



Teaching With **Technology**

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Over the years, I've had the pleasure of meeting many amazing teachers around the world. The kinds of teachers that a former student will rush up to and thank when they see them twenty years after graduation. The ones who worked tirelessly to connect with each student, and helped them dream bigger – and accomplish more – than they ever could have imagined.

It was their passion for helping students that inspired me to start a company dedicated to improving the educational experience. Our company's mission has always been ambitious: to transform the way the world learns. As someone who has spent the last seventeen years on the leading edge of learning technology, I have seen firsthand what teachers, professors, and academics at all levels of education can do when they have the right tools and support.

Every teacher has unique strategies to engage and inspire learners. We also need to remember that every learner is unique as well.

Every person has different needs and challenges to overcome in their pursuit of an education. Like a student who lives in a rural location and can't make the daily trek to campus. A mom who only has time for her coursework after her kids go to bed. Or a dyslexic student who struggles with traditional assignments and methods of assessment.

We believe every learner should have the same opportunity, with a personalized experience that meets their unique needs. Today, more than ever, I believe our mission is less about a single technology and more about anchoring all our work in finding new ways to help teachers reach every learner.

On behalf of everyone at D2L, we would like to celebrate teachers around the world who are working tirelessly to inspire every student, every day. Their efforts inspire our efforts, and – as always – we are committed to bringing them what they need to do what they do best.

John Baker
President & CEO
D2L

Introduction

Technology is ubiquitous in higher education teaching and learning – and changing all the time. Teaching with technology may or may not mean online education, may or may not be a complete course and may or may not be part of a traditional degree program.

The articles in this compilation explore a range of efforts at different kinds of colleges and universities to use technology to enhance the teaching and learning experience. There is no one model, but in many cases there may be ideas that can be applied at other institutions.

Inside Higher Ed will continue to cover these issues and welcomes your reactions to this booklet and your ideas for future coverage.

--The Editors
Inside Higher Ed

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'The Library Has Never Been More Important'

BY CARL STRAUMSHEIM

Arizona State, known for rejecting norms of traditional campuses, will invest more than \$100 million in its library, seeking to serve campus and a growing online student body.

Arizona State University will spend "well more than \$100 million" over the next few years to renovate and rethink its libraries, the clearest indication yet of how the library fits into the institution's plan for the public research university of the future.

The university later in 2017 plans to close the Hayden Library on its Tempe campus for a two-year renovation.

At the same time, the university will continue to work on expanding the library resources and services available to its roughly 26,000 degree-seeking online students and the hundreds of thousands more taking at least one class online from the university.

"The library has never been more important," President Michael M. Crow said in an interview. "The library turns out to be absolutely central to our logic of building our educational enterprise -- central in the sense that it is the tool which connects our students wherever they are."

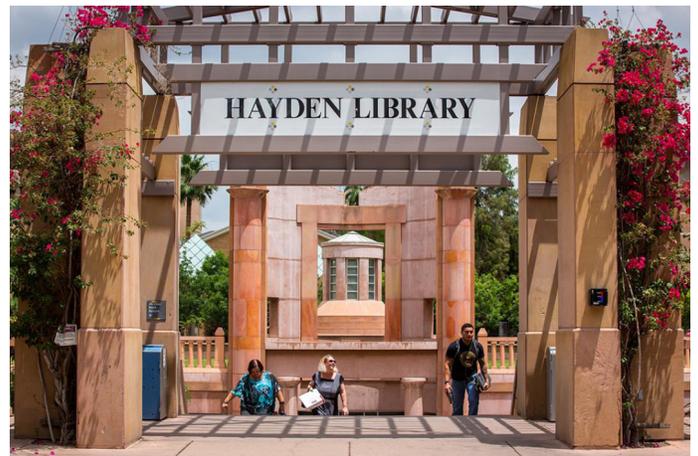
Plans for renovations have been in

the works for years, but now, Crow said, "We have the green light. We're moving ahead. And we don't move slowly."

Many other universities are reorganizing their libraries as they see an increase in the use of electronic resources and demand for cafes, multimedia classrooms, maker spaces, writing centers and other spaces devoted to teaching, learning and research.

ASU, which under Crow's leadership has relentlessly pursued an innovation agenda, joins their ranks to argue for the benefits of libraries at a time when federal funding is on the cutting block.

The university in October 2014 hired James J. O'Donnell, a classical scholar who previously served as provost at Georgetown University, to lead the university library through the reorganization process.



Arizona State University

In an interview, he said one of his priorities since taking the job has been to figure out what to do with the 4.5 million physical items in the library's collections.

"It's time to realize that all of our users are primarily online users of our collections," O'Donnell said. Reorganizing a university library around that concept "means changing your service model, your staffing structure and organization, and bringing in a bunch of new people," he said.

Some of those new people might

be embedded at EdPlus, ASU's innovation unit, or might work with instructional designers to embed library resources into course syllabi.

O'Donnell said he hopes to hire around 25 people, bringing the library staff up to about 200 people.

The university in 2016 received a \$50,000 [grant](#) from the Andrew W. Mellon Foundation to support that work. O'Donnell said he plans for the renovated library to highlight a "carefully chosen print collection." Its special collections feature prominently in those plans, as they will be moved from their current location "hidden away on the fourth floor" to the main floor, he said.

"We want it to be a place that says libraries are important because libraries have the good stuff," O'Donnell said. "Libraries have and manage access to the best-quality learning and research resources, and we have the wizards to help you find what you need. We can take you to lots and lots of places that the open internet just can't plain take you, and we can show you how to get there."

O'Donnell also said the library is considering a future in which it will feature smaller "thematic exhibits" with accompanying events on a rotating basis. One semester might be devoted to Italy; the next, sustainability.

The library is taking some cues from the retail world on how to design the rotating exhibits to invite visitors to attend and explore, O'Donnell said. The retail angle ex-

tends to how the library is talking about its operations.

The library will store the rest of its collections in off-site shelving on its Polytechnic campus, some 20 miles away from the Hayden Library. But librarians don't refer to the off-site shelving as "storage," he said. Instead, they are being encouraged by Crow to see it as a "fulfillment center," similar to those used by online retailers.

An informational [website](#) that the university set up to raise awareness about the library renovation completes the comparison to Amazon. It explains that books "will remain accessible to the ASU community through expedited delivery options similar to the Amazon Prime service."

"I'm hoping even that we can get to the point where we can have all the books on same-day delivery," Crow said, adding that the university is open to testing technologies such as delivery by drone in the future to make it possible.

Off-site storage has become a popular solution for university libraries looking to free up some space by removing stacks. Georgia Institute of Technology, for example, is [engaged](#) in its own library renovation project that involves moving virtually all of its physical books to a facility it shares with nearby Emory University (but keeping some as a "visual cue," administrators said in 2016).

Irene M. H. Herold, president of the Association of College & Research

Libraries, said in an interview that the trend of using off-site storage is one example of how the university library profession is changing.

"Our focus is where it has been all along," said Herold, university librarian at the University of Hawaii at Manoa.

"We're not just knowledge preservers and information-literacy, critical-thinking instructors. We're also engaged in knowledge creation. It's just that the knowledge that's being created is able to be accessed and shaped and shared in such different ways than in the past."

When it reopens in 2019, the Hayden Library will be a "comfortable, homey and welcoming" place that encourages and helps students succeed academically, O'Donnell said. The renovated building will ditch the traditional single entrance in favor of multiple points of access and egress and feature some food options to take advantage of its central location on campus.

O'Donnell expanded on his vision for the renovated building in an email.

"I want a building that is a showplace (a sign of ASU's academic and achievement) and a showcase (a place to make people aware of library treasures and resources and of the achievements of student and faculty partners) and a showroom (a place for users to go to find out about and road test and learn how to use information resources for best contribution to academic work and ambition)." ■

<https://www.insidehighered.com/news/2017/03/24/arizona-state-u-library-reorganization-plan-moves-ahead>



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A Sense of Belonging

BY CARL STRAUMSHEIM

Study finds completing a 10-minute activity at the beginning of a MOOC can lead to significantly improved outcomes for certain at-risk learners.

Assuring learners from less developed countries that they belong and encouraging them to share their core values can help them succeed in online courses, researchers at the Massachusetts Institute of Technology and Stanford University have found.

