The Use of Technology: Institutional Issues

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Community colleges—often at the forefront of instructional and administrative innovation—are now leaders of the technological revolution in education.[1] In 1998, for example, 62 percent of all two-year public institutions offered distance education; another 18 percent expected to follow by 2001.[2] Their reputation as adaptive, responsive, and flexible institutions makes community colleges well suited to embrace technology and the accompanying changes.[3]

Two-year colleges educate a diverse student clientele via multiple pedagogical strategies. Many community colleges therefore gravitated quickly to on-line and distance education to serve adult learners for whom such instructional practices are thought a panacea. "Technology-supported distance learning programs," an observer noted in 1993, "are key applications in which community colleges are leading higher education." Community colleges, this observer added, "exemplify the fundamental elements of the transformation of the teaching and learning process: movement out of the classroom and replacement of the teacher with the independent adult learner at the center of the teaching and learning process."[4] Adult-centered learning—accessed any time and any place—is a key "learning college" principle, providing access to occupational and vocational education, academic transfer programs, and lifelong learning opportunities for nontraditional learners.[5] Significant technology usage, this observer concluded, is a desideratum in structurally adaptive colleges committed to meeting student and client needs.

The key challenges to incorporating information technology in higher education, reported a 1997 study, included assisting faculty to integrate this technology into instruction, providing adequate user support, and financial planning.[6] But research on technology in community colleges focuses on classroom innovations and on strategies for implementing technological change—not on these challenges.[7] Worse, these studies provide little insight into how decision-makers experience and interpret technological changes.

Community colleges, says one analyst, would benefit "from taking a step back and evaluating the intent of technology being implemented and how it serves their mission and intent to deliver education."[8] And, we

would add, how it affects administrative work since the implications of technology reach beyond student learning and instruction. What infrastructure issues must be addressed to facilitate technical support, professional development for faculty and administrators, and hardware and software needs? How do institutions integrate technology into their planning processes? How do staff members align technology-related priorities, goals, and actions to the mission of the institution? How do answers become institutionally generalized, given that campuses and programs vary in their engagement with technology?

The growing presence of technology in community colleges, in short, raises two related issues: current behaviors and effective administration of technology, and the outcomes of using technology, especially in instruction. This article focuses on staff perceptions of technology issues and the effects of technology on their work.

ADMINISTRATOR PERCEPTIONS OF TECHNOLOGY ISSUES

This study identifies administrator and staff perceptions of key technology issues facing community colleges, including teaching and learning, infrastructure, mission attainment, organizational growth, and outreach. The respondents to our national survey are collectively responsible for all functional areas of their colleges. Two research questions guide this study:

1. To what extent have technology and technology issues become part of the driving mission of the community college?
2. What technology-related issues are most important to administrators and their institutions?

Our survey contained 34 open- and closed-ended response items, and Likert scale questions. We drew a stratified random sample of 1,700 community college staff and administrators across 14 positions from the data bank of the American Association of Community Colleges. The 54 percent response rate (n=910 usable surveys) included adequate representation by geographic region, urban and rural locale, and single and multi-campus sites. We used descriptive statistics to analyze quantitative variables and content analysis to examine open-ended responses. We first summarize our findings, and then discuss the impact of technology on support for learning, administrative processes, and institutional planning.

MISSION CHANGE AND MEANS OF ATTAINMENT

Our open-ended questions asked how the mission of the institution changed over the last ten years, and how it might change in the future. Respondents reiterated the traditional tripartite mission of community colleges—academic transfer, occupational/vocational education, and lifelong learning—but frequently noted increased technology use on campus for accomplishing these missions, and in all aspects of campus life. Areas of anticipated mission change reflected current rhetoric and organizational priorities—especially use of technology in instruction and administration. Respondents expected modes of instructional delivery to continue to evolve through distance education and on-line courses, especially short courses to meet constituent needs. They also expected increased funding challenges, debates over access to technology, and infrastructure support issues to accompany the increases in academic services.

