Learners, Learning, & Technology

By Diana G. Oblinger

THE EDUCAUSE LEARNING INITIATIVE

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Kara takes a picture of her study buddies with her cell phone and sends it to Angie. Angie recognizes that they are in the Student Union coffee shop and decides to join the study session.

Gardner is riding the bus back to his apartment and listening to his iPod. He notices that half the students on the bus have iPods, but he suspects that he is one of the few not listening to music; he's trying to catch up on some material he missed in class.

In the main lecture hall, Adam is lost. He does not understand what his instructor is talking about, so he turns to his laptop. Seeing that some of his "buddies" are online, he IMs a couple of friends who are in the same class. They're lost too. He Googles the phrase "dynamic flow processes" and finds a simulation. He points his friends to the site, and together they run the simulation. To the professor, they look like they aren't paying attention. But they're helping each other understand the concept.

Things are not going so well for Justin. He is frustrated and is wearing a T- shirt he hopes Dr. Smith, his professor, will notice: "It's not ADD—I'm just not listening." Dr. Smith might have been able to get away with being PowerPointless a few years ago, but Justin is tired of it.

Ben and his team are presenting their reconstruction of fifth-century B.C. Athens to the class. Along with the paper they wrote to explain their approach and rationale, they've re-created part of the city as a 3-D virtual model. The rest of the class has joined them on a three-dimensional tour. As Ben explains, "We had to research structures, material strengths, the angle of the sun, and all kinds of other information to determine the right placement of the temple . . ."

Tracina is engaged in a research project and has found a new way to gather research data. She developed a unique lab protocol by synthesizing information on the Web. She is collecting water-quality data from remote sites by using robots; the data are automatically input into a database that is accessible to a team of undergraduate researchers around the world.

Elaine and her middle-school friends are participating in a virtual field trip of the estuary. When they want to see something, they IM the on-site crew members, who take a closer shot with the video camera. The graduate student doing the explaining is answering questions from students in the United States and Australia. The next virtual field trip will be to an aquatic habitat in Australia. Then the students will form teams for the final project.

Hannah, Sarah, Brian, and Jake started using del.icio.us to share bookmarks for their senior design project. The tool led them to others interested in the topic, so now they have a whole community helping them with the project. Amir is using the social software program CiteULike to manage references for his thesis and found a potential collaborator in Europe.

Jonathan can't believe that the librarian says *Wikipedia* is not a legitimate resource. He's been to the library only twice in his college career—he does his research on the Web instead. He went to the library for help tracking down some things he learned about through *Wikipedia* and now he's getting pushback. How can information reviewed and updated by hundreds of thousands of people be wrong?

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Provost Johnson is in a quandary about how he'll handle yet another 10 percent increase in student enrollment. The college has grown from 25,000 to 37,000 students, without adding enough new classroom and laboratory buildings. He decides that a few more programs will have to move to a hybrid (some face-to-face and some online) format.

Laura came back to college at age thirty-eight. She had to; she couldn't see how she could support the kids—or herself—if she didn't get more education. She likes the online courses because they give her the flexibility to work around the kids' schedules.

It looks like Chris will have to drop his class. His supervisor just changed his work shift to a time that conflicts with the class. He doesn't have any options about working; he has to support his family while completing his education. With eleven weeks to go, classes meeting three times a week, and no online options, he'll have to delay graduation again.

Dr. Simon is amazed by the quality of the digital stories his class has developed. The students' ability to integrate research, video, narrative, music, and color was surprising—but not as surprising as the increased amount of time that students spent on their projects. Though impressed with their work, he is less confident of his ability to evaluate a genre not based on text.

Paul, a fourth-grader, just complained to his teacher that reading is boring. "You can do so much more on the Web. Why do we have to read books?"