The [study](#), “Closing Global Achievement Gaps in MOOCs: Brief Interventions Address Social Identity Threat at Scale,” doesn’t focus on the structural challenges that keep those learners from finishing massive open online courses, such as insufficient English language skills or internet access. Instead it looks at what MOOC designers and instructors can do to create an environment in an online course that tells learners they are able to do well regardless of their background.

The findings, which suggest something as simple as a one-time, 10-minute exercise can double persistence and completion rates, joins

research that has found at-risk learners need additional support when studying online. This study, which was published in the Jan. 20 issue of *Science*, explores that concept on an international level.

“Social identity threat appears to be a barrier to performance in an international learning context, even an online environment with little social interaction,” the report reads. “Psychological and learning sciences can help turn an accessible educational experience into an equitable one.”

Millions of people have signed up for MOOCs since the beginning of the decade, but millions more have signed up and dropped out. Researchers have over the last several years begun to piece together what



makes learners persist, finding [certain characteristics](#) in learners that make them more likely to finish the courses (such as whether they complete an optional precourse survey), course delivery methods that keep learners engaged (short video lectures followed by quick assignments have emerged as a popular structure) and [behavioral tools](#) that limit procrastination.

Critics of MOOCs initially seized on their low completion rates, which have frequently dipped into the sin-

gle percentage points. MOOC providers and some researchers have pushed back against that argument, however, pointing out that there are bound to be many learners who drop out or never show up in the first place when registering is as simple as clicking a few buttons.

As MOOCs have evolved and researchers have learned more about who appears to benefit from them, a different line of criticism has emerged: MOOCs, despite the talk about “democratizing” education and bringing famous professors to all corners of the world, have in many cases attracted working professionals with advanced degrees.

“Judged by completion rates, MOOCs do not spread benefits equitably across global regions,” the report reads. “Rather, they reflect prevailing educational disparities between nations.”

The researchers, René F. Kizilcec, Andrew J. Saltarelli and Geoffrey L. Cohen of Stanford and Justin Reich of MIT, explored two ways instructors can boost morale among students who feel like they may not belong in an online course. In two experiments, random learners in two MOOCs were assigned to complete either a writing exercise

in which they reflected on their personal values and how they were connected to the course material, or a reading exercise that presented them with testimonials from previous learners who initially were unsure about whether they belonged in that course but grew more confident over time. Most learners finished the exercises in about 10 minutes.

Both exercises closed the persistence gaps between students from less and more developed countries, the researchers found. In the original experiment, conducted in 2014, learners from less developed countries (such as Egypt, India and Pakistan) who completed the exercises studied twice as much course material as those who didn’t, effectively doubling their persistence rates.

The researchers found the same effect in a 2015 replication experiment, which also looked at the impact on completion rates. Learners from less developed countries in the control group posted a completion rate of 17 percent, but the rate jumped to 28 percent and 41 percent for learners who completed the writing and reading exercises, respectively. The researchers used

the United Nations’ Human Development Index to determine whether to classify countries as less or more developed.

Curiously, the researchers found that the reading exercise had a negative effect on learners in more developed countries (such as Canada, the U.K. and the U.S.). Those learners posted a 23 percent completion rate, down nine percentage points from the control group.

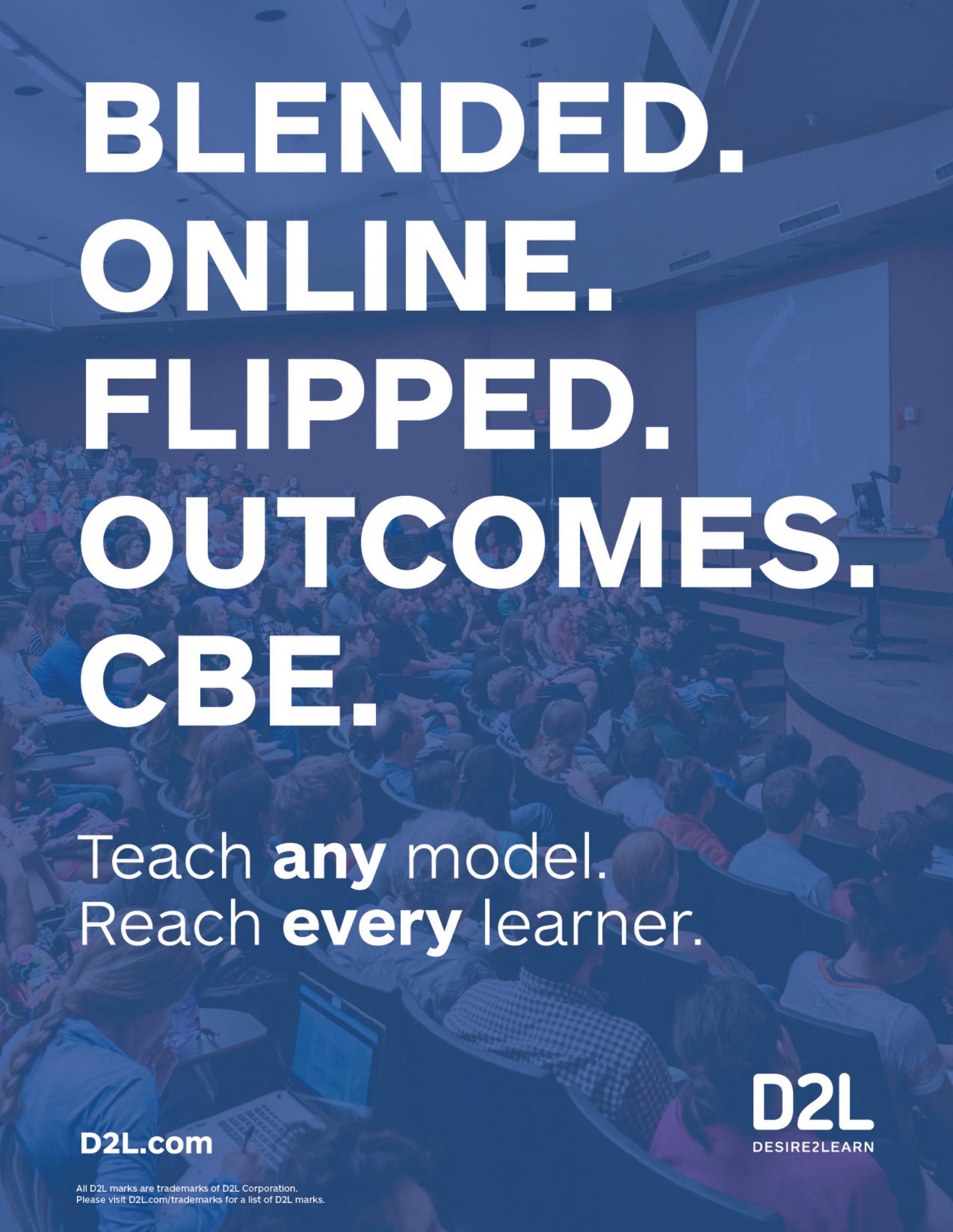
The researchers suggested heaping affirmation on students from more developed countries could actually make them less engaged, not more.

Kizilcec, lead author of the report, said the activities tested in the study go beyond simple “nudges,” which may influence short-term decision making but not change people’s behavior long term.

“The power of the psychological interventions in this study is that they target people’s construals and attributions, that is, how they interpret the situation and make sense of what is happening,” Kizilcec, who recently defended his dissertation at Stanford, wrote.

