The new generation of technology-savvy students currently enrolled in and entering college possesses unprecedented IT skill levels. They think about and use technology radically differently from earlier student cohorts. As a consequence, we expected to find that such students would demand greater use of technology in teaching and learning in the classroom. They did not. What we found was a moderate preference for technology.

We expected that it would be increasingly necessary for faculty to use technology in order to appeal to the attention and learning styles of this generation of students. Ironically, we found that many of the most skilled students in the use of technology had mixed feelings about technology in the classroom.

We expected students to already possess good skills in using IT in support of learning. What we found was that many necessary skills had to be learned at the university, and the motivation for doing so was very much tied to the requirements of the curriculum.

The students in our survey had not—outside of the classroom and prior to coming to college—gained the necessary skills to use technology in support of academic work outside the classroom. Concomitantly, we found a significant need for further training in using IT to support learning and develop problem-solving skills.

Lastly, we found that both faculty and students used course management systems mostly for communication of information and administrative activities and much less in support of learning.

These findings have significant consequences. Student and faculty use of instructional technology is more limited than is often portrayed. Students seem to be slower than expected in developing adequate problem-solving skills for using IT to support academic learning, and this impairs technology’s current value to the institution. Higher education’s investment in learning technology is paying less than optimal returns because students and faculty don’t have the appropriate skills or motivation to use it effectively. Colleges and universities appear not to be reaching enough students and faculty with technology education and training. Some complacency may have set in because of the belief that millennial students require less additional training with technology. As any number of individuals have said, “The experts are coming to school.” And few metrics are in place to monitor improvement and overall usage. In all likelihood, some students—perhaps many—are leaving college and university with technology skills inadequate for the challenges they might find in the workplace or in graduate school.

We emphasize that our findings are much like an audit—a snapshot in time, an early picture of a process that has great potential to support learning and is most promising. Like Zemsky and Massey, we were both surprised
and disappointed by what we learned. But
we would not characterize our snapshot as
"thwarted innovation" as much as we would
attribute much of what we saw to real grow-
ing pains.1 We found enough good practice
and favorable, if not enthusiastic, commentary
from the students to know that technology’s
potential in the classroom is enormous.

From Convenience to
Learning Revolution

In 1997, Michael Hooker proclaimed,
“Higher education is on the brink of a
revolution.” He went on to note that two
of the greatest challenges our institutions
face are those of “harnessing the power
digital technology and responding to
the information revolution.”2 What Hooker
and many others didn’t reckon with is the
likelihood that higher education’s learning
revolution would be a journey of a thousand
miles rather than a discreet event. Indeed, a
study of learning’s last great revolution—the
invention of movable type—reveals, too, a
revolution conducted over centuries leading
to the emergence of a publishing industry,
intellectual property rights law, the augmenta-
tion of customized lectures with textbooks,
and so forth.

Nearly eight years after Hooker’s procla-
mation, higher education finds itself still
poised on the brink of a revolution. In those
eight years, IT has continued its inexorable
penetration into myriad aspects of work,
education, and recreation, including activi-
ties that our students and faculty hold dear.
During this time, the video-game industry
surpassed the motion picture industry in
revenues, the University of Phoenix opened
the University of Phoenix Online, many no-
table virtual university efforts came and went,
and course management systems became a
common element of higher education’s base
of enterprise applications. During this same
period, the use of information technologies
in the classroom and residence halls became
widespread and commonplace, and the re-
search persuaded us that courses mediated
with information technologies showed no
significant differences in learning outcomes
from those that were not. And in that time, as
our study shows, student access to comput-
ing and narrowband networking has become
nearly ubiquitous, and access to broadband
networking and online information resources
is increasingly commonplace.

Both the ECAR study on faculty use of
course management systems and this study of
students’ IT experiences conclude that while
IT is indeed making important inroads into
classroom and study processes, to date the
effects of this penetration seem to signal im-
portant enhancements in the convenience of
postsecondary teaching and learning and but
not yet a “learning revolution.” This should
not surprise us. The invention of movable
type enhanced, nearly immediately, access
to published information and reduced the
time needed to produce new publications.
This invention did not itself change literacy
levels, teaching styles, learning styles, and
other key markers of a learning revolution.
These changes, while catalyzed by the new
technology, depended on slower changes to
social institutions.