Information technology has had a striking impact on learners and learning. Students bring their personal technologies to campus. iPods or other types of MP3 devices, cell phones with cameras, and social software support students' interactions with each other and with the world around them. IT facilitates running simulations, holding a conversation with someone across the world, capturing text, audio, or

video for use at a more convenient time, developing a portfolio documenting accomplishments, and any number of other learning activities. The world of learning technology today is radically different from that of just a decade ago. And the world of learning technology a decade from now will be radically different from that of today. Learning technologies are in a state of "interpretive flexibility": the technology itself is subject to change, as is also its application. However, learning technologies are affected not just by the possibilities of the technology but by our understanding of learning as well.[1]

A decade ago, the learning environment was composed of 386-based "luggable" computers and laser disc players. Today we have the Web, wikis, and course management systems. As learning technologies have enabled us to do new and exciting things in the classroom, we have also had to ask hard questions about their value for learning. These questions are reshaping how we integrate technology into education and are also pushing us to reexamine our assumptions about teaching and learning:

- *Who are the learners?* Although most colleges and universities were designed for a traditional-age, residential population, learners today are more diverse. Preparation, goals, participation, and learning styles of students can be radically different, even within the same institution.
- *How do people learn?* Learning occurs in a variety of ways and settings—through classes, personal networks, and work assignments, as well as through recreation and entertain-

ment. Informal learning is a significant part of the learning experience.

- *Is covering content enough?* Content-focused learning has a relatively short half-life, particularly since most learners' careers will span a variety of different, possibly unrelated fields over the course of their lifetime. "Know-how and know-what is being supplemented with know-where (the understanding of where to find knowledge needed)."[2]

Learners

Colleges and universities are about people and knowledge; they are about learners. Learners bring unique learning styles, preconceptions, attitudes, and needs to the learning environment; they are individuals. Many have never known life without the Internet; they're the Net Generation. Others are nontraditional students who bring more experience—and more personal and family obligations—to the learning environment. And those still to come—the next generation of learners—will demand to be engaged. Learning is advanced when the use of IT is predicated on an understanding of the diverse needs, expectations, and values of all of these students, rather than on the IT capabilities.

Net Generation

The Net Generation—students who have grown up in a wired world—are digital, connected, experiential, and social. Their desire for immediacy is palpable: they multitask or Google a subject rather than waiting for an explanation from the professor. Working in teams comes naturally to them; peer-to-peer is a common learning mode, not just a way of sharing files. When asked about their best learning experiences, Net Gen students use words like *engagement*, *interaction*, *visual*, and *active*. "Today's students are no longer the people our educational system was designed to teach."[3]

Nontraditional Learners

The majority of American students are considered *nontraditional*—a category defined by criteria such as age, work, and dependents. The challenges faced by nontraditional learners differ from those faced by traditional-age, full-time students. For example, work often limits the class schedules (46%), number of classes (39%), and course options (33%) of nontraditional students. It also hampers access to the library (30%) and participation in college-sponsored extracurricular activities (80%).[4] These students often select accelerated courses or attend evening or weekend classes to suit their work schedules. Older female students with families and jobs are more likely than traditional students to be drawn to undergraduate distance education programs.[5] And the number of nontraditional students shows no sign of decreasing.[6]

The Next Generation of Learners

If the current generation of learners differs from faculty and administrators in attitude, aptitude, and knowledge, the odds are that the differences with the next generation of learners will be even more striking. A survey of children ages eight to eighteen found that they are exposed to over six hours of television every day. They are also media multitaskers: 26 percent of the time they are involved with two or more media (TV, radio, computer, game) simultaneously. The result is that each day, these children are exposed to over eight hours of "media messages," whereas they spend forty-nine minutes reading for pleasure.[7] The next generation of learners will demand to be engaged—something they currently find in their daily activities but perhaps not in school.[8]

Learning Lesson #1: *Learning technology cannot bring value independent of the learner.*

Learning Principles and Practices

If learning technologies are defined, in part, by learning, we need to understand learning. Learning is an active process in which the learner develops his or her own comprehension by assembling facts, experience, and practice. Learning depends on participation as well; learning is part cerebral and part social.

