Innovation enters the classroom

Gen Y college students expect technology to be readily available, yet most classrooms are tech wastelands. Innovative college administrators are incorporating media:scape settings which let students share content and present their thinking to others at the push of a button.

Want to see something amazing?
Visit a college classroom.

You'll be amazed, perhaps astounded to learn that today's classrooms look completely – like the ones you sat in five, 10, or even 50 years ago. Despite revolutionary technology, the information explosion, and an interconnected planet, not to mention improved teaching and learning methods, the typical college classroom is fixed in time like a museum diorama.

Sure, there's often a computer in the corner that can pull up a YouTube video, maybe even an electronic whiteboard. But the scene rarely changes: rows of hard chairs with little tablet arms, a writing board attached to the wall, an instructor's lectern – in short, everything geared to the lecture format developed back when the only iPad was a chalk slate.

Can 19th century classroom design be the best way to prepare students for the 21st
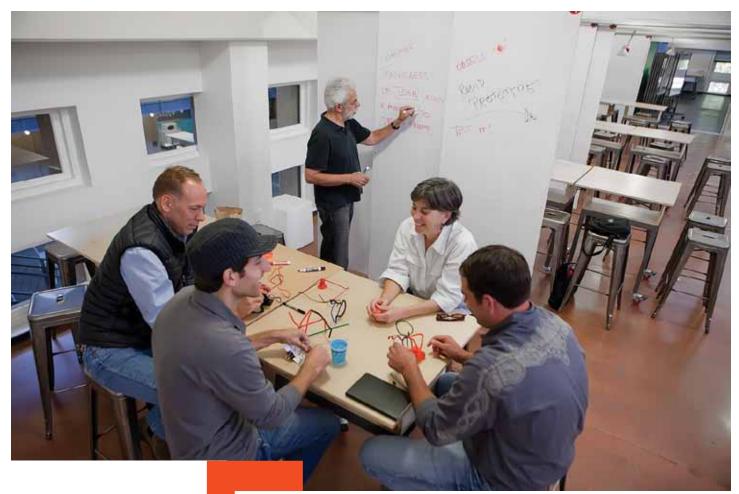
century knowledge economy? Now that would be amazing.

A few classrooms, however, are escaping the educational equivalent of a land time forgot. You'll find these innovative spaces at well-known schools such as Arizona State University, the University of Michigan, and Stanford University, as well as at small community colleges you may not have heard of before. These schools are reconsidering the relationships between classroom space, furniture, technology, and pedagogy and seeing great results.

Many educators say it's about time. "A lot of classrooms, in terms of flexibility, ease of use, comfort, proper lighting, I'd give a failing grade," says Dominique Laroche, director, Office of the University Architect at Arizona State University (ASU) and a faculty associate with the School of Architecture and

Landscape Architecture. "Technology is light years ahead of us. The infrastructure and the classrooms are lagging behind."

"Students today are far more connected, far more facile with technology than students 30 years ago, but schools haven't accommodated what kids can do, or adjusted what we try to do with them. You see students using laptops or other devices, but the instruction often isn't designed to take up on the fact that they're coming to class with those tools instead of binders and pencils," says Deborah Loewenberg Ball, dean of the School of Education at the University of Michigan (U of M) and a prominent researcher in effective teaching methods.

Jason Meneely, a professor in the College of Design, Construction & Planning at the University of Florida (UF), agrees that today's

If it's not written down, an idea can vanish in a matter of seconds. Whiteboards are simple and effective means for capturing, evaluating, and sharing ideas in any learning environment.

"We need to teach students not only how to acquire knowledge, but to be problem solvers, how to think and operate when they don't have all the information."

Jason Meneely
Professor, University of Florida

Generation Y students "have expertise and knowledge, particularly of technology and social networking, that we can start to leverage if they're given a voice in the classroom," but says it's not the primary reason to change. "The problems in today's world are complex and the pace of change imposes a short shelf life to the knowledge students acquire. We can't emphasize knowledge as a fixed quantity. The accumulated knowledge in every discipline shifts so quickly that what we

need to teach students, beyond the acquisition of knowledge, is how to become problem solvers and how to think and operate when they don't have all the information."