As with our administrative ERP systems, the
first wave of innovation in and use of learning
technologies we observed was mostly a wave
of convenience and improved transactions.
Mundane instructional processes were ren-
dered friendlier, accessible at all hours, and
painless. Communication became easier and
quicker. And certain efficiencies in terms of
student and faculty time emerged. As with
administrative ERP systems, we believe the
second wave of learning technologies is all
about taking the “information exhaust” from
the transaction systems and rendering it into
forms usable for analysis and supportive of
effective decision making.
So in the learning context, we now have data in machine-readable form about how students study, what they study, when they study, how long study activities take, and how much repetition is needed and taking place. This mirrors the emerging use of student enterprise data to flag at-risk students for institutional interventions, for example. Institutions can use the student study data obtained from course management systems to develop new learning models and instructional methods and strategies. These data record students’ individual learning preferences and, when aggregated, let us study the relationship between preferences, interventions, and outcomes. These are preconditions for a great leap forward in teaching.

Seven important trends (and probably more) will likely drive the IT-enabled revolution in teaching and learning.

First, institutional learning and cognitive scientists will mine and analyze student course activity data and translate their findings into programs and effective practices that policymakers and practitioners (and ultimately students) can effect.

Second, student and faculty information literacy will increase, and academic standards of research and evidence in Web-dominated information environments will emerge. Students will need to discern what is good information and what isn’t. We believe institutions will need to redesign their curricula to guide this effort and provide necessary incentives for students to learn how to learn with technology. And we will see the emergence of more-rigorous training programs. Concomitantly, we expect to see greater engagement of the K–12 sector in these activities, as colleges and universities will inevitably impose student admission requirements relating to technology skill and use.

Third, the quality and usability of course delivery systems will continue to improve. The software will become increasingly easier and transparent to use. It will become more student-centric, giving students more tools to take greater control of and shape learning. In the long term, learning management systems will get smarter and increasingly adapt their user interfaces, drill requirements, instructional strategy, and other aspects to future students’ learning styles and needs. If today’s course management systems represent the industrial automation of certain aspects of the instructional process, tomorrow’s systems will make it possible to massively customize learning for the learner. Such improvements will liberate both teachers and learners to make graduate-style mentoring possible in many cases at the undergraduate level.

Fourth, networked scholarly information will continue to proliferate, along with improvements in both digital rights management and mechanisms (such as micropayments and licensing) for the recovery of economic returns on these rights. We expect to see a standardization of learning objects and their use. Rights management environments will become increasingly robust, setting the context, expectations, and goals of any rights management implementation. Such implementations will likely include

- authoring and assembly tools,
- content repositories,
- learning management environments,
- rights management systems and services, and
- personal information systems such as e-portfolios.

Fifth, institutions will support exploration and integration of new capabilities and practices as they emerge from the video-gaming, virtual reality, simulation, and modeling arenas. These should lead to greater and improved information exchange and interaction between students and faculty.

Sixth, institutions will place greater emphasis on planning and creating comprehensive and integrated work plans for implementing
technology in support of learning. At many institutions, much of the implementation currently is piecemeal and in the hands of a few innovators and early adopters.

Finally, institutions will encourage and support experimentation and innovation of learning spaces and strive to understand the complex relationship between the built environment, social interaction, and learning dynamics.

**Beyond “No Significant Difference”**

Does and can technology make a difference in support of learning? Is it making a difference? Our data show that it is, but selectively. Students perceive that technology makes a difference when used appropriately. But we know that most courses they take don’t use technologies such as course management systems. And some faculty and students avoid courses that use technology, with little negative impact on the quality of teaching and learning.

The scholarly community is also ambivalent: witness the “no significant difference” debate started by Richard Clark. Clark maintains that learning effectiveness is simply the outcome of instruction and that the media or technology through which instruction is offered has no effect at all. According to Clark, technology is simply a vehicle, like a truck. He contends that it has no impact on the form or the content of what is taught—nor on the outcome.

Thomas Russell of North Carolina State University compiled and analyzed more than 350 studies that compare the effectiveness of distance education with regular face-to-face instruction. Russell showed that distance education is as successful as traditional face-to-face instruction. “No significant difference” exists in effectiveness between courses offered via different media and technologies.

Ostensibly, the “no significant difference” debates addressed the effectiveness of distance education. However, Phipps and Merisotis clearly scrutinized the effectiveness of technology more broadly—as a tool for teaching and learning. They acknowledged that the “purpose about much of the research is to ascertain how technology affects learning and student satisfaction.”

Ahmed Ali and Abdulaziz Elfessi surveyed 47 students taking an educational media and technology course at the University of Wisconsin—La Crosse. Twenty-four of the students took the course in a traditional classroom setting, and 23 took the course online. The authors found that the different learning environments did not produce a significant difference in students’ attitudes toward technology. They concluded that “technology plays a role in students’ learning, albeit a secondary role. Although students recognized the potential and significant role of technology in teaching and learning, the recognition is limited to the use of technology as an instructional medium, and not a key determinant of learning. The Web is an important instructional delivery medium that can rival, but not replace, classroom learning.”