THE KEY ISSUES

We asked respondents to rate a series of issues facing community colleges on a one to five scale, with one indicating no importance at their institution and five indicating very high importance. Technology-related issues included faculty, administrator, and student technological competence; on-line services and recruitment; student access to computers; technology support for instruction and administrative processes; and the use and creation of technologically mediated instructional programs. Support for instructional and administrative processes, most respondents agreed, was of utmost importance at their institutions. Technological competence for administrators, on-line student recruitment, and on-line services—though receiving "high" ratings on the Likert scale—received less attention (Table 1).

Table 1

Perspectives on Technology Issues

Technology Issues	Percentage of administrators rating this issue as important or very important at their institutions
Technology support for instructional and administrative processes	88.0%
Student access to computers	84.4
Use of technology in current instructional programs	84.2
Technological competence of students	81.9
Technological competence of faculty	81.6
Creation of new technologically mediated instructional programs	79.1
On-line student services	72.1
On-line student recruitment/marketing	67.6
Technological competence for administrators	64.0

TECHNOLOGY AND SUPPORT FOR LEARNING

Administrators, most researchers and commentators concur, must provide adequate technology support for teaching and learning in the classroom. Support for instructional and administrative processes, agreed a majority of respondents, was the technology issue of greatest importance. These respondents identified several key issues accompanying faculty use of technology in the classroom:

- Faculty overload. E-mail and 24-7 access expectations of students might result in a never-ending job.[9]
- Professional development. Technical expertise in on-line instruction and in rethinking the faculty role in teaching/learning requires new approaches to development.[10]
- Copyright and release time. Copyright includes courses and ideas; contract release time includes time for development of on-line courses and for professional development around technology issues.
- Part-time faculty. Two-thirds of faculty members at public community colleges teach part-time.[11] Their employment status or their hours on campus may restrict access to institutional support services for on-line instruction.

Barriers to incorporating instructional technology include insufficient or obsolete hardware and software, inadequate facilities and support services, lack of time and money, inappropriate reward structures, scarcity of information about good practice, and underestimating the difficulties in adopting new technologies.[12] Adult learners may not always find on-line instruction a comfortable, appropriate learning environment despite the press for continuous access.[13] The growing "digital divide" in and out of the classroom worries faculty and administrators as they attempt to increase the use of technology without disenfranchising learners and employees.[14] Each issue and barrier pressures the current infrastructure and support mechanisms of the community college— critical catalysts for innovation and for integrating technology into instruction—requiring careful examination of institutional policies, processes, and decisions.[15]

Approximately 22 percent of our respondents taught during the previous academic year; many more taught formerly; still others were librarians and Information Technology (IT) professionals. Faculty members, some

observers contend, are divided into two camps: those who embrace new technologies and see opportunities for innovation and colleagues who are reluctant to alter their approach to learning for fear of losing what they value.[16] Most of the sampled non-teaching and teaching respondents expressed similar opinions about the important technology issues at their institutions. But a slightly higher percentage of non-teachers gave a "very high importance" ranking to creating new instructional delivery methods, using technology in current instructional programs, and developing additional technologically mediated instructional programs to meet constituent needs.

TECHNOLOGY ADOPTION AND ADMINISTRATIVE PROCESSES

Major changes in the organization of work, notes one observer, often accompany the introduction of new technology.[17] New technologies, this commentator adds, are associated with organizations with highly skilled, flexible, and autonomous workers organized into small and nimble operational units. Most colleges and universities do not fit this characterization, and less than two-thirds of our survey respondents identified technological competence of administrators as important to their institution. But technology *has* transformed many non-instructional campus functions, including enrollment management—registration, billing, and financial aid, for example—parking services, library services, payroll, and employment resources. Growth in personnel associated with technology infrastructure is therefore no surprise.[18] Just as instructional technologists and courseware designers sprang up to support teaching and learning, web designers, media specialists, and technicians now support everything from college promotional materials and department web pages to interactive course advising and administrative teleconferencing.