Most college classrooms are set up for passive note taking, not the give and take common to knowledge work. "We found that most classrooms are a barrier to learning and don't support the individual needs of students and instructors," says Elise Valoe, a principal researcher with

Steelcase WorkSpace Futures. Her team studied learning spaces at a dozen different universities across the U.S., including public, private, and community colleges.

"In many academic disciplines, the curricula are moving to constructivist learning theory where students actively construct meaning when they make their own discoveries during the learning experience. It's how colleges teach students skills for the knowledge economy: how to work in groups, how to collaborate with others, creative problem solving, and other critical thinking skills. As a result, college students today have a much greater role in the learning process. They spend almost three-quarters of their class time in group discussions and nearly a quarter of their time in group work."

Yet traditional classrooms, which is to say most in use today, make working in groups and other new pedagogies (strategies of instruction) an almost impossible task.

Steelcase research shows colleges share many common problems:

- aging infrastructure – most buildings were constructed in the 1960s or earlier

- classrooms built for lectures, not learning

- very limited flexibility inside classrooms

- student movement is limited (fixed tablet arms, chairs and tables without casters, etc.)

- interaction between students and instructors is constrained by space and furniture

- technology is poorly integrated into the classroom

- support for collaborative learning is inconsistent or nonexistent

Add to those issues space standards that are driven by efficiency, a design process that doesn't usually involve users, and too many other demands for funding, and it's no surprise classrooms change at a glacial pace.

TEACHING OLD CLASSROOMS NEW TRICKS

As more educators shift to constructivist teaching methods, the need to rethink the classroom becomes more pressing. There's no single right answer. Steelcase researchers

Classroom work today means studying individually and in groups, with both analog and digital tools. (Photo courtesy of the University of Florida.)

found that schools vary in the degree of change that's right for their curricula and need a range of solutions to fit desired learning outcomes. "We see it as a spectrum of change that schools can explore as they move to a more constructivist pedagogy,"

says Valoe. "It may range from simply changing the furniture in existing classrooms to a more significant change in structure and technology, all the way to a learning environment that doesn't even resemble a traditional classroom."

In constructivist learning approaches, students are more engaged in the learning process and work closer with their peers. They spend up to three-quarters of their class time in group discussion.

One classroom, multiple settings. Mobile node chairs let students and teachers shift quickly from lecture mode to a U-shape set-up for discussion to working in groups. 89% of the students in this U of M class said the node chair improved their concentration and focus and 99% said the chair makes it easy to move into different activities.

Adding media:scape® to a LearnLab™ environment lets students present their laptop content at the click of a button.

Educators and college planners say the underlying need is for flexibility. The rationale is simple. Different courses often use the same classrooms, yet their needs vary: science classes are different from English discussions or business seminars. Teachers and pedagogies vary, so classes might employ lecture mode, group set-ups, individual work – from one class to the next, or even during the same class period. Flexibility in furniture, technology, and space simplifies transitions between different modes, classes, and teaching styles.

"We like to offer different types of spaces for students to work in so that they can be intentional about what space they want to work in during that phase of their process," says Scott Doorley, a professor at Stanford University's Hasso Plattner Institute of Design. "So we can have students jump into a space that has low couches when they want to have a discussion or reflect. Or a space that has tools if they want to be building, or a space that has whiteboards and stools if they want to have a brainstorm and be active about sharing ideas. We try to give students an environment that allows

them to be intentional about what they need at any given time."

Flexibility is a need not only in classrooms in North America, but in Europe as well. "There is a clear need for increased flexibility with learning spaces, to be able to reorganize the layout according to the task, the topic, and the activity," says Jean-Marc Jeltsch, vice president, Intellectual Property, Contracts & Partnerships at the University of Strasbourg, Strasbourg, France.

Classrooms are being designed that are as different from a traditional classroom as a tablet computer is from a tablet-arm chair. Jason Meneely's University of Florida classroom exemplifies the multiple rhythms and work modes of interactive learning: working alone, in pairs, and in groups; employing digital and analog tools; using horizontal and vertical worksurfaces; being immersed in and creating content, not merely receiving it.

When a classroom supports lectures, group discussions, and team project work, it not only supports new pedagogies, it also makes better use of real estate, furniture, and technology.

FIRST STEPS

Using existing real estate, without redesign and construction, traditional classrooms can be made more flexible by incorporating chairs that support more active and engaged students. "I have '50s-era table arm chairs in some classrooms. These are chairs I may have sat in when I was in school. Some rooms have chalkboards. Some days I can't get enough money for a fresh coat of paint," says ASU's Laroche.