Learning Outcomes

Principles derived from learning science can guide the selection of pedagogies and technologies. But what are the intended

outcomes of learning? Whereas acquiring content and accumulating enough credits to graduate may have been sufficient in the past, this is no longer enough: "Our ability to learn what we need for tomorrow is more important than what we know today."[9] Learning implies acquiring a set of skills, attitudes, aptitudes, and competencies. It is more than knowing things; it is being able to figure out how to do new things—often with little time or information. It is knowing how to engage in inquiry, lifelong learning, and civic engagement.

Reports exploring what it means to be "educated" in today's environment advocate that colleges and universities should help students become "intentional learners who can adapt to new environments, integrate knowledge from different sources, and continue learning throughout their lives."[10] Twenty-first-century skills include the following: information and media literacy; critical thinking and systems thinking; problem identification, formulation, and solution; creativity and intellectual curiosity; interpersonal and collaborative skills; and social responsibility.[11] Many of these skills are enabled by IT.

Successful Learning

Even with clear goals, learning can be difficult. Defining competencies does not necessarily result in successful learning, nor does teaching necessarily result in learning. Knowing that students differ in learning styles, motivation, prior learning, and personal circumstances, how can colleges and universities ensure that learning is successful? Part of the answer is to identify the barriers to students' success, which may range from the time a class meets to the way material is presented. Institutions are thus experimenting with alternatives designed to enhance successful learning: flexible learning, blended learning, online access to programs and resources, and self-assessment tools.

One of the most common limitations to learning may be the inflexibility of class schedules, which often conflict with other demands on learners' time. For example, Santa Monica College identified the length of courses as inversely related to course completion rates. Maricopa

Community Colleges found that the longer and more fixed the classroom schedule, the greater is the probability that students will encounter a problem that will disrupt their learning experience (e.g., family or work responsibilities; health, transportation, or financial difficulties). Replacing some of the fixed seat-time with online activities leads to improved learning, higher completion rates, and lower cost both to the student and to the institution.[12]

Successful learning also hinges on interaction and engagement. The importance of interaction is not new. Students who are tutored tend to do significantly better (by 2δ) than students in a class, in large part due to the student-tutor interaction. The average college class has minimal interaction; estimates are that students ask 0.1 question per hour and that faculty ask 0.3. By contrast, students in tutored sessions ask 20–30 questions, and tutors ask more than 100. In computer-based instruction, the number of questions posed to students per hour ranges from 160 to 800.[13] Technology opens up many options for interaction: student-to-student, student-to-faculty, and student-

to-information. Active and collaborative learning environments are particularly effective for Net Generation learners. Games, simulations, group projects, undergraduate research, and digital storytelling are some of the IT-enabled models being used.

Informal Learning

More learning takes place outside of the classroom than in it. Whether learners are searching the Web for information, visiting a museum exhibit, or participating in a naturalist hike, they are constructing their own courses of learning. Learning occurs through daily life, team projects, Web surfing, conversations, and social interactions. Largely self-directed and internally motivated, informal learning is unconstrained by time, place, or formal learning structures. It is often facilitated by technology and emerges from the interaction of people.[14]

For example, students learn while working on team projects: they learn about each other, they learn about the subject, and they may learn about completely different subjects. When students network—mingling informally, online or face-to-face—with other students, faculty members, or people in the external community, they learn as well. Informal learning can help a physics student better understand art or sociology, for example. International students can develop others' appreciation of different cultures and languages. Interaction with faculty helps students understand a profession, whereas interaction with external groups develops an appreciation of real-world problems.

Increasingly, campuses are creating environments that encourage students to mingle, collaborate, share, and make connections. A first step is to identify those spaces where learning occurs after class hours or the places where students congregate. A next step is to design spaces that promote inquiry, curiosity, and problem solving. These spaces foster informal learning, an important complement to formal learning environments.

Learning Lesson #2: *Learning theory translated into practice, along with an understanding of learners, helps ensure successful learning.*

Learning Technologies

Learning technologies range from the traditional (chalkboard) to the novel (wikis), all of which can be used in the service of learning. But some interesting trends are emerging. When users are polled about what they do with technology, some form of social interaction is typically at the top of the list (e.g., conversing, collaborating, playing games). The traditional assumption of a "computer-as-a-box" is giving way to the idea and the software design of the "computer-as-a-door"—that is, the computer as the entrance to social spaces.[15] Institutions are challenged to go beyond the technology—whether novel or traditional—to consider its integration, support, and sustainability.

