross-district, cross-school, and cross-teacher comparisons. We may expect this use of computer-generated information to be increasingly a feature of the educational landscape. Further, the ability of the computer to conduct analyses on multi-variate aggregate data enables central decision makers to monitor and control actions on a much wider basis than was possible before computer-based information systems. Already we see numerous districts that have in essence removed financial decision making from the principal's job description, and similar developments are occurring in other decision areas, particularly with respect to the allocation and control of various resources, such as equipment, maintenance, and to some extent curriculum and personnel. The movement toward centralization of decision making is naturally most pronounced in districts that have opted for centralized computing services. The widespread use of microcomputers as independent, unmonitored systems, as is the case with a considerable amount of public school computing, should significantly reduce the impacts of computing on organizational control and on power concentration (Danziger, 1985; Kraemer and Danziger, 1984).

Clearly the critical organizational issue is who controls. "The impacts of a technology are fundamentally determined by the actions of those groups who control its development and use" (Danziger, 1985, p. 5). At least three potential loci of control seem possible in education. The most obvious is the administrative staff, who already dominate access to the policy formation process. Another is the group of computer "champions," those enthusiasts who by dint of their specialized knowledge and by simply beginning to use computers in what they do have seized control by default. The third possibility is that no one is in control—an anarchy of decision responsibility brought about by everyone riding off in all directions in the absence of policy planning. Current indications (Becker, 1986; King, 1986) are that all are true in one district or another. Probably the most common pattern, particularly in smaller districts which have not instituted centralized computing, is that anarchy prevails, and into that vacuum have come the computer champions. Not willing to wait for central administration, the computing enthusiasts among teachers and administrators have begun to use computers in their work on an ad hoc basis, almost always leading to problems of machine and software incompatibility when policy planning and centralized coordination attempt to catch up.

Another important dimension of control is whether computing has altered the educator's control over the work of teaching or administering. Control in this context takes on a variety of meanings (Kraemer and Danziger, 1984). First, control can mean supervision—control of the educator's work by others. In many cases, academic applications of computing are unsupervised to a degree that is not true of more traditional academic processes, because administrators feel inadequate to evaluate computing. Second, control can mean influence—the educator's control over what others do. The computer can be such a mysterious, intimidating object to many people that the computer enthusiast on the staff acquires considerable influence in various applications of computing. Third, control can mean control by the machine—through specification of procedures, through coordination, through initiating action (such as supplying data for someone else's MIS), through the tighter monitoring of accuracy, and through the imposition of deadlines (Whisler, 1970). We may posit a law of organizational computing, that reports will expand to consume the data available. In the context of academic computing, machine control is manifested in the availability of software for specific machines and in the likelihood of one or very few software packages for any given application. Fourth, control can refer to the educator's overall sense of control over his/her work life, as indicated by a sense of accomplishment and the belief that computing is enabling the educator to do a better job. Clearly computing enthusiasts believe that computing is efficacious in their work. Equally clear is the need for continuing research and development activities to advance the potential of academic and administrative computing, particularly for those educators not intrinsically enthusiastic about computers.

Perhaps the most interesting aspect of the issue on control is the rise of the information elite, a phenomenon first noted in other organizations, but apparent in schools as well. These persons, who combine some sophistication in the use of computers with technical expertise in teaching or administration, gain access to the policy process by their ability to provide the computing experiences which educator peer pressure and the public demand. In the absence of managers who are comfortable with computer technology, the information elite gains influence over others and avoids control by others through a combination of the force of what is seen as specialized, somewhat arcane knowledge and their ability and usefulness in serving as information brokers for decision makers. The teacher who can incorporate academic computing into the curriculum becomes a powerful public relations as well as educational resource for the school. This writer is familiar with a district where one principal has emerged as first among equals by his ability to craft various budgetary spreadsheets for use by the superintendent. In the long run, as principals and superintendents become more computer sophisticated, the power of the teachers and staff who now constitute the information elite may diminish, but in the short run their influence is apt to remain considerable (Kraemer and Danziger, 1984).

References

Bank, A., and Williams, R. C. (1986, April). Impediments to creating instructional information systems and how they might be handled. Paper presented at the meeting of the American Educational Research Association, San Francisco, CA.

Becker, H. J. (1986). Our national report card: Preliminary results from the new Johns Hopkins Survey. **Classroom Computer Learning, 6**(4), 30–33.

Brod, C. (1984). **Techno stress: The human cost of the computer revolution**. Reading, MA: Addison-Wesley Publishing Company.