According to Carol Twigg, thinking only in terms of the “no significant difference” debate gets in the way of innovation in technology use. She warned that if we focus only on making teaching with technology as good as traditional education, we likely miss the ways that using technology might make education better.

**Benchmarking and Quality Issues**

How do we address Carol Twigg’s challenge? How can we improve the ways students use technology to enhance their learning? Our study reveals numerous areas and issues that require further research
and attention by administrators wanting to improve students’ technology experiences and skills. We believe technology should be embedded in the curriculum and that the success of several disciplines, such as business and engineering, can help establish benchmarks. Institutions would benefit from a more comprehensive training program for students and faculty that is directed by clearly articulated goals for IT skill levels and literacy. Faculty need to use course management systems’ lesser-used interactive features more often and effectively. And all of these activities will benefit from the development of appropriate metrics, benchmarks, and empirical analysis.

Jane Henderson, e-Scholar teaching and learning director, University of Wisconsin–Stout, reflected on measuring the success of their laptop program. “So far we’ve been measuring satisfaction and use (of the laptop service). We need to move to measuring learning and skill.”

Several noteworthy benchmarking initiatives seek to identify the elements that must be in place to ensure highly effective use of technology in teaching and learning. The Institute for Higher Education Policy (IHEP) undertook one such initiative. Its research is based on surveys and interviews with faculty, staff, and administrators at six institutions (Brevard Community College, Regents College, University of Illinois at Urban-Champaign, University of Maryland University College, Utah State University, and Weber State University). Seeking to go beyond the hyperbole that characterizes many studies on technology use in teaching and learning, the authors identified 24 benchmarks, divided into seven categories:

- student support,
- faculty support, and
- evaluation and assessment.

Most benchmarks in these categories addressed high-level infrastructural requirements or policies, which must be in place to ensure quality. For example, the “student support” category contains the following benchmarks:

- Do students receive program information including admission requirements, tuition and fees, books and supplies, technical and proctoring requirements, and student support services?
- Are students provided with hands-on training and information about securing materials from electronic databases, interlibrary loans, government archives, news services, and other sources?
- Throughout the course or program’s duration, do students have access to technical assistance, including detailed instructions regarding the electronic media used, practice sessions prior to the course’s start, and convenient access to technical support staff?
- Are questions to student support personnel answered quickly and accurately with a structured system in place to address student complaints?

Quite interesting is what IHEP omitted. Among the benchmarks they tested and rejected were those relating to student learning styles and how to incorporate these into course planning and design. The following benchmarks were included in the surveys but failed to make the final list:

- Are various learning styles considered during course design?
- Are assessment tools used to ascertain the specific learning styles of students, which then determine the type of course delivery?
Are courses designed with a consistent structure easily discernible to students with a variety of learning styles? IHEP rejected these benchmarks because faculty and administrators believed them to be too difficult to implement and because research on learning styles is still in its early stages and not yet strong enough to base practice upon.\(^\text{11}\)

We heard from numerous students about how technology supported their individual learning style. More important, they perceived this to be an important benefit of technology in the classroom. Tools that make it possible for students to take greater control of how and when they learn or provide them with a choice of visual and textual materials appear to make a difference to the students. If these features have a positive impact on learning, then it would appear to be prudent to establish metrics and measure them.

Similarly, IHEP rejected several benchmarks relating to student collaboration, including the following:

- Are courses designed to require students to work in groups using problem-solving activities to develop topic understanding?
- Do course materials promote collaboration among students?\(^\text{12}\)

These omissions are especially problematic, given the emphasis on collaboration and problem solving in studies of effective practices described in previous chapters and below. Students in our study ranked these activities among the highest in support of learning.

The Sloan Consortium in their *Report to the Nation: Five Pillars of Quality in Online Education* also developed a set of quality standards for technology use in teaching.\(^\text{13}\) They may be used as “a framework for measuring and improving an online program at any institution.”\(^\text{14}\) The five “pillars” are learning effectiveness, student satisfaction, faculty satisfaction, cost-effectiveness, and access.\(^\text{15}\)

As with the categories and benchmarks developed by IHEP, they are intended primarily to be applied in asynchronous or distance-education settings. These pillars identify several issues crucial to students’ effective use of technology, but they do so at a very high level of abstraction.