How has technology affected the way we work? One observer distinguishes between automation and augmentation.[19] Automation uses technology for repetitive tasks and leads to demonstrated gains in productivity and profitability. Augmentation, in contrast, uses technology to assist people when machines cannot completely substitute for humans. Examples of automation and augmentation are plentiful in higher education.

Another observer offers a three-stage framework—duplication, application, and transformation—to characterize the adoption and progressive use of technology in higher education.[20] *Duplication* involves using technology to replicate what is already being done: nothing revolutionary, just modifications of current practices. During the duplication phase, traditional goods or services are available more widely or in a new form that can reach new audiences. Also, first-time users may experience new technology without completely altering their work styles. College libraries provide a good example of duplication. Electronic resources originally duplicated existing text or hard-copy material, but these resources then drastically altered how faculty, staff, and students use the library.

Rethinking the use of technology in light of new possibilities and using technology to transform tasks characterize the *application* phase. This messy, difficult phase features breakthrough achievements and glorious failures as people determine what the technology and organizational structure can accommodate. Converting traditional classes into on-line courses is a department-specific example of the application phase. Interacting with students via e-mail and chat rooms transforms classroom tasks. Developing on-line courses often leads to questioning and reassessing the "usual" policies and practices.

During the third phase, new technologies *transform* the organization, which now does old things in new ways, or becomes a new enterprise. Behaviors of individuals are meaningfully reorganized around the possibilities inherent in the technology.[21] Institutions that develop and maintain successful on-line degree programs, including offering all needed services on-line, are in the transformation phase. Students may never set foot on a college campus or have face-to-face interaction with college staff, but they may still receive a college degree—a revolutionary change.

IMPLICATIONS FOR INSTITUTIONAL PLANNING

The issues, challenges, and opportunities presented by technology give institutional

planning and decision-making processes added importance. Many institutions with long-range or strategic planning processes did not successfully plan for information technology.[22] The need for integrated planning, across departments, units, and disciplines, becomes evident as improved technological capabilities influence institutional processes. In decentralized community colleges or research universities, innovative practices often occur at the local or area-specific level. Incorporating a new on-line service that increases efficiency in one unit may not be shared with other units or departments that would similarly benefit. Yet, at some point, these changes converge on one college system, on one set of institutional priorities, and on one pool of institutional resources.

Integrated campus-wide plans for incorporating technology do not ensure shared vision and accomplishment of institutional goals. Campus technology plans, notes one reviewer, fall into two categories: a vision without substance or a budget without a vision.[23] Plans with no substance were vague generalizations that lacked clear strategies, objectives, or even assessments of the present status of the college. The planning process at these institutions was painstakingly long—too much time spent defining vision, and little or no time spent on an implementation or action plan. "When you spend two years building a technology plan," this reviewer concluded, "three things occur: Nobody wants to be involved with implementing the plan, the plan is out of date before you get it distributed, and nobody wants to be on the next planning team."[24]

"Budget without a vision" plans, in contrast, address no key problems. Instead they focus on long-range funding, while offering little rationale for proposed expenditures. Adequate funding is a critical success factor for any technology plan, but funding formulas that ignore objectives treat technology as an "end," not as a means to achieve the institutional goals and mission.[25]

Planning for technology, other observers suggest, requires careful attention to four areas.[26] First is the technology itself—the hardware, software, networking, and upgrading capabilities. This area is complicated by the non-stop changes that may make a new system or process outdated before the purchase order is approved. IT officers cannot keep up with or predict technological changes and may better use their time to focus on the processes in place to incorporate new technology.

The second area for attention is pedagogical and technical support for faculty, staff, and students—the top institutional issue reported by respondents. Many institutions experience technology "support services crises" in which the current supply of resources needed for faculty, staff, and students does not meet the rising demands and expectations.[27] Institutions must pay particular attention to this critical part of the planning process, especially to the available types of training as the organization incorporates new technologies.