“This can have a profound and lasting impact on behavior and academic performance.” ■

<https://www.insidehighered.com/news/2017/01/20/study-finds-simple-interventions-can-help-certain-online-learners-persist>



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Trial and Error: Digital Case Studies

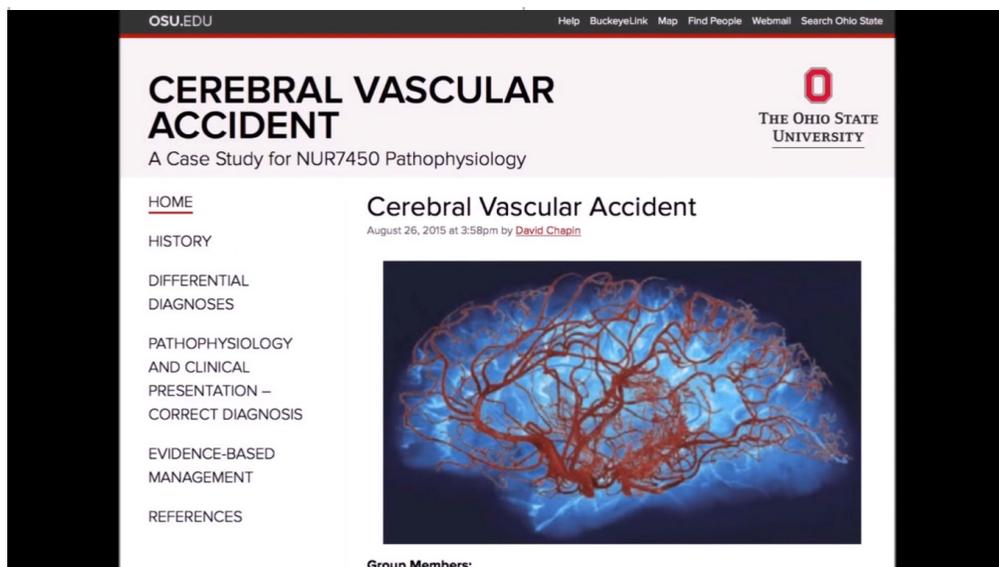
BY DOUG LEDERMAN

To better help students apply their knowledge, instructors in a core course at Ohio State's nursing program had students collaborate to create and present their own digital case studies.

Institution: Ohio State University

The Problem: As with many large core classes (especially in practical fields), Ohio State's pathophysiology course for advanced practice nursing students requires students to absorb a ton of information and learn to apply it in real-world settings (to "bridge the knowledge-practice gap," in the parlance of the field). Requiring students to work through case studies is a much better way to get them to apply knowledge than multiple-choice assessments are -- but in a course that nearly doubled in size to more than 200 students, in-person and online, instructors struggled to develop case studies on enough topics and to engage students sufficiently deeply in the work.

The Goal: Inject digital case studies into the curriculum in ways that made students creators rather than just absorbers of knowledge. "This material can be very dry, and after a while, you can be the best lecturer and still not be able to retain students' interest," says Jodi



A case study from Ohio State's pathophysiology course

McDaniel, associate professor of nursing and the pathophysiology instructor.

The Experiment: McDaniel took a first stab at introducing case studies in 2014, when she and a course associate created a handful of case studies in Softchalk and had groups of students analyze them to diagnose the "patients," prepare annotated bibliographies about the conditions, and the like.

In 2015, the instructional designer,

Joni Tornwall, suggested to McDaniel that they respond to the isolation that set in as class size grew (to 230) by having groups of students develop their own studies. "We had these great case studies, but we needed more, so we thought we'd turn the students into creators rather than consumers," Tornwall says. "Having them do more of the work means they learn more and we put less strain on the instructors."

Students divided into groups by

using Google Docs to choose from a series of what McDaniel described as “common diseases they would normally see in the field.” Using the instructor-created studies as models, the students created and presented their own case studies in the course blog on Wordpress, incorporated feedback that fellow students offered on their presentations into the case studies, and then submitted final versions at the end of the semester. Students in the online sections of the course created their presentations digitally in Voicethread rather than presenting in class.

What Worked (and Why):

The process forced students to think about the content in an entirely different way. For instance, in analyzing an existing case study, a nursing student might look at the symptoms and figure out which three diagnoses might make sense, and then which is likeliest. Creating their own case studies (and making up the patients out of whole cloth) instead forced students to “be more



creative to work backwards to come up with what other diagnoses would have to be ruled out” to come up with the chosen diagnosis, one student explained in her course review.

What Didn't (and Why): With roughly 50 case studies, grading was a challenge for the instructors, who tried to limit that burden by letting students peer review each others' studies after they were presented. But McDaniel says that the way they designed the peer component made it difficult to assess students' contributions to the peer review process.

Next Steps: Enrollment in the course ballooned to nearly 260 last fall, and the instructors dropped the case study element because they feared it would be unmanageable at that size, replacing them with more multiple-choice quizzes. Students didn't like the change, saying the quizzes helped them learn, but not apply, the material. “Now we have the evidence that we really need to bring [the case studies] back,” said Tornwall.

The course will be offered again next fall, and the instructors are planning a series of changes to improve the course's delivery. Ohio State's new Canvas learning management system includes an automated peer review system that the instructors hope will ease the grading burden. And all students are expected to do their presentations online, rather than in-class. “The virtual presentations through Voicethread,” Tornwall says, “are far more engaging than listening to somebody read a Powerpoint.” ■

<https://www.insidehighered.com/digital-learning/article/2017/02/13/trial-and-error-using-digital-case-studies-help-nursing-students>

'Access Moves': How One Instructor Seeks Accessibility

BY CARL STRAUMSHEIM

Issues are being brought to the forefront as education becomes more digital. Inside Higher Ed profiles a Ph.D. student as she designs her first online course.

How can an instructor design an online course so as many students as possible can benefit from it?

Jessie Male is about to find out. Male, 33, is a Ph.D. student in English at Ohio State University, and she's preparing to teach her first online course. But first, she has to create it.

The course in question is an introductory disability studies course, of which she is teaching a version (English 2277: Introduction to Disability Studies) on campus this semester. Male met with an educational technologist in her department Feb. 23 to discuss the work required to offer the course online.

She is now undertaking the bulk of that work: adapting the syllabus to fit an online setting. Beyond that lie administrative hurdles, including gaining the approval of several faculty committees in order to put the course on the calendar for this fall, or perhaps next spring.

Over the course of several interviews with *Inside Higher Ed*, Male spoke about her approach to course design and how her personal background influences the way she views accessibility issues.

During the interviews, Male spoke about "access moves" -- design choices that increase accessibility to education. Captioning a video lecture is an access move, for example. So is allowing students to revise and resubmit their work, offering students a choice of format to submit their work for their assignments, reducing the cost of course materials, and -- to some extent -- teaching a course online.

"It's interesting to think about establishing an online space of its own as a movement toward accessibility, but it doesn't necessarily become an accessible space unless there are very clear moves that are made to make it as such," she said.

Broadly speaking, Male said, she is pursuing a vision of universal design, an architectural concept that has since made it to education. For Male, universal design means designing a course to work for everyone -- students with disabilities, students whose career or personal obligations prevent them from studying in person, students with anxiety, students taking a semester abroad, students who prefer reading a transcript over watching a lecture



JESSIE MALE

video -- everyone.

"I am very interested in ideas of universal design and not only building an online curriculum specifically for students with disabilities, but for students who might not be able to access an on-site education space for an array of reasons, whether it's child care, temporary illness, disability or any other circumstance," Male said. "It's interesting to think about how many different students can be further accommodated by an online curriculum."

Male also stressed that her approach to online education is one of many, and that she does not believe

hers is necessarily the ideal way to design an online course. She has yet to finalize the syllabus, and she acknowledged that issues related to course materials and student services for now remain unresolved.

"I'm in the process of learning and discovering," she said.

Male is not alone. Many faculty members -- and indeed entire institutions -- are struggling with making education accessible to people with disabilities. In February 2017, the University of California at Berkeley [said](#) it would cut off public access to video and audio content after a U.S. Department of Justice investigation found it inaccessible to people with disabilities.

Inside Higher Ed will follow Male throughout the process, from the design phase to the classroom and beyond.

Boilerplate Language No More

For Male, the project -- and her specialization in disability studies -- has a personal angle. Both her mother and aunt contracted polio in the 1950s, and they both have post-polio syndrome, a condition where symptoms such as pain and muscle weakness re-emerge years after infection. Her aunt uses a wheelchair for mobility.

"It's something that definitely impacts the family as well and their identities as women with disabilities," Male said. "That's absolutely informed my life, the way I teach, my scholarship."

A glance at Male's syllabus (click on the thumbnail to read it) reveals

one way it differs from many others. The first section students see (after Male's contact information and where and when the course is offered) is dedicated to accommodating students with disabilities.

Much of the syllabus was written by Margaret Price, associate professor of English and coordinator of the disability studies program at Ohio State. Male has made her own changes to suit her way of teaching.