Colleen Carmean and Jeremy Haefner identified a set of effective practices and issues to bear in mind when teaching with a CMS.\(^\text{16}\) Their analysis focused on ways to use a CMS to create an effective learning environment. However, their recommendations also apply to most classroom uses of technology. For them, technology does not and should not drive pedagogy. It can accommodate deeper learning principles and thereby help create effective learning environments. On the basis of research about learning, they identified five principles necessary for deeper learning, which occurs when learning is social, active, contextual, engaging, and student owned.\(^\text{17}\)

According to Carmean and Haefner, course management systems can help put into practice these principles. By so doing, they foster effective learning environments. For example, by providing easy access to asynchronous communication, visual information, and active learning, a CMS provides a more engaging learning environment. It respects diverse talents and ways of learning. It communicates high expectations. It encourages high-challenge, low-threat environments. And it emphasizes intrinsic motivators and natural curiosities.\(^\text{18}\)

Karen Swan focused on the course rather than the CMS. She summarized numerous researchers’ insights and created a list of prerequisites for making the most effective use of instructional technologies.\(^\text{19}\) Faculty must provide

- clear goals and expectations for learners,
- multiple representations of course content,
- frequent opportunities for active learning,
- frequent and constructive feedback,
flexibility and choice in satisfying course objectives, and

- instructor guidance and support.

Swan paid particular attention to technology’s huge potential to support interactivity, which improves the student learning experience. Like Carol Twigg, Swan believes we should move away from the “no significant difference” debate and focus our energy on learning activities that technology can improve. According to Swan, technology can foster five kinds of interactivity:

- between the student and the instructor,
- between students and their peers,
- between students and content,
- between students and technology interfaces, and
- by vicarious interaction.

Swan described the learning impact of increased online interaction between students and instructor (referred to as teaching presence), students and their peers (referred to as social presence), and students and content. Interactions between a student and technology interfaces can promote or constrain the first three types of interactions described above and thereby discourage or promote learning. Vicarious interaction happens all the time in the classroom. For example, a student can learn from observing an interaction between the instructor and another student. This also occurs through discussions using the technology medium. Further research in these two areas, Swan suggested, can lead to improvements in technology use and, ultimately, greater learning effectiveness and student satisfaction.20

A New Wealth of Data

Enterprise systems, data warehousing, and course management systems are recording and making available to researchers and university administrators a plethora of detailed quantitative data on students and how they learn. These data on all aspects of student activity represent a gold mine of information for benchmarking and for developing new learning models and effective practices. They can be used to affirm that effective practices really are effective practices. As we learned from our study, course management systems are now unobtrusively collecting information on more than 80 percent of the students at the 13 institutions we studied. As these numbers continue to grow, the ability to map the learning activities of nearly 100 percent of the student body in courses at all levels and in all disciplines offers unprecedented opportunities to improve the quality of education. Researchers on effective learning practices will have a sound empirical base with which to test their hypotheses on what works and what doesn’t work in support of learning.

These data and findings will inevitably be fed into a cycle of institutional planning, resource allocation, implementation, and assessment of outcomes, which we discuss later in this chapter. A plan not based on data is worthless, and long-term success requires an appropriately funded plan. These data will support the formulation of plans that include metrics to track student and faculty performance; operational performance of the teaching and learning processes, including their quality and outcomes; and factors that contribute to desired outcomes, such as higher graduation and retention rates. In addition, used with the right technology and tools, the data can provide faculty, students, advisors, and administrators with on-demand reports, analyses, and alerts, which in turn support the teaching and learning process.

Accreditation and Effective Practices

As classroom technology use matures and plays an increasingly important role in support of quality education, the higher education accreditation bodies will likely take
greater interest and eventually establish technology criteria as a basis for accreditation. The North Central Association: Commission on Accreditation and School Improvement has established a set of guidelines for online courses and programs. Currently, some of their criteria specified for accreditation address technology, though they are illustrative rather than prescriptive. They are consistent with many of the effective practices elaborated upon in this chapter.

The North Central Association’s technology criteria examine how the organization plans for current and future technology requirements and how it prepares to incorporate technological innovations into the organization to meet system priorities. Among the criteria:

- The system has an ongoing instructional technology plan that addresses technology utilization, professional development, effectiveness, and the needs of all students and staff.
- All technology resources are conveniently accessible to all students, faculty, and staff and are integrated across the curriculum.
- Personnel with appropriate expertise are available to assist students and staff in making effective use of all technology resources.
- The system’s instructional technology plan includes a budget that is adequate for the needs of the system.
- The system evaluates and improves the technology plan on the basis of the system’s strategic priorities.