Alternative Media

The daily lives of today's students are filled with visual images, whether on the Web, on TV, or through games. By the end of twelfth grade, the average teen has logged 15,000 hours of watching television, compared with 11,000 hours of learning in the classroom.[16] So perhaps it is no surprise that many students (and an increasing number of faculty) are choosing to express themselves through visual media in addition to text. Even for those who choose text-based expression, the ability to create and interpret visual images is an emerging need. Visual media is the vernacular of the digital culture.[17] Multimedia allows the construction of complex meanings independent of text. It also enables communicating, conducting research, publishing, and teaching in ways that are essentially different from those based on text.

iPods have catalyzed another media trend: podcasting. Developing and delivering a "broadcast" via the Web—a podcast—requires no more than a handheld recording device, some editing software, and a Web interface. Faculty are discovering that podcasting allows them to share lectures, updates, or additional material with students in a format that provides the flexibility desired by a highly mobile, busy student population. And students are creating their own podcasts, whether informally or as a part of class projects.

An increasing number of instructors are experimenting with alternative media formats. They report that multimedia projects

- motivate students to participate,
- integrate multiple skills,
- create practical reasons for reading, writing, and revising communication,
- require students to analyze sources and think about evidence in new ways,
- require higher-order thinking and problem-solving skills,
- let faculty address multiple intelligences and learning styles, and
- lead faculty to think about their students, classes, and lessons in new ways.[18]

Should we be expanding the definition of "communication skills" to include media? What knowledge and skills should learners acquire in visual, digital, and aural media?

Learning Spaces

The classroom can be considered a "learning technology": blackboards, chalk, lecterns, chairs, and projectors support the activities of a face-to-face classroom; networks, software, and computers support online courses. The learning technology—whether seating arrangements or chat rooms—should support learning activity, not be independent of it. However, physical space does not always keep pace with learning models. For example, practicing active and collaborative learning in a classroom with chairs bolted to the floor, all facing the lectern, presents a challenge.

Classroom design can help—or hinder—learning. Getting it right is critical, particularly considering the longevity of the investment. Technology changes every year. Courses and curricula change more slowly, perhaps every decade. But a building (with its learning spaces) is designed to last fifty to one hundred years.

Effective learning spaces create new patterns of social and intellectual interaction stemming from an understanding of desired competencies, learner activities, campus culture, and human habits.[19] Space is no longer defined by "the class" but rather by "learning." Interesting questions arise as a result of this reconceptualization. For example, how would college and university planners think about space if students stayed at home (or in their dorm rooms) to go to "class" but came to campus to do their homework?

Not all learning spaces are physical or formal, particularly on campuses with wireless networks. Information commons, group spaces, and "think stops" encourage informal interaction. In fact, many buildings now house multiple departments to encourage cross-disciplinary collaboration.

Learning spaces should

- support multiple modes of learning (discussion, experience, reflection),
- facilitate face-to-face and online discussion within and beyond the classroom,
- enable interaction with teammates, external experts, and others,
- be easily reconfigurable in a short

period of time for group and individual work, without losing power or network capabilities,
- provide students with adequate functional work space (room for laptops, elbows, and so forth), and
- be fully accessible.

The forms and functions of learning spaces are changing rapidly as we discover new ways to take advantage of learning technologies.

Social Networks

In the early days of technology use, people had to adapt to what the technology would allow. After decades of IT exploration, people are beginning to harness the Internet, using the Internet for its strengths and using people for their unique skills. Perhaps the best example of this distribution of duties is social software or social networks (e.g., Ryze, Orkut, Yahoo! 360°).