Following the boilerplate language directing students to the university's Office of Student Life Disability Services, Price added some additional language, which Male decided to keep:

I assume that all of us learn in different ways, and that the organization of any course will accommodate each student differently. For example, you may prefer to process information by speaking and listening, or you might prefer to articulate ideas via email or discussion board. Please talk to me as soon as you can about your individual learning needs and how this course can best accommodate them.

Rather than tuck that and other information the university requires faculty members to include in their syllabi toward the end of the document, Male said the placement sends a message to students.

"This is an 11-page syllabus," she said. "By highlighting it at the top of a syllabus, you're saying to students that accessibility, accommodation, support is highly valued in this space -- and these are the resources that you need."

Male said students in previous classes have seen the language as an invitation to disclose a learning disability or express a preference to learn in a specific way.

"I'm not demanding any level of disclosure, but I'm saying in order for you to be successful and for you to achieve anything you want from this class, it would be very helpful for me to have an idea how you best learn," she said.

Other required language, which in many face-to-face courses could have been copied and pasted without a second thought, is proving more difficult to change so that it fits an online course.

For example, Male's syllabus includes a section about the academic and personal resources available to students, among them the university's writing center and counseling services. But those resources are first and foremost intended for students on campus. At the moment, Male said, she isn't sure how to extend those services to cover online students.

"This is also why the syllabus design is a very lengthy process that's lengthy for a reason," she said. "These questions will come up as you adapt."

Changing Grades

In the face-to-face version of the disability studies course, students are graded on a 100-point scale. Their final grade is based on their performance in four short assignments (including an introductory exercise, a captioning exercise, a documentary analysis and a final

reflection) worth 30 points; a group accessibility audit, 15 points; participation, 15 points; note taking, 10 points; an artifact presentation, 5 points; and a final project, 25 points.

Not all of those assignments will be included in the online version of the course, Male said.

The note-taking exercise is out -- no need to take notes when lectures are delivered in the form of a video with its own transcript, she said.

The assignment is an attempt to help students take ownership of their own education, she explained. Instead of a student who missed class emailing her to ask what he or she missed, Male assigns a student to take extensive "collaborative" notes from one lecture. The student has to make sure to identify important questions discussed during that lecture and define relevant concepts, then make the notes available on the class's learning management system.

"I really can't imagine how to replicate the kind of goals that I have for the collaborative notes and apply them to an online space," Male said. She added that she will probably add one more short assignment in its place.

While the course is housed in the English department, it is not writing intensive, Male said. Students are free to turn in assignments in the form of video or audio (as long as they provide captions, of course).

Students also have options for how they can satisfy the class participation requirement. The syllabus makes it clear that students who

don't feel comfortable raising their hand can participate "through email correspondence, discussion board, office meetings or short response papers." That means finding out how to grade class participation won't be an issue once she begins teaching online.

Participating in class discussions online counts just as much as in person, Male said. "Why wouldn't it? They're engaging with the materials. They're asking questions. They're responding to each other."

She added, "When I first started teaching ... I made a lot of assumptions about what participation was. I assumed it was the way I participated as a college student -- raising my hand, being active in conversations, providing my perspective or opinion, arguing with my classmates, etc. -- really asserting myself as an active presence vocally. That's not the way lots of students want to communicate or [that] is best for them to communicate."

The artifact presentation and group accessibility audits will also make the jump to online, although in a slightly tweaked forms. The first -- a five-minute presentation during which students talk about anything from an anecdote to a Facebook video related to disability -- will be handled as discussion threads on the online messaging board.

"It no longer becomes a launch pad for discussion, but instead becomes an opportunity for students to be engaging with the outside world and applying it to the questions we're asking in those original

course objectives," Male said.

And the group accessibility audit -- where students examine a physical or digital space of their own choosing and evaluate how accessible it is -- will lose the group part. Working with other students will be optional, since students will likely be much more spread out than those taking the course on campus.

"Again, we're thinking about different ways of accessibility and accountability," Male said.

How (and When) to Communicate

While Male may have determined how she will evaluate participation in an online course, she is prepared that the ways in which she communicates with students will change.

First of all, there will be more of them. Prior to this semester, the largest course Male ever taught enrolled 24 students. She currently has 44 students in the face-to-face disability studies course. The online version of that course will also seat 45.

"You're going to find other outlets to foster relationships with your students," Male said. Then, with a laugh, she added, "It's a little bit like [the ABC reality dating show] The Bachelor. You have to find some way of establishing yourself as a person in this space. There are all these 'contestants' [read: students]. What's going to make you stand out?"

On campus, Male offers office hours. Online, she will offer video-conferencing hours to give students some semblance of face-to-face time. But she said she will enforce

a window of time for students to connect online -- if that window doesn't work, students themselves are responsible for emailing her to suggest a different time.

In addition to email and videoconferencing, Male will be active on the discussion board. She is also considering a mandatory midsemester check-in, meaning she will have connected one-on-one with each student at least once during the course.

Feedback -- both her own and peer grading -- will be handled in more or less the same way it is in the face-to-face course: through the learning management system.

In other words, even though a fully online course gives students more flexibility to decide when they want to study, Male is not creating an expectation that she will be available around the clock.

"I believe in protecting myself and my time," Male said. "I apply that to face-to-face spaces as well. I tell my students, 'These are my office hours. If they don't work for you, please email me."

We'll set up an alternative time.' I don't check emails on weekends. The labor involved in being a professor is exhausting, and it can be all encompassing if you let it."

Access to Course Materials

Access to course materials has

[been at the center of lawsuits](#) against colleges and universities across the country. Some organizations that advocate for the rights of people for disabilities, such as the National Federation of the Blind, are lobbying Congress to pass the Accessible Instructional Materials in Higher Education (AIM-HE) Act, which is intended to help develop guidelines for accessible course materials.

Male said the purpose of her course is to give students a "taste" of disability studies. Therefore, all the readings in her class are available for free online.

"That's also a question of access," she said. "I don't want to assume that a student can pay \$50 for a disability studies textbook."

The course also includes several films, and Male said she refuses to assign one unless she can find robust captions -- not automatically generated ones.

If there are students in her class who are working with the Office of Student Life Disability Services -- for example if they use screen readers or need physical textbooks -- she will be notified weeks in advance. But that is not a perfect system, Male acknowledged.

"That's rooted in the assumption that all students are working with disability services, which is not the

case, and I would assume not the case when students are taking online classes," she said.

The introductory exercise, the first assignment in the class, presents another opportunity for students to talk about how they learn best and share accommodation requests, if any.

But that still attempts to address issues after the fact rather than tackle them before class starts, Male said.

"That's something I want to avoid -- the waiting to say, 'This is what I need' -- and move toward a space of universal design and pre-emptively thinking there are students who learn in different ways," she said. "How can I present [information] visually, textually, as audio? Those are modalities I as an educator am still very much learning and working through and evolving."

Despite the many changes needed to teach the course online, the course objectives and desired outcomes will remain the same no matter how the class is taught, Male said.

"These objectives to me would not be successful if they could not translate over multiple platforms," Male said. "That's part of accessibility and universal design -- that there are multiple modalities of design and leaning." ■

The 'Computerless' Computer Lab

BY CARL STRAUMSHEIM

After realizing virtually all students bring their own laptops to campus, Wisconsin liberal arts college opened an unorthodox computer lab.

Colleges were once the place where many students encountered their first computer -- and back then, the computer took up an entire room. Now, with computing power in every student's book bag and pocket, some colleges are finding the standard computer lab is no longer needed.

St. Norbert College is one such example. The private Roman Catholic liberal arts college, located in De Pere, Wis., in 2015 finished a complete renovation of its Gehl-Mulva Science Center. The last phase of the project included plans for a computer lab, but with the college about to phase in a bring-your-own-device (BYOD) policy -- requiring that all students bring their own laptops to campus -- filling that lab with desktop computers didn't seem to make sense, said Krissy Lukens, the college's director of academic technology.

"We had been noticing that students were beginning to use their own computers more," Lukens said in an interview. "Even in their computer science classes, about half of

the students would bring in their own computers."

As it turned out, the number of students bringing their own devices to campus was higher than that anecdote would suggest, Lukens said. In fact, a full 98 percent of students were using their own laptops, the college found. Making laptop ownership a requirement meant students could use their financial aid funds to pay for computers (though the college also started a laptop scholarship program to cover the last few laptopless students).