A plan that follows these criteria would specify that students must be able to or must demonstrate:

- knowledge base for developing the capacity to use and manage technology;
- ability to evaluate the positive and negative effects of various technologies;
- ability to protect oneself from unethical, illegal, or inappropriate uses of technology;
- ability to select, use, and evaluate technologies other than computers;
- ability to select and use computers, peripheral hardware, and software to word process, create and manage database spreadsheets, and create multimedia presentations;
- ability to use technology ethically;
- knowledge of the characteristics and uses of computer hardware and operating systems;
- knowledge of the characteristics and uses of computer software; and
- understanding of relationships among science, technology, society, and the individual.

**Faculty IT Literacy**

A key finding emerging from our study is the need to improve faculty use of technology. The qualitative findings revealed a perception among many students that faculty technology use is not uniform and often wanting. Faculty members, like their students, use the convenience and management features of course management systems more than the interactive features, which students said contributed the most to their learning (see Table 5-8). Students also complained about inconsistent CMS use. Glenda Morgan found that some faculty indicated they would use course management systems if the institution provided additional training.21

Rhonda Epper and Tony Bates elaborate on effective practices in faculty development, building on the findings of the State Higher Education Executives Organization and the American Productivity and Quality Center study on faculty development practices at 45 institutions in both the corporate and education sectors in the United States and Canada. In *Teaching Faculty to Use Technology: Best Practices from Leading Institutions*,22 Epper noted that “one of the most important lessons learned over the past decade in higher
education is that while technology is obviously expensive, supporting its use is even more expensive,” and many technology administrators have been slow to appreciate and support the full costs. Where adequate funding and technical help have been provided, a more effective job has been done. Epper and Bates noticed the following:

♦ Institutions were characterized by a culture pervaded by technology. The focus was on teaching and learning, not on the technology in and of itself.
♦ All institutions had a strong instructional technology plan.
♦ There had been and continued to be extensive investment in the technology infrastructure.
♦ There was strong support from senior leadership for the use of technology in teaching.
♦ There was support for faculty use of technology, exemplified by project funding, technical support, and computer upgrades.
♦ There was support for students in the form of computer access, Internet accounts, and financial support.

Epper and Bates identify several specific programs that illustrate how these guidelines can work in practice. At the Virginia Institute of Technology, faculty computer upgrades are linked to ongoing faculty development in technology use. Faculty at the University of Central Florida can participate in an online program that prepares them to teach using technology.

Paul Hagner advises that institutions considering making improvements to their faculty development initiatives should not think of particular practices in isolation but should think in terms of sets of practices that support one another, or “best systems.” He discusses “interesting practices,” organized within the following themes:

♦ training in the use of teaching and learning technologies;
♦ grants and start-up support for faculty;
♦ “just in time” technical assistance for faculty;
♦ assessment of the outcomes of technology integration into teaching and learning; and
♦ information exchange and communication, especially how innovations spread among faculty as well as how faculty members learn about services and opportunities.

In summary, institutional leadership must establish a funded priority for faculty technology development using effective practices as guidelines. They need to establish appropriate rewards and incentives. Technology innovation, skill, and use in the classroom should be considered in merit, promotion, and tenure decisions. In the absence of such incentives, many faculty members are unlikely to change how they teach and what teaching tools they use. Nor will they believe that technology makes a difference.

Student IT Literacy

No matter how well an institution implements faculty development in technology use, students still need related support and training. Our study shows that while some students are highly skilled in using technology, many still require support and training in using software and tools. Sixteen percent of...
the faculty who participated in ECAR’s *Faculty Use of Course Management Systems* study reported having decreased their CMS use because students found it difficult to use.³⁰ Student technology difficulties included problems in obtaining access, low technology skills, low student motivation to use a CMS, and low student preference for online materials. Our data support Zemsky and Massey’s conclusion debunking the myth that “the kids will take to this like ducks to water.”³¹

Few studies elaborate on effective practices in this area. One small-scale qualitative in-depth study² of how students used technology and what strategies would be most helpful advised that institutions and faculty

- articulate technology’s importance within their own disciplines and interests,
- develop processes for and reflective approaches to learning technology skills,
- identify motivational factors to learn and use technology, and
- explore how students can use technology for self-expression.

Software training classes are proliferating at colleges and universities, most often for no credit, but in some colleges for credit. A good example is the Software Training for Students program at the University of Wisconsin–Madison, which we discussed in Chapter 3. Some colleges are offering courses in Excel and similar applications for credit. We recommend that these courses earn no credits and be centralized. Institutions should determine a skill level needed of all students and then establish a coordinated structure and process that ensures that students obtain these skills institution-wide. The alternative is a piecemeal “Ma and Pa shop” approach that often yields mixed quality with highly variable outcomes across the institution. Nontraditional students’ needs warrant particular attention, especially if they have been out of school for some years. They will likely need additional technology training. Also, our study found that students especially lack skills in overall computer maintenance, including file setup, virus protection, and recovery. These skills should be a basic part of any training program.