Social networks adapt to people; social software emulates how people behave. Applications like blogs bring extensive networks of links, references, and recommendations to campuses. "Who do you know?" and "How do you know them?" are questions being revisited electronically, and social software allows these connections to be visualized. Social applications make explicit connections to friends, content, and communities; they promise to help find that "friend of a friend"—and more. For example, groups of individuals are sharing opinions and working together to distinguish good content from bad—an example of collaborative filtering. Adding content (such as photos in Flickr or links to Web sites in del.icio.us) is catalyzing a reevaluation of how knowledge is organized, stored, and created.

An example is the practice of social bookmarking: saving bookmarks to a public Web site and "tagging" them with keywords. The creator of a bookmark assigns tags to each resource, resulting in a user-directed, "amateur" method of classifying information. Because social

bookmarking services indicate who created each bookmark and provide access to that person's other bookmarked resources, users can easily make social connections with other individuals interested in just about any topic. Users can also see how many people have used a tag and can search for all resources that have been assigned that tag. Over time, the community of users will thus develop a unique structure of keywords to define resources—something that has come to be known as a *folksonomy.*[20]

Folksonomies are an experiment into how people collectively interpret and organize information. Users can express differing perspectives on information and resources through informal organizational structures, allowing like-minded individuals to find one another and create new communities of users. The high-tech side—metadata and a good system for organizing data—has started to give way to the very old-fashioned practice of person-to-person referral. Trust becomes very important, as do the intricate networks of recommendations and references that solve problems or harvest knowledge.

Learning Lesson #3: *It is not the technology that is most important but the activity it enables; the activity, not the technology, is what advances learning.*

The EDUCAUSE Learning Initiative

The EDUCAUSE Learning Initiative (ELI) is a leading-edge teaching and learning initiative. When the initiative was originally created in 1994 as the NLII, information technology was beginning to be recognized as an important component of the campus environment. In these early years, the NLII focused on creating an infrastructure to facilitate flexible, technology-mediated learning. New technology tools and standards were required to ensure access to high-quality, affordable education.

The need for a technology infrastructure to support teaching and learning is no longer in question. The time came to move from a focus on inputs (the information technology itself) to a focus on

outcomes (successful learning). Today, IT is defined more broadly: it concerns not only *information* technology but also *instructional* technology—that is, technology in service to learning. The mission of the EDUCAUSE Learning Initiative is to help institutions advance learning through IT innovation. This requires a focus on technology, of course, but also on learners and on successful learning. Understanding learners is the first step toward the goal of using IT to improve learning. Taking the second step, understanding learning principles, and the third step, understanding the learning technologies, can help institutions ensure that learning is successful.

The EDUCAUSE Learning Initiative is also designed to help increase awareness of how to advance learning through IT innovation. That awareness applies not only to IT staff (whether information technology or instructional technology) but also to institutional leaders, faculty, librarians, and others committed to ensuring successful learning, including the students themselves. ELI helps demystify both the technology and the pedagogy. Individuals throughout the institution must be enabled to use technologies and pedagogies to advance learning. ELI thus provides professional development opportunities, tools, and techniques, in a range of formats. In addition to organizing location-specific conferences, ELI provides audio files, Webcasts, podcasts, blogs, publications, and tools online so that users can choose the time, place, and format. Realizing that no two institutions are alike, ELI offers materials that can be adapted and integrated on campus. Institutions can use these materials—from ELI focus sessions, white papers, surveys, and

checklists—to catalyze an ongoing process that will transform learning.

Advancing learning requires a diverse group of people, a group that spans departmental and institutional boundaries and includes people at all levels. It takes learners, faculty, librarians, IT staff, deans, department chairs, and policymakers. It takes theory, and it takes practice. ELI is distinctive in bringing together this diverse group to advance learning through IT innovation.

Learning Lesson #4: *The goal of ELI is to help institutions understand learners, learning principles, and learning technologies to ensure successful learning.*

Conclusion

Much of what education seeks to achieve—developing human potential—remains constant from one generation of students to the next. However, the social, intellectual, and technical context changes rapidly. As the context changes, institutions must adapt. The EDUCAUSE Learning Initiative is positioned to help.

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