The third area is college or university policies and procedures. How does the use of new technology change policies governing faculty and administrative workloads, salary and rewards, intellectual property, and user security? Specific units or cross-functional teams may help to answer aspects of this question, but the pieces must ultimately come together in a cohesive process and an understanding of how technology is integrated into organizational functioning.

The last area of focus during technology planning: aligning technology with institutional goals. Colleges can accomplish this alignment, suggests one observer, by thoroughly assessing the institution's current state of technology usage, and then devising a vision of what the institution wants to become.[28] Like any other contextual planning process, the next important question is: "How will we get there?" Answering this question involves sequencing and prioritizing projects and implementation strategies.

WHO IS INVOLVED?

What are the least successful technology plans? Plans devised apart from overall institutional planning.[29] Problems may occur when initiatives are organized and managed outside the traditional institutional bureaucracy and hierarchies.[30] Institutional leaders must ensure that the appropriate units and departments are involved in the planning process and that innovations are not left on the organizational periphery.

Community colleges traditionally disperse technology-related functions throughout the organization. But separating support for one kind of computing from another no longer makes organizational sense.[31] Information technology support involves academic computing, administrative computing, distance learning, media services/instructional technology, and telecommunications. "The incredible dynamism and convergence of digital technologies and instructional applications," notes one observer, "has all but broken the historical basis for separate organizations for different aspects of technology support."[32] Many colleges have combined instructional and administrative computing within one structure to maximize coordination, support, and financial resources.[33] No one organizational chart, our survey concludes, describes the ideal location for technology experts and support professionals at community colleges. The titles of our respondents often revealed that technology responsibilities were combined with other administrative duties—director of technology and facilities, dean for learning and information technology services, and director of institutional effectiveness and distance education, for example. This variety of institutional strategies or arrangements suggests the absence of a "best practice" for coordinating technology functions.

Librarians, and other learning resources professionals, may play key roles in coordinating technology transitions. The library at the University of Indiana houses the Center for Teaching and Learning—allowing for active participation from information specialists and copyright experts. Adding a technology function to the library's responsibilities helps ensure that initiatives assume a high profile and that equitable access to information receives priority. This possibility assumes that community colleges have libraries with high institutional visibility, which is not always the case.[34]

Institutions are struggling to coordinate technology processes under one umbrella, but can a chief information officer effectively assume responsibility, especially at larger institutions?[35] The roots of most technology successes and problems, some observers note, are not within the direct control of the chief technology officer or the technology staff. "The technology staff swims, and sometimes sinks," these observers note, "while towing major technology initiatives through a sea of overall college politics, social and work customs, finances, state and federal policies, organizational structures, and other factors outside the daily operations of the technology department."[36] Successful technology transition requires leaders—faculty, librarians, and IT professionals—inclined and able to understand the college culture and to partner with influential, possibly non-technologically oriented colleagues to gain support and resources for new initiatives.[37]

One possibility: an associate academic vice president who oversees academic technology issues as part of a larger unit for teaching and learning, and who works closely with the head of computing and telecommunications services. A technology advisory board or committee would be responsible for setting and coordinating institutional policy and procedures. The "ideal" advisory board would include faculty members having classroom experience with technology, representatives from the teaching-learning center and the library, and staff responsible for the technology infrastructure.[38] Regardless of the specifics, community colleges must devise representative mechanisms to determine technology-related policies, priorities, and concerns.

The Maricopa Community College District's Ocotillo initiative exemplifies this kind of organizational structure and planning. "Ocotillo," writes an observer, "reflects an organizational design that involves inclusion, collaboration, shared leadership, timely and relevant planning, and decision making."[39] Ocotillo is Maricopa's vehicle for cross-functional and cross-campus decision making and problem solving related to learning through technology. After significant investments in technological innovations, senior district administrators inquired about their impact, limitations, and sustainability, their benefits to community members, and the structure of leadership. Discovering the answers led to Ocotillo's 1987 inception as a faculty-administrator think tank for successfully infusing technology into college life.