Cathy O’Bryan, manager of professional and technical education at the University of Wisconsin–Madison, advised, “I think all students coming in should go through an IT skills assessment. Those not meeting a minimal level of computer skills should be required to take for-credit courses to improve those skills. These courses should emphasize situational problems and seek to develop problem-solving skills rather than procedures.” Similarly, Jane Henderson, e-Scholar teaching and learning director at the University of Wisconsin–Stout, suggested, “We need to train students in information technology by using a first-year credit class where we teach basic skills and relate it to learning activities they are doing.” And a University of Wisconsin–Milwaukee student agreed. “We should have classes on the various applications with hands-on time. Everyone should take a class on Word and Excel.” A University of Wisconsin–Whitewater student offered a slightly different recommendation: “I would hate to require another course. It would be a waste of time. The university needs to set a basic standard for things you need to know so you can test out of it. Peer training would be good.”

As the need for classroom technology skills increases, higher education will likely look for help from the K–12 system, much as it did with foreign-language preparation. The use of course management systems in the K–12 system will help prepare students to use these tools in college, and instruction in selected applications such as PowerPoint and Excel would be most helpful. These skills may become admission requirements. A Colgate
undergraduate observed, “College is not the best place to start addressing technical skill problems. It needs to start before college, in K–12. In college, there is no down time.”

Several institutions have launched exemplary instruction technology training programs. Noteworthy is George Mason University, which in 1998 instituted a Technology Across the Curriculum program. The program has three broad aims: to ensure that technology is well integrated with academic content and geared toward student learning, to avoid “episodic” or ad hoc efforts at technology integration, and to facilitate support for both faculty and student technology use.33 The use of IT is embedded within the traditional liberal arts curriculum. Students are expected to extend their mastery of course content while learning technology skills and applying them in creative and problem-solving ways. The program expects students to achieve a defined level of skill in 10 areas:
- collaboration;
- the use and creation of structured electronic documents;
- technology-enhanced presentations;
- the use of electronic tools for research and evaluation;
- the use of databases to manage information;
- the use of spreadsheets to manage information;
- the use of electronic tools to analyze quantitative and qualitative data;
- the use of graphical and multimedia representational technologies;
- legal, ethical, privacy, and security issues in IT; and
- a working knowledge of basic types of software and hardware.34

The curriculum requires numerous discipline-based projects undertaken by faculty with financial, technical, and pedagogical support from the Technology Across the Curriculum program and other campus support units.

**Toward Integrated Learning Management Systems**

Course management systems and other learning technologies such as e-portfolios promise to radically increase the workload of IT offices at colleges and universities in the near future, not to mention that of students and faculty. We predict that the effort and resources needed to support student and faculty use of these evolving technologies will soon surpass what is currently invested in administrative enterprise systems. Moreover, there will be enormous pressure to integrate the information and functions from the enterprise systems with the information and functions of course management systems and e-portfolios. Without greater integration, institutions run an unintended risk of replacing the old brick-and-mortar student service bunkers with digital bunkers and what Carl Jacobsen of the University of Delaware calls a “runaround by mouse.”

The reasons for greater integration are obvious and are very similar to those that caused universities to Web-enable administrative enterprise systems and rethink business processes. They include rising customer expectations and demand for customer access and control, a reduction of instruction’s administrative costs, a demand for simplicity and transparency in an increasingly complex environment, and elimination of procedural controls and simplification of processes. These reasons are all interrelated and mutually reinforcing.

It is clear from our study that students and faculty applaud the power of course management systems to support administrative activities, and students especially appreciate how the tool helps them take greater control of their learning experience. But their expectations will certainly rise as they continue to use the product and their ability to use it increases. The millennial students are impatient, and as
they learn to manage their classroom activities as well as their enrollment activities, we anticipate pressure from them or a visionary entrepreneur to create stronger and reinforcing links between the course management systems, e-portfolios, and one-stop student enrollment services.

Students will increasingly want to control and manage their entire college experience in a convenient and easy manner. That implies the necessity for tools that integrate administrative and classroom transactions and activities, facilitate course and curriculum planning, and permit subsequent self-assessment of performance. We would liken such a tool to Quicken, which lets the user track and pay bills, plan a budget and, at the end of the year, assess and understand why his or her budget plan failed or succeeded. And like Quicken, the new tool might also allow the institution to market programs, services, and events. The tool will also have to become easier to use and transparent like Quicken. And it cannot be loaded up with so many bells and whistles that it becomes overwhelming. One of the most common complaints among students and faculty in our study was that their CMS was too complex and required better training.