Danziger, J. N. (1985). Social science and the social impacts of computer technology. **Social Science Quarterly, 66**(1), 3–21.

Dede, C. (1983). The likely evolution of computer use in schools. **Educational Leadership, 41**(1), 22–24.

Dede, C. (1985). Educational and social implications. In T. Forester (Ed.), **The information technology revolution** (pp. 242–257). Cambridge, MA: The MIT Press.

Duttweiler, P. C. (1983). Barriers to optimum use of educational technology. **Educational Technology, 23**(11), 37–40.

Estes, N., and Watkins, K. (1983). Implications of the microcomputer for educational administrators. **Educational Leadership, 41**(1), 28–29.

King, R. A. (1986, April). Equity in computer education: Determinants of access and use. Paper presented at the meeting of the American Educational Research Association, San Francisco, CA.

Klein, S. S. (1986, April). Beyond 1984: The positive and negative potential of computer supported school focused information systems. Paper presented at the meeting of the American Educational Research Association, San Francisco, CA.

Kraemer, K. L., Dutton, W. H., and Northrop, A. (1981). **The Management of Information Systems.** New York: Columbia University Press.

Kraemer, K. L., and Danziger, J. N. (1984). Computers and control in the work environment. **Public Administration Review, 44**(1), 32–42.

Lessinger, L. M. (1985). Technology for accountability. **T.H.E. Journal, 13**(4), 75–77.

Lindelow, J. (1983). **Administrator's guide to computers in the classroom.** Eugene, OR: Clearinghouse on Educational Management, University of Oregon.

Lowi, T. J. (1981). The political impact of information technology. In T. Forester (Ed.), **The microelectronics revolution** (pp. 453–472). Cambridge, MA: The MIT Press.

Mojkowski, C. (1986). The principal and technology: Beyond automation to revitalization. **Educational Leadership, 43**(6), 45–48.

Moskowitz, J. H., and Birman, B. F. (1985). Computers in the schools: Implications of change. **Educational Technology, 25**(1), 7–14.

Molnar, A. (1986). Common sense about information and information technology. **Educational Leadership, 43**(6), 64–66.

Neibauer, A. (1985). The computer literacy myth. **T.H.E. Journal, 12**(6), 88–90.

Pea, R. D. (1985). Beyond amplification: Using the computer to reorganize mental functioning. **Educational Psychologist, 20**(4), 167–182.

Podemski, R. S. (1984). Implications of electronic learning technology: The future is now! **T.H.E. Journal, 11**(8), 118–121.

https://newprairiepress.org/edconsiderations/vol13/iss3/6
DOI: 10.4148/0146-9282.1698

Protheroe, N., Carroll, D., and Zoetis, T. (1982). **School district uses of computer technology.** Arlington, VA: Educational Research Service, Inc.

Railsback, C. E. (1983) Microcomputers: solutions in search of problems? **Phi Delta Kappan, 65**(2), 118–120.

Rampy, L., White, D. J. D., and Rockman, S. (1983). Computers in the schools: 21 critical issues for policy decisions. **Educational Technology, 23**(8), 20–23.

Rockman, S., White, D. J. D., and Rampy, L. (1983). Computers in the schools: The need for policy and action. **Educational Technology, 23**(11), 13–18.

Sardello, R. J. (1984). The technological threat to education. **Teachers College Record, 85**(4), 631–639.

Shallis,M. (1984). **The silicon idol: The micro revolution and its social implications.** Oxford: Oxford University Press.

Sherman, B. (1984). **The new revolution: The impact of computers on society.** New York: John Wiley and Sons.

Sloan, D. (1984). On raising critical questions about the computer in education. **Teachers College Record, 85**(4), 539–547.

Sturdivant, P. (1984). Planning and training for a new educational delivery system. **Educational Leadership, 43**(6), 38–40.

Trumbull, D. J. (1986). Games children play: A cautionary tale. **Educational Leadership, 43**(6), 18–21.

Turkle, S. (1984). **The second self. Computers and the human spirit.** New York: Simon and Schuster.

Walker, D F. (1983). Reflections on the educational potential andlimitations of microcomputers. **Phi Delta Kappan, 65**(2), 103–107.

Whisler, T. L. (1970). **The impact of computers on organizations.** New York: Praeger Publishers.

Zajonc, A. G. (1984). Computer pedagogy? Questions concerning the new educational technology. **Teachers College Record, 85**(4), 569–577.