Yet student life has changed. "Students have backpacks, laptops. You can't put a laptop on a tablet arm, it'll fall right off." To provide more storage and worksurface, and support for a more interactive learning style, Laroche installed Steelcase node™ classroom chairs "as a kind of easy, less expensive retrofit."

The chairs feature adjustable worksurfaces and flexible seats that swivel, a built-in storage shelf, and five casters for easy movement. When Laroche showed them to six instructors, one was hesitant to try the chair but the students convinced her; the other five instructors said, "It's about time."

A LearnLab classroom with round tables and mobile chairs provides an egalitarian teaching and learning environment for students and faculty at Arizona State University.

Follow-up surveys with students after a week using the chairs provided definite reactions:

51% said the node chairs would improve their classroom experience, and 42% said possibly it would. In addition, 71% of students said they like the function of the chair best; 58% said they liked best its versatility, and 51% said its comfort. Some students asked for upholstered seats, but Laroche says, "As a facilities person, I have to think about upkeep. I like it that I can hose the chairs down."

She plans follow-up surveys after the semester but is convinced the chair's a positive step forward for her classrooms. "It's a very innovative way of looking at a very old design and updating it for this generation."

ASU LearnLab: Bottom Line

Redesigned classroom
New furniture & technology
+ New pedagogy

Higher grades,
better retention, and
$600,000 savings/yr.

WHERE'S THE TEACHER?

As professors embrace a constructivist approach and students are actively involved in the learning process, the professor's role evolves from a traditional "sage on the stage" to "guide on the side," as educators phrase it. The instructor becomes both an expert facilitator who conveys subject matter and a mentor who helps students reach their own understanding of the content via small groups and informal individual conversations with students. They, in turn, help guide their peers.

This requires rethinking the classroom. As the instructor's and students' roles shift, the classroom furniture and tools help them work differently. Good example: a classroom at ASU where Ron Briggs, senior lecturer and coordinator of general chemistry, teaches large chemistry classes. "We've done inquiry-based learning in the labs for years," says Briggs, "but we wanted to incorporate it into our recitation sections, too. That's a period before labs where the teaching assistants talk about the lab, students ask questions and they work with models and other hands-on work, short of using chemicals." The classroom incorporates projection on multiple screens, tools that allow real-time annotation of screen content, furniture that supports group work, and a design that puts the instructor anywhere in the classroom: there's no "front" of the room or lectern he's anchored to, so he can teach

wherever it's appropriate. Students are more engaged and they coach each other. "Try to find the teacher in the photo of the students at work," he says. "At any one time there are 72 teachers in this class."

Briggs' classroom is a LearnLab™ environment (a rendering of LearnLab environment is pictured on pg. 9), a design introduced by Steelcase three years ago that creates stages for the instructor and students as well as space that encourages communication and collaboration. It also immerses participants in information. LearnLabs have:

- projectors and screens at a predetermined geometry that breaks the traditional classroom hierarchy and gives everyone an unobstructed view
- fixed and portable whiteboards and display screens that support information immersion and retention
- spaces and furniture that support different learning processes and styles

ASU is one of the largest universities in the country, but budgets and real estate are tight here, as they are at every college. So Briggs, in collaboration with other ASU faculty and staff, made an educated bet, if you will: they traded six 24-seat classrooms for the chance to rehab a 1,623-sq.-ft. room ("a derelict lecture hall," Briggs calls it) into a LearnLab.

The room now seats 72 people at round tables and mobile task chairs so students can work together easily. Projectors, big screens, and tablet PCs support a new, more interactive curriculum developed by Briggs and his colleagues. With no front stage, instructors move around and immerse themselves in the learning environment with the students, who build Lego models to better understand chemical reactions or fashion a spectroscope from a cardboard box and a DVD. Once-sleepy recitation sections are now hands-on, brains-engaged classes that have connected well with students.

How well? Chemistry has a high dropout rate compared to other subjects, which Briggs says "has less to do with their performance in the course than feeling a part of the group." The ASU LearnLab nurtures community as students work in pairs, information is easily displayed for everyone to see, and "you get a question to answer, not a process to follow," says Briggs. Retention is up nearly 5% and grade performance is up 3-4%. Briggs credits the personal connections students form in the classroom environment. "We put students in groups. They don't get to pick their teammates. Once they make the initial connection, they get together outside of class as well. It all gets back to community."