We note here that training will likely remain a priority even if the software becomes easier to use. The IHEP panel warned that as technology evolves and becomes simpler and more transparent to use, some might be tempted to conclude that the need to train students in technology skills will lessen. The opposite is true. “Simpler interfaces may broaden access to technology, but they do not make people technology literate. Individuals still need to develop critical cognitive and technical skills.”

We already see evidence of pressure to integrate these technologies and simultaneously provide students with greater control of their learning experience. A useful document for tracking trends and the future development of course management systems is the report of the National Learning Infrastructure Initiative (NLII) Next-Generation Course Management Systems Focus Session held in Tucson, Arizona, in March 2003. The report contains a well-organized set of recommendations to improve current course management systems, which also would broaden them to become more integrated learning management systems. The document provides a wealth of information and links to work on next-generation course management systems.

We found especially interesting their recommendation to free the tool from a particular course and from time constraints. Practically, this means giving students the ability to extract information on activities or learning products from a course taken earlier, or adding functions that let students manage all of their courses from a single site and communicate with students in all of their courses, not just within one course.

Concomitantly, such innovation will increase student access and control and their ability to communicate with one another, which was another major benefit students reported in our study. Student interaction was perceived to be the course management system’s single most important feature for improving learning.

Attendees at the NLII conference stressed that course management systems are currently too course- and faculty-centric and too little student- and learner-centric. Our data suggest that students would welcome the ability to take greater control of communications and its purpose. Currently, students cannot unilaterally establish a discussion group, for example. The tool needs to empower students. If it does, its value to students will increase, as will its use. Students will come to own the tool as much as the faculty does.

The tool should also further empower the student to assess his or her own performance
in various ways—not just by tracking grades, taking sample quizzes, and comparing grades with other class members’. Course management systems can measure every transaction and activity, and these digital records can be linked to outcomes—progress and productivity. Such tools should be available to students in ways that make sense to them as well as to the faculty and researchers who can test the impact of effective practices recommended by NLII members. We envision students having the ability to create custom dashboards to monitor their learning performance.

Our data show that faculty and students use course management systems primarily to transmit information because the software is convenient to use, improves timeliness, and is efficient. Administrative chores, especially, are made easier. What’s lacking, we found, was the tool’s use to improve learning, although both students and faculty recognize learning gains and also see the tool’s potential for improved learning. The NLII session in Tucson addressed these concerns and emphasized skill development in knowledge management, interactive activities, and effective learning practices in general.

The tool must also enhance students’ ability to use networked scholarly information.

**Networked Scholarly Information**

This study has generally limited its scope to a core set of information systems, institutional services, and student preferences and behaviors related to the learning process and student experience. A companion study could and should be undertaken in the broad area described as networked scholarly information. A literature reading strongly suggests that the World Wide Web has become the research repository of choice even though it doesn’t mirror an academic library in important ways. As Marshall McLuhan predicted, wholesale changes in the nature of the communication medium are changing long-established communications norms and nuanced disciplinary differences in styles and manner of communication. These changes aren’t understood widely among the professoriate, making it nearly impossible to acculturate today’s students to clear expectations about things as basic as the evidentiary value of information residing on the Web.

**An Alliance with Computer Games**

Our study found that 69.9 percent of students play computer games, and male freshmen play more than any other subgroup in our study. We found that 36.8 percent of male freshmen spend five hours or more per week playing computer games. Is there some way to harness part of their effort and turn game-playing into a learning experience that goes beyond the development of navigation and typing skills? To what degree can games be designed to more deliberately improve critical thinking and problem-solving skills? A good example is Microsoft’s *Flight Simulator*, which has provided a foundation for learning in a novel and creative manner.

Video gaming, virtual reality, simulation, and modeling are robust and profitable industries that continually add new capabilities and practices that could lead to innovative and highly productive interaction among students, faculty, and information. Some universities are already experimenting in this area. The University of Southern California School of Engineering and School of Fine Arts plan to offer jointly a minor in computer games, focusing on animation, 3D modeling, programming, and design. MIT’s Comparative Media Studies program and the University of Wisconsin–Madison School of Education, together with LeapFrog Inc., are investigating how consumers might identify games that support learning. At this point, though, the effort to make games more educational
is minimal. The private sector likely questions the profitability of educational games, and college-level educators may be skeptical on pedagogical grounds.

