THE EVER CHANGING CAMPUS:

by Arthur J. Lidsky, AICP

Pedagogy (the art and science of teaching), technology, and facilities are intricately intertwined. They each affect the other—and each has changed dramatically in recent years. Over the past 30 years, research on how people learn has made great strides. Moving beyond theory, this research is beginning to have a significant impact on teaching, the approach to student learning, and the facility resources required.

Even more than pedagogical change, technology has, is, and will continue to be a rapidly evolving tool used for teaching and learning. Colleges and universities need to have a strategy for providing facilities that will respond to and support this continuously changing resource, as well as the changes that are occurring in learning.

This article will explore the characteristics and types of facilities that will be required to support these new pedagogical and technological initiatives.

Pedagogy

Research has shown that there are more effective ways to facilitate learning than the traditional teaching. Lecturing to passive students who are busy taking notes is less effective than actively engaging students in their own education. Engaged, active, hands-on, problem-based, and project-oriented are all current terms used to describe an approach that recognizes that students learn by doing. The goal is to encourage critical thinking and the understanding of concepts—not the memorization of facts, dates, and figures.

Two examples of current active learning initiatives at the undergraduate level are Workshop Physics at Dickinson College and project-based learning at the College of Wooster. There is growing support for undergraduate research at many institutions, and dramatic changes are taking place in introductory courses, particularly in the sciences.

Colleges and universities are supporting these programmatic initiatives in many ways. One is a more appropriate and sophisticated approach to faculty development. Formerly cast in remedial undertones, faculty development centers are becoming laboratories for faculty experimentation and learning, staffed by professional educators and information technology specialists. The Anderson Center of Undergraduate Education at Rensselaer Polytechnic Institute is an example of this evolution.

Academic fields are also changing. The scope of classic and familiar disciplines is expanding, and new disciplines are being created. Thirty years ago, none of the following departments existed: bioinformatics, biomedical engineering, cinema and comparative literature, earth and space science, ecology and evolutionary biology, genome sciences, information infrastructure, management science and engineering, and molecular technology.

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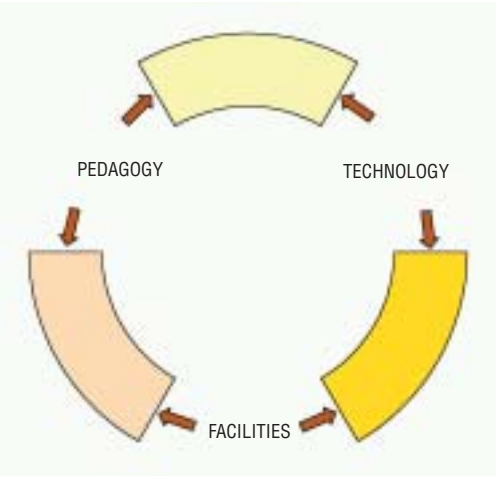

Today, these and other such departments are becoming commonplace. With them comes the need for new types of research space, located to advance interaction among faculty, students, and staff with relevant interests.

The number and complexity of centers and institutes, the interdisciplinary organizations common to universities, has increased significantly since the early 1970s—from about 6,000 to about 13,000. Most have facility needs ranging from simple office space to major buildings.

In the recent past, changes in facilities were being driven more by technological and programmatic change than by changes in enrollment. Over the next 15 years, however, enrollments are expected to increase by 15 percent as the Baby Boomers' baby boom moves through the primary and secondary school system.

Technology

The most startling changes are in technology. It was only 27 years ago (1977) that the Apple and Tandy computers were first introduced, and 23 years (1981) since the IBM PC reached the market. Ten years ago Netscape was introduced and the Internet became an incredible resource linking institutions, corporations, individuals, and information in ways that were inconceivable just shortly before. Only nine years ago, Microsoft entered the so-called browser war with Internet Explorer.

In this relatively short period, the way we work, teach, communicate, interact, and do research has changed. So, too, has the way we design and construct individual buildings and whole campuses.

The average age of college or university students today is between 22 to 24. For these students there never was a time when computers didn't exist. Having grown-up with Game Boys, cell phones, PDAs, and the Internet, they expect their educational experience will be technologically advanced and accessible.

Computers, laptops, and handhelds will become faster, cheaper, more complex, and more pervasive. They will continue to change and evolve and be integrated into the learning environment. Colleges and universities should expect to continuously upgrade these "edge" tools. Because a greater proportion of students will bring their own devices, institutions will have to decide what they will provide to supplement student machines and to support the academic program.

The rapid advances in wireless technology—increasing speed and security—will mean students can use their computers anywhere on the campus. Students will be able to create instant, networked, learning environments wherever and whenever they wish. A group of students might meet in the campus center, dorm, or outdoor quad and create a small networked community focused on an assignment, project, or laboratory experiment. It might be serendipitous, but there certainly is a coming together of the opportunities created by a wireless network and the pedagogic initiative of collaboration and community learning environments.

There continue to be exciting developments in display technology. Digital projectors are no longer the province of the so-called "smart classroom," as they are becoming a mandatory and expected resource in all classrooms. The SMART Board is also no longer cutting-edge, combining whiteboard, computer, and projector with a touch-sensitive display that can save text and graphics to a computer file for printing, e-mailing, or Web display.