The growing use of personal computers and, more recently, smart devices is changing how colleges offer IT services. Without having to acquire and maintain desktop computers, college IT offices are free to move those resources around and change their priorities.

That can come as a much-needed



Students work in St. Norbert College's "computerless" computer lab.

windfall. According to the Campus Computing Survey, which tracks IT trends in higher education, nearly two-thirds of the chief information officers and senior IT leaders surveyed this fall said their offices' budgets have yet to recover from the financial crisis and the subsequent recession. About one-third said they began the academic year in fall 2016 with less funding than last year.

Not all colleges are able to require students to bring their own devices to campus, however. At colleges

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that serve mostly low-income students, for example, a laptop requirement adds an additional financial burden. It also poses challenges for colleges themselves, as their networking infrastructure has to handle the crush of extra traffic.

In St. Norbert's case, the college was able to turn one of its many lecture halls into both offices and the new computer lab. As the before-and-after pictures show, the renovation left the new space virtually unrecognizable. The drab concrete cavern, complete with a leaky roof ("It was awful," said David C. Pankratz, associate professor of computer science), was replaced by a more communal space, with tables for small groups of students to work together, plug in their devices and display their work on large monitors, as well as movable lounge chairs, personal dry-erase boards and -- crucially -- a healthy supply of candy.

Faculty members in the computer science department said they were able to influence the renovation process, including sharing thoughts on the general layout of the room and more specific wishes, such as the size of the monitors.

Since the idea behind the lab was for students to bring and use their own laptops, the faculty members said they focused specifically on creating a room that would give stu-

dents space to work with one another and for instructors to view that work without invading students' personal space.

Bonita M. McVey, associate professor of computer science, said in an interview that there are some drawbacks to students bringing their own laptops to the computer lab -- lack of common configuration being one of them (though the college offers a virtual desktop environment that anyone can log in to for a more standardized experience). And while many students carry multiple devices with them -- laptops, tablets and smartphones -- she said computer science needs to be done on larger surfaces than can fit in a student's pocket.

"Students can work from anywhere now," McVey said. "What's cool is that students choose to come to the lab."

Since this is only the second year the computer science faculty members are using the lab, they could not say whether it has had an impact on the way they teach.

Unlike the room it replaced, the lab isn't being used for lecturing, though



Renovation of the new space virtually unrecognizable

Pankratz said he will occasionally schedule classes to meet in the lab rather than the lecture hall if he feels that students need hands-on time with the subject matter.

Similarly, McVey said she likes using the lab as a space where students can show off their work. In that setting, students use the tables and their monitors to host poster sessions.

But both McVey and Pankratz said the main benefit of the new computer lab isn't the technology it contains, but rather what it means for computer science majors at the college. "We're really happy that our students have a place to call home," McVey said. "It has mattered greatly to us -- people feeling comfortable and feeling like they belong in the major." ■

<https://www.insidehighered.com/news/2016/12/05/st-norbert-colleges-computerless-computer-lab-shows-impact-byod-higher-ed>

Become a Doctor, No Lectures Required

BY CARL STRAUMSHEIM

University of Vermont's College of Medicine announces it will get rid of lecture courses and completely reshape the faculty role -- a first for a traditional medical school.

Four years after two senior academics at Stanford University challenged medical schools to stop lecturing and start flipping their classrooms, major reforms are underway at a handful of colleges to change the way they teach medicine.

The University of Vermont in the fall of 2016 became the most recent institution to join the trend, announcing a pedagogical reform in its College of Medicine that observers say is the most sweeping yet. The college will over the next several years remove all lecture courses, replacing them with videos students watch on their own time. And instead of sitting through lectures, students will meet in "active learning" classrooms, led by faculty members, working with their classmates in small groups.

"We teach evidence-based medicine all the time," William Jeffries, senior associate dean for medical education at UVM, said in an interview. "If you have the evidence to show one treatment is better than



An instructor at the U. of Vermont Robert Larner, M.D. College of Medicine teaches in an 'active classroom.'

the other, you would naturally use that treatment. So if we know that there are methods superior to lecturing, why are we lecturing at all?"

The approach builds on experiments at Stanford, which has [worked with Khan Academy](#) to test a flipped classroom model in certain medicine courses. Other institutions have taken that model a step further. The Touro College of

Osteopathic Medicine in New York, for example, has since the 2012-13 academic offered an entirely flipped curriculum.

UVM's announcement, however, marks the first time a member of the Association of American Medical Colleges has declared it will abolish lectures across all its programs, Lisa Howley, the organization's senior director of educational

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affairs, said in an interview.

“What we know about learning in general is different than it was decades ago,” Howley said. “Our medical students are of a generation that has grown up differently when it comes to technology and the impact that has on their ability to receive and retain information.”

But moving away from how medical schools have trained new physicians for centuries is no easy task. Major curricular changes could jeopardize the schools’ regional and professional accreditation statuses, repel prospective students, offend alumni donors and alienate some faculty members, to mention just a few.

The most pressing concern, Jeffries said, is also the simplest: money. “Most schools do not have the resources to ‘turn the battleship around,’” he said.

UVM will put a \$66 million gift, announced in September 2016, toward building renovating classrooms and retraining faculty members. It has also renamed its College of Medicine in honor of the donor, alumnus and retired physician Robert Lerner.

The college will spend part of the gift on expanding its [Teaching Academy](#). Faculty members in the College of Medicine join the academy for three- to five-year periods, during which they are mentored by

more experienced instructors, attend conferences and workshops, and complete self-paced courses, among other activities.

The overarching goal of the academy, Jeffries said, is to help faculty members discover teaching methods that can be as rewarding -- if not more so -- than lecturing.

“That internal oomph or dopamine release that you get when you lecture and are the center of attention is a barrier to converting faculty over,” Jeffries said. “What we need to do is ensure they have the time and support to develop alternative ways of teaching.”

The most powerful tool the med school has to win faculty members over is that they are “scientists at heart” and “understand the evidence” suggesting students in flipped classrooms perform better than students in lecture courses, Jeffries said. At Touro, for example, the pass rate on an important licensing exam has climbed to above 95 percent -- higher than the national average -- since the college flipped its curriculum.

About 80 faculty members joined the Vermont academy when it first opened, but the College of Medicine has a long way to go before the faculty is prepared to teach in the new classrooms. The med school has more than 700 faculty members in

total.

The transition to an all-flipped model at UVM has already begun, and the university plans to complete it by 2022, Jeffries said. Lecture courses now make up a minority of the college’s foundational curriculum -- about 40 percent, down from 50 percent two years ago. The first semester courses have already been redesigned into a series of connected components, and the college plans to pour over data collected from them during a curricular retreat in February, where administrators and faculty members will produce a strategic five-year plan.

There are some major unanswered questions facing UVM, including what an education at the college will look like in 2022, how much time students will spend in the classroom and how faculty members will respond to their roles changing from lecturing to facilitating.

Jeffries said he expects some of those details will be settled during the February retreat, while other pieces will fall into place as the medical school transitions away from lectures.

“A lot of this is a great unknown to us,” Jeffries said. “We are starting an evolutionary process in making this initial commitment ... to formulate a new model.” ■

<https://www.insidehighered.com/news/2016/09/26/u-vermont-medical-school-get-rid-all-lecture-courses>

'First Step' Toward More Digital Undergrad Experience

By CARL STRAUMSHEIM

Georgia Tech, having enrolled thousands of students in its well-regarded online master's degree program in computer science, expands its experiments with low-cost online education for undergraduates.

The Georgia Institute of Technology is expanding its model of low-cost online computer science education to undergraduates.

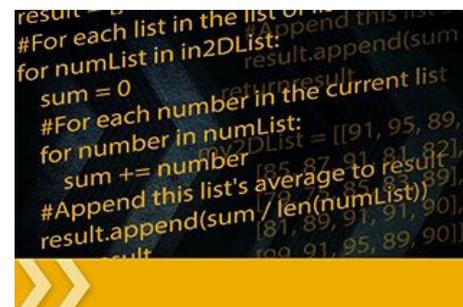
The institute in November 2016 said it has partnered with massive open online course provider edX and McGraw-Hill Education to offer a fully online introductory coding course. Initially, the course will be available to anyone as a MOOC with an optional \$99 identity-verified certificate. After piloting the course in the spring of 2017 among its own students, Georgia Tech intends to offer another incentive for completion: college credit.