Deciding who controls and participates in establishing the policy agenda and infrastructure associated with information and

instructional technology involves internal and external constituencies. Internally, classic debates between faculty and administrator priorities often drive the question. When participation in decision making and policy development is not inclusive, all members of the college community will ask, "What educational priorities will be compromised to pay the escalating costs of acquiring new computer technology?"[40]

Externally, the question is enmeshed within the larger educational policy arena, differentiated by state systems of education—including but often not limited to postsecondary institutions—legislative agendas, and other state agencies.[41] The external arena became more important as public colleges increased their dependence on competitive state legislative allocations to pay for technological infrastructure. The alternative: higher user and equipment charges to students. The higher education policy documents in only one state represented in the Big 12 athletic conference, a recent study notes, addressed technology infrastructure directly.[42] The Missouri postsecondary coordinating board appointed a telecommunications advisory committee with members from the state's higher education institutions to guide implementation of recommendations and establish funding priorities. Changing geographic boundaries for service delivery and increasing competition for funds from new educational service providers require more coordinated policy development.

DIFFERENCES IN PERCEPTION

Effective planning requires coordination of widespread input, but not all actors have similar views on technology-related issues. The extent to which campus units and their administrators use and are directly affected by technology varies; therefore, it would not be surprising to see variation in perspectives shared by administrators in different position categories.

Some respondents accorded high priority to their particular areas within the college. Student services administrators were more likely than colleagues in business affairs, institutional research, development, and human resources to give a higher "importance" rank to student access to computers and on-line services (93 percent to 86 percent), and to student technological competence (95 percent to 79 percent). These staff members—traditionally the most vocal advocates for students—are sensitive to the importance of computer and Internet access and proficiency for low-income, minority and first-generation college students.[43] Only direct, continuous administrative and faculty attention will bridge the gap between technological innovation that assumes computer access and competency and the reality of student economic circumstances and prior experience.

Chief academic officers gave "high importance" ranks to faculty-related issues and to the use of technology in the classroom: faculty technological competence = 88 percent, use of technology in current instructional programs = 91 percent. Chief academic officers and presidents shared similar views—an expected result, given their institution-wide perspectives and their close ties.

Librarians, information technology administrators, and distance education administrators—often seen as frontliners—were less likely to rank technology issues "very important" at their institutions. Creating new on-line and electronically mediated delivery systems, for example, received scores of "high importance" from almost 90 percent of respondents in business and industry positions, continuing education, and occupation education, but from only 73 percent of librarians. This difference may reflect the reliance of business, industry, and occupational programs on technology, the need to keep pace with changes and meet the demands of employers and students, and the perceived competition with alternate delivery systems. It may also reflect a greater understanding of the existing technologically mediated systems and their capacity by the IT staff—those staff most directly involved in their maintenance. The limited research on the role of IT staff in larger institutional decision processes precludes a definitive explanation for the views expressed by this group. Table 2 details administrator and staff perspectives on the key technology issues at their institutions.

Table 2

Views on Technology Issues by Position/Area: Percent of Respondents Rating Items as "High in Importance" (4–5 on Likert scale) at their Institutions

Technology Issue	Presidents	Chief Academic Officers	Student Services Officer	Administrative*	Occupational Education and Continuing Education	Distance Education and Information Technology	Librarians and Learning Resources
Technology support for instructional and administrative processes	92.3	92.9	86.0	90.2	90.6	88.9	77.8
Student access to computers	86.5	81.0	92.9	86.3	82.8	79.6	84.4
Use of technology in current instructional programs	88.7	90.9	83.7	84.8	85.9	79.6	75.0
Technological competence of students	90.6	84.0	95.3	79.3	82.2	77.8	84.1
Technological competence of faculty	88.7	88.0	88.4	75.0	85.8	85.2	75.6
Creation of new technologically mediated instructional programs	84.6	87.8	88.1	84.8	89.2	86.8	73.3
On-line student services	79.2	78.8	83.7	72.9	70.5	75.5	60.0
On-line student recruitment/ marketing	81.1	75.8	72.1	68.9	66.4	61.1	50.0
Technological competence of administrators	73.6	70.0	76.7	58.2	67.7	57.4	51.1