ASU's LearnLab class costs less to operate than their previous traditional classroom. Briggs and his colleagues teach 6,000 students over the academic year in more effective fashion (booked solid 12 hours a day, Monday through Friday) and do it with fewer teaching assistants, ultimately saving the university $600,000 per year in reduced staff costs and an estimated additional $300,000 in real estate savings.

Why does this classroom work so well? Equal parts good design, effective tools, and inspired teaching methods. Every seat is a good seat, so students don't have to crane their necks or twist around in their seats to see content on the board. They have adequate horizontal worksurfaces for tools, technology, and materials, and vertical surfaces for sharing information. Instructors have visual and physical access to every student, and students have the same access to course content and fellow students. Collaborative learning also impacts student outcomes. Briggs replaced what he calls "typical cookbook experiments" with guided inquiry exercises that encourage students to think and work as a group rather than follow recipes with predetermined results. "They develop skills that better prepare them for future work and give them the tools to help them retain knowledge long after the semester ends," he says.

BETTER TECHNOLOGY INTEGRATION

When it comes to technology, students and instructors have one thing in common: they learn from their peers. Gen Y students are digital natives, comfortable with technology. Instructors tend to be digital adopters, yet need to learn how to incorporate technology into their curricula. The task is made easier by effectively integrating mixed media that can be used easily by both students and instructors. Some classrooms, designed decades ago, are practically anti-technology. "Approximately 50% of our students use laptops during class," notes the University of Strasbourg's Jeltsch, "but there are not enough sockets, so cables lay around the floors and that can cause accidents."

Power is only part of it. "We have a lot of classrooms that are traditional classrooms, with primarily a blackboard and an acetate overhead projector. That works for some faculty who want to focus on discussion with students. Other faculty are interested in doing more than a plain PowerPoint presentation. These instructors and their students are going out to the web, pulling up videos, using social media, going out on the fly when a student asks a question to the library's digital resources or to a digital archive, or doing an instant poll about something that's going on in the news, and bringing all of that into the classroom,"

Design principles for 21st century classrooms

Steelcase WorkSpace Futures researchers and designers have developed key design principles for planning 21st century classrooms. "These are based on our research and intended to provide people who plan higher education spaces some guiding tenets for more interactive, more flexible learning environments," says Elise Valoe, a principal researcher with Steelcase. The essential principles:

› Design for multiple rhythms in the same classroom

› Allow everyone to be seen and heard

› Take advantage of new media

› Support the dynamic presentation of information

› Design for mentoring and apprenticeship

› Design for temporary ownership of space

WorkSpace Futures also developed design renderings for each principle, with application variations for different space dimensions.

The design principles grew out of the Steelcase User-Centered Design Process, a six-stage protocol: Understand, Observe, Synthesize, Realize, Prototype and Measure. In the Understand phase, secondary research gathers essential information, language, and trends about the industry.

Next, Observation involves going on site to see how things work. This may include contextual interviews, focus groups, photography and videography of how users and their work processes function. From these first two phases, they Synthesize the findings to develop insights about the situation and design principles to help solve identified problems.

These design principles are used in the Realize stage to create thought starters or design considerations as potential solutions. Ideas are shared and concepts are visualized, leading to the next step, Prototypes of the hypotheses. Full-scale prototypes are built to carefully Measure their performance. Solutions are refined, tested, and evaluated to yield workable solutions.

An instructor and her students reference content on the flat screen of a media:scape setting at the University of Michigan.

says Monika R. Dressler, Ph.D., director of Instructional Support Services in the School of Literature, Science, and the Arts at the University of Michigan.

Many faculty members are trying new ways for students to more actively participate, "encouraging students to ask questions in a live chat during lecture, which a grad student instructor or the faculty member answers as the lecture continues, or having students work collectively on questions in small groups during class, research a topic, and then come back to class to discuss what they found. So we need to work with faculty to think about how to use technology to engage students in new ways and how to outfit classrooms in a variety of ways to meet different approaches of teaching and learning."