The CAVE (Cave Automatic Virtual Environment) is a new technology that will find its way onto many campuses in the next few years. It is typically an eight- to ten-foot cubicle where high-resolution graphics are displayed on three walls and the floor creating a three-dimensional virtual environment. Hardware and software can keep track of a person moving in this virtual environment and change the image accordingly. Do you want to walk through the arteries of a virtual heart or be in the center of a virtual space station? How about walking into a room that you are designing?

One of the most interesting new technologies involves the use of haptic devices. A haptic device allows a user to see and reach into a virtual three-dimensional environment and seemingly touch, feel, and manipulate an object created by a computer. A student wearing haptic gloves can pick up and hold a virtual three-dimensional molecule. The student can pull the molecule apart and reassemble it in various ways, and in pulling it apart can feel the "tug" of atomic attraction much they way one feels the force between two magnets being pulled apart.

Online communication, either through the campus network or the Internet, has led to online academic programs, electronic office hours, interactive assignments, Web-based projects, and formal and informal communities of learners. It is not uncommon for faculty from several institutions to jointly teach a course over the Internet to students. Nor is it uncommon for one professor to teach a course over the Internet to students at several colleges or universities.

Sharing expensive and sophisticated scientific instrumentation over the Internet is becoming more prevalent

as their costs increase and the need for specialized technicians grow.

Facilities

The design and construction of academic buildings has shifted dramatically over the past 30 years. This shift is in response to changes in pedagogy and technology and the need to ensure that academic buildings can accommodate current and future initiatives. These facilities must allow change to occur at minimum cost and with little disruption. In the past, they were designed for specific faculty and programs. It has become clear that the more a design caters to individuals, the more inflexible and the quickly dated it will become. At Middlebury College, at least one third of the laboratory space in their new science building was designed as generic, division-owned space.

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Classroom

Fifteen or 20 years ago, the typical classroom looked similar to the way classrooms have looked for the previous 50 years. Many new and renovated classrooms today are the result of pedagogical shifts and technological advances. They are different in size, configuration, furnishings, and technological equipment.

To differentiate between traditional classrooms and the newer, technology-rich classrooms, many colleges and universities use the term "smart classroom." That distinction will disappear as most classrooms are brought up to current standards.

Reflecting the shift toward engaged, interactive student learning, some faculty are moving away from the lecture style of teaching to a seminar or discussion format. This format requires a flexible classroom where students face each other around a table, in a circle, or a U-shape design, requiring more space.

Laboratory

Nowhere have the changes in facility design been more dramatic than in science, technology, engineering, and math departments (STEM). From a teaching standpoint, these fields require a lab-rich, hands-on, experiential, project-oriented collaboration of students and faculty learning and doing research together. Research used to be at the graduate level only, but today is a component of programs at undergraduate institutions and secondary schools.

The new style of teaching, learning, and collaboration requires a physical environment with flexible, movable benches designed for groups of two, four, or six students working together. In addition, some labs are being designed for both a discussion area with movable seating as well as a lab bench environment with small group benches, enabling faculty and students to move back and forth between discussion and experimentation. Labs of this nature require more space per student than traditional labs.

STEM spaces are also affected by the increasing number of computers and by the specialized, complex, and sophisticated equipment required for contemporary teaching, learning, and research. Much of the equipment now occupying floor and bench top space didn't even exist 30 years ago.

Office

Under the misguided notion of efficiency, a number of states have guidelines for the size of faculty offices based on a misunderstanding of the purpose of these spaces. Unlike offices used by industry, faculty offices are multipurpose teaching, research, and administrative spaces. There is growing pressure to increase the size of faculty offices to respond to changes in pedagogy and technology. Whereas 100- to 120-square feet per office used to be a typical guideline, faculty offices are now more likely to be in the 140- to 160-square foot range.

Library

Librarians as professionals and libraries as places are going through the greatest transition—and are still in the process of becoming. Becoming what, however, is still unclear as soul searching and experimentation continue to define and redefine the library. A library is no longer viewed as a passive depository for books and solitary scholars, but as an active, service-oriented, technology-based resource for collaboration and learning.

Computers in libraries have increased radically and the creation of "information commons" such as at the University of Arizona, are becoming important centers for learning and interaction. The information commons integrates information specialists, technology specialists, multimedia specialists, library resources, and technology resources, in an individual and group learning environment.

Some libraries are trying to make the library more comfortable and inviting. Clemson has introduced a small café, for instance. Other libraries, such as at Worcester Polytechnic, are moving some books off-site to make room for technology and small group study and collaboration spaces.

In the world of education, as in life, change is constant. A significant difference with the past is the speed with which change is occurring. Today, campus buildings must be designed to anticipate change through thoughtful decisions about building systems, building materials, structural bay size, room configuration, sight lines, room locations, and careful consideration about furniture and equipment.

Colleges and universities must continuously strive to reinvent themselves to become or continue as preeminent places for vibrant, interactive, transformative programs for teaching and learning. Flexible and adaptable facilities will play a pivotal role in creating environments to attain that goal.