* *Business and financial affairs, human resources, development, and institutional research.*

CONCLUSION

Technology is a valuable tool for supporting learning, managing student flow, creating instructional delivery systems, and linking instructional units, external resources, and campus members.[44] The abundance of conferences, summits, and professional development workshops on incorporating technology onto college campuses, and the banter about the "on-line instructional bandwagon" imply that community colleges are well positioned for new forms of instructional delivery and technology support. But even if we agree, for example, with the direction or expected outcome of a technological innovation, organizational change processes to support the innovation may remain vague. What is clear is that rapid changes resulting from technological improvements demand more systematic approaches to faculty development, staff training, technological compatibility/upgrades, and student support services—training, administrative processes, and student activities—to control costs and provide seamless learning opportunities.[45]

Major technology transitions *are* organizational transitions. "On a simple level, technology transitions are all about computers, software, networks, and technology staffing," notes one study. "However, at a more significant level, such transitions are actually more about institutional policies, types of services

offered, costs and budgets, college-wide workflow and work behaviors, and outcomes." These transitions, the study concludes, "are all about changing at least in part *what* is done in a college, *how* it is done, *when* it is done, *who* does it, *who* pays for it, and *what* the outcomes are."[46] Implementing these transitions requires fundamental changes in the organization and management of our educational institutions.[47] Some changes may be perceived as too drastic and too threatening to institutional values; others will almost certainly be perceived as revolutionizing the professional identities of faculty, staff, and administrators. The real technology challenge in education involves people, not products.[48]

Energetic leaders looking to position their institutions effectively in the technology forefront often overlook the key to success: the human resources aspects of change processes. The rapidity with which changes are institutionally accepted and sustained is directly related to how administrators, faculty, staff, and students understand and adjust to these changes. Transition issues encompass faculty willingness to include instructional technology in their classes, the ability of institutional researchers and planners to abandon traditional planning and budgeting models, and managerial recognition that technology requires integration across academic and administrative units. Technology changes may involve tangible hardware needs, revised mission statements, and even the identity and efficacy of campus professionals.

Technology transitions affect processes, tasks, policies, culture, and people. Organizational context, multiple missions and priorities, funding issues, and instructional and administrative readiness all affect the extent to which these transitions succeed at our community colleges. Needed for success is a culture of campus-wide involvement, collaboration, and coordination, widespread and substantive participation from knowledgeable individuals in many functional areas, and administrators who can demonstrate central leadership.[49] Our data show differing perspectives among community college staff. Obtaining an institutional understanding of these differences is a key step toward creating and institutionalizing successful technological innovations.

NOTES

[1] O'Banion, 1997, 2000.
[2] Hancock, 2001.
[3] Cohen & Brawer, 1996; Levin, 2001.
[4] Doucette 1993, 24.
[5] O'Banion, 1997.
[6] Green, 1997.
[7] See for example, Anandam, 1998.
[8] Hull, 1999, 38; Levin, 2001.
[9] Baldwin, 1998; Simpson, 1998.
[10] McLean, 2001; Baldwin, 1998.
[11] AACC, 2000.
[12] Baldwin, 1998; Gilbert, 1996.
[13] O'Banion, 1997.
[14] de los Santos et al., 2001.
[15] Green, 1997.
[16] Levin, 1998.
[17] Bates, 2000.
[18] Green, 2001; Katz & Rudy, 1999.
[19] Landauer, 1995.
[20] Cross, 2000.
[21] Cross, 2000.
[22] Lewis, Massey, & Smith, 2001.
[23] Moran, 1998.
[24] Moran, 1998, 41.
[25] Bates, 2000.
[26] Lewis, Massey, and Smith, 2001.
[27] Milliron and Miles, 2000.
[28] Moran, 1998.
[29] Lewis, et al., 2001.
[30] Bates, 2000.
[31] Luker, 2000.
[32] Lassner, 2000, 38.
[33] Villadsen, et al., 2000.
[34] Lewis, Massey, and Smith, 2001.
[35] Bates, 2000.
[36] Johnson and Carney, 2000, 275.
[37] Johnson & Carney, 2000.
[38] Bates, 2000.
[39] de los Santos, Jr. & Story, 2001, 54.
[40] Bromley, 51.
[41] Cintron, Dillon & Boyd, 2001.
[42] Cintron et al., 2001.
[43] De los Santos, et al., 2001; de los Santos, Jr., 2001.
[44] O'Banion, 2000.