Georgia Tech has since 2014 offered a low-cost online master's degree program in computer science, in which course content is delivered through MOOCs. That program now has nearly 4,000 students, and the institute is looking for opportunities to test the model elsewhere, said

Zvi Galil, the John P. Imlay Jr. Dean of Computing. Early reviews of the program have given it high marks for rigor, and experts on online education has been watching it closely.

Unlike at the master's degree level, Georgia Tech is not considering creating a fully online undergraduate degree in computer science, Galil said. Instead, the institute plans to use the pilot as the first careful move toward a future where students spend less time on campus -- perhaps two to three years -- completing introductory and senior-level courses while in high school or pursuing a career, respectively.

"I still think that the on-campus program and living, learning, maturing socially and otherwise getting out of home -- all these aspects -- make college very important," Galil said. "I'm not a big proponent of replacing the college. I'm a proponent of substituting some pieces that



will be maybe 20-25 percent of the college degree. That is a dream, and it may take time. We are now doing the first step."

That first step involves offering an online section of the course (as well as several face-to-face ones) to its residential students in the spring, Galil said. Enrollment in the online section will be voluntary -- students can even change their minds and move to a different section during the first week -- and Georgia Tech expects to accept about 50 students. At the end of the semester, researchers will look at student out-

comes in all sections and determine if -- like in the online and residential master's degree programs -- the results are comparable.

If the answer to that question is yes, only then will Georgia Tech decide how to proceed with fully online education for undergraduates, Galil said.

The pilot could, for example, reveal that the course is best suited as a complement to Advanced Placement credit, or perhaps as a continuing education credential for computer science professionals to demonstrate their mastery of basic skills.

Galil informed the faculty about the pilot during an Oct. 12 meeting, a faculty member in the College of Computing said in an email. Faculty members did not hold a vote on whether to approve the pilot, as they were told it was "[Galil's] decision and his implementation," according to the faculty member. Any larger expansion plans would have to be approved by the faculty, however.

Georgia Tech is not the first institution to consider a future where students spend less time on campus. The Massachusetts Institute of Technology, which co-founded

edX, is also [exploring](#) if freshman and senior years could be delivered through online education.

While Tuesday's announcement stated that credit will only be available to students who are admitted to Georgia Tech, the institute has plans to award credit generally to students who finish the course, Galil said.

While Georgia Tech has partnered with Udacity, another online education provider, for the master's degree program, it chose to distribute the undergraduate course through edX. Galil pointed out that the institute prefers to collaborate with a broad set of partners, and that it also offers online courses on Coursera.

The partnership is also an opportunity for McGraw-Hill Education to further rebrand itself away from simply being a textbook publisher. In this case, the company, which promotes itself as being in the business of "learning science," isn't supplying any course material, but rather the learning platform. The company also provided some instructional design help to Georgia Tech to build a SmartBook, an enhanced, digital textbook that will be

used in the course.

"As a business, we're trying to emerge as something very different, and we think we can play a very relevant part supporting the new architecture of higher education," David Levin, president and CEO of McGraw-Hill Education, said in an interview.

The company already has software licensing deals in place with Arizona State University and the Cleveland Clinic medical center (though in those examples, the clients use some of the company's content as well).

Levin said those deals represent an "emerging new business model" for the company.

Levin declined to share details about the licensing deal, but said students who use the company's digital course materials on average pay half the cost of a physical textbook. The SmartBook will be free of charge to students in the spring pilot, Galil said.

"The models have to change for the provision of instructional materials," Levin said. "It has to move beyond selling pure content to being part of the course and course development." ■

<https://www.insidehighered.com/news/2016/11/02/georgia-institute-technology-award-credit-through-massive-open-online-course>

MIT's New Model

BY CARL STRAUMSHEIM

Massachusetts Institute of Technology will explore stackable credentials and massive open online courses as an alternative path to earning a master's degree.

The Massachusetts Institute of Technology has launched the first of what could be several pilots to determine if pieces of what it has provided face-to-face can be delivered through massive open online courses.

The institute in late 2015 announced an alternative path for students to enroll in its supply chain management program and earn a master's of engineering in logistics degree. Instead of students being required to move to Cambridge, Mass., for the duration of the 10-month program, MIT will offer half of the program through MOOCs, saving students tens of thousands of dollars in tuition.

Learners who complete the MOOCs but can't afford or simply aren't interested in finishing the degree won't walk away empty-handed. MIT will offer those learners a new microcredential, called a Micro-Master's, and is working with other organizations that offer supply

chain management programs to ensure they will accept the credential toward degree completion.

MIT has for years expressed an interest in using MOOCs and other technologies to cut down on the time students spend on campus. In a [2013 report](#) on the future of MIT, a task force urged the institute to explore new models of education and "take advantage of ... disruptions rather than ignoring them."

In an interview with *Inside Higher Ed*, MIT President L. Rafael Reif echoed that conclusion. "I'd rather we disrupt ourselves than be disrupted by somebody else," he said.

By letting students complete their first semester through MOOCs, MIT is effectively offering a "try before you buy" promotion. The institute calls this inverted admissions -- taking courses and then applying, as opposed to the traditional other way around.

MIT is the latest institution to use low-cost MOOCs as a step-



ping-stone to a degree. Earlier this fall, edX and Arizona State University launched [Global Freshman Academy](#), which offers students an opportunity to enroll in a MOOC, complete course requirements and -- if they are satisfied with their performance -- pay the university to receive credit.

The University of Illinois at Urbana-Champaign has used a similar model for its [iMBA program](#), which allows students to complete much

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of the curriculum before deciding whether or not to apply to the university's College of Business and pursue the full M.B.A. degree.

George Siemens, a MOOC researcher who leads the Learning Innovation and Networked Knowledge Research Lab at the University of Texas at Arlington, said those examples suggest the institutions are showing a willingness to remake themselves.

"We are finally starting to see that process unfolding now as universities are responding to trends in technology and society broadly," Siemens said in an email.

"What has been called disruption -- [competency-based education], boot camps and so on -- will be appropriated by universities. This is the start."

Richard DeMillo, the Charlotte B. and Roger C. Warren Chair of Computing at the Georgia Institute of Technology, said the MicroMaster's path is "yet another indication that the old models [of higher education] are vulnerable." (Georgia Tech is already well underway with its own [MOOC-powered degree program](#).)

"My guess is that once learners find out that this is a better, more effective learning experience, they will come pouring in," DeMillo said in an email.

MIT will offer the first MOOC start-

ing in February. Since it will take some time for the institute to convert all five of the courses offered during the first semester of the program into MOOCs, the first cohort is unlikely to graduate before June 2018, Reif said.

MIT may launch similar pilots in other programs in the coming years, Reif said. Before the institute makes a final decision about whether or not to expand the model, "it would be great to see at least once class graduate, if not two," he said.

The pilot will hopefully provide MIT with answers to questions about admissions, course quality and

“

If it goes well, I do expect that the faculty at MIT would want to expand this program. If there are many, many, many more people who prefer to try out the program [online] ... that's what we'll gravitate toward, inevitably.”

”

need-based financial aid, Reif said. He was unable to say specifically how MIT will ensure learners who complete the MOOCs will quickly be evaluated for admission into the residential program, but suggested learners may be able to announce their intent at an early stage and complete the paperwork before finishing the last MOOC.

MIT's [website](#) states learners who "do exceptionally well" in both the MOOCs and proctored exams will "significantly enhance their chances of being accepted to the full mas-

ter's program."

The institute is also searching for corporate partners that would be willing to offer financial aid. MIT expects many of those who choose the MicroMaster's path to come from outside the U.S., meaning they will not be eligible for federal aid. Those students will only pay about half of the \$65,446 students in the residential program pay for tuition, but a semester priced at more than \$30,000 could be a significant barrier.

Although MIT hopes the MicroMaster's path will increase access to the supply chain management

program, the expansion will also come with increased costs for the institution, as it may have to accommodate the program doubling in size. The residential program,

which MIT will continue to offer for the time being, normally enrolls about 30 to 40 students, Reif said.

MIT plans to track student performance and if students on the MicroMaster's path receive comparable job offers as residential students during the pilot, Reif said.