**Instructional IT Planning**

The implementation of course management systems and other classroom technologies would benefit from an institution-wide planning process resulting in an approved instructional IT plan, which must be part of a broader institutional planning process and plan. We suspect that many instructional technology initiatives are decentralized and provide for little monitoring and benchmarking. Too many initiatives support one-time efforts by individual faculty to improve individual courses even though many of these initiatives require long-term financial and departmental support. We believe it’s wiser to invest resources in department- or college-led initiatives that are tied to curricular improvement and which commit groups of faculty to the effort and provide ongoing resources. On the basis of our findings where students learn to use technology in support of learning, we believe the plans should be curriculum focused. A “let a thousand flowers bloom” strategy leads to slow and uneven adoption and to uneven and underleveraged outcomes—learning or otherwise.

In our interviews at the University of Wisconsin–Stout, IT administrators reflected on what their campus is doing well with IT. The initiatives they noted included the laptop program, a university portal, strong support from the chancellor, skilled IT staff, e-mail for all students with all official correspondence sent through the e-mail system, wireless access across the entire campus, and walk-up help services with extended hours. Attention was being paid to wide-ranging, linked activities. This is a good direction, but more is needed. The instructional IT plan should be tied to and closely aligned with the institution’s other IT plans to ensure that all student IT services, including e-mail, network access, and student administrative applications, are consistent and comprehensive.

Instructional IT planning should be an ongoing process of establishing priorities based on an assessment of the quality and performance of current instructional technology programs and services, future academic programmatic needs and opportunities, and resources available and needed for their implementation. It should be focused on improving the quality of academic programs and overall student performance.

A good plan in this area must be student-centric. We believe institutions haven’t spent enough time listening to students, especially when they express how and why they want to use technology for learning. We were astounded by the outpouring of student commentary on technology use in response to our survey’s open-ended questions. The instructional IT plan should foster cooperation among students, faculty, staff, and administrators in support of collective goals and priorities.

The instructional technology planning process should be broadly participatory and sensitive to the norms and culture of the colleges and their departments and other units. It should accommodate a variety of needs. The requirements of art and design courses differ from those in the social sciences. Plans should anticipate future requirements in areas such as film studies, from history to production; this discipline can no longer function without IT. Most geography students will use geographic information systems in their field of study. A growing number of writing courses—mostly in freshman composition—use computer-mediated writing. Graduate study in any science field, including the behavioral sciences, is necessarily IT-intensive. Planning will have to be
sensitive to future academic requirements. A one-size-fits-all solution is unlikely to work.

Instructional IT plans should be future oriented, with goals set in the context of each discipline’s expected future and then aggregated as well as possible.

As we noted earlier in this chapter, institutions should base planning on empirical data and continual analysis of the data, systematically using course management systems’ data-gathering capacity and data in the planning process. We anticipate that such plans will change constantly as new standards of performance, technology, demand, and opportunities present themselves. Planning, especially in this area, is an iterative, learning process.

Lastly, it is critical that collegiate as well as central academic and technology officers be responsible for the overall quality of instructional technology plans and planning and ensure that the IT plan is integrated with and supports the institution’s overall plan and mission.

**A Concluding Recommendation**

We emphasize again that our study is a snapshot in time of a rapidly changing environment. The tracking of trends is critical to understanding how students learn and how IT can improve overall satisfaction with the classroom experience. Longitudinal studies are needed, and we encourage our readers and their institutions to consider joining ECAR in a series of follow-up studies using the same (albeit improved) survey. Such studies will demonstrate whether initiatives currently under way are making a difference in how students use technology both in and out of the classroom, and they will show how IT affects the learning experience.

**Endnotes**


5. R. Phipps and J. Merisotis, What’s the Difference? A Review of Contemporary Research on the Effectiveness of Distance Education in Higher Education (Washington, D.C.: Institute for Higher Education Policy, 1999). Phipps and Merisotis take exception to Russell’s findings. They believed that much of his data and resulting insights were questionable because of methodological shortcomings, including sampling techniques and questionable measurement instruments.

6. Ibid., p. 31.


9. IHEP, Quality on the Line: Benchmarks for Success in Internet-Based Distance Education (Washington, D.C.: Institute for Higher Education Policy, 2000).

10. Ibid., p. 3.

11. Ibid., p. 15.

12. Ibid., p. 16.

14. Ibid., p. 3.
15. Ibid., pp. 4–6.
17. Ibid., p. 29.
18. Ibid., p. 32.
20. Ibid., pp. 17–23.
25. Ibid., p. 145.
26. Ibid., p. 147.
27. Ibid., p. 148.
30. Morgan, op. cit., p. 49.
34. See <http://cas.gmu.edu/tac/program/it_goals.html>.