To solve for these challenges, U of M has installed media:scape® settings in classroom and lounge spaces. media:scape makes sharing information easy for students and faculty: they simply plug a media:scape Puck™ to their laptop in a USB port and share what's on their computers via the integrated monitor at the table. Pressing the

puck switches between laptops. "Students can use their laptops, show what they've been working
on outside of class, give suggestions to each other, and do a lot of peer-to-peer editing and collaboration," says Dressler.

media:scape's unique approach to information display makes content review and sharing more effective. Pharmacy students at Virginia Commonwealth University use a lab equipped with media:scape to review patient cases, "then they share their analysis and conclusions with their peers," says William E. Smith, professor and executive associate dean of the School of Pharmacy. In the past, students would have to connect laptops via cables, a process Smith says was "too cumbersome" and took valuable time from class work. "Now the whole process is more efficient. The first morning we used media:scape, the students went into the labs at eight o'clock, plugged in, and got to work. They absolutely loved it.

"The ability to use their own computer, work together as a group, be able to pull up different information sources – we just think it's great."

VCU has six media:scape settings, each seating seven students. The space is used for both required course lab sections and elective courses. Using teleconferencing integrated in the media:scape settings allows students at another campus 100 miles distant to connect with faculty and students on the main campus. "We want to assess this space on its impact on learning, and think about where we think we can go with teaching in this space over the next three years, and lay out a plan for how to use the space even more effectively than we are now," says Smith.

The University of South Dakota equipped a 62' x 32' classroom with nine media:scape settings that each serve a dozen students. "We didn't come at media:scape from a technology standpoint, it's about sharing information. It's simple and not scary at all. It's very intuitive to use," says Cathy Wagner, director of planning and construction at USD. The classroom has Huddleboard™ portable whiteboards between each media:scape setting and Cobi® chairs designed specifically for group work.

Virginia Commonwealth University pharmacy students use a classroom media:scape setting. "The ability to use their own computer, work together as a group, be able to pull up different information sources – we just think it's great," says William E. Smith, professor and executive associate dean of the School of Pharmacy.

Retrofitting existing classroom space in this fashion addresses common facilities issues of aging buildings: how to easily integrate technology, how to make classrooms more interactive, and how to solve these issues in a cost-effective fashion.

AND NOW FOR SOMETHING COMPLETELY DIFFERENT...

The Stanford Institute of Design, known as the d.school, pushes the notion of the classroom even further by creating a range of spaces where faculty and students can work and learn together (see page 14). Educators there fully embrace constructivist teaching methods, referring to it as "the flip" when content comes from students who generate rather than receive information. One of the principles to support this flip – which can make old-school instructors shudder – is to promote movement throughout class. For example, they purposely chose more stool-height seating because, as professor Doorley explains, "When the students can get up and move and lean and feel a bit more fluid, it allows the leadership in a group to be dynamic. If you have five people sitting around the table and one person is the

leader and no one can move or re-establish a physical position, it creates a very static relationship. If people can stand up, students can reposition themselves, which allows a shared sense of leadership, and we think that's really important to collaborative creation."

Movement has other benefits, Doorley believes. "We try to have college students share responsibility for different tasks. They're in a learning environment so we want to push them out of their comfort zone into areas that they might feel they have a weakness. We try to set up scenarios where students can move around a lot, exchange leadership responsibility, or trade off on roles. Another reason I think movement is good in the classroom is it allows a release of energy and it actually allows them an exchange of energy. Moving allows students to express anxiety or express excitement, or just kind of check out for a minute, which I think is really important."

With the cost of higher education outpacing inflation, it will be a continuing balancing act for colleges to cope with aging infrastructure, new technology and

pedagogies, and meeting the heightened demands of students and their families. New design strategies can help improve the effectiveness of long-overlooked classroom space. Even new technology and furniture products alone can improve the learning opportunities in an existing space.

"Space is very good at supporting, communicating, and giving students the ideas that are inherent in the lesson that you're trying to teach," notes Doorley. But space is only part of the solution. Educators need to learn to use these new spaces, technologies, and teaching methods. As U of M's Dr. Ball points out, there are 4.5 million teachers in the U.S., across all grade levels. They are the largest occupational group in the country and key to the successful use of classroom space. "If you think we can make fundamental change in the way classrooms work without actually touching all the ways in which those people are prepared and supported in their work, it isn't going to happen." ○