"If it goes well, I do expect that the faculty at MIT would want to expand this program," Reif said. "If there are many, many, many more people who prefer to try out the program [online] ... that's what we'll gravitate toward, inevitably." ■

<https://www.insidehighered.com/news/2015/10/08/massachusetts-institute-technology-launch-half-mooc-half-person-masters-degree>

'Dream Big, Start Small'

BY CARL STRAUMSHEIM

The University of Illinois's iMBA program offers encouraging news about the viability of graduate degrees built on MOOCs.

Less than a year after the University of Illinois at Urbana-Champaign's M.B.A.-through-MOOCs program launched, its College of Business says it is seeing the contours of a model it can use to promote the university abroad, enroll previously untapped groups of students and attract corporate partners.

Since launching in January 2016, the roughly \$22,000 online program, called the iMBA, has brought 270 new degree-seeking and tuition-paying students to the college. Another 80 are paying to take individual courses, priced at about \$1,000 each. The college has also seen more than 950,000 people sign up for free versions of the courses, which have been offered on Coursera, a massive open online course platform, for 18 months. About 27,000 of them have paid a fee to receive an identity-verified certificate (see more information about the program here).

The college has previously de-

scribed the iMBA program and its four configurations as "Lego blocks" that build on one another. Most of the content is delivered through the Coursera MOOCs, but credit-seeking students -- who need to apply and be admitted to the college -- can access additional case studies and assessments through the university's content management system.

"We are beyond excited," Rajagopal Echambadi, the college's senior associate dean of M.B.A. programs and strategic innovation, said about the enrollment numbers. "We seem to have tapped into a market where people were completely underserved."

The college had expected to enroll fewer degree-seeking students



-- about 200 -- and up to 300 students taking individual courses. But combined with the interest in the free MOOCs, the numbers have surpassed the expectations of the university, which Echambadi said is redefining itself "as being in the education business and not exclusively in the degree business."

The iMBA is one of a handful of programs that use the scale of MOOCs to both find new students and teach more of them than can fit in a residential program. The Georgia Institute of Technology's low-cost online master's degree in computer science, created in partnership with the online education provider Udacity, is another early and prominent example. The program launched in 2014, and UIUC cited it as one of the main influences guiding the development of the iMBA program.

Graduate degrees that use MOOCs appear to be close to an inflection point. MOOC provider edX has announced that more than a dozen of its partner universities around the world would participate in an expansion of its MicroMasters program, bringing 19 new programs to the marketplace. The programs allow students to finish between one-quarter to half of the curriculum through MOOCs before transferring to the residential program.

The demographic makeup of the cohorts UIUC has recruited for the iMBA so far suggests the program appeals to students not served by the college's other M.B.A. programs, Echambadi said. The college doesn't

offer a separate online M.B.A. program, but runs three residential programs: an executive program that draws exclusively from Chicago and central Illinois, a professional program that attracts students living in the Champaign-Urbana metropolitan area, and a full-time program in which half of the students come from the Midwest, half from other regions.

The full-time program usually has a small group of international students from between eight and 10 countries, Echambadi said.

The people who applied as degree-seeking students to the iMBA program are the most diverse group of applicants the college has seen -- at least based on national origin. The college received more than 1,100 applications, and although 82.5 percent of them came from people based in the U.S., the international applicants represented a greater variety of countries than applicants to the college's other M.B.A. programs -- about 50, Echambadi said.

The demographics also reveal areas where the college needs to improve, Echambadi said. Gender is one of them. The typical student admitted to the iMBA program is a 37-year-old man with 12 years of work experience (three times as much as the average student in the full-time program). Women make up only 26 percent of the 270 students admitted.

"We thought by virtue of being flexible and convenient that we'd have larger numbers [of women],"

Echambadi said. "We are not there yet."

The gender gap resembles what Georgia Tech experienced when it admitted its first cohort to the computer science program. While men in the residential program at the time outnumbered women by a three-to-one margin, the gap widened to nine to one among the first 401 students admitted to the online program.

Carol Aslanian, president and founder of Aslanian Market Research, said in an interview that she was "stumped" by the gender disparity, calling it "totally out of line" with national numbers. While computer science is a traditionally male-dominated field, data collected by the firm suggest that women are overrepresented in online graduate business degree programs, 60 to 40 percent.

Aslanian said she could not point to a clear reason why women are showing less interest in the iMBA program, but speculated UIUC's marketing efforts, the cohort model or the experimental nature of the program could be less attractive to women.

"Women are not as risk taking as men when it comes to taking that real degree they need to do well in business," Aslanian said.

The college admits cohorts to the iMBA program twice a year -- in January and August. Echambadi said the college plans to admit about 175 students for the January 2017 cohort and then continue to expand the program until it reaches

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1,000 total degree-seeking students (though that number is not “set in stone,” he said).

The program will grow “responsibly,” Echambadi stressed. At the moment, students are sorted into 25-person sections, each with an assigned teaching assistant drawn from the college’s pool of graduate students.

The college likes that ratio and does not intend to build the program to a point where it would need to increase the size of the sections, he said.

The college is also paying attention to demands on instructor time. While most of the course work can be completed asynchronously, faculty members are required to host two live sessions a week to accommodate students in different time zones.

The college has about 100 faculty

members, and roughly 20 of them have so far been involved in creating the iMBA program, Echambadi said.

In a statement, Nikhil Sinha, Coursera’s chief business officer, said the growth of the iMBA program suggests the master’s degree market is “ripe for innovation.” The MOOC provider has found UIUC’s results promising enough to launch a master of computer science in data science degree following the same model at UIUC.

“The University of Illinois has been a fantastic partner as we explore ways to make degrees from high-quality institutions more accessible through a model that is entirely online and extremely flexible,” Sinha said.

“We’re confident these programs will pave the way for other educational institutions to establish flexible, stackable and affordable gradu-

ate programs in the future.”

Although the iMBA program has attracted fewer non-degree-seeking students than expected, Echambadi said the college has yet to take advantage of two initiatives that could quickly boost those numbers.

Corporate partnerships is one of them. Since the launch, the college has heard from companies eager to sign up their employees for a single course of the iMBA program, for example strategic leadership or digital marketing, Echambadi said. The college has also been approached by other business schools interested in awarding transfer credit to their own students if they complete courses in UIUC’s program.

Both options are being considered as the iMBA program moves beyond its launch phase, Echambadi said, adding, “Our mantra is dream big, start small.” ■

<https://www.insidehighered.com/news/2016/10/07/growth-illinois-mooc-powered-mba-degree-exceeds-universitys-expectations>

Reaching for the Stars

By JENNIFER GOODMAN

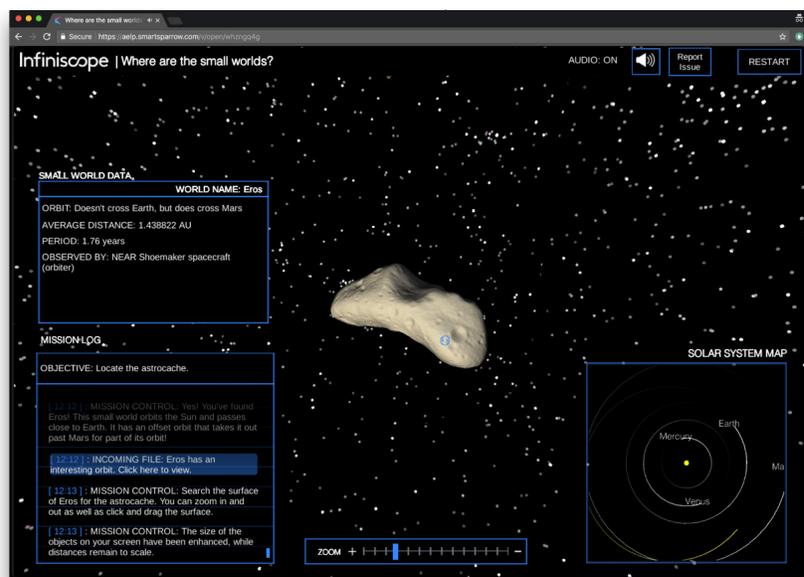
Arizona State University launches free interactive space exploration lessons fueled by NASA content -- and 1,200 users quickly jump on board.