[45] Cintron, et al., 2001.

[46] Johnson & Carney, 2000, 276.

[47] Bates, 2000.

[48] Green, 2001.

[49] Johnson & Carney, 2000.

REFERENCES

American Association of Community Colleges (2000). *National profile of community colleges: Trends and statistics,* 3rd Edition. Washington, D.C.: Community College Press.

Anandam, K. (1998). *Integrating technology on campus: Human sensibilities and technical possibilities.* New Directions for Community Colleges, no. 101. San Francisco: Jossey-Bass.

Baldwin, R. G. (1998). Technology's impact on faculty life and work. In K. H. Gillespie (Ed.), *The Impact of technology on faculty development, life and work,* 7-21. New Directions for Teaching and Learning No. 76. San Francisco: Jossey-Bass.

Bates, A. (2000). *Managing technological change: Strategies for college and university leaders.* San Francisco, Calif.: Jossey-Bass.

Bromley, H. (1998). How to tell if you really need the latest technology. *Thought and action,* 14 (1), 21-28.

Cintron, R., Dillon, C., & Boyd, T. (2001). Teaching and learning in the new information age: State-system policies for technology. In B. K. Townsend and S. B. Twombly (Eds.), *Community colleges: Policy in the future context,* 229-239. Westport, Conn.: Anker Publishing.

Cohen, A., & Brawer, F. (1996). *The American community college.* San Francisco, Calif.: Jossey-Bass.

Cross, C. (2000). Cyber-counseling, virtual registration, and student self-service: Student services in the information age. In M. Milliron and C. Miles (Eds.), *Taking a big picture look at teaching, learning, and the community college,* 131-162. Mission Viejo, Calif.: League for Innovation in Community Colleges.

de los Santos, Jr., A. G. (2001). A divide at our door: A review of the trend literature related to the digital divide. In G. E. de los Santos, A. G., de los Santos, Jr., & M. D. Milliron (Eds.), *Access in the information age: Community colleges bridging the digital divide,* 23-33. Mission Viejo, Calif.: League for Innovation in Community Colleges.

de los Santos, G. E., de los Santos, Jr., A. G., & Milliron, M. D. (2001). Access in the information age: Community colleges bridging the digital divide. In G. E. de los Santos, A. G., de los Santos, Jr., & M. D. Milliron (Eds.), *Access in the information age: community colleges bridging the digital divide,* 17-21. Mission Viejo, Calif.: League for Innovation in Community Colleges.

de los Santos, Jr., A. G. & Story, N. O. (2001). Maricopa's Ocotillo: Connectivity for Curriculum, Technology, and Pedagogy. In G. E. de los Santos, A. G., de los Santos, Jr., & M. D. Milliron (Eds.). *Access in the information age: community colleges bridging the digital divide,* 53-60. Mission Viejo, Calif.: League for Innovation in Community Colleges.

Doucette, D. (1993). Transforming teaching and learning using information technology. The *College Board review,* 167, 18-24.