Researchers at Arizona State University are on a mission to make science more appealing for K-12 students.

Funded by a \$10.8 million, five-year grant from NASA, the university in April 2017 launched a program that uses the agency's real-world data to create engaging educational experiences targeted to students in middle and high school. The aim of the web-based Infiniscope project is to help prepare children for the type of analytical thinking that will be required of them in college science classes.

The free program already has more than 1,200 users, far exceeding the team's goal for about 100 users in 2017, said Joe Tamer, assistant director of ASU's [Center for Education Through eXploration \(ETX\)](#), which is leading the project.

"At the college level we really want to see kids coming from middle school and high school who are better trained in science concepts,



A screen shot from the Infiniscope project

and who get the mindset of problem-solving and engaging with the unknown, not just memorizing facts from a textbook," said Ariel Anbar, the project's deputy principal investigator and director of ETX.

[The first Infiniscope module](#) is a series of digital lessons and simulations designed to teach science through the exploration of space.

Powered by NASA content and adaptive learning technology from San Francisco-based [Smart Sparrow](#), Infiniscope is available to educators, students, parents and the general public.

The program draws on emerging research that shows that science is best learned through exploration rather than the rote memorization

of facts. It presents information as a series of lessons, simulations and virtual field trips that engage students in learning by doing, said Dror Ben-Naim, ASU professor of practice and CEO and founder of Smart Sparrow.

"This is an exciting example of where digital learning is headed -- the best subject matter experts collaborating with creative instructional designers and engineers to create interactive experiences tailored to the needs of students," he said.

Model, Analyze, Interpret

The "Where Are the Small Worlds?" module teaches learners to use a model to make observations, analyze and interpret evidence as they explore small worlds -- bodies in the solar system that are not classified as a planet or a moon.

Through a simulated exploration of the solar system in search of asteroids and other objects, participants collect data on small worlds, observe the motion of different worlds to determine their location and launch probes to discover "astrocaches" hidden throughout the solar system. Users are guided along individual pathways, which adapt and give feedback as they go.

The project makes the vastness of space and space exploration inviting, accessible and interactive for educators and learners of all ages, Anbar said.

"The aim is to help learners become problem-solvers capable of exploring the unknown, rather

than just mastering what is already known," he said. "Learning science should be approached as a process and as a universe of questions rather than as a dusty collection of facts."

The learning modules can especially benefit smaller schools with limited resources or staff, said Ben-Naim. The program alerts teachers to topics that students have trouble with and prompts them to correct their mistakes.

"It's like students go on a virtual field trip through space, and then they stop and get a little quiz," he said. "If students answer incorrectly, they get feedback that tells them to go back to a certain part of the lesson to get more context for the right answer. It doesn't just give them the right answer."

The interactive nature of the lessons will be a hit with the video-game obsessed generation, Anbar said. "There's a lot of doing in the experience, you're not just sitting back and being passive," he said.

Introduced at the National Science Teachers Association Conference in San Diego earlier this month, the module includes a lesson guide for K-12 educators and is aligned to work with middle and high school curricula. The project team plans to develop at least 15 more lessons on different space-focused topics over the next four years of the grant, Tamer said.

Trial and Error

The Infiniscope project has not

been without challenges. The team had to align NASA content and space exploration themes with existing standards for middle school curriculum, which required some trial and error in the design of the program, Anbar said.

In addition, it wasn't easy staying on time and within budget while ensuring that the program was educationally sound and compelling for students.

"Meeting all those goals required some iteration during design and -- more painfully -- after development was underway," Anbar said. "It's a creative process, and like all creative processes it is not always linear nor always predictable."

Infiniscope is part of the [Inspark Science Network](#), a digital platform of educators from around the world who collaborate, create, customize and share next-generation exploratory activities. A joint initiative of the ETX Center and Smart Sparrow, the network was launched in 2015 with support from the Bill & Melinda Gates Foundation to create new digital courseware that helps students who typically fail science courses succeed.

The project perfectly aligns with the ETX Center's mission, according to Anbar.

"The idea is to build learning experiences around questions that explore ideas as opposed to telling students what the answers are, and Infiniscope is a great example of that," he said. ■

<https://www.insidehighered.com/digital-learning/article/2017/04/12/asu-uses-nasa-data-create-middle-and-high-school-program>

Michigan's 'Next Step' in Technology

BY CARL STRAUMSHEIM

U of Michigan starts a “yearlong conversation” about innovation in the classroom to determine what a public research university should look like in the 21st century.

The University of Michigan is launching an Academic Innovation Initiative to encourage even more of its faculty members to experiment with technology in the classroom.

The initiative, which comes as the university prepares to celebrate its bicentennial in 2017, is being billed as a “next step” by President Mark Schlissel for Michigan to play a leading role in shaping the future for public research universities. Schlissel formally launched the initiative during a kickoff event in October 2016.

“The initiative will formally help us consider how U of M will lead the way for higher education through the information age and further strengthen the quality of a Michigan education and our impact on society,” Schlissel said. “We know more about learners and curricula than we ever have before, and using the power of data analytics, we can measure their interactions in ways that are unprecedented. And

using digital modes of communication, we can reach millions of learners no longer limited by geography or by demographics. This initiative will help us supply all of this -- the data, the content, the access -- in service of higher education and in service of society at large.”

Michigan is by no means short of the types of experiments the university hopes the initiative will foster. The university was one of the first to embrace massive open online courses, and as recently as last month, it [became one of the strongest supporters](#) of graduate degree programs offered through MOOCs. Its in-house personalized education platform, ECoach, has this fall grown from a pilot in a handful of physics courses to a tool serving the entire freshman class. In a [news release](#) announcing the initia-



U of Michigan President Mark Schlissel speaks during a leadership breakfast event.

tive, the university also highlighted its work in data analytics with the Academic Reporting Toolkit (ART) 2.0, a visualization tool.

Most research universities could put together a similar list of projects. Another thing they likely have in common: too many projects -- at least according to a [recent survey](#) of college leaders conducted by Eduventures, which found initiative fatigue is the No. 1 barrier preventing them from improving student outcomes. Organizational silos also placed in the top three.

Teaching With Technology

The innovation initiative adds a new layer of organization to Michigan's many experiments. Three faculty-led design groups will explore how the university can increase access to education, test new ways of teaching face-to-face courses and create opportunities for academic innovation. That work will be overseen by a steering committee, also made up of faculty members, which will deliver a set of recommendations to university leaders next fall.

Michigan's Office of Academic Innovation will host the initiative. A [website](#) set up to promote the initiative features many of the projects already finished or in the works at the university, and points faculty members interested in participating to resources on campus.

James L. Hilton, vice provost for academic innovation and dean of libraries at Michigan, described the initiative as a "yearlong conversation" that will take place across the university.

"At the highest level, the Academic Innovation Initiative is an

invitation to the entire campus to imagine again what the great public research university ought to look like for this century, this technology, this economy, this global scale, this workforce," Hilton said. "We know people are going to have to continually learn, and they're probably not going to be able to drop out for one, two, three years to retrain every time they're going to have to take on something new. How do you think of Michigan in that space?"

Hilton said the innovation initiative is meant to be a positive counterargument to recent debates about the value of higher education, many of which have been framed around "threat and crisis." Online education is one example -- administrators and faculty members sometimes focus on concerns about how it could replace face-to-face education, as opposed to how it could complement it, he said.

When the initiative concludes in 2017, Hilton said he hopes to see more of everything: more new projects, more conversations among

faculty members about how to structure face-to-face courses and more involvement from the university's colleges and schools.

Joanna Millunchick, the Arthur F. Thurnau Professor of Materials Science and Engineering, serves on both the steering committee and the design group looking at increasing participation. In an interview, she said she plans to focus on projects that will increase students' access to education before they come to campus and after they have graduated.

"A real success to me a year from now is if we can point to a handful of projects, some of which have really worked and some of which have really failed," Millunchick said. "If we fail, that means we took a risk. ... What we really want to do is start shifting the culture to be less risk averse -- not to the detriment of students, of course, but to really get faculty to think about different ways of teaching their courses and different ways of engaging their students." ■

<https://www.insidehighered.com/news/2016/10/13/u-michigan-launches-yearlong-academic-innovation-initiative-promote-experimentation>

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