Geoghegan, W. (1994). Stuck at the barricades: Can information technology really enter the mainstream of teaching and learning? *AAHE bulletin.*

Gilbert, S. W. 1996. Making the most of a slow revolution. *Change 28* (2), 10-23.

Green, K. (1997). *The 1997 national survey of information technology in higher education.* Encino, Calif.: The Campus Computing Project. ED 428 645.

Green, K. (January, 2001). The real IT problem: People, not products. *Converge, 3* (1), available at www.convergemag.com.

Hancock, A. (2001). Technology: The great equalizer. *Community college journal, 72* (2), 17-21.

Hull, D. (1999). The power and peril in technology. *Community college journal, 70* (1), 38-44.

Johnson, S. & Carney, C. (2000). On the moving rock we stand: Technology and transition. In M. Milliron and C. Miles (Eds.), *Taking a big picture look at teaching, learning, and the community college,* 275-300. Mission Viejo, Calif.: League for Innovation in Community Colleges.

Katz, R. N. & Rudy, J. A. (1999). Editors' notes. In R. N. Katz & J. A. Rudy (Eds.), *Information technology in higher education: Assessing its impact and planning for the future.* New Directions for Institutional Research 102: 1-8. San Francisco, Calif.: Jossey-Bass.

Landauer, T. (1995). *The trouble with computers: Usefulness, usability, and productivity. Cambridge, Mass.: MIT Press.*

Lassner, D. (2000). Information technology. In L. Johnsrud and V. Rosser. (Eds.), *Understanding the work and career paths of midlevel administrators.* New Directions for Higher Education, No. 111. San Francisco, Calif.: Jossey-Bass.

Levin, J. (1998). Making sense of organizational change. In J. Levin (Ed.), *Organizational change in the community college,* 43-54. New Directions

for Community Colleges, No. 102. San Francisco, Calif.: Jossey-Bass.

Levin, J. (2001). *Globalizing the community college: Strategies for change in the twenty-first century*. New York, N.Y.: Palgrave.

Lewis, B., Massey, C., & Smith, R. (2001). *The tower under siege: Technology, power, and education.* Montreal, Quebec: McGill-Queen's University Press.

Luker, M. (2000). What campus leaders can do today. In M. Luker (Ed.), *Preparing your campus for a networked future,* 93-100. San Francisco, Calif.: Jossey-Bass.

McLean, R. (2001). Bridging the digital divide: Supporting the learning journey of college faculty and staff. In G. E. de los Santos, A. G., de los Santos, Jr., & M. D. Milliron (Eds.), *Access in the information age: community college bridging the digital divide,*43-51. Mission Viejo, Calif.: League for Innovation in Community Colleges.

Milliron, M. & Miles, C. (2000). Seven signs on the road ahead for community colleges. In M. Milliron and C. Miles (Eds.), *Taking a big picture look at teaching, learning, and the community college,* 1-52. Mission Viejo, Calif.: League for Innovation in Community Colleges.

Moran, C. (1998). Strategic Information technology planning in higher education. In D. Oblinger and S. Rush (Eds.), *The future compatible campus,* 36-52. Boston, Mass.: Anker Publishing.

O'Banion, T. (2000). An inventory for learning-centered colleges. *Community college journal, 71* (1), 14-23.

O'Banion, T. (1997). *A learning college for the 21st century.* Phoenix, Ariz.: Oryx Press.

Simpson, R. (1998). The overwhelming nature of higher education. *Innovative higher education, 22* (4), 267-269.

Smith, R., Lewis, B., & Massey, C. (2000). Policy processes for technological change. In L. Petrides (Ed.), *Case studies on information technology in higher education,* 34-42. Hershey, Penn.: Idea Group Publishing.

Villadsen, A., Kickels, M., Chand, S. (2000). Administrators' roles in the adoption of technology by faculty. In M. Milliron and C. Miles (Eds.), *Taking a big picture look at teaching, learning, and the community college,* 69-100. Mission Viejo, Calif.: League for Innovation in Community Colleges.